

SYSTEM AND METHOD FOR RECONFIGURING A MOBILE DOCKING APPARATUS FOR TRANSPORTING, REMOVAL, INSTALLATION, HOUSING AND TRANSFERRING ASSETS

Background

5 Field of Invention

Embodiments of the invention relate to the delivery, receiving, housing, lifting, transporting, removing, transferring and/or offloading of transportable and / or non-transportable, floating and non-floating assets from sea to shore, shore to sea, sea to sea, platform to platform and vessel to vessel and the methods of operation thereof. More particularly, the invention provides a moveable, mobile and re-deployable floaters which is the high buoyancy ballastable tank(s) in plurality mounted with rigid locking devices on the moveable docking apparatus which is reconfigurable to provide greater flexibility in longitudinal or side transfer, increased variability in installation, removal, lift and/or submergibility capacity, and/or additional floating structure space for various purposes, e.g. emergency or amphibious operation, and removal of additional floating structure to reduce dead-weight for lifting, and / or hybrid operations and in so doing increased platform deck storage or work space.

Description of Related Art

There are many methods as well to deliver, receive, house, lift, transport, remove, transfer and/or offload any transportable and non-transportable, floating and non-floating assets to different locations for various purposes, e.g. repairs, under-hull work, refurbishment, installation and removal, long term fixture as operable asset(s) or factory or farm or any other services required. These methods involve a multiplicity of equipment, such as lift-boat, self – elevated units, heavy-lift semisubmersible vessel, combi-docks, floating dock, floating crane, synchrolift and/or other floating or non-floating asset / infrastructure or equipment to do the same above services. Due to the multiplicity or array of equipment required, these methods often require good planning and coordination, complicated by wait-on weather, more time consuming and hence more expensive.

International Publication No. WO 2017/058098 “A Mobile Docking Apparatus and Method of Operating Thereof” filed under International Application PCT/SG2015/050349 discloses a mobile docking apparatus which comprises a platform arranged to receive at least one floating/transportable object; and a plurality of supporting legs movably coupled to the platform and configurable to be lowered to the seabed to anchor and/or support the

apparatus, wherein the platform is operable cooperatively with the lowered supporting legs to be adaptively raised or lowered with reference to a water-level to receive and lift the object. A method of operating the apparatus is also disclosed.

5 Although WO 2017/058098 provides a mobile docking apparatus and methods for lifting, transporting and transferring assets, there remains at least one limitation with this method.

One object of the present invention is therefore to address the problems of the existing art and/or to provide a choice that is useful in the art.

Summary

10 Embodiments of the invention eliminate the multiplicity of equipment required for receiving, lifting, transporting, transferring and/or offloading of floating and non-floating assets from sea to shore, shore to sea, sea to sea and vessel to vessel. The invention provides a versatile mobile docking apparatus which is reconfigurable to provide a combination of floating dock, jack up and mobile shipyard, and yet the reconfiguration can be
15 achieved simpler, faster, cheaper cost effective solution with all-in-one concept than existing methods, without the needs for an array of offshore support infrastructure from floating crane to accommodation work barges etc.

According to one aspect of the invention, a reconfigurable mobile docking apparatus is provided which comprises:

20 a platform having at least a longitudinal side and a transverse side, and arranged to receive an asset;

a plurality of supporting legs movably coupled to the platform and configurable to be lowered to the bottom of a body of water to anchor and/or support the apparatus, wherein the platform is operable cooperatively with the lowered
25 supporting legs to be adaptively raised or lowered with reference to a water-level; and

a reconfigurable modular tank system which includes a plurality of high buoyancy ballast tanks which are removably supported by the platform and relocatable at least between a first and a second position, wherein in the first position,
30 asset transfer to or from the platform is permitted through the longitudinal side, and wherein in the second position, asset transfer to or from the platform is permitted through the transverse side.

According to one aspect of the invention, a method of operating a mobile docking apparatus which comprises a platform having at least a longitudinal side and a transverse side, and arranged to receive an asset; a plurality of supporting legs movably coupled to the platform and configurable to be lowered to the bottom of a body of water to anchor and/or support the apparatus, wherein the platform is operable cooperatively with the lowered supporting legs to be adaptively raised or lowered with reference to a water-level; and a reconfigurable modular tank system comprising a plurality of high buoyancy ballast tanks, is provided. The method comprises:

removably arranging the tanks to be supported by the platform; and

relocating at least some of the tanks between a first and a second position, wherein in the first position, asset transfer to or from the platform is permitted through the longitudinal side, and wherein in the second position, asset transfer to or from the platform is permitted through the transverse side.

