Method for tanker construction

Field of the invention

The present invention relates to the field of constructing tankers for the carriage of liquid such as oil and chemicals, in particular parcel tankers.

Background of the invention

A tanker is a cargo ship configured for the transportation of liquid in bulk. It has a hull including a number of cargo tanks in which the liquid for transportation is stored. The liquid for transportation is loaded onto the tanker and subsequently into its cargo tanks via a system of pipes, referred to as outfitting. Once the tanker has arrived at its destination, the transported liquid is unloaded from the cargo tanks and subsequently from the tanker via said system of pipes.

In addition to tankers, there are cargo ships that are configured for the transportation of dry cargo in bulk. These so-called dry bulk carriers have a hull including a number of holds instead of cargo tanks. A hold is a space for carrying the dry cargo. Access to a hold is at the top of the hold by a hatch opening in the main deck of the ship. The dry cargo for transportation is loaded into a hold and unloaded from said hold via its hatch opening. Loading and unloading of the hold is for instance by means of a quay crane. Dry bulk carriers are in general provided with hatch covers for covering the hatch opening during the transportation of the dry cargo.

The transportation of liquid and dry cargo in bulk is different from containerized cargo transportation wherein

cargo is stored in containers and wherein the cargo and the container in which the cargo is stored are lifted in/out of the ship at the same time. Ships configured for containerized cargo transportation are called container carriers. Like dry bulk carriers container carriers have a hull including a number of holds, wherein access to a hold is at the top of the hold by a hatch opening in the main deck of the ship. The size and shape of containers used in containerized cargo transportation are such that a container containing its cargo can be lifted in and out of the holds of the container carrier and can be handled and transported with ease on shore by road or by rail. Consequently, a plurality of containers can be carried in each hold of a container carrier. For easy positioning of the containers relative to each other in a hold and for securing the containers in the hold, the holds of container carriers are provided with so-called cell guides.

In US patent 4,949,659 a cargo ship is described having a hull including a number of holds, wherein a hold is provided with an interchangeable system allowing such ship to carry in said hold both containers and dry cargo in bulk. Such a cargo ship thus can function both as dry bulk carrier and container carrier.

The present invention relates to the field of constructing tankers, in particular parcel tankers. A parcel tanker is a tanker designed to carry an assortment of liquids, such as chemicals, or different grades of a liquid, such as oil, at one time. A parcel tanker has a relatively large number of small tanks for carrying the assortment of liquids or different grades of a liquid in small quantities in complete separation on one ship. Parcel tankers are

currently constructed with integrated steel tanks (either of mild, clad or stainless steel) that form part of the structure of the tanker.

Summary of the invention

The present invention provides a method for tanker, preferably parcel tanker, construction.

The method according to the invention comprises the steps of:

- providing a hull having a main deck and having arranged therein at least one hold which is accessible via a hatch opening in the main deck;
- providing a self-contained tank module comprising a number of cargo tanks;
- arranging in the hold the self-contained tank module to provide a tanker, wherein
  - the tank module is arranged in the hold such that the tank module and the hull are structurally independent and such that the tank module is removable via said hatch opening of the hold after a period of use of the tanker.

In the method according to the invention, the size and shape of the tank module are such that once arranged in the hold, the part of the tank module that is arranged in the hold fits the size and shape of the hold, and the hatch opening of the hold is closed by means of the tank module. In other words, in the method according to the invention one tank module is arranged in a hold wherein the tank module fills the cargo space provided by the hold.

Furthermore, in the method according to the invention an outfitting comprising conduits for loading a liquid to be

transported into the cargo tanks of the tank module and for unloading the liquid from the cargo tanks after transport is arranged above the main deck. Such outfitting allows for loading and unloading liquid bulk cargo without removing the cargo tanks from the hull. The resulting tanker is thus configured for loading and unloading liquid bulk cargo wherein the tank module and its cargo tanks remain in place on the ship during loading and unloading of the liquid bulk cargo. When arranging the tank module in the hold during tanker construction and removing the tank module from the hold, the cargo tanks of the tank module will be empty. Unlike containers in containerized transport, the tank modules of the present invention do not need a size and shape to allow for arranging in the hold and removing from the hold while loaded with cargo and do not need a size and shape for road or rail transportation. Therefore, unlike containers in containerized transport, the tank modules of the present invention can have a size and shape that fills the cargo space provided by the hold, and can even have a size and shape such that the tank module extends out of the hold and above the hatch opening. A typical size of the tank module is approximately 24 m Beam x 28 m Length x 13 m Height.

By closing the hatch opening of the hold by means of the tank module, the need for a main deck or hatch cover for covering the tank module and closing the hatch opening after arranging the tank module in the hold is eliminated, and the tank module is allowed to extend above the hatch opening. Furthermore, the need for loading, unloading, and servicing conduits in the hold is eliminated.

