

SPECIFICATION

TITLE OF THE INVENTION

Omnidirectionally Loadable System

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BACKGROUND OF THE INVENTION

(i) Field of the Invention

This invention relates to a cargo relay system that is positioned between a first ship and a second ship to relay cargos when the cargos are transshipped from the first ship to the second ship.

(ii) Description of the Related Art

For example, when cargos such as mined coals are transported by a large ship such as a Panamax ship (mother ship), it is difficult to tie up such a large ship at the shallows. Thus, it is generally required to load the cargos on a small ship such as a sand carrier tied up at the shallows near the mining site once, carry these cargos by the small ship to the off-island large ship and transship the cargos from the small ship to the large ship.

20 However, such a transshipment method has such a problem that when the large ship is unavailable because of being in the middle of transportation, transfer of the cargos by the small ship has to be halted, resulting in a decrease in working efficiency.

Further, there is currently no cargo relay system (ship) that is positioned between a first ship and a second ship to relay cargos when the cargos are transshipped from the first ship to the second ship. Therefore, prior art documents do not particularly exist.

SUMMARY OF THE INVENTION

Example embodiment of present invention has been conceived to solve the above problem in the prior art. Example embodiments of the present invention seek to improve the efficiency of transshipment of cargos between ships.

According to a first aspect, there is provided a cargo relay system that is positioned between a first ship and a second ship to relay cargos when the cargos are transshipped from the first ship to the second ship, the system comprising repositories for storing at least larger cargos than the load capacity of the first ship temporarily, first transshipment means provided in a lower portion of the system on the side of the first ship, for acquiring cargos from the first ship, first conveyors provided around the repositories, for transferring the cargos acquired from the first ship by the first transshipment means to an upper portion of the system, second transshipment means provided in the upper portion of the system on the side of the second ship opposite to the side of the first ship, for storing the cargos transferred by the first conveyors on the repositories temporarily, and second conveyors positioned between the side of the first ship and the side of the second ship and under the repositories, for transferring the cargos stored temporarily in the repositories, the second transshipment means transshipping the cargos transferred to the upper portion of the system by the second conveyors and the first conveyors to the second ship.

Further, the above system may use vibratory equipment when taking out the cargos from the repositories.

According to a second aspect, there is provided a ship comprising a cargo relay system.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic plan view of a relay system according to the present invention together with peripheral equipments.

Fig. 2 is a side view of Fig. 1.

Fig. 3 is a front view of Fig. 1.

5 Fig. 4 is a schematic plan view of first transfer means and second transfer means.

Fig. 5 is a schematic side view of Fig. 4.

Fig. 6 is a diagram showing Fig. 4 viewed from the A-A direction.

10 Fig. 7 is a diagram showing Fig. 4 viewed from the B-B direction.

Fig. 8 is a diagram showing Fig. 4 viewed from the C-C direction.

15 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, a suitable embodiment of the present invention will be described with reference to the attached drawings. Figs. 1 to 3 schematically show a relay system 30 according to the present invention, together with a large ship 10 and a small ship 20 that can use the system 30. Fig. 1 is a schematic plan view of the large ship 10, small ship 20 and relay system 30, Fig. 2 is a side view thereof, and Fig. 3 is a front view thereof.

25 The relay system 30 is positioned between the small ship (first ship) 20 and the large ship (second ship) 10 to temporarily store cargos such as coals 3, when the cargos are transshipped from the ship 20 to the ship 30, for example. By the temporary storage, for example, the small ship 20 can engage in transshipment via the relay system 30 even when the large ship 10 cannot engage in transshipment because of being in the middle of transportation,

and the cargos stored temporarily in the relay system 30 can be transferred to the large ship even when the small ship cannot engage in transshipment because of being in the middle of transportation. Thus, the efficiency of transshipment can be improved significantly.

5 Although Figs. 1 to 3 show a case where both the small ship 20 and the large ship 10 exist for the sake of convenience, it is needless to say that the relay system 30 can also be applied to a case where only one of the ships exists. The large ship 10 may be, for example, a Panamax ship having an overall length of about 200 m, and the
10 small ship 20 may be, for example, a sand carrier having an overall length of about 10 m. Further, the relay system 30 may be formed as a general ship that can move on its own just like the large ship 10 and the small ship 20 or may be moved by being towed by another ship.

