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(54) LOADING AND UNLOADING SYSTEM FOR SHIPS

(71) We, MACGREGOR INTERNATIONAL S.A., a Body Corporate organized under the laws of Switzerland, of St. Jakobs-strasse 9, 4002 Basel, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

- 10 The present invention relates to loading and unloading systems for ships, and the invention is particularly but not exclusively relating to ships used for transportation of pallet cargos. Ships built today for
 15 rationalised loading and unloading of pallets are usually special type ships and for this reason rather expensive. Such a special type ship is not suitable for carrying of bulk cargo. It is obvious that if a bulk carrier may be converted to a pallet ship, or vice versa, in a simple way, this would involve substantial technical and economic advantages. Accordingly, the invention has been devised with due regard to the provision of a loading and unloading system permitting a bulk carrier to be rigged into a pallet ship, or vice versa, in a simple way. The invention may enable the advantages to be achieved by ships with
 20 side gates, without including the disadvantages resulting from side gates, such as the necessity of reinforcing of the ship's structure etc.
- 25 According to the invention, there is provided a loading and unloading equipment for ships the equipment comprising an elevator platform; a pair of spaced guide means adapted for individual guiding location of the elevator platform, a hoisting device coupled with the elevator platform for effecting raising and lowering thereof, a means enabling transfer of the elevator platform between one and the other of said guide means, wherein the guide means are
 30 adapted for mounting one inboard and one

outboard of a ship to enable transport of cargo by the elevator platform between the hold and a loading area adjacent the ship via each of said guide means.

The means enabling transfer of the elevator platform may be pivotally mounted to permit said transfer.

The means enabling transfer of the elevator platform between one and the other of said guide means may comprise a guide movable selectively into alignment with one or the other of said guide means to permit transfer of the elevator platform between said guide means and said guide.

An additional elevator platform, operable by the hoisting device, and an additional guide may be provided, the two guides being locatable in alignment each with a different one of the guide means and being movable to interchange the position of the guides such that they are located in alignment with the other one of the guide means.

The system according to the invention is applicable to new ships as well as older ships which are to be rebuilt for carrying of pallet cargo, motor cars, containers. By re-rigging of for instance a bulk carrier for freightage of mixed cargo it is relatively simple to rig the cargo holds with a certain number of decks and mounting onboard a loading system in accordance with the invention and in this way obtain an appropriate pallet ship without too great expenses.

In order that the invention and its various other preferred features may be understood more easily, embodiments thereof will now be described by way of example with reference to the drawings, in which:—

Figure 1 is a transverse sectional view of one side of a ship provided with an embodiment of equipment in accordance with the invention, and with a turnable

hoisting device in working position.

Figure 2 is a view similar to that of Figure 1 showing the hoisting device in pivoted downwards position.

5 Figure 3 shows the upper part of the equipment shown in Figure 2 with a modified positioning of the ship's side guide.

10 Figure 4 shows the upper right portion of the equipment of Figures 1 or 2 illustrating a refinement of the invention in which the turnable hoisting device is mounted in a fixed base on the ship's deck. The Figure shows the hoisting device removed from the base to a storage position below the top deck of the ship.

15 Figure 5 is a transverse sectional view of a ship showing a third embodiment of the invention, in which a turnable hoisting device is run lengthwise of the ship.

20 Figure 6 is an elevational view showing part of the top deck of the ship with the system fitted according to Figure 5.