Since the self-contained tank module is independent of the hull, the structure of the tank module is not affected by the same stresses and fatigue as an integrated tank and hull construction during the operation. As a result the tank module built and installed according to the method of the present invention should be safer in operation than a traditional integrated tank as the tanks within the tank module will be less prone to cracking caused by stresses and fatigue in a ship. Additionally, unlike in an integrated tank and hull construction, the hull does not form one or more walls of the cargo tanks of a tank module. Consequently, an additional barrier is provided between the liquid carried in the cargo tanks and the environment.

The fact that the structure of the tank module is not affected by the same stresses and fatigue as an integrated tank and hull construction during the operation, will also mean that the tank module will have a longer life. Because the tank module can be removed from the ship without modifying the hull or the tank module, the tank module can be re-used after removal without any requirement for the rebuilding of the original hull or the tank module. This would not be possible in a traditional tanker with integrated tanks without modifying the entirety of the ship (both hull and integrated tanks). The method according to the invention allows for relatively easy disassembly of the tanker after a period of use and for re-use of the tank module after disassembly in another ship.

A tank module can also be exchanged for another tank module of different internal design in the method according to the invention should this be considered desirable, which is not possible in a tanker where the tanks are an

integrated part of the construction. For instance it may become desirable to install a tank module having either more or less separate tanks to meet changing market demands. Any increase or decrease in the number of segregations is very difficult in a tanker with integrated tanks but is relatively easy where only the tank module is changed. This makes the tanker far more flexible. In the method according to the invention a single tank module has at least one, but preferably a plurality of separate cargo tanks.

Furthermore, the tank module can also be re-used when the hull of the tanker has reached the end of its life, but the tank module has not yet reached its end of life. This would apply not only where, for example, the hull of the tanker was damaged but also in case of changes in the regulatory or environmental requirements for a tanker necessitating extensive work on the hull or the machinery of the tanker. A tank module can be removed from the damaged or non-compliant hull and be installed into a hull that complies with the changed environmental or safety regulations at renewal costs much less than in a traditional tanker with integrated tanks. This would also apply where there was a commercially desirable result, for example where new engine technology made it commercially desirable to change hull rather than continue with a less efficiently propelled hull.

In the method according to the invention the tank module is preferably installed in the tanker as an independent tank module by supporting the tank module in the hold so that relative movement is allowed between the hold and the tank module. The tank module is preferably supported by tank module support members that allow some movement of

the tank module relative to the sides of the hold, and provide gaps between support surfaces, but preventing excessive movement, preferably by providing retaining keys.

Furthermore, fitting the tank modules into the hatch opening of the hold allows for the tank module to extend above the hatch opening, thus providing more storage volume in the same hold space as the module extends above where the main deck would otherwise have been: the tank module then forms a part of the main deck. In the method according to the invention the hatch opening of the hold is closed by means of the tank module.

In order to allow for relative movement between the periphery of the opening of the hold and the tank module arranged therein, a water tight seal is preferably provided between the tank module and the periphery of the hatch opening that prevents the ingress of water but still allows for relative movement between the tank module and the periphery of the hatch opening.

Furthermore, the method according to the invention allows for standardization of both the hull and the tank modules. Such standardization allows for repeated use of the same basic design for the hull and the modules in constructing a series of tankers. Repeated use of such a single hull design and tank module design makes it possible to reduce the costs of construction of a single tanker.

Furthermore, in the method according to the invention the hull of a pre-built dry bulk cargo ship can advantageously be used as a recipient vessel for the tank modules (with relatively minor adaptation) due to the nature

of the modules being installed. Because of the structural independence of the tank module in the hold neither the structure of the hull nor the structure of the tank module need be affected significantly by the installation of the tank modules in the hold. As a result the dry bulk cargo ship and the tank modules can be built separately.

Furthermore, if the dry bulk cargo ship is newly built the ship may be a standard design. Such a ship may be built repeatedly for the purpose of assembling a number of different tankers. Repeated building of such a ship will lower the costs significantly.

Cargo ships constructed for the transportation of dry bulk cargo, such as a bulk carrier, are more commonly constructed than chemical parcel tankers. As a result such dry bulk cargo ships can be built for far less cost.

A further advantage of the method according to the invention is that the tank module can be removed via the hatch opening after a period of use of the tanker. After removal of the tank module a replacement tank module may be installed via the hatch opening in the hold. Alternatively or additionally the removed tank module is arranged in the hold of another cargo ship. A replacement module can therefore be installed and the tanker can continue in use without delay while the original tank module is repaired.