Brief Description of Drawings

Embodiments of the invention are disclosed hereinafter with reference to the drawings, in which:

Figure 1A is a perspective view of a reconfigurable mobile docking apparatus according to one embodiment of the invention;

Figure 1B is a plan view of the reconfigurable mobile docking apparatus of Figure 1A having tanks arranged at longitudinal sides on the port and starboard of the platform;

Figure 1C is a plan view of the reconfigurable mobile docking apparatus of Figure 1A having tanks arranged at transverse sides on the forward and aft of the platform and parallel to the transverse sides;

Figure 1D is a plan view of the reconfigurable mobile docking apparatus of Figure 1A having tanks arranged near/proximate to one of the transverse sides at the aft of the platform;

Figure 1E is a plan view of the reconfigurable mobile docking apparatus of Figure 1A having tanks arranged at transverse sides on the forward and aft of the platform and transverse to the transverse sides;

Figure 1F is a perspective view of a reconfigurable mobile docking apparatus according to one embodiment of the invention;

Figure 1G is a plan view of the reconfigurable mobile docking apparatus of Figure 1F having sponson tanks arranged at longitudinal sides on the port and starboard of the platform;

Figure 1H is a plan view of the reconfigurable mobile docking apparatus of Figure 1F having tanks arranged at transverse sides of the platform and parallel to the transverse sides;

Figure 1I is a plan view of the reconfigurable mobile docking apparatus of Figure 1F having tanks arranged near to one of the transverse sides of the platform;

Figure 1J is a plan view of the reconfigurable mobile docking apparatus of Figure 1F having tanks arranged at transverse sides of the platform and transverse to the transverse sides;

Figure 1K is a perspective view of a reconfigurable mobile docking apparatus according to one embodiment of the invention;

Figure 2A illustrates a relocation of tanks from longitudinal sides of the port and starboard to transverse sides to the forward and aft of platform;

Figure 2B illustrates a relocation of tanks from transverse sides of the forward and aft of the platform to longitudinal sides on the port and starboard side;

Figure 2C illustrates a relocation or offloading of tanks from platform of the reconfigurable mobile docking apparatus into a body of water, wherein the offloaded tanks are coupled to each other with strong interlocking devices to provide a floating structure, e.g. barge;

Figure 2D illustrates a relocation or offloading of tanks from platform of the reconfigurable mobile docking apparatus into a body of water, wherein the offloaded tanks are coupled to each other longitudinally with strong interlocking devices to provide a long floating structure, e.g. bridge;

Figure 3 illustrates methods of operating the reconfigurable mobile docking apparatus; with its high buoyancy ballast tanks; operating in tandem to the legs pre-loading and loading conditions to suit the operating requirements;

Figures 4A and 4B show possible post-relocation arrangements of the modular high buoyancy tanks to accommodate one or more assets, e.g. jack-up;

Figure 5A shows a perspective view of a transfer of process module between a reconfigurable mobile docking apparatus and skidding to a FPSO;

Figure 5B shows a schematic plan view of a possible post-relocation arrangement of the modular high buoyancy tanks to accommodate one or more assets, e.g. process modules according to another example;

Figure 6 shows a possible post-relocation arrangement of the modular high buoyancy tanks to accommodate one or more non-marine asset;

Figure 7 shows a possible post-relocation arrangement of the modular high buoyancy tanks similar to the purpose of Figure 2C;

Figure 8 shows a possible post-relocation arrangement of the modular high buoyancy tanks similar to the purpose of Figure 2D;

Figure 9A shows a multi-user yard and the reconfigurable mobile docking apparatus for three localities in the ship-repair, new-building and fabrication of modules and structure yard ;

Figure 9B shows the reconfigurable mobile docking apparatus which may be removed of/added with the tanks to respectively increase lifting capacity/submergibility, and berthed at a multi-storey slipway building at the multi-user yard and ship transfer to the large enclosed ship hull blasting hall of Figure 9A;

Figure 9C shows the reconfigurable mobile docking apparatus in which the tanks arranged at transverse sides of the platform and the apparatus is berthed at the heavy fabrication and module fabricator site for side transfer in the multi-user yard of Figure 9A;

Figure 10 shows a possible arrangement of two units of reconfigurable mobile docking apparatuses for inland waterway shallow draft ship transfer to move from upstream to downstream and vice-versa as arranged at two position of the inland waterways;

Figure 11A is a perspective view of a reconfigurable mobile docking apparatus deployed on remote shallow water site receiving a small scale LNG carrier, here to act as a LNG storage regasification terminal act as jetty and to provide LNG gas for commercial usage and power plant according to one instance;

Figure 11B is a schematic plan view of a reconfigurable mobile docking apparatus as a LNG storage regasification terminal according to Figure 11A;

Figure 11C is a see-through side elevation view taken from starboard side of the reconfigurable mobile docking apparatus of Figure 11B;