25 Figures 1 and 2 show, very simplified, a transverse section through one half of a ship's hull 1 having a ship's side wall 2, a double bottom 3, a main deck 4, an intermediate deck 5, and a top deck 6 or shelter deck. The main deck 4 and the intermediate deck 5 are provided with through openings 7 and 8, respectively, adjacent the ship's side 2 for hoisting and lowering of a winch or elevator platform to be described more fully below. In the top deck a cargo hatchway 9 with a coaming 10 is provided having a hatchway cover 11, as shown in Figure 2. On the top deck 6 a base 12 is provided between the hatchway 9 and the ship's side 2 carrying a hoisting device 14 turnable about a vertical axis 13. A supporting shaft 15 is firmly secured in the upper part of the base 12 turnably supporting the housing 16 of the hoisting device 14. The housing 16 is journaled on the shaft 15 for the shaft to accommodate axial as well as radial loads. The bearings 17, 18 on the shaft 15 are indicated in Figure 1 by shadings. The top of the base 12 and the bottom of the housing 16 are generally planar and provided at a short distance from each other. Two upper guide rails 21, 22 having a channel-shaped cross section are mounted on opposite side walls 19, 20 of the housing 16 extending vertically from the bottom of the housing approximately to the top of it. Hoisting means 23, 24 are positioned in the guide rails 21, 22 according to the example and have winch platforms 25, 26 supported on carriages 27, 28, respectively, with wheels 29 running on and being held by the bottoms and the flanges of the guide rails 21, 22. The upper guide rails 21, 22 on the housing 16 are of the same cross section as the lower guide rails of the system, to be

described below and of which one is shown in end view on Figure 2 just below the hatchway cover 11. Two winches 30, 31 are mounted in top of the housing 16 to be driven by electrical, hydraulic, or mechanical means and having drums on which the hoisting lines 32, 33 for the winch platforms 25, 26 are wound. The turnable housing 16 with the guide rails, winch platforms and winches will be seen in elevation in Figure 6, which otherwise shows another embodiment of the invention. Instead of two separate winches only one may be used having independently driven drums. The winches 30, 31 and with these the winch platforms are driven independently of each other. The distance between the axis of rotation 13 of the hoisting device 14 and the ship's side is such that one of the guide rails is located outside the ship's side in the event of both guide rails being situated in the transverse plane of the ship, as shown in Figure 1.

Extending vertically downwards from the top of the base 12 are two lower guide rails 34, 35 in alignment with the upper guide rails 21, 22, when these are located in the transverse plane of the ship, and having the same cross section as the upper rails, that is a lower outer guide rail 34 extending downwards along the ship's side, and a lower inner rail 35 extending through the hatchway 9 of the top deck 6 and openings 8, 7 in the intermediate deck 5 and the main deck 4, respectively, downwards to the top 36 of the double bottom of the ship. The lower outer rail 34 is according to Figure 1 pivotably mounted on a trunnion 37 firmly secured in the side of the base 12. The length of the outer rail downwards is the height of the side of the ship and a stopping device 38 is arranged on the ship's side 2 directly below the lower end of the rail, which may also act as a fender. At the base 12 and/or on the ship's side latching means are present (not shown) for keeping the guide rail 34 in a proper vertical position. The lower inner guide rail 35 comprises two sections. The lower section 35a is extending upwards from the top 36 of the double bottom to a location between the intermediate deck 5 and the top deck 6 being firmly mounted. The upper guide rail section 35b is pivotably connected to the lower rail section 35a by means of a lever 39 which at a location between its ends is pivotably mounted on a trunnion 40 provided in a support 41 secured to the deck assembly 5. The upper end of the lever (as seen in Figure 1) is firmly secured to the lower portion of the upper rail section (e.g. by welding), while the lower end of the lever is link-connected with the ship's structure by means of a

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jack 42 (cylinder piston assembly). This appears particularly clear from Figure 2. In the Figures only one jack 42 is shown, but the system comprises preferably two levers 39 spaced apart and two jacks 42 to improve the stability. The upper end of the upper rail section 35b is firmly secured to the inner side of the base 12 (this is also best seen in Figure 2). The base 12 supporting the housing 16 is not firmly secured to the deck structure 6 but is resting on the deck structure and base supports 43 on the deck when located in the working position shown in Figure 1.

As can be seen from Figure 2, the complete hoisting device 14 with the base 12, the housing 16 and the platforms 25, 26 may accordingly be pivoted downwards into the cargo hold 44 below the top deck by activating the jack 42 (making it shorter) so that the upper guide section is forced to move into a generally horizontal position in which this section is resting against supports 45 arranged on the intermediate deck 5. When the turnable hoisting device is situated in working position as seen in Figure 1 the base 12 is in locking engagement with the deck structure by means of latching elements (not shown).