In the chemical parcel tankers market the method according to the invention is advantageous as currently chemical parcel tankers are purpose built for a specific market with a hull having a fixed number of structurally integrated tanks to meet the demand in that specific market.

As a result chemical parcel tankers of the same design are generally built in small series by a few specialized ship builders. The method according to the invention now makes it possible to build cargo ships of a standard design in larger series by less specialized ship builders, and to install tank modules with an internal design for a specific market.

Currently adapting chemical parcel tankers with structurally integrated tanks to meet changing market demands is not possible without heavily modifying the hull. In view of high costs of such heavy modifications, operators of the known chemical parcel tankers generally do not modify the chemical parcel tankers, resulting in less effective use of the tankers. The relatively easy exchange of a tank module for a tank module of a different internal design allows for a more effective use of a tanker during the life time thereof in the event of changing markets in which chemical parcel tankers operate.

The most difficult cargos, such as acids, can only be carried in tanks of chemical parcel tankers that are made of stainless steel. Since stainless steel is less affected by corrosion compared to the steel of which the hull is made, stainless steel tanks of a chemical parcel tanker are suitable for re-use when the hull has reached its end of life. As explained herein above, the method according to the invention promotes the re-use of tank modules. This makes the method according to the invention advantageous.

In a preferred embodiment of the method according to the invention, the hull has arranged therein a plurality of holds, and one tank module is arranged in each of the holds.

Each tank module can have a different number of cargo tanks. Typical dimensions of the hull are Length approx. 180 m, Breadth approx. 32 m, and Depth approx. 15 m. Typical number of holds and tank modules is five.

The present invention further provides a tanker, preferably a parcel tanker, comprising:

- a cargo ship with a hull having at least one hold that is accessible via a hatch opening; and
- a self-contained tank module comprising a number of cargo tanks;

wherein

- the tank module is installed in the hold such that the tank module and the hull are structurally independent and such that the tank module is removable via the hatch opening of the hold after a period of use of the tanker.

Preferably, the hull has arranged therein a plurality of holds, and one tank module is arranged in each of the holds. A single tank module has at least one, but preferably a plurality of separate cargo tanks.

As described herein above with respect to the method according to the invention, this tanker according to the invention allows for relatively easy disassembly of the tanker after a period of use thereof and for reuse of either the hull or the tank module after disassembly.

According to the invention the tank module closes the hatch opening of the hold. As described herein above with respect to the method according to the invention closing the hatch opening of the hold by means of the tank module, the need for a main deck is eliminated, the tank module is

allowed to extend above the hatch opening, and the need for loading, unloading, and service conduits in the hold is eliminated.

In order to allow for relative movement between the periphery of the hatch opening of the hold and the tank module arranged therein, a water resisting construction is preferably provided between the tank module and the periphery of the hatch opening that allows for relative movement between the tank module and the periphery of the hatch opening. In an advantageous embodiment thereof the water resisting construction comprises a flexible seal member sealing a gap between the tank module and the periphery of the hatch opening.

According to the invention the cargo ship comprises a main deck in which the hatch opening of the at least one hold is arranged, and an outfitting arranged above the main deck for loading, unloading, and/or servicing the cargo tanks of the tank module. For loading and unloading the outfitting comprises conduits for loading a liquid to be transported into the cargo tanks of the tank module and for unloading the liquid from the cargo tanks after transport

Having an outfitting arranged above the main deck for loading, unloading, and/or servicing the cargo tanks of the at least one tank module, such as conduits providing a liquid connection, eliminates the need for such outfitting underneath the main deck. Having outfitting arranged on the main deck thus provides relatively easy access to the outfitting. Having an outfitting arranged on the main deck for loading, unloading, and/or servicing the cargo tanks of the at least one tank module further makes it possible to

provide a pre-build or converted cargo ship with such outfitting with relatively small modifications and makes it possible to change the outfitting after a period of use thereof relatively easy.

In an advantageous embodiment thereof the outfitting comprises:

- a number of rigid pipelines fixedly mounted on the main deck; and
- a number of flexible conduits between the tank module and the rigid pipelines for providing a liquid connection between the cargo tanks of the tank module and the rigid pipelines.

In such outfitting the rigid pipelines fixedly arranged on the main deck provide secure arrangement of the pipelines above the main deck, while the flexible conduits, such as flexible hoses or flexible pipes, allow for relative movement between the rigid pipelines fixedly arranged on the main deck and the tank module.

The rigid pipelines can be arranged beside the hatch opening. This makes it possible to arrange the rigid pipelines on the main deck before arranging the tank module into the hold, for instance during the build of the cargo ship, and leave the rigid piping in place when removing the tank module from the hold. Alternatively, the rigid pipelines are arranged above a tank module that is arranged in the hold. This requires arranging the rigid pipelines after arranging the tank module in the hold and removing the rigid piping before removing the tank module from the hold, but has the advantage that more space is available for the rigid pipelines relative to the space that is available beside the hatch opening.