Figure 11D is a perspective view representation of a reconfigurable mobile docking apparatus while acting as a LNG storage regasification terminal, the high buoyancy tanks are dismounted to reduce the deadweight of the apparatus and re-position to the forward and aft of the apparatus to act as mooring barges according to another instance;

5 Figure 11E is a schematic plan view representation of a reconfigurable mobile docking apparatus, with longitudinal arrange to act as mooring barges to the LNG storage regasification terminal according to Figure 11D, however LNG storage tanks are not illustrated;

10 Figure 12A shows a reconfigurable mobile docking apparatus having a cantilever system which is in an extended position to receive a decommissioned deck box of a decommissioned old oil production platform on shallow water in the high sea;

15 Figure 12B shows the reconfigurable mobile docking apparatus having a cantilever system which is in a retracted position to load the deck box onto the reconfigurable mobile docking apparatus and be ready for disposal to scrap yard or assigned sea spot to be lowered and for reefing;

Figure 12C shows a tug pulling a decommissioned jacket structure onto the reconfigurable mobile docking apparatus;

Figure 12D shows the decommissioned jacket structure loaded onto the reconfigurable mobile docking apparatus;

20 Figure 12E shows the decommissioned jacket structure being offloaded into water for reefing;

Figure 13A shows a perspective view of reconfigurable mobile docking apparatus as security outpost command;

Figure 13B shows a plan view of Figure 13A.

25 **Detailed Description of Invention**

In the following description, numerous specific details are set forth in order to provide a thorough understanding of various illustrative embodiments of the invention. It will be understood, however, to one skilled in the art, that embodiments of the invention may be practiced without some or all of these specific details. In other instances, well known process
30 operations have not been described in detail in order not to unnecessarily obscure pertinent

aspects of embodiments being described. In the drawings, like reference numerals refer to same or similar functionalities or features throughout the several views.

Embodiments described in the context of one of the methods or devices or systems are analogously valid for the other methods or devices or systems. Similarly, embodiments described in the context of a method are analogously valid for a system or device, and vice versa.

Features that are described in the context of an embodiment may correspondingly be applicable to the same or similar features in the other embodiments. Features that are described in the context of an embodiment may correspondingly be applicable to the other embodiments, even if not explicitly described in these other embodiments. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of an embodiment may correspondingly be applicable to the same or similar feature in the other embodiments.

As used herein, the articles “a”, “an”, “some”, “any” and “the” as used with regard to a feature or element include a reference to one or more of the features or elements.

As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

As used herein, the term “each other” denotes a reciprocal relation between two or more objects, depending on the number of objects involved.

As used herein, the term “between” when used in reference to two objects or positions denotes a reciprocal relation, e.g. movement, in any direction, e.g. “between position A and position B” refer to from position A to position B and vice versa.

As used herein, the term “coupled” and related terms are used in an operational sense and are not necessarily limited to a direct physical connection or coupling. Thus, for example, two devices may be coupled directly, or via one or more intermediary devices. Based on the present disclosure, a person of ordinary skill in the art will appreciate a variety of ways in which coupling exists in accordance with the aforementioned definition.

As used herein, the terms “first,” “second,” and “third,” etc. are used merely as labels, and are not intended to impose numerical requirements on their objects.

As used herein, the terms “configured to” includes references to “adapted to”, “arranged to” and “constructed and arranged to”, and these terms may be interchangeably used.

As used herein, the terms “body of water” and “water body” refer to marine waters, e.g. sea, ocean, and to inland fresh or salt waters, e.g. lakes, reservoirs, rivers.

As used herein, the term “asset” refer to as floatable, floating, and/or non-floatable objects, structures or cargo. Examples of assets include maritime or sea-going vessels, e.g. boats, crafts and vessels; infrastructure structure, power generation modules, manufacturing factory, offshore structures, e.g. jack-up rigs; industrial modules, e.g. process modules; structures, e.g. gravity-based foundations and caissons; cargo, e.g. minerals.

1. Overview of Main Features

According to one aspect of the invention, a reconfigurable mobile docking apparatus 100 is provided (see at least Figures 1A and 1B). The apparatus 100 is configured to be arranged in a body of water, and to be mobile, i.e. it may not be permanently fixed to an offshore or onshore location, e.g. dock, jetty or shipyard. Instead, the apparatus 100 is movable, by self-propulsion or otherwise, e.g. by towing, across the body of water to a desired location. In certain instances, the docking apparatus 100 may be self-elevating, e.g. able to lift its body or platform 102 upward and with the asset (if required) above the water-level to a desired elevation.

