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(54) A CONTAINER SHIP

(71) We, NORD MARINE INC., a Company organised and existing under the laws of the State of New Jersey, United States of America, of P.O. Box 305, Fair Haven, New Jersey 07701, United States of America, 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:—

The present invention relates to a container ship.

Up to now containers have generally been carried in ships in such a way that some of the containers have been placed in the holds of the ship and the rest of the containers have been transported on deck and on the hatch covers of the holds. Recently the uppermost deck of the container ship has been lifted up as high as possible in order to increase the number of containers placed in the holds versus the number of containers placed on deck, and thus provide a better protection for the containers.

Many container ships have a gantry crane arranged to move along rails mounted on the main deck. The deck must then be considerably reinforced to be able to support the moving crane and the load to be handled therewith. Most such gantry cranes are provided with jibs extending out over the side of the ship for moving containers in and out of the ship. When containers are moved in this way from the quay into the ship, or vice versa, the ship will start rocking sideways which makes handling of the containers difficult and often causes damage to the containers when the ship's rocking movement disadvantageously coincides with the lifting or lowering movement of the crane.

For this reason container ships are often left without cranes altogether whereby loading and unloading of the ship is performed by port cranes. However, many smaller ports do not have appropriate equipment.

A gantry crane of the above described type cannot practically be used in smaller ships because as inclination increases the difficulties in handling the container become too great. It is theoretically possible to solve the problems by increasing the width of the ship but such a ship would have very poor hydrodynamic properties. For this reason a crane type, a new type of portal crane, has been developed no jibs turning sideways. The crane moves along the ship's deck and lifts the containers at the rear on a transfer table or truck backed up from behind along the ramp and through the deck structure, wherefrom the container is taken ashore.

In roll-on roll-off or rear gate ships and car ferries, loading and unloading are effected by means of transfer tables and trucks on wheels without crane equipment. Heavy decks designed for point loading are connected with hydraulic ramps. The main deck is usually the deck close to the water line. Heavy middle and upper decks add to the ship's strength to stand stresses caused by twisting and torsional forces.

In so called LASH (Lighter Aboard Ships) or lighter ships, heavy portal crane movable on deck and lifting up to 500 tons moves along the deck and on two jibs extending over the stern. Through the space of the fork formed by the jibs the crane lifts the lighter from the water and transports it along rails for lowering into the hold. The ship's frame is stressed by the crane together with its load movable on deck and weighing in total up to 1000 tons.

In lighter ships of the so called SeaBee type, a lighter weighing up to 2000 tons is lifted with a so called Syncrolift table from behind from the space between the sideboards up from the water and is transferred on roll means forward across the rear bulkhead and into the hold.

In all these ships the handling of containers in loading and unloading stages is rather cumbersome whereby the hatch covers of the holds in particular cause problems. On the other hand, the deck placed high up in modern ships affords the ship sufficient mechanical strength to absorb the twisting and torsion forces exerted on the ship by the waves.

It is an object of this invention to provide a container ship wherein the above mentioned effect of the deck and the hold hatches hampering the handling of con-

tainers is eliminated without reducing the ship's mechanical strength.

According to the present invention there is provided a container ship having a main deck with cells for accommodating containers arranged over the main deck, the ship having a girder structure comprising vertical side girders spaced apart from each other along the ship, the vertical side girders being fastened to and extending upwardly of the main deck, at least one longitudinal girder on each side of the ship interconnecting said vertical side girders, and traverse girders interconnecting said longitudinal girders, the ship further comprising a support structure for supporting container handling means above said cells, said support structure being rigidly connected to said girder structure above said main deck so as to improve the mechanical strength of the ship.

The girder structure of the ship enables the ship to withstand the wave forces. Accordingly, the main deck of the ship can be arranged quite close to the water line whereby all containers can be loaded on deck and holds and hold hatches become entirely unnecessary. The entire ship space can be efficiently utilized and the arrangement of containers in uniform stacks becomes possible.

