

A transverse frameless ship

The present invention relates to a transverse frameless ship, and more particularly but not exclusively to a structure for tankers and like cargo ships.

With a navigating tanker, various forces act on the
5 hull. For example, the hull itself is subjected to a longitudinal bending moment and torsional forces, the outer bottom plating and the outer side plating to the pressure of water, and the inner bottom plating and side wall of the hold (oil tank) to the load of oil cargo under gravity. To
10 withstand these forces, the hull includes a large number of structural members such as longitudinals (side longitudinals, bottom longitudinal, central girders, etc) extending longitudinally of the ship and transverses (that is, transverse frames) (side transverses, bottom
15 transverses, etc) provided transversely of the ship. In the case of such a structure, however, longitudinals and transverses are provided in an intersecting arrangement, so that difficulties are encountered in building the hull by automatic work procedures (e.g., automatic welding). To
20 assure automatic work procedures, therefore, we have conceived the transverse-frameless ship, that is, a ship of a double shell structure which comprises inner and outer hull platings connected by plate-to-plate longitudinals and no transverses except for transverse bulkheads which extend
25 the full depth of the ship and which are spaced apart longitudinally. Nevertheless, use of the double shell structure for the hull involves various problems. For example, when the double shell structure is used only for the bottom of a ship of conventional construction, an
30 external force acting on the outer side plating is transmitted to the bottom portion through transverses provided inside the outer side plating,

but the inner and outer bottom platings will buckle because the bottom portion has no transverse. Conversely if the double shell structure is used for the side portion only, an external force acting on the bottom and delivered to the side portion through bottom transverses will buckle the inner and outer side platings because the side portion has no transverse.

The present invention seeks to provide a transverse frameless ship which has a double shell structure comprising an inner hull plating and an outer hull plating connected thereto by plate-to-plate longitudinals only except for transverse bulkheads and which is nevertheless free of the problem of buckling of the inner and outer platings, the double shell structure having an interior space which is advantageously used owing to the absence of transverses.

According to the present invention there is provided a ship comprising at least at opposite side portions and a bottom portion a double shell structure consisting of an inner hull plating and an outer hull plating, transverse bulkheads extending the full depth of the ship and spaced apart longitudinally of the ship and fixed to said inner and outer hull platings, and a plurality of plate-to-plate longitudinals fixed to said transverse bulkheads, said inner and outer hull platings being connected together solely by the longitudinals and by the bulkheads, the bottom portion having a space defined by at least two plate-to-plate longitudinals and divided by a partition into at least one upper chamber means and a lower chamber means, wherein the or each upper chamber means is subdivided by a second partition into a first upper chamber and a second upper chamber, and the first and second upper chambers are adapted for passing different fluids individually therethrough.

With the structure described, an external force acting on the hull can be absorbed through the plate-to-plate longitudinals and the transverse bulkheads which have sufficient strength to thereby prevent the inner and outer
5 platings from buckling. Since at least one of the spaces defined by the plate-to-plate longitudinals is utilised as a fluid channel, there is no need to provide additional fluid transporting piping.

Further because the double shell structure has an
10 inner hull plating and an outer hull plating which are connected together substantially by plate-to-plate longitudinals only except for the transverse bulkheads, a transverse frameless ship has the following advantages:

(1) Absence of transverses decreases the number
15 of components, while the absence of intersections between the longitudinals makes it possible to build the hull by automatic work procedures (e.g. automatic welding) with a greatly improved efficiency, further facilitating perfect inspection of the space defined by the inner and outer hull
20 platings.

(2) Because the plate-to-plate longitudinals have no intersections with transverses, cracking is avoidable that would otherwise result from stress concentration at such intersections.

5 (3) Spaces defined by the inner and outer hull platings and divided by the plate-to-plate longitudinals only can be utilized as ballast tanks. Moreover, the ballast tank, which is not divided by transverses longitudinally of the ship drains completely with ease.

10 (4) Even if a flammable liquid or gas should ingress into a space between the inner and outer hull platings owing to damage to the inner plating, the liquid or gas can be easily drawn off from the space to eliminate an explosion hazard since there is no transverse dividing
15 the space longitudinally of the ship.

(5) Absence of transverses facilitates stress analysis for the hull and assures a rational arrangement of components for a weight reduction.

(6) The double shell structure prevents outflow of
20 cargo oil in the event of a collision with other ship or stranding.

(7) Since the hold has no inside projections such as stiffeners, the inside wall of the hold can be coated, washed or stripped efficiently and properly and is
25 smaller in the surface area to be coated.

Various features and advantages of the present invention will become apparent from the following description of embodiments with reference to the accompanying drawings, in which:-

5 Fig. 1 is a diagram in transverse section schematically showing the overall construction of a transverse-frameless ship according to an embodiment of the invention;

Fig. 2 is a fragmentary diagram in transverse section showing the ship;

Fig. 3 is a diagram in section taken along the line III-III in Fig. 2;

Fig. 4 is a fragmentary diagram in transverse section showing a transverse-frameless ship according to another embodiment of the invention; and

Fig. 5 is a diagram in section taken along the line V-V in Fig. 4.