In an advantageous embodiment the rigid pipes are arranged beside the at least one hold and a hold manifold is arranged on the main deck adjacent said hatch opening of said at least one hold, said hold manifold comprising a number of manifold connectors for connecting to the hold manifold said flexible conduits, wherein each hold manifold connector is in liquid communication with one of said rigid pipelines.

Such outfitting can be arranged on the main deck before the tank module is arranged in the hold and allows easy connection of a tank in the tank module to the ship load/unload manifold via the hold manifold after arranging the tank module in the hold.

Having a tank module manifold adjacent the hold manifold makes it possible to connect a tank module to the rigid piping by simply connecting, after arrangement of the tank module in the hold, a manifold connector of the hold load/unload manifold to a manifold connector of the tank module load/unload manifold by means of a relatively short flexible conduit. The tank module manifold can be arranged on the tank module during the building of the tank module.

Such outfitting allows for loading and unloading of the cargo tanks of a tank module from a central location on the main deck. Preferably each cargo tank of the tank module is connected to the ship load/unload manifold via a dedicated rigid pipeline. This makes it possible to keep different liquids completely separate. Alternatively, the number of rigid pipelines for loading/unloading is less than the number of separate cargo tanks. In that case a rigid

pipeline is used for loading/unloading a plurality of tanks. This requires less rigid pipes to be arranged on the main deck. After loading/unloading one tank the rigid pipeline is then disconnected from the loaded/unloaded tank and connected to a tank to be loaded/unloaded. When rigid lines are shared between tanks for loading and unloading, the embodiment as described herein above including a hold manifold, and optionally a tank module manifold adjacent said hold manifold, is particularly advantageous as it allows for easy connection and disconnection of the flexible conduit.

In a further advantageous embodiment of the tanker according to the invention at least one of the rigid pipelines is connected to a service facility remote from the at least one hold. Such outfitting allows for servicing the cargo tanks of a tank module from a central service facility. Such a central service facility provides for instance service liquids such as compressed air, nitrogen, water, and heating/cooling fluids.

In a further advantageous embodiment of the tanker according to the invention having an outfitting on the main deck, the outfitting comprises for servicing:

- at least one deck house module arranged on the main deck;
- at least one conduit that provides a liquid connection between the deck house module and a tank module.

In a further advantageous embodiment of the tanker according to the invention the tank module has a self-contained structure comprising an external framework, preferably comprising longitudinal and transverse webs. The

external framework allows for less reinforcing elements inside the tank module. As a result of the external framework there is a space between walls of the tank module and walls of the hold in which the tank module is arranged. This space can be used for the application of insulating material.

Since according to the invention the tank module and the hull are structurally independent, there is more freedom in the design for the structure of the tank module.

In a further advantageous embodiment of the tanker according to the invention the tank module comprises walls enclosing an inner space, wherein preferably the internal space is divided in a plurality of tanks, preferably by means of internal walls.

In an advantageous embodiment thereof the walls of the tank module can be made of solid stainless steel or less expensive clad stainless steel.

The present invention further provides a cargo ship for providing a tanker according to the invention as described herein above, including a hull having arranged therein at least one hold which hold is accessible via a hatch opening, wherein the hold is adapted for arranging in the hold via the hatch opening a self-contained tank module to provide a tanker such that the tank module and the hull are structurally independent and such that the tank module is removable via the hatch opening of the hold after a period of use of the parcel tanker. As described herein above with respect to the method according to the invention the cargo ship is advantageously a converted dry bulk carrier.

Alternatively, the cargo ship is purpose built for providing the tanker.

The present invention further provides a self-contained tank module for providing a tanker according to the invention, adapted for being arranged in a hold in a hull of a cargo ship via the hatch opening via which hatch opening the hold is accessible to provide a tanker, such that the tank module and the hull are structurally independent and such that the tank module is removable via the hatch opening of the hold after a period of use of the tanker.

Brief description of the figures

The present invention is further elucidated in the following description with reference to the accompanying schematic figures. In the figures non limitative embodiments of the method and tanker according to the invention are shown. In the figures:

- Fig.1 shows an embodiment of a tanker according to the invention in perspective view;
- Fig.2 shows an embodiment of a tanker system including the tanker of fig.1 in perspective view;
- Figs.3 to 7 show subsequent steps of an embodiment of the method of tanker construction according to the invention in perspective view;
- Fig. 8 and 9 show in detail an embodiment of the interface between a tank module and a hatch opening in a tanker according to the invention in perspective view;
- Fig. 10 shows a view in cross-section of an embodiment of a tanker according to the invention;
- Fig. 11 schematically shows an embodiment of the deck outfitting of a tanker according to the invention;

- fig. 12 schematically shows a further embodiment of the deck outfitting of a tanker according to the invention.