Advantageously, the container ship includes container handling means comprising pairs of rails mounted above the cells and extending longitudinally to the rear of the ship which projects over the quay, preferably one pair of rails for each pair of longitudinal cell lines, and a bridge crane on each pair of rails, said bridge crane moving along the rails for lifting containers from the quay below the rear of the ship or from a truck on the quay and for moving these to a desired cell when loading the ship, and vice versa when unloading the ship.

In the case described above, a heavy crane of the bridge crane type stressing the frame with point weights and of complicated construction is avoided and replaced with a rigid supporting frame for the container handling means thus increasing the strength of the ship. Bridge cranes of light weight and simple construction are movable along this supporting frame.

Advantageously said bridge cranes are operable independently of each other and each bridge crane comprises a traversely movable carriage provided with two lifting frames for lifting and lowering two containers. Also these lifting frames are advantageously operable independently of each other.

With the construction according to the invention also an essentially more advantageous ratio of the gross register tonnage to the net register tonnage is likely to be achieved wherefore the number of the crew can probably be reduced and there will also be an appreciable reduction e.g. in port charges.

Due to the advantageous bridge crane system efficient use can be made in loading and unloading of the possibilties offered by the ship construction according to the invention. Up to now loading and unloading have been effected either on the so called "roll-on roll-off" principle including complicated bridge and driving arrangements or over the ship's board by means of using the ship's own crane or a crane on the quay. A great many ports do not have necessary cranes and the lifting of heavy containers with the ship's own crane over the board easily causes a dangerous lurch.

In the ship according to the invention these difficulties are overcome and the loading and unloading capacity is considerably improved.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a container ship from the side partly in section,

Figure 2 is a view of the ship from above, with the top structure of the ship removed,

Figure 3 shows the ship in a traverse section along lines III—III in Figure 1, and

Figure 4 shows an alternative embodiment of a ship, in a similar section as Figure 3.

The main deck 16 of the ship 1 is located quite close to the water line, neither holds nor hatch covers are needed. Cells 5 for the containers are arranged across the enter deck 16, in which cells containers 6 are stacked on top of each other in a way known per se. In order that the ship absorb wave forces exerted thereon, strong vertical girders 14 fastened at their lower end to the deck 16 are appropriately spaced along the ship's sides and at least one horizontal girder 2 interconnecting the upper ends of the vertical girders 14 is arranged on each side of the ship at a suitable height. The girders 2 are interconnected with traverse girders 3. The girders are all preferably box girders. A side plate 15 is provided on each side of the ship.

In the case shown in the drawing, the longitudinal girder 2 is made so heavy that one girder on each side is sufficient.

A support structure for the ship's container handling means is rigidly connected to the basic support structure formed by box girders 2, 3 and 14. In the embodiment according to the drawing, this support structure comprises outer vertical girders 4 and inner vertical girders 4a, traverse girders or a plate designated by numeral 20. The container handling means comprises longi-

tudinal pairs of rails 7 mounted on girders 4 and 4*a*, preferably one pair for each pair of longitudinal cell lines, and bridge cranes 8 movable along the rails 7.

The support structure described above for the container handling means appreciably increases the ship's mechanical strength, thus making it possible to use correspondingly smaller girders in the basic support structure.

The cranes 8 are operable independently of each other and can advantageously be remote-controlled. Each crane is provided with a traversely movable carriage 9 provided with two lifting frames 10 operable independently of each other.

The upper part 13 of the rear of the ship is extended to project over a port quay 12. As the rails 7 also project over the quay, the loading and unloading of quite heavy containers can be effected quickly and safely through the rear. The cranes 8 lift the containers from the quay or straight from trucks, the traverse mobility of the carriage 9 facilitating the work. The lifting frames 10 of the cranes become rigidly attached in the lifted position wherefore the containers 6 can be safely transported at a high speed along the ship to the desired cell 5.