With reference to Fig. 1, indicated at 1 is a transverse-frameless ship such as a tanker. The tanker 1 has opposite side portions and a bottom portion defining holds 2 and each having a double shell structure which comprises an inner hull plating 3 and an outer hull plating. The inner hull plating 3 and the outer hull plating 4 are connected together only by plate-to-plate longitudinals 5 extending longitudinally of the ship and by transverse bulkheads.

As seen in Figs. 2 and 3, the bottom portion has

at the central portion of the ship three adjacent connecting longitudinals 5A defining two spaces therebetween. Each of the spaces is divided by a partition 6 into an upper chamber 7 and a lower chamber 8. The upper chamber 7 serves as
5 a channel for a fluid such as water, oil or the like.

Accordingly the inner hull plating 3, the connecting longitudinals 5 (only three in the center) and the partitions 6 defining the upper fluid channels 7 are designed to have a thickness sufficient to withstand the internal fluid pressure,
10 with a corrosion allowance considered. Indicated at 9 are weight reduction holes formed in the connecting longitudinals 5A of the bottom portion, and at 10 are buckling preventing, longitudinal stiffeners attached to the bottom portion connecting longitudinals 5A other than the three central
15 longitudinals.

Unlike the conventional hull structure, the double shell structure has no transverses, so that the inner hull plating 3 and the outer hull plating 4 have reduced strength against buckling. To compensate for this, the connecting
20 longitudinals 5 are provided in a larger number with a smaller spacing. Further because of such arrangement, other small longitudinals are dispensed with. The force acting on the connecting longitudinal 5A of the bottom portion will not be delivered to the inner and outer side
25 platings 3, 4 because of absence of transverses. Conversely

the force acting on the connecting longitudinal 5B of the side portion will not be transmitted to the inner and outer bottom platings 3, 4 or to the upper deck portion similarly owing to the absence of transverses. Such forces are all transmitted to the front and rear transverse bulkheads 11 of the hold 2, so that the transverse bulkheads 11 are correspondingly reinforced. For example, the bulkheads 11 are made of corrugated plates so as to withstand forces acting in any direction. When required, structural box members are provided around the bulkheads. The upper deck plating 12 shown has substantially the same structure as heretofore used and is therefore provided with reinforcing members as suitably arranged (not shown).

Although the bottom portion and the opposite side portions only are adapted to have the double shell structure according to the above embodiment, the upper deck portion may of course have such a double shell structure similarly. The fluid channels, which are positioned close to the hull center line in the bottom portion, may be positioned closer to one side of the ship. The fluid channels are not always limited to two in number; any number of fluid channels can be provided as required. Furthermore, fluid piping may be provided in the space defined by the connecting longitudinals 5A.

With reference to Figs. 4 and 5 showing another

embodiment of the invention, two spaces are defined by three adjacent connecting longitudinals 5A in the center of the bottom portion of a ship. Each of the spaces is divided by a first partition 6 and a second partition 6' into a first upper chamber 7A, a second upper chamber 7B and a lower chamber 8. Different fluids are passed through the first and second upper chambers 7A, 7B. For example, when the ship is a tanker, the first upper chamber 7A is used for transporting the cargo oil, while the second upper chamber 7B is usable for supplying and discharging water ballast. Accordingly the double bottom is internally provided with a well 11 adapted to communicate with a bottom portion of the hold and communicating with the first upper chamber 7A through a connecting pipe 12. The second upper chamber 7B communicates through a bellmouth 13 with a ballast tank 14 provided in the interior of the double bottom. On the other hand, the lower chamber 8 is provided with a docking bracket 15 conforming to the sectional shape thereof. When the ship is supported on a keel block 6 while in a dock, the docking bracket 15 serves to prevent the double bottom from deforming under gravity.

(21)

CLAIMS:

1. A ship comprising at least at opposite side portions and a bottom portion a double shell structure consisting of an inner hull plating and an outer hull plating, transverse bulkheads extending the full depth of the ship and spaced apart longitudinally of the ship and fixed to said inner and outer hull platings, and a plurality of plate-to-plate longitudinals fixed to said transverse bulkheads, said inner and outer hull platings being connected together solely by the longitudinals and by the bulkheads, the bottom portion having a spaced defined by at least two plate-to-plate longitudinals and divided by a partition into at least one upper chamber means and a lower chamber means, wherein the or each upper chambers means is subdivided by a second partition into a first upper chamber and a second upper chamber, and the first and second upper chambers are adapted for passing different fluids individually therethrough

2. A ship as defined in claim 1 wherein the or each first upper chamber communicates through a connecting pipe with a well formed in the bottom portion.



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3. A ship as defined in any one of claims 1 to 3, wherein the or each second upper chamber communicates through a bellmouth with a ballast tank formed in the bottom portion.

5 4. A ship as defined in any one of claims 1 to 3 wherein the lower chamber is provided with a docking bracket conforming to its sectional shape.

5. A ship substantially as described herein with reference to and as illustrated in Figures 1 to 3 of Figures
10 1 to 3 as modified by Figures 4 and 5 of the accompanying drawings.