The apparatus 100 comprises a platform 102 arranged or configured to receive the asset. The platform 102 may be generally rectangular but not limited as such. The platform 102 may be provided in any geometrical or non-geometrical shape. The platform 102 is coupled to the wing hulls on the port and starboard side to form a part of the twin hull of the docking apparatus 100. It is these high buoyancy wing hulls that provide the buoyancy to the apparatus 100 and are configured, according to the invention, to moveable, skidable, dismountable and/or re-mountable tanks 120. Generally, the platform 102 may be defined by a plurality of sides, including a pair of opposed longitudinal sides 102a and a pair of opposed transverse sides 102b. Generally, the longitudinal sides 102a may correspond to port and starboard side of the docking apparatus 100 while the transverse sides 102b may correspond to bow and stern of the docking apparatus 100. Generally, the longitudinal sides 102a may refer to or be parallel to a length of the docking apparatus 100 while the transverse sides 102b may correspond to or be parallel to a beam of the docking apparatus 100, but this reference may be interchangeably used. The platform 102 includes a length or longitude which may be generally parallel to the longitudinal side 102a, a width or beam which may be generally parallel to the transverse side 102b, and a height or thickness which may refer to a distance between a top surface, e.g. deck, and a bottom surface, e.g. keel, of the platform.

The apparatus 100 further comprises a plurality of supporting legs 104 movably coupled to the platform 102 and configurable to be lowered to the bottom of the body of water, e.g. seabed, and secured thereto, e.g. anchor to the seabed, and/or support the apparatus 100. Each supporting leg is movable between a plurality of positions, including a retracted or raised position and a deployed or lowered position. In the deployed or lowered position, the supporting legs 104 are lowered to the bottom of the body of water, e.g. seabed. In the retracted or raised position, the supporting legs 104 are removed or remote from the bottom of the body of water. Other intermediate raised or lowered positions are also possible. The supporting legs 104 may be provided as tubular (e.g. circular or square) legs 104, or trussed legs 104 (which are suitable for deeper water operations). Each supporting leg 104 may include a leg footing or spud can provided at a bottom portion thereof, which is configured to be driven into a bottom of the body of water, e.g. seabed, when the supporting leg 104 is to be pinned down or anchored.

The apparatus 100 further comprises one or more jacking systems operably coupled to the platform 102 and the supporting legs 104. The jacking systems are configured to raise and/or lower the platform 102 relative to the supporting legs 104 as well as raise and/or lower the supporting legs 104 relative to the platform 102. Examples of jacking system include hydraulic ring beam lifting system, and rack and pinion gear-lifting system arranged to be driven by electric or hydraulic motors, but are not limited as such. The jacking system may be provided with one or more leg locking devices, which may include a mechanical/hydraulic locking mechanism, configured to secure and hold the hull of the apparatus 100 in position when the hull is lifted to desired elevation above the water-level.

The apparatus 100 further comprises a pair of hull portions 106a, 106b arranged at each of the starboard and port side of the platform 102. The platform 102 and hull portions 106a, 106b collectively form the hull of the docking apparatus 100. The hull portions 106a, 106b may be detachably and mechanically coupled to the platform 102. At certain locations of the apparatus 100, the hull has a generally U-shaped cross-sectional arrangement, (i.e. configured as a horizontal portion and side-walls extending from ends of the horizontal portion and generally arranged transverse to the horizontal portion) and a rectangular arrangement when viewed from the top. At other locations of the apparatus 100, the cross-section the hull generally corresponds to the cross-section of the platform 102. The hull is configured to be operable cooperatively with the lowered supporting legs 104 so that the platform 102 is raised or lowered with reference to a water-level to receive and lift an asset out of water.

More specifically, each hull portion 106a, 106b may be substantially rectangular and longitudinal in configuration but not limited as such. Each hull portion 106a, 106b may provide a leg housing. Each leg housing is configured to movably receive a supporting leg 104, and accordingly, the docking apparatus 100 may have a total of four supporting legs 104, but not limited as such. Each leg housing, which may be arranged with an associated receptacle at a centre portion thereof, may comprise an upper leg guiding portion and a lower leg guiding portion underneath thereto. An associated jacking house may be arranged on top of each leg-housing to house the aforementioned jacking system. As illustrated in Figures 1A and 1B, the supporting legs 104 are movably coupled to the platform 102 via the hull portions 106a, 106b.

The apparatus 100 may provide a plurality of void spaces which may be configured to provide habitable spaces, e.g. working, operating and living spaces for crew members, equipment housing, e.g. for jacking and/or gearing equipment. Equipment, e.g. lift cranes, deck machinery, may be arranged atop the hull portion 106a, 106b or on the platform 102 to facilitate internal cargo loading/unloading and external cargo transportation to/from the asset docked at the apparatus 100. Moreover, other types of lifting cranes may be appropriately located on the apparatus 100, but not at the top of the hull portions 106a, 106b, such as fixed marine/offshore cranes, gantry cranes (which may be movable on guiding tracks 130), marine/offshore leg encircling cranes, or the like. Moreover, to further enhance an overall lifting capacity and capability, the docking apparatus 100 may be provided with cantilevered arms.