Detailed description of preferred embodiments

Figures 1 and 2 show a tanker, in particular a parcel tanker 1. The parcel tanker comprises a cargo ship 3 including a hull 5 having arranged therein a number of holds 7, in the shown embodiment five holds, wherein each hold is accessible via a hatch opening 9. The parcel tanker 1 further comprises a number of independent tank modules 11, in the shown embodiment five independent tank modules, arranged in the holds 7. Each tank module 11 that is arranged in a hold closes the hatch opening 9 of the hold 7 in which the tank module 11 is arranged.

In figure 2 is shown that independent tank module 11a is removed from the hold 7a by lifting the tank module 11a out of the hold 7a in the direction of arrow A, without removal or modification of the hatch opening 9a, and without disassembly of the tank module 11a. Each of the independent tank modules 11a, 11b, 11c, 11d, and 11e is removably arranged in one of the holds 7 via its hatch opening 9.

The independent tank modules 11 are shown with longitudinal external webs 13 and transverse external webs 15 arranged on the outer walls 17 of the tank module 11. This external webbing is part of the self supporting structure of the independent tank modules 11. The walls 17 enclose an inner space in which a number of tanks are formed. One tank can be formed in a tank module or a plurality of tanks separated by means of internal walls.

After removal, the independent tank module 11a can be arranged in the hold of another cargo ship to form another parcel tanker. A replacement independent tank module 11f can be arranged in the empty hold 7a of the cargo ship 3. The replacement independent tank module 11f can be of a different internal design, and includes for instance more or less separate cargo tanks.

Figures 3 to 6 illustrate the conversion of a pre-build bulk-carrier 19 of standard design, into a cargo ship 3 that is adapted for assembling a parcel tanker 1 as shown in figures 1 and 2.

In figures 3 is shown that the bulk-carrier 19 comprises a hull 5 and a super structure 21 arranged at the aft end of the hull. In the hull are arranged five holds 7. Each of the holds 7 is accessible via a hatch opening 23, i.e. an opening in the hull, in particular in the main deck 25, leading to the hold. The hatch openings 23 are covered in figure 3 by means of hold covers 27.

In figure 4 is shown that for converting the bulk-carrier 19, the hold covers 27 are removed. It is further shown in figure 4 that the hatch coaming 29 and part 25a of the main deck 25 is removed. A hatch coaming is a raised frame arranged around the periphery of each hatch opening that forms a support for the hold covers and strengthens the edge of the hatch opening.

In figure 5 is shown that the result of the removal of the hold covers 27, the hatch coaming 29, and part 25a of the main deck 25, is that the openings in the main deck 25

are increased in size and the main deck 25 no longer extends inwards beyond the side walls 31 of the holds 7.

In figure 6 is shown that a new hatch coaming 33 is subsequently arranged around the periphery of the openings of increased size. The new hatch coaming 33 is flush with the side walls 31 of the holds 7, such that via the thus created hatch openings 9 of increased size, tank modules 11 can be arranged in the holds 7 that closely fit the available space in the hold 7.

In figure 7, the cargo ship 3 resulting from the conversion is shown. From the cargo ship 3 and a plurality of independent tank modules 11 a parcel tanker 1 as shown in figure 1 can be assembled by arranging an independent tank module 11 in each hold 7. In figure 7 is shown that an independent tank module 11a is being arranged in one of the holds 7a by lowering the independent tank module 11a into the hold 7a in the direction of arrow B via the hatch opening 19a that gives access to said hold. The independent tank module 11a is lowered into the hold 7a via the hatch opening 19a without removal or modification of the hatch opening 19a. After arranging the independent tank module 11a in the hold 7a, it can be lifted out of the hold again without removal or modification of the hatch opening 19a, and without disassembly of the tank module 11a.

In figures 8 and 9 is shown that independent tank module 11 closes the hatch opening of the hold in which it is arranged. A flexible seal 34 is arranged between the hatch coaming 29 and a flange 35 of the tank module in order to seal the hatch opening. As shown the tank module 11 extends above the hatch opening. The seal 34 needs to be

flexible, because the tank modules 11 are supported in the holds in such a way that relative movement between the hull 5 and the independent tank modules 11 is allowed.

