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Flat Deck Barge And Method Of Maximising Load Capacity

Field of Invention

[0001] The present invention relates to flat deck barges and a method of carrying different types of cargoes to maximise the payload capacity.

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Background

[0002] Barges/supply vessels are used to transport fuel, food, fresh water and other goods in the marine and offshore supply industry. Barges plying rivers also transport mineral ores and agricultural produce from inland areas to towns or plants down the rivers. As cost of berthing at a port is increasing, plus long turn-around time for discharging these commodities, more and more fleet owners are resorting to ship-to-ship transfer at the port anchoring area to save money and time.

[0003] Services provided by conventional barges are limited by their dedicated usage. For example, bunkering barges are designed and built to carry fuel oil to mother vessels and most of the piping facilities are installed on the deck surface, making the entire deck surfaces unsuitable for carrying other types of cargoes. On the other hand, conventional flat-top barges use the entire deck surfaces to carry bulk cargoes and the spaces below the deck become wasted. In another example, in operation, hopper barges used for ship-to-ship transfer normally go to the mother vessels empty and return with containers or goods. Such one-way empty trips also happen in river transportation, for example, empty barges go upstream to carry mineral ores or agricultural produce to towns downstream, or tanker barges carry fuel upstream to mines and plantations but return to the towns empty.

[0004] It can thus be seen that there exists a need for another type of barge to overcome the inefficient use of conventional barges.

Summary

[0005] The following presents a simplified summary to provide a basic understanding of the present invention. This summary is not an extensive overview of the invention, and is not intended to identify key features of the invention. Rather, it is to present some of the inventive concepts of this invention in a generalised form as a prelude to the detailed description that is to follow.

[0006] The present invention provides several embodiments of flat deck barges. The flat deck barges have large flat deck surfaces for transporting different types of cargoes, such as, containers, bales, crates and bulk materials and so on, on the deck surfaces whilst flowable or fluid cargoes are transported in storage compartments or tanks disposed below the deck. Advantageously, the load capacity and transport efficiency of the barges in both supply and return trips are maximized, in contrast with conventional barges in which a forward or return trip is empty.

[0007] In one embodiment, the present invention provides a flat deck barge comprising: a hull and a deck formed across a top of the hull to provide a substantially flat deck surface and a storage compartment below the deck; wherein the flat deck surface is arranged to carry cargoes, bales, crates or containers whilst the storage compartment is arranged to carry flowable or fluid cargo.

[0008] In one embodiment of the barge, the storage compartment comprises a plurality of storage compartments. The storage compartments may house one or more storage tanks, such as those IMO tanks that comply with international maritime regulations.

[0009] In one embodiment, the barge further comprises a piping skid room disposed below the deck. The skid room includes a piping skid on which pumps, pipes, hoses, ports, valves and meters are mounted for transferring the flowable or fluid cargoes in or out of the storage compartments or storage tanks. The ports may be located on a port skid. In one embodiment, the piping skid is extendable above the deck surface when in use or retracted into the piping skid room. In another embodiment, the port skid is pivoted in a recess on the deck surface which is pivoted up when in use.

[0010] In another embodiment, the present invention provides a method for maximizing a load capacity of a flat deck barge, the method comprises: carrying cargoes, containers, bales or crates on a deck surface of the flat deck barge; and carrying flowable granular or fluid cargoes in storage compartments or tanks disposed below the deck surface; wherein, when the flowable granular or fluid cargoes in the storage compartments/tanks are discharged from the barge in a supply trip, other cargoes, containers, bales and crates are loaded onto the deck surface for a return trip; or when, cargoes, containers, bales or crates are delivered from the barge in a supply trip, flowable granular or fluid cargo are loaded into the storage compartments/tanks for a return trip, with the cargoes, containers and so on being delivered/loaded in partial capacities or full capacities, so that the load capacity of the flat deck barge is maximized in both the supply and return trips.