A plurality of pontoon / sponson tanks may be arranged within at the forward, mid-part, and aft sections of the platform 102 to act as buoyancy tanks and hence contribute to the total reserve buoyancy capacity of the docking apparatus 100. These pontoon / sponson tanks may be skidable, movable and/or dismountable modular high buoyancy ballastable sponson tanks. They may be coupled to the platform or wing hulls by rigid couplers and/or locking devices.

The apparatus 100 may further comprise propulsion and/or thruster devices (e.g. jet-thrusters) to enable the apparatus 100 to be self-propelled, station-keeping apparatus 100 to maintain position of the apparatus 100 in the body of water, and other equipment as necessary.

The apparatus 100 further comprises a reconfigurable modular tank system which provides versatility, flexibility and enhances the multi-functionality of the mobile docking apparatus 100, such as, but not limited, allowing greater flexibility in side transfer, increased

variability in lift and/or submergibility capacity, and/or additional floating structure space for various purposes, e.g. emergency or amphibious operation, increased storage or work space.

2. Reconfigurable Modular Tank System

5 The reconfigurable modular tank system includes a plurality of modular high buoyancy ballast pontoon / sponson tanks 120 (or floaters). The tanks 120 are modular, e.g. discrete and independent of each other. The tanks 120 are ballastable and/or deballastable to enhance and provide controllable buoyancy for the docking apparatus 100 and hence its lifting and/or submergibility capacity. Layout of the tanks 120 on the platform 102 is
10 reconfigurable in accordance with various purposes. The tanks 120 are removably supported by the platform 102, e.g. any tank may be dismounted or detached or removed from the platform 102, tanks may be arranged on the deck of the platform or coupled to the side of the platform. The tanks 120 are movable and/or relocatable to various positions, including within and/or outside the platform 102. In other words, the tanks 120 are movable,
15 detachable or removable or dismountable, and redeployable. The tanks 120 may be partially or fully de-ballasted (empty) to increase buoyancy and/or lift capacity, or partially or fully ballasted (filled) to provide stability to the platform 102.

Reference is made to Figures 1A to 1K showing various embodiments of the invention in which the tanks 120 may be arranged and reconfigured in various non-limiting
20 positions. Although various illustrative figures show two port side tanks 120 (P1 and P2) and two starboard side tanks (S1 and S2), it is to be appreciated that other number of tanks 120 and/or other arrangement of P1, P2, S1 and S2 tanks are equally possible.

In Figures 1B to 1E, the tanks 120 are removably arranged on the platform 102, e.g. deck. In Figures 1B and 1C, the tanks 120 may be arranged at a pair of opposed sides, e.g.
25 either longitudinal sides (see Figure 1B) or transverse sides (see Figure 1C wherein the tanks 120 are arranged parallel to the transverse sides 102b), of the platform 102. At each side which is provided with the tanks 120, one or more tanks 120 may be arranged. In Figure 1D, the tanks 120 may be arranged near/towards one of the transverse sides 102b. This arrangement may be useful to provide a counterweight if an asset is to be received from
30 the opposed transverse side. In Figure 1E, the tanks 120 are arranged at opposed transverse sides 102b wherein the tanks 120 are arranged transversely to the transverse side 102b.

In Figures 1F to 1J, the sponson tanks 120 are removably coupled to the platform 102. The platform 102 of Figures 1F to 1J is provided with at least an indent region 128 at

each longitudinal side 102a. Each indent region 128 extends partially along a length and a beam of the platform 120. Each indent region 128 also extends through a height of the platform. Each indent region 128 is configured to accommodate one or more sponson tanks. The indent region may be suitably dimensioned such that when tanks 120 arranged therein and coupled to the platform 102, sides of the sponson tanks 120, e.g. lateral sides remote from the platform 102, may be generally flush with side of the platform 102. The sponson tanks 102 are mechanically coupled to the platform 102 such as by known rigid couplers or locking mechanisms may allow quick-release.

In Figure 1G, the sponson tanks 120 may be arranged at opposed longitudinal sides 102a of the platform 102, and particularly in the indented regions. In Figure 1H, the tanks 120 may be arranged at opposed transverse sides 102a of the platform 102, and particularly on the platform 102. In Figure 1I, the sponson tanks 120 may be arranged on the platform 102 and near/towards one of the transverse sides 102b. This arrangement may be useful to provide a counterweight if an asset is to be received from the opposed transverse side. In Figure 1J, the sponson tanks 120 are arranged on the platform 102 and at opposed transverse sides 102b wherein the sponson tanks 120 are arranged transversely to the transverse side 102b.