In figure 10 a cross-section of the hull 5 of the cargo ship 3 is schematically shown. In particular it is illustrated in figure 10 that tank module support members 37, 39, 41 are arranged between the side walls 31 and bottom wall 43 of the hold 7 and the tank module 11 arranged in the hold 7 for supporting the tank module in the hold. Two types of tank support members are shown arranged on the bottom wall 43 of the hold 7. The first type of tank support members 37 vertically supports the tank module 11. Support pads 45 are provided between these support members 37 and external web 15 of the tank module 11 in order to allow for relative movement between the hull 5 and the tank module 11 in the horizontal plane. Tank module support members 39 arranged on the bottom wall 43, allow for relative movement between the hull 5 and the tank module 11 in the horizontal plane in longitudinal direction of the hull 5, but restrain relative movement in transverse direction C in the horizontal plane. Longitudinal beams 47 arranged on the transverse webs 15 of the tank module 11 extend between two support surfaces 39a and 39b of the support members of the second type. Relative movement between the hull 5 and the tank module 11 in transverse direction C in the horizontal plane is further restrained by tank module support members 41 arranged between side walls 31 of the hold 7 and external web 15 of the tank module 11. By allowing a small gap to exist between support surfaces 39a, 39b of the tank module support members 39 and the longitudinal beams 47, and between support surface 41a of tank module support members 41 and the external web 15, some relative movement between

the hull 5 and the tank module 11 in transverse direction C in the horizontal plane is allowed, while excessive movement is restrained. Tank module support members similar to tank module support members 41 are arranged on the side walls of the hold 7 that are not shown in figure 10. Again by allowing a small gap to exist between support surfaces of such tank module support members the tank module 11, some relative movement between the hull 5 and the tank module 11 in longitudinal direction of the hull 5 in the horizontal plane is allowed, while excessive movement is restrained.

The available space 49 between the walls 31, 43 of the hold and the outer walls 17 of the tank module 11 allow for inspection and/or for applying insulation.

In figure 11 the outfitting of the parcel tanker 1 for loading, unloading, and servicing of the tank modules 11 is schematically shown. The outfitting is arranged above the main deck 25.

The outfitting for loading and unloading includes for each hold 7 a hold load/unload manifold 51 arranged on the main deck 25 adjacent the hatch opening of the respective hold. The hold load/unload manifold 51 comprises a number of manifold connectors.

A ship load/unload manifold 53 is arranged on the main deck 25 remote from the hold load/unload manifolds 51. The ship load/unload manifold comprises a number of manifold connectors for connecting conduits to the ship load/unload manifold that provide a liquid connection between the ship load/unload manifold 53 and a load/unload facility on shore.

A number of load/unload rigid pipelines 55 is arranged fixedly on the main deck 25 beside the holds, providing a liquid connection between the manifold connectors of the hold load/unload manifold 51 and the manifold connectors of the ship load/unload manifold 53.

Each tank module 11 comprises a tank module load/unload manifold 57 located adjacent the hold load/unload manifold 51 of the hold in which the tank module 11 is arranged. The tank module load/unload manifold 57 comprises a number of manifold connectors. The connectors are liquidly connected to the tanks of the tank module 11 by means of conduits 59. The shown tank modules 11 each include four tanks 61, 63, 65, 67.

Flexible conduits 71, such as flexible hoses, are connected between manifold connectors of the hold load/unload manifold 51 and the tank module load/unload manifold 57 to provide a liquid connection between the ship load/unload manifold 53 and the tanks 61, 63, 65, 67 of the respective tank module 11.

In figure 11 is shown that the tank module 11a on the left includes four tanks 61, 63, 65, 67. Four load/unload pipelines 55a, 55b, 55c, 55d are arranged between the hold load/unload manifold 51 and the ship load/unload manifold 53, and each tank of the tank module is connected to the ship load/unload manifold by means of a dedicated pipeline.

The tank module 11b on the right also includes four tanks 61, 63, 65, 67. However, only two load/unload pipelines 55e, 55f are arranged between the hold load/unload manifold 51 and the ship load/unload manifold 53, such that

only two tanks at a time can be connected to the ship load/unload manifold 53. After load/unloading a tank one of the flexible conduits 71a and 71b shown in figure 11 is disconnected from the manifold connector of the tank module load/unload manifold 57 in order to disconnect the loaded/unloaded tank. Subsequently the flexible conduit 71a, 71b is connected to another manifold connector of the tank module load/unload manifold 57 to liquidly connect another tank to the ship load/unload manifold 53. For loading/unloading both tanks use is thus made of only one shared load/unload pipeline.

The outfitting of a parcel tanker 1 can be such that for each tank module 11 dedicated load/unload pipelines are provided. Alternatively, the outfitting of a parcel tanker 1 can be such that for each tank module 11 shared load/unload pipelines are provided.