Brief Description of the Drawings

[0011] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0012] FIG. 1 illustrates a plan sectional view EE of a barge 10 according to an embodiment of the present invention;

[0013] FIG. 2 illustrates a cross-sectional view DD of the barge shown in FIG. 1;

[0014] FIG. 3 illustrates a sectional view FF of the barge, as seen in FIG. 2;

[0015] FIG. 4 illustrates a piping skid and port skid for use in the barge;

[0016] FIG. 5 illustrates a plan sectional view BB of a barge 10a according to another embodiment of the present invention;

[0017] FIG. 6 illustrates a cross-sectional view AA of the barge shown in FIG. 5;

[0018] FIG. 7 illustrates a sectional view CC of the barge of barge shown in FIG. 5;

[0019] FIG. 8 illustrate a plan view of a barge 20 according to another embodiment of the present invention;

[0020] FIG. 9 illustrates a plan view of a barge 20a according to yet another embodiment of the present invention; and

[0021] FIG. 10 illustrates a section view of the above barge carrying different types of cargoes on the deck surface and flowable or fluid cargoes in storage compartments/ tanks erected below the deck surface.

Detailed Description

[0022] One or more specific and alternative embodiments of the present invention will now be described with reference to the attached drawings. It shall be apparent to one skilled in the art, however, that this invention may be practised without such specific details. Some of the details may not be described at length so as not to obscure the invention. For ease of reference, common reference numerals or series of numerals will be used throughout the figures when referring to the same or similar features common to the figures.

[0023] FIGs. 1-4 show a flat deck barge **10** according to an embodiment of the present invention. FIG. 1 shows a plan sectional view of the barge **10**. For illustration purposes, the barge **10**, shown with a rectangular outline, has a flat deck **11**, a double layered walls **12**, **13** and double layered **14**, **15** bottom. The spaces **50** between the doubled layered bottom plates **14**, **15** and the spaces **51** between the double layered side plates **12**, **13** is operable as water ballast or fuel tanks. These spaces **50**, **51** may be compartmentalized. The space below the flat deck **11** and bounded by the inner side walls **13** and inner bottom plates **14** is divided into 6 exemplary compartments or storage tanks **48a-48f** and a piping skid room **31**. In one embodiment, the bottom of the flat deck **11** is lined with a shield **73** for easy maintenance. In another embodiment, the

shield is a cover **73** that is removably strung across the top of each compartment or tank **48**. The shield may be a stainless steel or a canvas sheet. With a shield **73**, it is easier to clean and maintain the compartments/tanks **48** as rust or paint chips from the inside surfaces of the flat deck are prevented from falling into the contents in the compartments and cause contamination as vibration and impact frequently occur on the deck surfaces.

[0024] The piping skid room **31** is accessible from the deck **11** surface through a removable cover **32**. Preferably, the piping skid room **31** is located in a centre position so that each wall of the piping skid room shares at least part of the walls of the adjoining compartments/tanks **48**. The fluid content of the compartments/tanks **48**, such as, fuel oil, diesel, fresh water and chemicals, are pumped in or out by pumps mounted on a piping skid **23**, which is secured on a mount **58** in the piping skid room **31**. The piping skid **23** also includes pipes **22**, hoses, ports **24**, valves, meters, monitoring and controlling devices, and so on, for the filling or discharging of the compartments/tanks **48**. In one embodiment, each set of ports **24** is located in a recess on the deck **11** surface. In another embodiment, each set of ports **24** is mounted on a port skid **25** that is pivoted on the deck **11** surface, so that when not in use, the port skid **25** is returned to a position below the deck **11** surface. In another embodiment, the ports **24** are located within the piping skid **23** and is accessible through the recess on the deck surface. In another embodiment, each set of port **24s** is mounted on a port skid **25** that is pivoted on a top part of the piping skid **23** so that in use, the port skid **25** is pivoted up to extend out through the recess on the deck **11** surface. In another embodiment, the mount **58** is operable to extend or lift the piping skid **23** out of the piping skid room **31** to a predetermined height above the deck **11** surface and the port skid **25** is then accessible from the deck surface. Hoses **26** connect pipes on the piping skid **23** to the respective ports **24** on the port skid **25**. Quick connect/disconnect couplings can also be used at the port connections.