In Figure 1K, the sponson tanks 120 are removably coupled to the platform 102. Features in Figure 1K are generally similar to Figures 1F to 1J and therefore the corresponding description will apply. However, additional tanks 120 may be mechanically coupled to transverse sides 102b of the platform 102. It is to be appreciated that at least some of the sponson tanks 120 shown in Figure 1K may be relocatable to the positions as shown in Figures 1G to 1J.

In various embodiments as illustrated in Figures 1A to 1K and in other embodiments that may be envisaged, pontoon / sponson tanks 120 may be configured in various sizes, shapes and dimensions to be stacked singularly, doubly, vertically or horizontally in any orientation.

In various embodiments as illustrated in Figures 1A to 1K and in other embodiments that may be envisaged, the reconfigurable modular pontoon / sponson tank system is configured to allow any or all of the tanks 120 relocate to various positions on the platform 102, including a first and a second position. In the first position, asset transfer to or from the platform 102 is permitted through the longitudinal side. In the second position, asset transfer to or from the platform 102 is permitted through the transverse side.

Particularly, at least some of the tanks 120 may be relocatable from a longitudinal side of the platform 102 to a transverse side of the platform 102. With the relocation, a previously-occupied region, e.g. first occupied region along the longitudinal side of the platform 102, is converted into a first unoccupied region. The first occupied region would not have allowed side transfer of asset to the platform 102, through the longitudinal side, as it was occupied by the tank(s). By converting the first occupied region to a first unoccupied region, i.e. after relocation of tank(s), the platform 102 is allowed to transfer, e.g. receive and/or unload, asset(s) through the first unoccupied region along the longitudinal side of the platform 102. Figure 2A illustrates a relocation of tanks 120 from longitudinal sides to transverse sides.

Similarly, at least some of the tanks 120 may be relocatable from a transverse side of the platform 102 to a longitudinal side of the platform 102. With the relocation, a previously-occupied region, e.g. second occupied region along the transverse side of the platform 102, is converted into a second unoccupied region. The second occupied region would not have allowed side transfer of asset to the platform 102, through the transverse side, as it was occupied by the tank(s). By converting the second occupied region to a second unoccupied region, i.e. after relocation of tank(s), the platform 102 is allowed to transfer, e.g. receive and/or unload, asset(s) through the second unoccupied region along the transverse side of the platform 102. Figure 2B illustrates a relocation of tanks 120 from transverse sides to longitudinal sides.

The tanks 120 may relocate from a port or starboard side of the platform 102 to a bow (forward) or stern (aft) side of the platform 102, or vice versa.

It is to be appreciated that the tanks 120 may be relocated to any position or orientation on the platform 102, including other positions not illustrated in the accompanying drawings.

In certain embodiments, a plurality of skidding tracks 130 or guides are arranged on the platform 102. The tracks 130 are configured to movably support the tanks 120 and allow the tanks 120 to be relocated at least within the platform 102. The tanks 120 may include or be mounted on wheel means to allow locomotion along the tracks 130. The path and relocatable positions of the tanks 120 are defined by the skidding track layout. One or more driving or propulsion units may be provided and operable to move or drive or propel the tanks 120 on the skidding tracks 130. In the accompanying drawings, some embodiments show skidding tracks 130 but it is to be appreciated that these illustrated embodiments may not be provided with skidding tracks in other instances. Conversely, illustrated embodiments

which do not show skidding tracks 130 may be provided with skidding tracks in other instances.

In certain embodiments where skidding tracks 130 are not provided, the path and relocatable positions of the tanks 120 are less restricted. The tanks 120 may include or be mounted on wheel means to allow locomotion along the platform 102.

In some other embodiments where skidding tracks 130 are not provided, the tanks 102 may be relocatable using a float-in-float-out method which will be described later.

As will be appreciated from the above, relocation of one or more tanks 120, e.g., from a longitudinal side to a transverse side, or vice versa, allows the platform 102 to be reconfigured in accordance with the dimensions and/or shape of the asset to be transported by the docking apparatus 100 and, more particularly, to allow flexibility in berthing and asset transfer through any selected side of the platform 102 by converting an occupied region into an unoccupied region such that an asset may be transferred therethrough.

The reconfigurable modular tank system and/or arrangement of the skidding tracks 130 may be further configured to allow any of the tanks 120 relocate to outside the platform 102, e.g. outboard, and particularly to be offloaded into the body of water in which the docking apparatus 100 is arranged. Figure 2C illustrates offloaded tanks 120 arranged in the body of water 1 to provide additional deck space. Figure 2D illustrates offloaded tanks 120 arranged in the body of water 1 to provide a landing bridge. In Figures 2C and 2D, it is to be appreciated that the arrangement of the tanks 120 port side tanks 120 (P1, P2) and starboard side tanks 120 (S1, S2) may be modified according to a sequence of offloading of tanks 120 into the body of water.

