

PATENT SPECIFICATION (11)

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- (21) Application No. 8101/78 (22) Filed 1 March 1978 (19)
 (31) Convention Application No. 770 721 (32) Filed 2 March 1977 in
 (33) Norway (NO)
 (44) Complete Specification published 8 April 1981
 (51) INT. CL.³ B66F 9/02
 (52) Index at acceptance

B8H 505 603 605 PD
 B8L 24 50 B CB



SCIENCE REFERENCE LIBRARY

(54) SIDE PORT LOADING HOIST SYSTEM

(71) We, NORSK MACGREGOR A/S a Norwegian Joint Stock Company of Østre Muralm 1, 5000 Bergen, Norway 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:—

This invention relates to loading hoist systems co-operating with a vertical loading aperture, in particular a side port of a ship.

Ships are formerly known having side ports and hoisting means arranged within the ship hull. One side port system comprises a side port cover which can be turned outwards and be used as a loading ramp, so that a truck can run up the ramp and deliver its cargo to the platform of a hoist. Since the height dimension of a side part is rather limited, it is a drawback of such an embodiment that the driving ramp can become too short and too steep when the ship is floating without cargo and/or the quay is low (e.g. because of the tide).

A loading and unloading arrangement is also formerly known comprising a loading ramp provided with transport wheels and which can be moved into the side port of a ship. The hoist platform is provided with conveyor rollers so that cargo can be transferred from the hoist to the ramp or vice versa and then transferred to a truck on board or a truck on the quay. The control of such an arrangement is rather complex and in addition it is not suited for mixed cargo.

It will be understood that a more rational way to convey cargo between quay and ship would be to deliver cargo directly from a truck on the quay to the hoist platform on board. The object of this invention is to provide a loading system which allows that cargo can be conveyed directly from a truck or the like on the quay to the hoist platform and vice versa and which can be used regardless the actual height dimension of the quay or the draught of the ship.

According to the invention there is provided a loading and unloading system for a ship, comprising a loading/unloading aperture

in a substantially vertical hull wall of the ship, a substantially vertical hoist shaft located on an inner side of and adjacent to the wall, at least one hoist carriage movable along said hoist shaft and supporting a substantially horizontal loading platform, the platform being movable substantially horizontally through the loading/unloading aperture between a first position on the inner side of the wall and within the hoist shaft and a second position on the outer side of the wall.

Preferably, the platform of the hoist is arranged to pivot in a horizontal plane with respect to the carriage. The system preferably includes adjustable stopping means for the movement of the hoist carriage, so that the platform level can be adjusted in advance, for example to the height of a quay. The advantage of this embodiment is obvious. When the hoist platform is adjusted to the correct level above the quay a truck can receive/deliver cargo from/to the platform without need of a loading ramp so that no more quay area is needed than what is necessary for the truck itself. So, the distance between the water side of the quay and e.g. a warehouse can be reduced.

A particularly expedient loading and unloading system has two loading hoists provided with platforms movable through the same port. The width of the port is then utilized optimally for loading or unloading and, in addition, it is possible to use one of the hoists for loading and the other one for unloading.

Preferably a cantilever arm is supported pivotally on the hoist carriage and supports the platform at its free lever end, there also being provided parallel bracing rod to control the angular position of the platform as it moved by the cantilever arm, for example to ensure that the platform is always located in a parallel position relative to the ship side. The platform can be moved out relatively far across the quay and/or bridge over the gap between the ship side and the quay which renders it possible to use the system on large ships having large fenders, e.g. with a diameter of 1 m, placed between the ship side and

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the quay. As cargo is placed directly on the hoist platform it is no longer necessary to scan over the outlines of the cargo by means of photo cells or the like. The geometrical shape of the cargo has no influence on the loading/unloading sequence.

In one embodiment of the invention a guide rod is pivotably connected between the carriage and the platform to rotate the latter horizontally up to 90° when being moved out to the external position, for adaption to the actual condition on the loading/unloading location on a quay.

The invention will be explained more closely by way of example and with reference to the accompanying drawings.

In the drawings Figure 1 is a cross section elevation of a ship side and adjacent deck portions of a ship as well as of a portion of a quay, Figure 2 is a plan view of the embodiment of Figure 1, and Figures 3 and 4 are plan views corresponding to Figure 2 of another embodiment of the invention.

Figure 1 shows a portion of a ship 1 having a ship side 2, a double tank top 3, a between deck 4, and a top deck 5. A side part 6 is provided in the ship side 2. Inside the ship and adjacent the port a vertical hoist shaft 7 is provided extending from the tank top 3 through apertures in the decks 4 and 5 and ending between two hoist tower mountings 8 on the top deck 5, one of them being indicated in Figure 1.