As shown in figure 11, the outfitting comprises for servicing a hold service manifold 73 arranged on the main deck 25 adjacent the hatch opening of each hold 7. The hold service manifold 73 comprises a number of manifold connectors. A number of service pipelines 75a, 75b are arranged fixedly on the deck beside the holds, providing a liquid connection between the manifold connectors of the hold service manifold 73 and an onboard service facility 77 providing for instance service liquids such as compressed air, N_2, water, etc.

Each tank module 11 comprises a tank module service station 79 located adjacent the hold service manifold 73 of the hold in which the tank module 11 is arranged. The tank

module service station 79 comprises a number of manifold connectors.

Flexible conduits 81 are connected between manifold connectors of the hold service manifold 73 and manifold connectors of the tank module service station 79 to provide a liquid connection between the service facility 77 and the tank module 11.

As shown in figure 11 the outfitting further comprises for servicing a deck house module 83 that is removably arranged on the main deck 25. The deck house module can for instance house secondary heating systems, nitrogen bottle racks, cooling systems, tank module dehumidifiers, and other equipment.

In figure 11 the deck house module 83 is arranged between two holds 7. Flexible conduits 85 connect the deck house module 83 to the tank module service stations 79 of two tank modules 11a, 11b.

The flexible conduits 71 and 81 allow for relative movement between the rigid pipelines 55, 75 fixedly arranged on the main deck 25 and the tank modules 11a, 11b that are allowed move relative to the hull and thus main deck 25. For removing a tank module 11 from a hold, the flexible conduits 71 and 81 are simply disconnected from one of the manifolds, after which the tank module 11 can be lifted out of the hold in which it is arranged.

In figure 12 an alternative outfitting for the parcel tanker 1 is shown. In this alternative outfitting the rigid loading/unloading pipelines 55 are arranged above the tank

modules 11 and are fixedly arranged on the main deck 25 on supports arranged between the holds in which the tank modules 11 are arranged. For each tank module 11 each tank 61, 63, 65, 67 is connected to the ship load/unload manifold via a dedicated load/unload pipeline 55. Each tank 61, 63, 65, 67 is connected to its dedicated load/unload pipeline 55 by means of a flexible conduit 87.

The description and drawing merely illustrate the principles of the invention. It will thus be appreciated that those skilled in the art will be able to devise various arrangements that, although not explicitly described or shown herein, embody the principles of the invention and are included within its spirit and scope.

Furthermore, all examples recited herein are principally intended expressly to be only for pedagogical purposes to aid the reader in understanding the principles of the invention and the concepts contributed by the inventor(s) to furthering the art, and are to be construed as being without limitation to such specifically recited examples and conditions. Moreover, all statements herein reciting principles, aspects, and embodiments of the invention, as well as specific examples thereof, are intended to encompass equivalents thereof.

Claims

1. Method for tanker, preferably parcel tanker, construction, comprising the steps of:

- providing a hull having a main deck and having arranged therein at least one hold which is accessible via a hatch opening in the main deck;
- providing a self-contained tank module comprising a number of cargo tanks;
- arranging in the hold the self-contained tank module to provide a tanker, wherein
  - the tank module is arranged in the hold such that the tank module and the hull are structurally independent and such that the tank module is removable via said hatch opening of the hold after a period of use of the tanker;
  - the size and shape of the tank module are such that once arranged in the hold, the part of the tank module that is arranged in the hold fits the size and shape of the hold; and
  - the hatch opening of the hold is closed by means of the tank module;

the method further comprising the step of:

- arranging above the main deck an outfitting comprising conduits for loading a liquid to be transported into the cargo tanks of the tank module and for unloading the liquid from the cargo tanks after transport.

2. Method according to claim 1, wherein arranging in the hold the tank module such that the tank module and the hull are structurally independent comprises the step of:

- supporting the tank module in the hold such that relative movement is allowed between the hold and the tank module.

3. Method according to claim 1 or 2, wherein the hull is a hull of a pre-built dry bulk cargo ship having arranged therein said at least one hold which is accessible via a hatch opening, wherein said tank module is arranged in said hold via said hatch opening.

4. Method according to claim 1 or 2, wherein providing a hull having arranged therein at least one hold which hold is accessible via a hatch opening, comprises the step of:

- converting a cargo ship constructed for the bulk transportation of dry cargo, such as a bulk carrier, such that it includes at least one hold which is accessible via a hatch opening and which is adapted for arranging in said hold via said hatch opening the self-contained tank module to provide a tanker.

5. Method according to claim 4, wherein the cargo ship to be converted includes a hull having arranged therein at least one hold which is accessible via a hatch opening and wherein converting said cargo ship comprises the step of expanding the hatch opening of the hold of the cargo ship to be converted such that the periphery of the expanded hatch opening is substantially flush with the side walls of the hold.

6. Method according to any of the claims 1 to 5, further comprising the step of removing via the hatch opening the tank module after a period of use of the tanker.