Relocation of one or more tanks 120 to outside the platform 102 allows the platform 102 to increase buoyancy and/or lifting capacity by reducing platform 102 or hull weight, and/or provides a floating structure in the body of water, which may be useful for various purposes which will be described later in various non-limiting examples.

3. Methods of Operation

Broadly, a method of operating the docking apparatus 100 includes lowering the supporting legs 104 to the bottom of the body of water, e.g. seabed, to anchor and/or support the apparatus 100, operating the platform 102 or hull cooperatively with the supporting legs 104 to raise or lower the platform 102, with reference to a water-level, such as to first receive and then lift an asset out of water.

More specific operating modes of the docking apparatus 100 are described below.

a. Operating Mode-1

In Operating Mode-1 (also known as full-floating mode), the docking apparatus 100 functions similarly to a floating dock (arranged in a stationary position), or a moving semisubmersible heavy lift vessel (e.g. the Can-Do Barge or a self-propelled Roll-Dock Vessel).

In Operating Mode-1, the docking apparatus 100 may initially be floating on water or semi-submerged state. Ballast and/or pontoon / sponson tanks may be ballasted to lower the hull, an asset, i.e. floating asset, may be received into the hull of the docking apparatus 100, the ballast and/or pontoon / sponson tanks may be deballasted to raise the hull until the received asset is securely arranged or seated on the platform 102 or docking blocks arranged on the platform 102, the hull may be raised further to be completely lifted above the water-level, the docking apparatus 100 may be propelled to transport the received asset to a destination.

In Operating Mode-1, the docking apparatus 100 may operate without anchors/anchor chains, or without anchoring the supporting legs 104 and associated spud can 300 to the seabed to maintain a relatively stationary position on water. The supporting legs 104 may be generally arranged in the raised or retracted position, however, the supporting legs 104 may be soft-pinned to the seabed or pre-loaded, depending on a duration the docking apparatus 100 needs to be stationed onsite.

b. Operating Mode-2

In Operating Mode-2 (also known as full-jacked-up mode), the docking apparatus 100 is operated to a self-elevated or jacked-up state, where there are similarities to a jack-up barge, a self-elevated platform 102, or a lift boat. The docking apparatus 100 is self-elevated using its jacking system and also pre-loaded onsite. It must be noted that the ballast tanks 120 and/or pontoon/sponson tanks “floater” can be removed to reduce the total weight of the apparatus and in so doing allow higher payload and reduce the load bearing forces on the supporting legs 104.

In Operating Mode-2, the docking apparatus 100 may initially be in floating on water or semi-submerged state. Supporting legs 104 may be lowered to the bottom of the body of water, e.g. seabed, using the jacking system to soft-pin the legs 104 thereto, the hull may be elevated to be completely lifted above the water-level, ballast and/or pontoon / sponson

tanks may be ballasted to pre-load the supporting legs 104 and spud cans for anchoring the apparatus 100 to the seabed, other optional piling or securing may be performed to anchor the supporting legs 104 to the seabed, and the tanks 120 may be deballasted.

Further, in Operating Mode-2, the hull may be lowered and its hatches opened such that the ballast tanks 120 and/or pontoons/sponsons may be ballasted by seawater until the hull may be semi-submerged, an asset may be received into the hull, the ballast and/or pontoon/sponson tanks may be deballasted to raise the hull and received asset until the received asset is securely arranged or seated on the platform 102 or docking blocks arranged on the platform 102, and the hull may be raised further to be completely lifted above the water-level.

c. Operating Mode-3

In Operating Mode-3 (also known as hybrid mode), the docking apparatus 100 is operated in a mode that combines Operating Mode-1 and Operating Mode-2. Alternatively, the docking apparatus 100 may also be operated as not fully floating and not fully jacked-up.

In a first mode of Operating Mode-3, a hull having received an asset therein may be semi-submerged state. If the received asset is to be lifted above the water-level, the ballast and/or pontoon / sponson tanks are to be fully de- ballasted, and the operation steps under Operating Mode-2 are performed. In this first mode, the jacking system is locked, e.g. not in operation. It is to be appreciated that the maximum lift capacity of the docking apparatus 100 is approximately equal to a combination of lifting capacity provided by the jacking system and buoyancy of the hull. Buoyancy forces acting on the hull are reduced when it is elevated above the water-level. If the received asset docked at the docking apparatus 100 has an effective weight more than the configured lifting capacity of the jacking system and if maximum lift capacity is used, the docking apparatus 100 may lift the asset only up to about the water-level during high tide, until the docked marine asset is just clear of the water-level.