[0025] In another embodiment, selection valves **81** (not shown) are arranged on a valve skid **27**. In one embodiment, the valve skid **27** is connected to the port skid **25** and mounted adjacent thereto. The valve skid **27** allows an operator to choose the flow

directions and shift supply/discharge from one compartment/tank **48** to another without having to reconnect the hoses **26** at the port skid **25**. An advantage is that an operator requires only one supply or discharge hose at the port skid **25** and there is no downtime in having to reconnect the supply or discharge hose.

[0026] A control console **28** (as seen in FIG. 5) can also be provided on the piping skid **23** for controlling and monitoring the filling and discharging of the compartments/tanks **48**; in addition, a printer can also be provided at the control console **28** for printing the filling/discharge records and other associated documents. Alternatively or in addition, an operation room **29** is provided in the piping skid room **31**. The operation room **29** contains a mimic control board with which an operator can activate, select and monitor the compartments/tanks **48** to fill/discharge. In an embodiment, the operation room **29** is supported on a mount **57** that is operable to lift the operation room **29** above the deck **11** surface for better observation during operation and return the operation room **29** to its home position after filling/discharging operation is complete.

[0027] In FIG. 1, the piping skid room **31** is centrally located below the deck **11** surface. In another embodiment, the piping skid room **31** need not be centrally located; it may be located at the bow, stern or to one side of the barge **10** and the pipes **22** connecting the storage compartments to the piping skid **23** are located in shallow trenches on the deck **11** surface. These trenches may be protected by removable reinforced covers.

[0028] FIGs. 5-7 show a flat deck barge **10a** according to another embodiment of the present invention. As shown in FIG. 5, the barge **10a** is similar to the above barge, except that the compartments **48** below the flat deck 11 are occupied by storage tanks **38**, such as IMO tanks that comply with regulations of the International Maritime Organisation (IMO). Each IMO tank **38** is supported on a mount **59**. Similar to the above embodiment, the IMO tanks **38** are connected by pipes **22** and hoses to the piping skid **23**, with the piping skid **23** located in the piping skid room **31**. In the barge **10a**, the piping skid room **31** is located at the stern of the barge. The piping skid room **31** is accessible from the deck **11** surface through the removable covers **32** whilst the IMO

tanks **38** are accessible through a door **43** from the piping skid room **31**. As in the above embodiment, the piping skid **23** also includes pipes 22, hoses, ports **24**, valves, meters, monitoring and controlling devices, and so on, for the filling or discharging of the IMO tanks **38**. In one embodiment, each set of ports **24** is located in a recess on the deck **11** surface. In another embodiment, each set of ports **24** is mounted on the port skid **25** that is pivoted on the deck **11** surface, so that when not in use, the port skid **25** is returned to a position below the deck **11** surface. In another embodiment, the ports **24** are located within the piping skid **23** and is accessible through the recess on the deck surface. In another embodiment, each set of ports **24** is mounted on the port skid **25** that is pivoted on a top part of the piping skid **23** so that in use, the port skid **25** is pivoted up to extend out through the recess on the deck surface. In another embodiment, a mount **58** is operable to extend or lift the piping skid **23** out of the piping skid room **31** to a predetermined height above the deck **11** surface and the port skid **25** is then accessible from the deck surface. Hoses **26** connect pipes on the piping skid **23** to the respective ports **24** on the port skid **25**. Quick connect/disconnect couplings can also be used at the port connections.

[0029] As in the above embodiment, selection valves **81** (not shown) are arranged on a valve skid **27**. In one embodiment, the valve skid **27** is connected to the port skid **25** and mounted adjacent thereto. The valve skid **27** allows an operator to choose the flow directions and shift supply/discharge from one tank **38** to another without having to reconnect the hoses **26** at the port skid **25**. An advantage is that an operator requires only one supply or discharge hose at the port skid **25** and there is no downtime in having to reconnect the supply or discharge hose. A control console **28** can also be provided on the piping skid **23** for controlling and monitoring the filling and discharging of the tanks **38**. An operation room **29** may be provided in the piping skid room **31**. The operation room **29** contains a mimic control board with which an operator can activate, select and monitor the tanks **38** to fill/discharge. In an embodiment, the operation room **29** is supported on a mount **57** that is operable to lift the operation room **29** above the deck **11** surface for better observation during operation and return the operation room **29** to its home position after filling/discharging operation is complete.