As mentioned above, the lower outer guide rail 34 is pivotable about the trunnion 37. When the hoisting device 14 is to be stored into the cargo hold the guide rail 34 is pivoted into horizontal position (by hoisting means on the deck) being lockingly secured, and then the hoisting device 14 with the base 12 may be pivoted down into the position shown in Figure 2. The lower outer guide rail 34 is then extending lengthwise of the ship as it appears from this Figure.

The system is provided with means (not shown) which only permits turning of the hoisting device 14 about the vertical shaft 15 when both winch platforms 25, 26 are located in the upper guide rails 21, 22. The system further comprises means permitting lowering of the winch platforms only when the inner rails 21, 35 and the outer rails 22, 34 are in alignment with each other. A security arrangement of this kind includes elements known per se and is no part of the invention, accordingly it will not be described further herein.

The mode of operation of the system will be described with reference to Figure 1. The ship is located by a pier 46, as shown. The turnable hoisting device 14 is pivoted upwards into working position and turned so that both upper guide rails 21, 22 are situated generally in the transverse plane of the ship and in alignment with the lower guide rails 35, 34, the outer rail 34 being pivoted down into a vertical position. The outer winch platform 26 may then be

lowered to the downward position A to receive a pallet cargo from for instance a truck 47. If desired, the inner winch platform 25 may simultaneously be lowered to the intermediate deck 5 for instance, to receive a cargo from another truck 48, as shown. The platforms are then hoisted upwards into the position shown in full lines in Figure 1, and the hoisting device is turned through 180°. Then the platforms are lowered again so that the cargo on the now inner platform may be transferred to the cargo hold of the ship, while the cargo from the outer platform may be transferred to the truck on the pier. Now, the platforms are again hoisted upwards and the operation is repeated. It is obvious that the system may be used for loading only or unloading only of the ship when this is required. The two winch platforms are driven independently of each other as mentioned above, but it is also possible to run them synchronously if this is considered of advantage.

Figure 3 generally shows the same system as Figure 2 except that the outer lower guide rail 134 is not pivotably mounted on the base 112 of the hoisting device but on a separate base 143 on the deck, so that this guide rail does not follow the hoisting device 14 when this is to be pivoted down below deck. The hatchway of the top deck is closed by a cover as shown in Figure 2, so that the hoisting device is protected against climatic influences when not in operation and the ship is sailing.

Figure 4 shows another embodiment of the invention in which is omitted the downward pivotable base of the turnable hoisting device 214. Instead of the base 12 according to Figures 1, 2 or 3 a fixed base 212 is provided on the deck structure 206 and comprises a block with a tapered bore 249, the vertical center axis of which is situated at such a distance from the ship's side 202 that the upper outer guide rail (not shown) is located outside the ship's side when the hoisting device is in the working position. The supporting shaft 215, or the turning shaft, of the hoisting device 214 is in this case provided with a tapered trunnion 250 at the lower end fitting into the bore 249. The lower side of the base block 212 is provided with a recess 251 for a latching means (not shown) locking the shaft firmly into the base. In or on the intermediate deck of the ship (or somewhere else on board) a similar mounting base 252 is provided for the hoisting device. This device may be lifted upwards out of the base 212 and secured into the base 252 in the cargo hold 244 as shown in Figure 4. The base 212, the inner rail 235 and the outer rail 234 having in this

case their top edges somewhat below the level of the top edge of the hatchway coaming, so that the cover may be arranged on the hatchway of the top deck without the inner guide rail being an obstacle. Figure 4 also shows the outer guide rail 234 being provided in a recess in the ship's side (shown in detail in Figures 5 and 6).

It is obvious that the turnable hoisting device may also be permanently mounted on a base at the ship's deck, being of the type shown in Figure 4 or some other suitable base. The upper section of the inner guide rail may also, if desired, in this case be pivotable downwards as in the embodiments according to Figures 1 and 2. The mode of operation of the system according to Figure 4 is exactly the same as disclosed above. It is also obvious that a number of turnable hoisting devices 14, 214 of the types described above may be arranged along a ship's side.