The sectional view of the ship in Figure 1 can be considered as made along the line I-I in Figure 2, but shows the hoist with the platform in a turned out position. As shown in Figures 1 and 2, at least at one of the sides of the shaft which extends in planes rectangular to the side port aperture 6 a plurality of guide bars 9-12 are provided extending in parallel and mutually spaced along the whole vertical dimension of the shaft. On the top of the hoist tower 8 a hoist winch 13 is mounted having a hoist cable 14 in which a hoist carriage 15 is suspended. The carriage is in shape of a relatively flat, welded box structure having its main dimension in the vertical plane. The carriage 15 is substantially rectangular and somewhat oblong in the vertical direction and has four rollers 16 in one plane and two rollers 17 positioned in a plane being normal to the plane of the wheels 16. The guide bars 9-12 are so positioned in relation to the carriage rollers that the carriage is not allowed to decline from the imagined vertical axis along which the carriage is moving.

On the side of the carriage facing the shaft and near the outer edge of the carriage there are provided two bearing brackets 18 mounted above one another presenting a pivotable bearing for a cantilever arm 19 supporting at its outer end a hoist platform 20. As shown in Figure 1 the inner portion 21 of the cantilever

arm 19 has a substantial height dimension and the vertical distance between the bearing brackets 18 is relatively large. The cantilever arm 19 is made as a welded box structure and is supported pivotably by a pivot shaft 22 on the bearing bracket structure 18, 18. At its outer end the cantilever arm 19 has a vertical sleeve bearing 23. The platform 20 is made as a flat, rectangular, oblong box or plate structure reinforced by ribs on the under side thereof and having in its center of gravity a bearing pivot 24 projecting downwardly into the sleeve bearing 23 at the end of the cantilever arm 19.

On the inner side (shaft side) of the hoist carriage 15 there are in addition to the bearing brackets 18 also provided two bearing brackets 25 located spaced from the bearing brackets 18. On the under side of the platform 20 and spaced from the bearing 23, 24 a pivot 26 is provided and a parallel brace 27 is connected pivotably between the brackets 25 and the pivot 26. The arrangement is so that the line intersecting the axis of the two pivot bearings 22, 24 of the platform 20 extends in parallel with the line intersecting the axes of the parallel brace pivots 25a, 26, respectively. Spaced from the above mentioned bearing brackets 18, 25 and more remote from the ship side the carriage 15 has a further bearing bracket 28, a corresponding bearing bracket 29 being provided on the inner side of the cantilever arm 19 spaced from the pivot end thereof. Between the brackets 28, 29 at least one double acting hydraulic jack 30 is provided and connected with a driving energy source, not shown. When considering Figure 2 it will be understood that when the jack is actuated the piston rod of the jack will be extended causing the cantilever arm 19 to pivot outwardly and the whole platform with the cantilever arm and the parallel brace will be displaced outwardly, i.e. displaced in parallel with itself (translation movement) along an arc-shaped path to a position outside the side port 6. As shown in Fig. 2 two hoists 15, 20; 15', 20' are accommodated in the shaft 7. In case of a smaller side port aperture, however, it would be satisfactorily to provide a single hoist apparatus, e.g. as suggested with the bracket A in the upper part of Figure 2.

The control system for the hoist apparatus is not shown as it comprises mainly known components. The control system comprises among others a plurality of adjustable limit switches arranged along the shaft 7 defining the distance to be selected from the lower edge 31 of the side port aperture 6 for stopping the movement of the carriage 15 with platform 20. With these stopping means the height difference between the quay level 32 (see Figure 1) and the platform 20 can be determined optimally for loading and unloading so that it can be operated at a height difference

which is the m lift truck 33. A lift truck 33 container 34, When the cargo activated and to the hoisting drum 13 is sta the cargo ship. Another the cargo and location in the

In the load hoist system a top cover 36 hoist shaft where the plant is not are turned down seals against aperture.

The loading 3 and 4 is identical except for the guide brace 122 brace of Figure guide brace 122 riage 15 and that the brace with the cantilever arm between and relation to those cantilever arm form 20 will be turned to the Figure 4. The tensile link (effective lever varied to rotate position. Instead be used cooper fixedly mounted platform coaxial This embodiment the utility of invention.

According to operated by me be understood t provided with (telescopic cylinders operating means rack). Various for the pivoting Obviously, car directly from the ship hold.