[0030] FIG. 8 shows a barge **20** according to another embodiment of the present invention. For illustration purposes, the barge **20** is similar to the above flat deck barge **10b** complete with IMO tanks **38** except that on the deck surface at the stern or bow, there is a piping skid room **31a**. The piping skid room **31a** occupies only a small area of the deck **11** surface, leaving the rest of the deck surface for carrying cargoes and containers. As in the above embodiments, an operation room **29** may be located inside the piping skid room **31a** together with a control console **28**. Preferably, the piping skid room **31a** has observation windows to facilitate monitoring activities on the deck surface during the filling/discharging of the IMO tanks **38**.

[0031] FIG. 9 shows a barge **20a** according to another embodiment of the present invention. The barge **20a** is similar to the above barge **20** except that the barge **20a** is self-propelled and has a round bow **16**. In addition, the barge **20a** has a pilot cabin **71** located at the bow **16**. The pilot cabin **71** occupies a small area of the deck surface leaving most of the deck surface available for carrying cargoes and containers. As shown in FIG. 9, the deck surface has two cranes **72a**, **72b**. The cranes may be equipped with an apparatus, such as a container spreader, hoppers and other material handling mechanisms. Other material handling equipment, such as, an excavator, skid loader may also be provided on the deck. As shown in FIG. 9, below the deck surface, there is a plurality of storage compartments **48**, storage tanks **38** and the piping skid room **31** is located below the deck **11** surface. In another embodiment, it is possible that the control console **28** is located in the pilot cabin **71**.

[0032] With the present invention, the above barges **10**,**10a**, **20**, **20a** have large flat deck **11** surfaces. The deck **11** surface may be equipped with locking devices (such as twist locks) and securing devices to hold containers (shipping containers **61**, **62** and general cargo containers **63**, **66**), bales **67**, crates **69** and tanks during transit. It is also possible to equip the deck surface with conveyor belts to transport bulk dry cargo **68** like mineral ores, sand and aggregates. Alternatively, the conveyors are located outside the barge **10**, **20**, etc, but the bulk cargoes **68** are transferred from the conveyors and are discharged through hoppers that may be suspended from the crane **72a**, **72b**. Existing barges can also be retrofitted with storage compartments **48** or tanks **38** below the deck

surface complete with piping skid rooms **31** and operation rooms **29**, where features of extendable and retractable port skids **25** and piping skid **23** are advantageous.

[0033] In an example, FIG. 10 shows the barge according to the present invention carry different types of cargoes **61-63**, **66-69** on the deck **11** surface whilst bulk fluid cargo is stored in the compartments **48** or storage tanks **38** below the deck surface. By storing the bulk fluid cargo in storage compartments and tanks below the deck surface, an operator frees up the deck **11** surface for non-fluid cargo in order to maximize use of space and transport efficiency. To illustrate maximizing transport efficiency, an example is given: these barges **10**, **10a**, **20**, **20a** carry heavy marine fuel and fresh water in storage compartments **48** and tanks **38** deliver them to mother vessels anchored off the port area, and after delivery the barges are loaded on the deck **11** surfaces with cargoes from the mother vessels or other nearby mother vessels for delivery to the port area; in this way, the load capacity of the barges in both the supply and return trips is fully utilized, in contrast with conventional barges that deliver marine oil or water to mother vessels but return to port without any payload. In another example, these barges **10**, **10a**, **20**, **20a** supply fuel in the storage compartments/tanks **48**, **38**, consumer goods, equipment and so on to farms, factories, stockpile deports, etc. which are located in areas remote from the towns/cities and, in the return trips, transport agricultural products, processed goods, timber, cement, mineral ores, etc. on the deck surface to processing centres in the towns/cities. In another example, these barges deliver bulk raw materials on the deck 11 surface and fuel in the storage tanks **38**, **48** to chemical plants and, in the return trips, transport bulk fluid chemicals processed at the plants using the storage tanks **38**, **48** to the towns/cities or ports for distribution. With the present invention, the load capacities of these barges and transport efficiency are maximized, thereby leading to productivity and lower operating costs. In addition, as these barges are usually loaded during transit, operations to ballast water in and out of the barges for navigation stability can be reduced.