Figures 5 and 6 show an embodiment of the invention in which the turnable hoisting device 314 is turnably mounted with its turning shaft on a carriage 353 running in a channel-shaped track 343 extending between the coaming 357 of the hatchway or hatchways of the top deck and the ship's side 302, and being provided with lower wheels 355 and side wheels 356 guiding the carriage in the track 343, the hoisting device 314 being of the above mentioned types. Hoisting openings 307, 308, 359 are provided adjacent the ship's side in the decks 304, 305, 358 of the cargo holds situated below, as shown in Figure 5. The inner guide rail 335 is firmly mounted extending from a recess 360 in the top of the double bottom and all the way up to the edge of the top hatchway coaming 357. Although a corresponding outer guide rail 334 on the ship's side is shown for each inner guide rail 335 it is not definitely necessary to have such outer guide rails for all of the hatchways. The outer lower guide rail 334 is provided in a recess 361 in the side plating of the ship for better protection, as shown in Figures 5 and 6.

In addition to the above mentioned security means for preventing a turning of the hoisting device if both of the winch platforms are not located in the top position, and means for preventing hoisting or lowering if the upper and lower guide rails are not in alignment with each other, the system according to Figures 5 and 6 also includes per se known elements securing that turning and hoisting or lowering may occur only when the carriage is located in such a position that the upper guide rails 321, 322 are in alignment with a pair of the lower guide rails 335, 334 of the ship.

Onboard ships with several cargo holds

small hatchways may be provided in the top hatchway cover. The hoisting device may then be run or lifted to the various hatchways either together with the outer lower guide rail or without this rail.

The invention is not limited by the disclosed embodiments. In particular it must be understood that the different embodiments may be used in combination with each other. It must be especially mentioned that the term "winch platform" is to be understood in the widest meaning of the word. The most simple type may be in the form of a fork, but it is also possible that the platform is shaped as a container, or the like, all depending on the type of ship involved and the type of cargo for which the ship is adapted.

WHAT WE CLAIM IS:

1. A loading and unloading equipment for ships, the equipment comprising an elevator platform; a pair of spaced guide means adapted for individual guiding location of the elevator platform, a hoisting device coupled with the elevator platform for effecting raising and lowering thereof, a means enabling transfer of the elevator platform between one and the other of said guide means, wherein the guide means are adapted for mounting one inboard and one outboard of a ship to enable transport of cargo by the elevator platform between the hold and a loading area adjacent the ship via each of said guide means.
2. A loading and unloading equipment as claimed in Claim 1, wherein the means enabling transfer of the elevator platform is pivotally mounted to permit said transfer.
3. A loading and unloading equipment as claimed in Claim 1 or 2, wherein the means enabling transfer of the elevator platform between one and the other of said guide means comprises a guide movable selectively into alignment with one or the other of said guide means to permit transfer of the elevator platform between said guide means and said guide.
4. A loading and unloading equipment as claimed in claim 3, comprising an additional elevator platform, operable by the hoisting device, and an additional guide the two guides being locatable in alignment each with a different one of the guide means and being movable to interchange the position of the guides such that they are located in alignment with the other one of the guide means.
5. A loading and unloading equipment as claimed in any preceding claim, wherein the guide means which is adapted for mounting outboard of a ship is pivotally mounted about an axis at right angles to the guiding direction so as to permit pivoting about a transverse axis of a ship.

case their top edges somewhat below the level of the top edge of the hatchway coaming, so that the cover may be arranged on the hatchway of the top deck without the inner guide rail being an obstacle. Figure 4 also shows the outer guide rail 234 being provided in a recess in the ship's side (shown in detail in Figures 5 and 6).

It is obvious that the turnable hoisting device may also be permanently mounted on a base at the ship's deck, being of the type shown in Figure 4 or some other suitable base. The upper section of the inner guide rail may also, if desired, in this case be pivotable downwards as in the embodiments according to Figures 1 and 2. The mode of operation of the system according to Figure 4 is exactly the same as disclosed above. It is also obvious that a number of turnable hoisting devices 14, 214 of the types described above may be arranged along a ship's side.

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Onboard ships with several cargo holds

small hatchways may be provided in the top hatchway cover. The hoisting device may then be run or lifted to the various hatchways either together with the outer lower guide rail or without this rail.