WHAT WE 1. A loading ship, comprising a structure in a substantial ship, a substantial located on an i the wall, at least along said hoist

right dimension and between the bearing edge. The cantilevered box structure and a pivot shaft 22 on structure 18, 18. At its arm 19 has a vertical form 20 is made as a box or plate structure on the under side center of gravity a sag downwardly into the end of the cantilevered

ft side) of the hoist in addition to the bearing and two bearing brackets from the bearing side of the platform bearing 23, 24 a pivot parallel brace 27 is between the brackets 25 arrangement is so that axis of the two pivot platform 20 extends in intersecting the axes of 25a, 26, respectively. mentioned bearing are remote from the has a further bearing guiding bearing bracket the inner side of the d from the pivot end brackets 28, 29 at least a hydraulic jack 30 is provided with a driving energy in considering Figure that when the jack is d of the jack will be cantilever arm 19 to the whole platform with the parallel brace will ly, i.e. displaced in translation movement) ath to a position outside shown in Fig. 2 two are accommodated in of a smaller side port would be satisfactorily dist apparatus, e.g. as bracket A in the upper part

for the hoist apparatus comprises mainly known control system comprises ability of adjustable limiting the shaft 7 defining the lower edge structure 6 for stopping the carriage 15 with platform lifting means the height the quay level 32 (see platform 20 can be determined and unloading so at a height difference

which is the most appropriate, e.g. for a fork lift truck 33. As shown in Figure 1 the fork lift truck 33 delivers the cargo, e.g. a pallet or container 34, directly on to the platform 20. When the cargo is delivered the jack 30 is activated and the platform is moved inwardly to the hoisting position and then the winch drum 13 is started for movement to convey the cargo upwardly or downwardly into the ship. Another truck or trolley will take over the cargo and convey it to the destined location in the ship hold.

In the embodiment shown in Figure 1 the load hoist system has a side port cover 35 and a top cover 36 which provide a roof over the hoist shaft when in turned up position. When the plant is not being used the covers 35, 36 are turned down so that the side port cover 35 seals against the edges of the side port aperture.

The loading arrangement shown in Figures 3 and 4 is identical with that of Figures 1 and 2 except for the shape and location of the guide brace 127 corresponding to the parallel brace of Figures 1 and 2. The pivots of the guide brace 127 are so mounted on the carriage 15 and the platform 20, respectively, that the brace 127 does not extend in parallel with the cantilever arm 19. The distance between and location of these pivots in relation to those of the pivots 125a, 23 of the cantilever arm are so selected that the platform 20 will be rotated about 90° when it is turned to the external position as shown in Figure 4. The brace 127 comprises an extensible link (e.g. a hydraulic jack) 140, so the effective length of the brace may be varied to rotate the platform to the desired position. Instead of a jack a tooth rack may be used cooperating with a tooth wheel 141 fixedly mounted on the under side of the platform coaxially with the platform pivot 23. This embodiment improves the flexibility in the utility of the system according to the invention.

According to the example the hoist is operated by means of a cable winch 13. It will be understood that the hoist apparatus can be provided with hydraulic operating means (telescopic cylinders) or other mechanical operating means (screw spindle and tooth rack). Various ways of operation can be used for the pivoting movement of the platform 20. Obviously, cargo can also be transferred directly from the platform to the adjacent ship hold.

WHAT WE CLAIM IS:—

1. A loading and unloading system for a ship, comprising a loading/unloading aperture in a substantially vertical hull wall of the ship, a substantially vertical hoist shaft located on an inner side of and adjacent to the wall, at least one hoist carriage movable along said hoist shaft and supporting a sub-

stantially horizontal loading platform, the platform being movable substantially horizontally through the loading/unloading aperture between a first position on the inner side of the wall and within the hoist shaft and a second position on the outer side of the wall.

2. A system as claimed in claim 1, in which the hoist carriage is guided for movement along a side of the hoist shaft substantially at a right angle to the plane of the loading aperture.

3. A system as claimed in claim 1 or 2, in which the hoist platform is pivotable in a horizontal plane with respect to the carriage.

4. A system as claimed in claim 1, 2 or 3, in which the carriage on a side thereof facing the interior of the shaft supports pivotably a horizontal cantilever arm having at its outer end a pivotable support for the pivotable platform, at least one hydraulic cylinder being provided between the carriage and the cantilever arm for turning the cantilever arm to pivot the platform.

5. A system as claimed in claim 4, in which a guiding brace spaced horizontally from the cantilever arm is linked to the carriage and to the platform to control the angular position of the platform.