No gate or similar is needed in the rear. Also the side plate 15 is not necessarily needed. In practice, however, the use of such a plate is preferred in order to protect the containers from rain or sea water. The upper structure of the ship is entirely located above the container space.

In the foregoing one preferred embodiment of the invention has been described. In its details it can naturally vary considerably within the scope of the appended claims. Thus, e.g. the support girders 2 can be located higher up, e.g. at the level of the bridge cranes. This is illustrated in Figure 4 where the main horizontal side girder is designated with numeral 18 and auxiliary girders with numeral 19. To give extra mechanical strength a plate deck arrangement 21 having upper and lower spaced plates 22 is provided between girders 18. The plates 22 also shield the containers from rain or sea water.

WHAT WE CLAIM IS:—

1. A container ship having a main deck with cells for accommodating containers arranged over the main deck, the ship having a girder structure comprising vertical side girders spaced apart from each other along the ship, the vertical side girders being fastened to and extending upwardly of the main deck, at least one longitudinal girder on each side of the ship interconnecting said vertical side girders, and traverse girders interconnecting said longitudinal girders, the ship further comprising a support structure for supporting container handling means above said cells, said support structure being rigidly connected to said girder structure above said main deck so as to improve the mechanical strength of the ship.

2. A ship as claimed in claim 1, wherein said vertical side girders, longitudinal support girders and traverse girders are box girders.

3. A ship as claimed in claim 1 or 2, wherein the upper part of the rear of the ship is extended to project over a quay, and further including container handling means comprising at least one pair of rails extending along the ship to the projecting rear, and a bridge crane on each pair of rails for moving containers to and from the cells.

4. A container ship as claimed in claim 3, wherein the cells for the containers are arranged in longitudinal and traverse lines, and wherein one pair of rails is associated with each pair of longitudinal cell lines.

5. A ship as claimed in claim 3 or 4, wherein said bridge cranes are operable independently from each other.

6. A ship as claimed in any of claims 3 to 5, wherein each bridge crane comprises a traversely movable carriage provided with two lifting frames for lifting or lowering two containers.

7. A ship as claimed in claim 6, wherein said lifting frames are independently operable.

8. A container ship substantially as hereinbefore described with reference to and as shown in Figures 1 to 3 or 4 of the accompanying drawings.

PAGE, WHITE & FARRER,
Chartered Patent Agents,
27 Chancery Lane,
London WC2A 1NT.
Agents for the Applicants.

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In the foregoing one preferred embodiment of the invention has been described. In its details it can naturally vary considerably within the scope of the appended claims. Thus, e.g. the support girders 2 can be located higher up, e.g. at the level of the bridge cranes. This is illustrated in Figure 4 where the main horizontal side girder is designated with numeral 18 and auxiliary girders with numeral 19. To give extra mechanical strength a plate deck arrangement 21 having upper and lower spaced plates 22 is provided between girders 18. The plates 22 also shield the containers from rain or sea water.

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2. A ship as claimed in claim 1, wherein said vertical side girders, longitudinal support girders and traverse girders are box girders.

3. A ship as claimed in claim 1 or 2, wherein the upper part of the rear of the ship is extended to project over a quay, and further including container handling means comprising at least one pair of rails extending along the ship to the projecting rear, and a bridge crane on each pair of rails for moving containers to and from the cells.

4. A container ship as claimed in claim 3, wherein the cells for the containers are arranged in longitudinal and traverse lines, and wherein one pair of rails is associated with each pair of longitudinal cell lines.

5. A ship as claimed in claim 3 or 4, wherein said bridge cranes are operable independently from each other.

6. A ship as claimed in any of claims 3 to 5, wherein each bridge crane comprises a traversely movable carriage provided with two lifting frames for lifting or lowering two containers.

7. A ship as claimed in claim 6, wherein said lifting frames are independently operable.

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