[0034] In the above description, supply and return trips refer to the point of delivery, for eg., at the mother vessels, farms or plant. This means return trip can refer to transit to another location different from origin of the supply trip.

[0035] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations thereof could be made to the present invention without departing from the scope of the invention. In the above, a flat deck, in practice, has a camber or is slightly inclined; this is to allow water to flow away the deck surface. It is possible that the barge is functionally divided into two or more sections, where a section has a flat deck on which general cargoes, containers, bales, crates are stored and flowable/fluid cargoes are stored in storage compartments/tanks disposed below the deck, whilst in the other section(s) general cargoes, containers, bales, crates, bulk cargoes and so on are stored on the inner bottom plate 14 of the barge.

CLAIMS:

1. A flat deck barge comprising:

a hull; and

a deck formed across a top of the hull, along a length of the hull or a section thereof, to provide a substantially flat deck surface and a storage compartment below the deck;

wherein the flat deck surface is arranged to carry cargoes, bales, crates or containers whilst the storage compartment is arranged to carry flowable or fluid cargo.

2. A flat deck barge according to claim 1, further comprising a piping skid room located adjacent to the storage compartment, wherein access to the piping skid room is through a removable cover at the deck surface.

3. A flat deck barge according to claim 1 or 2, wherein the storage compartment comprises a plurality of storage compartments.

4. A flat deck barge according to claim 3, wherein a shield or cover sheet is disposed beneath the deck in each storage compartment.

5. A flat deck barge according to claim 2 or 3, wherein some of the storage compartments comprise a storage tank or tanks in each storage compartment.

6. A flat deck barge according to any one of claims 2-5, wherein the piping skid room comprises a piping skid, on which are installed pumps, pipes, inlet and outlet ports, valves and meters for the filling or discharging of the storage compartment(s) or storage tank(s).

7. A flat deck barge according to claim 6, wherein the pipes between the storage compartments or tanks and the piping skid are installed below the deck.

8. A flat deck barge according to claim 6, wherein the pipes between the storage compartments or tanks and the piping skid are installed in a trench on the deck surface.

9. A flat deck barge according to any one of claims 6-8, wherein the inlet and outlet ports are located on a port skid.

10. A flat deck barge according to claim 9, wherein the port skid is:
- pivoted on a top part of the piping skid so that the port skid is accessible through an opening in the deck surface; or
- located in a recess in the deck surface and is pivoted up for access or retracted when not in use; or
- mounted on the piping skid with a mounting of the piping skid being operable to extend so that the port skid is accessible through an opening in the deck surface when in use.

11. A flat deck barge according to claim 9 or 10, wherein the port skid further comprises a valve skid, which is connected to the port skid.

12. A flat deck barge according to any one of claims 2-11, wherein the piping skid room further comprises an operation room, with the operation room comprises a control console.

13. A flat deck barge according to claim 12, wherein a mounting of the operation room is operable to extend the operation room above the deck surface when in use or to retract into the piping skid room when not in use.

14. A flat deck barge according to any one of claims 2-13, wherein the piping skid room is on the deck surface.

15. A flat deck barge according to any one of claims 1-13, further comprising a pilot cabin that is erected above the deck surface.

16. A flat deck barge according to claim 15, further comprising a crane, which is equipped with material handling mechanism(s) to transfer cargoes on or off the deck surface.

17. A flat deck barge according to claim 15 or 16, wherein the barge is self-propelled.

18. A method for maximizing a load capacity of a flat deck barge, the method comprises:

carrying cargoes, containers, bales or crates on a deck surface of the flat deck barge; and

carrying flowable granular or fluid cargoes in storage compartments or tanks disposed below the deck surface;

wherein, when the flowable granular or fluid cargoes in the storage compartments/tanks are discharged from the barge in a supply trip, other cargoes, containers, bales and crates are loaded onto the deck surface for a return trip; or when, cargoes, containers, bales or crates are delivered from the barge in a supply trip, flowable granular or fluid cargo are loaded into the storage compartments/tanks for a return trip, with the cargoes, containers and so on being delivered/loaded in partial capacities or full capacities, so that the load capacity of the flat deck barge is maximized in both the supply and return trips.