15 For temporary storage of cargos, the relay system 30 comprises repositories 32-1 to 32-3. These repositories 32-1 to 32-3 can store at least larger cargos than the load capacity of the small ship 20 temporarily. For example, the storage capacity of the repositories may be equal to the load capacity of the large ship
20 10, and in this case, cargos to be loaded on the large ship 10 can be prepared (stored) in perfect condition for the next arrival in port of the large ship 10 even when the large ship 10 is not in the port. The storage period is not particularly limited and may be a long period, e.g. one year.

25 For transshipment of cargos, the relay system 30 comprises two types of transshipment equipments (transshipment means). One of them is first transshipment means 34 that can also be called excavator or the like, and the other is second transshipment means 36 that can also be called spreader system or the like. The first

transshipment means 34 are provided on a side on the small ship 20 side, and the second transshipment means 36 are provided on the opposed side on the large ship 10 side. These transshipment means 34 and 36 may be provided, for example, such that they can be slid
5 along parallel rails 35 and 37 so that an operation site can be changed easily. According to the relationship between the sizes (heights) of the small ship 20 and the large ship 10, the first transshipment means 34 are provided in the lower portion of the relay system 30, and the second transshipment means 36 are provided
10 in the upper portion of the relay system 30.

The first transshipment means 34 are used to transship the cargos 3 loaded on the small ship 20 being in harbor to the relay system 30. After collected from the small ship 20 by use of hydraulic shovels 51 or the like of the first transshipment means
15 34, the cargos 3 are put in accumulation ports 39 and loaded on first transfer means (41, 45, 47) that are provided near outlets 40 of the accumulation ports 39. Then, the cargos 3 are transferred to the second transshipment means 36 by use of the first transfer means (41, 45, 47).

20 The second transshipment means 36 are used to discharge the cargos 3 transferred by the first transfer means (41, 45, 47) into the repositories 32-1 to 32-3 and store the cargos 3 there temporarily. Further, the second transshipment means 36 are also used to discharge the cargos 3 into repositories 12 of the large
25 ship 10 through loading ports 13 and transship the cargos 3 to the large ship 10 when the cargos 3 stored in the repositories 32-1 to 32-3 are transferred to the second transshipment means 36 by use of second transfer means (43) and the first transfer means (41, 45, 47). In each case, the cargos 3 are discharged from discharge

ports 52 that are provided near the front ends of spreaders 38. To discharge the cargos 3 into the repositories 32-1 to 32-3 of the relay system 30 and discharge the cargos 3 into the repositories 12 of the large ship 10, the spreaders 38 extending from the second transshipment means 36 can pivot at least to the repositories 32-1 to 32-3 side and the repositories 12 side of the large ship 10. By enabling the spreaders 38 to pivot and make a parallel movement along the parallel rails 37, the cargos 3 can be transshipped from the relay system 30 to the large ship 10 without moving the large ship 10 and the relay system 30.

The first transfer means (41, 45, 47) and the second transfer means (43) will be described in more detail with reference to Figs. 4 to 8. Fig. 4 is a schematic plan view of these means. Fig. 5 is a schematic side view of Fig. 4. Fig. 6 is a diagram showing Fig. 4 viewed from the A-A direction. Fig. 7 is a diagram showing Fig. 4 viewed from the B-B direction. Fig. 8 is a diagram showing Fig. 4 viewed from the C-C direction, more specifically a front view of vibratory feeders 80-1 to 80-3 used in association with the second transfer means (43) and peripheral members thereof. In these drawings, the first transshipment means 34 and the second transshipment means 36 are omitted.

The first transfer means are so provided as to surround the repositories 32-1 to 32-3 and comprise deck conveyors 47A and 47B, lifting conveyors 45A, 45A', 45A'', 45B, 45B' and 45B'' and transfer conveyors 41A and 41B. These conveyors can be considered virtually symmetrical, except for the transfer conveyors 41A and 41B. Further, the same reference numbers refer to the same members, and symbols "A" and "B" will be omitted hereinafter unless they are really needed.