6. A system as claimed in claim 5, in which the guiding brace extends parallel to the cantilever arm.

7. A system as claimed in claim 4 or 5, in which the guiding brace extends at an angle to the cantilever arm and has a variable effective length to rotate the platform during its movement.

8. A system as claimed in any one of claims 1 to 7, in which at least one double acting hydraulic cylinder is provided for pivoting the platform.

9. A system as claimed in any one of claims 1 to 8, in which adjustable means are provided along the shaft to stop the hoist platform at a predetermined height level.

10. A system according to any one of the preceding claims in a ship comprising a side port aperture having a side port cover, or a side port cover and a top cover which are hinged to one another with the top cover being hinged to the upper deck of the ship, the hoist shaft extending from a bottom wall of the ship to a level above an upper deck, the hoist carriage being movable along one of the sides of the shaft which extends substantially perpendicularly to the port aperture and is disposed to one side thereof, guide bars in the shaft preventing the carriage from tipping or turning in at least two planes and serving as support for rollers of the carriage, support bearings on the inner (shaft) side of the hoist carriage supporting a cantilever arm which can be turned outwardly through the port aperture and at the outer end thereof having a support bearing for the platform which is pivotable, substantially four-edged, and has



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of the hoist to the bearing bearing brack- the bearing of the platform 23, 24 a pivot brace 27 is e brackets 25 ent is so that the two pivot 20 extends in g the axes of , respectively. oned bearing note from the urther bearing aring bracket er side of the the pivot end 28, 29 at least ack 30 is pro- driving energy idering Figure hen the jack is e jack will be er arm 19 to platform with allel brace will displaced in on movement) a position out- in Fig. 2 two commodated in aller side port be satisfactorily paratus, e.g. as n the upper part

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According to the example the hoist is operated by means of a cable winch 13. It will be understood that the hoist apparatus can be provided with hydraulic operating means (telescopic cylinders) or other mechanical operating means (screw spindle and tooth rack). Various ways of operation can be used for the pivoting movement of the platform 20. Obviously, cargo can also be transferred directly from the platform to the adjacent ship hold.

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4. A system as claimed in claim 1, 2 or 3, in which the carriage on a side thereof facing the interior of the shaft supports pivotably a horizontal cantilever arm having at its outer end a pivotable support for the pivotable platform, at least one hydraulic cylinder being provided between the carriage and the cantilever arm for turning the cantilever arm to pivot the platform.

5. A system as claimed in claim 4, in which a guiding brace spaced horizontally from the cantilever arm is linked to the carriage and to the platform to control the angular position of the platform.

6. A system as claimed in claim 5, in which the guiding brace extends parallel to the cantilever arm.

7. A system as claimed in claim 4 or 5, in which the guiding brace extends at an angle to the cantilever arm and has a variable effective length to rotate the platform during its movement.

8. A system as claimed in any one of claims 1 to 7, in which at least one double acting hydraulic cylinder is provided for pivoting the platform.

9. A system as claimed in any one of claims 1 to 8, in which adjustable means are provided along the shaft to stop the hoist platform at a predetermined height level.

10. A system according to any one of the preceding claims in a ship comprising a side port aperture having a side port cover, or a side port cover and a top cover which are hinged to one another with the top cover being hinged to the upper deck of the ship, the hoist shaft extending from a bottom wall of the ship to a level above an upper deck, the hoist carriage being movable along one of the sides of the shaft which extends substantially perpendicularly to the port aperture and is disposed to one side thereof, guide bars in the shaft preventing the carriage from tipping or turning in at least two planes and serving as support for rollers of the carriage, support bearings on the inner (shaft) side of the hoist carriage supporting a cantilever arm which can be turned outwardly through the port aperture and at the outer end thereof having a support bearing for the platform which is pivotable, substantially four-edged, and has

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at the underside thereof a central support bearing on the free end of the cantilever arm, a guiding brace extending at a distance from the cantilever arm and linked at one end thereof to the hoist carriage and at the other end thereof to the platform, double acting, hydraulic jack means linked between the hoist carriage and a location on the cantilever at a distance from the carriage, and stopping means adjustable along the shaft to stop the hoist carriage with the platform at a predetermined height level.

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11. A loading and unloading hoist system substantially as herein described with reference to the accompanying drawings.

12. A system according to any one of the preceding claims, in which two hoist carriages are provided at the opposite sides of the hoist shaft, said carriages facing each other and each supporting a horizontal platform which can be moved through the loading/unloading aperture.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