7. Method according to claim 6, further comprising after the step of removing the tank module the step of arranging via the hatch opening a replacement tank module in the hold.

8. Method according to any of the claims 1 to 7, wherein

- the hull has arranged therein a plurality of holds; and
- one tank module is arranged in each of the holds.

9. Tanker, preferably a parcel tanker, comprising

- a cargo ship including a hull having a main deck and having arranged therein at least one hold which hold is accessible via a hatch opening in the main deck;
- a self-contained tank module comprising a number of cargo tanks, wherein
    - the tank module is arranged in the hold such that the tank module and the hull are structurally independent and such that the tank module is removable via said hatch opening of said hold after a period of use of the tanker;
    - the size and shape of the tank module are such that once arranged in the hold, the part of the tank module that is arranged in the hold fits the size and shape of the hold; and
    - the hatch opening of the hold is closed by means of the tank module;

the tanker further comprising:

- arranged above the main deck an outfitting comprising conduits for loading a liquid to be transported into the cargo tanks of the tank module and for unloading the liquid from the cargo tanks after transport.

10. Tanker according to claim 9,
wherein

- tank module support members are arranged between the hold and the tank module for supporting the tank module in the hold, wherein the tank module support members are adapted to allow for relative movement between the hold and the tank module.

11. Tanker according to claim 9 or 10,
wherein the periphery of the hatch opening is substantially flush with the side walls of the hold.

12. Tanker according to any of claims 9 to 11,
wherein

- a water resisting construction is provided between the tank module and the periphery of the hatch opening that allows for relative movement between the tank module and the periphery of the hatch opening, wherein preferably the water resisting construction comprises a flexible seal sealing a gap between the top deck of the tank module and the periphery of the hatch opening.

13. Tanker according to any of claims 9 to 12, wherein the outfitting comprises

- a number of rigid pipelines fixedly mounted on the main deck and arranged beside the at least one hold or over the tank module arranged in the at least one hold; and

- a number of flexible conduits between the tank module and the rigid pipelines for providing a liquid connection between the tank module and the rigid pipelines.

14. Tanker according to claim 13,

wherein

- a hold manifold is arranged on the main deck adjacent said hatch opening of said at least one hold, said hold manifold comprising a number of manifold connectors for connecting to the hold manifold said flexible conduits, wherein each hold manifold connector is in liquid communication with one of said rigid pipelines.

15. Tanker according to claim 14,

wherein

- the tank module arranged in a hold comprises a tank module manifold located adjacent said hold manifold, said tank module manifold comprising a number of manifold connectors for connecting to the hold manifold said flexible conduits.

16. Tanker according to any of claims 13 to 15, wherein

- at least one of the rigid pipelines is liquidly connected to a ship load/unload manifold arranged on the main deck remote from the at least one hold.

17. Tanker according to any of claims 13 to 16, wherein

- at least one of the rigid pipelines is connected to a service facility remote from the at least one hold.

18. Tanker according to any of claims 9 to 17, wherein the outfitting comprises for servicing:

- at least one deck house module, preferably removable, arranged on the main deck;

- at least one conduit that provides a liquid connection between the deck house module and the tank module.

19. Tanker according to any of claims 9 to 18, wherein the tank module has a self-contained structure comprising an external framework, preferably comprising longitudinal and transverse webs.

20. Tanker according to any of claims 9 to 19, wherein the tank module comprises walls enclosing an inner space, wherein preferably the internal space is divided in a plurality of tanks, preferably by means of internal walls.

21. Tanker according to claim 20, wherein the walls of the tank module are made of stainless steel.

22. Tanker according to any of the claims 9 to 21, wherein

- the hull has arranged therein a plurality of holds; and
- one tank module is arranged in each of the holds.

23. Cargo ship for providing a tanker according to any of claims 9 to 22, including a hull having a main deck and having arranged therein at least one hold which hold is accessible via a hatch opening in the main deck; wherein

- the hold is adapted for arranging in the hold via the hatch opening a self-contained tank module to provide a parcel tanker such that the tank module and the hull are structurally independent and such that the tank module is removable via the hatch opening of the hold after a period of use of the tanker; and wherein
- arranged above the main deck is an outfitting comprising conduits for loading a liquid to be transported into cargo tanks of the tank module and for unloading the liquid from the cargo tanks after transport.

24. Cargo ship according to claim 23, being a converted bulk carrier.

25. Self-contained tank module for providing a tanker according to any of claims 9 to 24, comprising a number of cargo tanks and adapted for being arranged in a hold in a hull of a cargo ship via the hatch opening via which hatch opening the hold is accessible to provide a tanker, such that the tank module and the hull are structurally independent and such that the tank module is removable via the hatch opening of the hold after a period of use of the tanker.