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WHAT WE CLAIM IS:

1. A loading and unloading equipment for ships, the equipment comprising an elevator platform; a pair of spaced guide means adapted for individual guiding location of the elevator platform, a hoisting device coupled with the elevator platform for effecting raising and lowering thereof, a means enabling transfer of the elevator platform between one and the other of said guide means, wherein the guide means are adapted for mounting one inboard and one outboard of a ship to enable transport of cargo by the elevator platform between the hold and a loading area adjacent the ship via each of said guide means.
2. A loading and unloading equipment as claimed in Claim 1, wherein the means enabling transfer of the elevator platform is pivotally mounted to permit said transfer.
3. A loading and unloading equipment as claimed in Claim 1 or 2, wherein the means enabling transfer of the elevator platform between one and the other of said guide means comprises a guide movable selectively into alignment with one or the other of said guide means to permit transfer of the elevator platform between said guide means and said guide.
4. A loading and unloading equipment as claimed in claim 3, comprising an additional elevator platform, operable by the hoisting device, and an additional guide the two guides being locatable in alignment each with a different one of the guide means and being movable to interchange the position of the guides such that they are located in alignment with the other one of the guide means.
5. A loading and unloading equipment as claimed in any preceding claim, wherein the guide means which is adapted for mounting outboard of a ship is pivotally mounted about an axis at right angles to the guiding direction so as to permit pivoting about a transverse axis of a ship.



6. A loading and unloading equipment as claimed in any preceding claim, wherein the hoisting device and the means enabling transfer of the elevator platform are mounted on a common base support. 5
7. A loading and unloading equipment as claimed in any preceding claim, wherein the guide means which is adapted for mounting inboard of a ship has an upper portion pivotally connected to a lower portion to permit in use the upper portion to be pivoted from a position where it extends above a ships deck and a position where it is situated below deck. 10
8. A loading and unloading equipment as claimed in Claim 6, wherein the hoisting device and the means enabling transfer of the elevator platform are mounted on a common base support and the upper portion of the guide means which is adapted for mounting inboard of a ship is fixedly mounted on the base and so arranged that the pivotal connection with the lower portion permits pivoting of the base with its attached equipment to permit in use the pivoting of the base inboard of a ship. 15
9. A loading and unloading equipment as claimed in Claim 6 or 8, wherein the hoisting device is detachably mounted on the fixed base. 20
10. A loading and unloading equipment as claimed in Claim 7, 8 or 9 wherein the common base support is movable along a track suitable for mounting on the deck of a ship. 25
11. A loading and unloading equipment substantially as described herein with reference to, or as illustrated in, the drawings.
12. A ship provided with a loading and unloading equipment as claimed in any preceding claim wherein one of the guide means is mounted inboard of the ship and arranged to communicate with the body of the ship via a hatchway. 30
13. A ship provided with a loading and unloading equipment as claimed in Claim 10, wherein the track is mounted along the ship adjacent a plurality of hatchways to permit movement of the common base support and lifting platform therealong to a selected hatchway. 35
14. A ship including a loading and unloading equipment as claimed in Claim 13 when dependent from Claim 3, wherein some or all of the hatchways are provided with guide means for communication with the body of the ship which guide means are suitable for receiving the common base in guiding engagement therewith on alignment of said guide of the means for enabling transfer of the elevator platform therewith. 40
15. A ship as claimed in Claim 13 or 14, wherein the track is mounted in a recess on the deck of the ship. 45
16. A ship as claimed in Claim 12, wherein the guide means which is adapted for mounting inboard of the ship is mounted such that the pivotal axis between upper and lower portions is situated in a transverse plane of the ship below the top deck and permits said base to be pivoted between an upward position where it rests on the top deck of the ship and a downward position where it rests on a lower deck structure. 50
17. A ship provided with a loading and unloading equipment as claimed in any one of Claims 1 to 4, wherein the guide means which is adapted for mounting outboard of a ship is securely mounted on the ship's side. 55
18. A ship provided with a loading and unloading equipment substantially as described herein with reference to, or as illustrated in, the drawings. 60
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