Cargos obtained by the first transshipment means 34 in the lower portion are first transferred in a direction indicated by an arrow a by the deck conveyor 47. Then, by the lifting conveyor 45, the cargos are transferred horizontally in a direction indicated by an arrow b and then upward in a direction indicated by an arrow c. Then, the cargos fall in a direction indicated by an arrow d from an end of the lifting conveyor 45 and are then transferred further upward in a direction indicated by an arrow e by the lifting conveyor 45'. Likewise, the cargos fall in a direction indicated by an arrow f from an end of the lifting conveyor 45' and are then transferred further upward in a direction indicated by an arrow g by the lifting conveyor 45". As a result, the cargos are lifted to the same level as the second transshipment means 36 in the upper portion and transferred in a direction indicated by an arrow h to the second transshipment means 36 by the transfer conveyor 41. The transferred cargos are then stored in the repositories 32-1 to 32-3 of the relay system 30 temporarily by use of the second transshipment means 36.

The second transfer means pass through nearly the center of the repositories 32-1 to 32-3, are positioned under the repositories 32-1 to 32-3 and comprise feed conveyors 43A and 43B. The feed conveyors 43A and 43B as well as the vibratory feeders 80-1 to 80-3 used in association with these feed conveyors 43A and 43B are provided under the repositories 32-1 to 32-3. Thus, in reality, the feed conveyors 43A and 43B and the vibratory feeders 80-1 to 80-3 are hidden by a baseplate 84 (shown in Figs. 3 and 6 to 8) and cannot be seen from the outside. Therefore, it is to be understood that Fig. 4 shows a state without the baseplate 84 for the sake of convenience. Hereinafter, as in the above description,

the same reference numbers will refer to the same members, and "A" and "B" will be omitted unless they are really needed.

When the cargos 3 stored temporarily in the repositories 32-1 to 32-3 are taken out, the cargos 3 are led to the feed conveyor 43 under the repositories 32-1 to 32-3 through accumulation ports 81 of the vibratory feeders 80-1 to 80-3 which are provided in the repositories 32-1 to 32-3. To load the cargos 3 on the feed conveyor, the vibratory feeders 80-1 to 80-3 each comprise a bended portion 85 that can adjust the direction of discharge of the cargos properly. By using the vibratory feeders 80 when taking out the cargos from the repositories 32-1 to 32-3, the cargos 3 that are coals can be loaded on the feed conveyor 43 in a more uniform state. Thereafter, the cargos loaded on the feed conveyor 43 are transferred in a direction indicated by an arrow i. One end of the feed conveyor 43 is communicated with the lifting conveyor 45 that is a part of the first transfer means. As a result, the cargos 3 are transferred to the second transshipment means 36 in the same manner as described above. After transferred to the second transshipment means 36, the cargos are stored in the repositories 12 of the large ship 10, i.e. transshipped to the large ship 10.

Although the same cargos can be stored in the repositories 32-1 to 32-3, it is also possible to store cargos 3 of different qualities, e.g. ranked coals, in these repositories, in states classified according to ranks. By storing them temporarily in the classified states, a mixture comprising the ranked coals in a desired ratio or only cargos of given quality can be stored in each repository 12 of the large ship 10.

CLAIMS:

1. A cargo relay system that is positioned between a first ship and a second ship to relay cargos when the cargos are transshipped from the first ship to the second ship, the system comprising

repositories for storing at least larger cargos than the load capacity of the first ship temporarily,

first transshipment means provided in a lower portion of the system on the side of the first ship, for acquiring cargos from the first ship,

first conveyors provided around the repositories, for transferring the cargos acquired from the first ship by the first transshipment means to an upper portion of the system,

second transshipment means provided in the upper portion of the system on the side of the second ship opposite to the side of the first ship, for storing the cargos transferred by the first conveyors in the repositories temporarily, and

second conveyors positioned between the side of the first ship and the side of the second ship and under the repositories, for transferring the cargos stored temporarily in the repositories,

the second transshipment means transshipping the cargos transferred to the upper portion of the system by the second conveyors and the first conveyors to the second ship.

2. The cargo relay system of claim 1, using vibratory equipment when taking out the cargos from the repositories.

3. A ship comprising a cargo relay system of claim 1 or 2.

Omnidirectionally Loadable System

ABSTRACT OF THE DISCLOSURE

5 There is provided a system that is positioned between a first ship and a second ship to relay cargos when the cargos are transshipped from the first ship to the second ship. The system comprises storage means for storing at least larger cargos than the load capacity of the first ship temporarily. Further, the
10 system also comprises first transshipment means for acquiring cargos from the first ship, first transfer means for transferring the cargos acquired from the first ship by the first transshipment means, and second transshipment means for storing the cargos transferred by the first transfer means in the storage means
15 temporarily.

Fig. 1