In a second mode of Operating Mode-3, the jacking system is unlocked, so that a docked asset may be lifted above the water-level. It is to be appreciated that a maximum jacked-up level which the hull may reach above the water-level is limited by the configured lifting capacity of the jacking system. Also, a maximum lift force generated from buoyancy of the hull of the docking apparatus 100 occurs at high tides. Further, the hull is designed or purposefully configured to gain more buoyancy at the lowest draft, and all the supporting legs 104 are arranged to be free-wheeling.

Accordingly, the hybrid mode combines the lifting capacity of the jacking system and buoyancy of the hull of the docking apparatus 100, and further with appropriate adjustment of an amount of ballast water in the ballast and/or pontoon tanks (e.g. pumping out water from these tanks 120 to increase buoyancy, and vice-versa) to assist in the jacking-up operation. Prior to jacking-up the hull, payload (e.g. raw-materials, loose machineries and etc.) arranged on the platform 102 may optionally be moved out of the platform 102 or hull using lifting cranes to reduce hull weight to enable the jacking-up to a maximum level possible. Also, if this operation is carried out during high tide to extract maximum lift capacity provided from the resulting generated buoyancy and the lifting capacity of the jacking system, it allows the docking apparatus 100 to lift a docked asset above the water-level more easily and to reduce likelihood of green water loading.

According to one aspect of the invention, methods of operating the above-described mobile docking apparatus 100 are provided, which may be performed in combination with or separately from the above-described Operation Modes 1, 2 and/or 3.

Broadly, in various embodiments of the invention, a method of operating the above-described mobile docking apparatus 100 may include the following (as illustrated in Figure 3):

In **block 31**, a plurality of modular high buoyancy ballast tanks 120 are removably supported by the platform 102 of the mobile docking apparatus 100. This may include removably arranging tanks 120 on the platform 102, removably coupling the tanks 120 to the platform 102 or hull, or both. Coupling the tanks 120 to the platform 102 may include removably arranging or accommodating the tanks 120 in the indent region(s) 128 as described earlier, and mechanically coupling the tanks 120 to the platform 102.

In **block 32**, at least some of the tanks 120 are moved and/or relocated to a first or a second position within the platform 102 as described in the foregoing description, or other positions within platform 102.

In one embodiment, block 31 includes arranging the tanks 120 at opposed sides of the platform 102, e.g. longitudinal sides. Accordingly, a first region along a longitudinal side is occupied by the tank(s) and would not allow side transfer of asset to or from the platform 102 through the first occupied region. Block 32 includes relocating at least some of the tanks 120 from the longitudinal side to a transverse side of the platform 102. The relocated tank(s) may be arranged parallel or transverse to the transverse side of the platform 102 as required. Accordingly, the first region along the longitudinal side is now freed up or converted to a first unoccupied region and would therefore allow side transfer of asset to or from the platform 102 through the first unoccupied region.

In one embodiment, block 31 includes arranging the tanks 120 at opposed sides of the platform 102, e.g. transverse sides. Accordingly, a second region along a transverse side is occupied by the tank(s) and would not allow side transfer of asset to or from the platform 102 through the second occupied region. Block 32 includes relocating at least some of the tanks 120 from the transverse side to a longitudinal side of the platform 102. The relocated tank(s) may be arranged parallel or transverse to the longitudinal side of the platform 102 as required. Accordingly, the second region along the transverse side is now freed up or converted to a second unoccupied region and would therefore allow side transfer of asset to or from the platform 102 through the second unoccupied region.

In one embodiment, similar to the above, block 31 includes arranging the tanks 120 at a port and/or starboard side; block 32 includes relocating any tank from the port and/or starboard side to a bow and/or stern of the platform 102. Conversely, this embodiment may also include relocating the tanks 120 at bow and/or stern to a port and/or starboard side of the platform 102.

In some of the embodiments where a plurality of skidding tracks 130 or guides are arranged on the platform 102, block 32 includes using skidding tracks 130 which are arranged on the platform 102, supporting and moving the tanks 120 which are arranged on the tracks 130 and relocating the tanks 120 to a new position within the platform 102.

In some of the embodiments where skidding tracks are not provided, or even if skidding tracks are provided, a "float-in-float-out" method may be performed to relocate the tanks 120 to a new position on the platform 102. In this regard, block 32 may include offloading some tanks 120 into the body water, and while the platform 102 is submerged, transferring the offloaded tanks onto the platform. This may be performed by moving the offloaded tanks through water, arranging the offloaded tanks in the body of water and over the submerged platform 102, and elevating the platform until the platform comes into supporting contact with the tanks such that the tanks are arranged or seated or docked on the platform 102. It is to be appreciated that the platform 102 may be lowered or submerged into the body of water prior to or after offloading the tanks 120.

Broadly, in various embodiments of the invention, the aforementioned method of operating the above-described mobile docking apparatus 100 may further include the following (as illustrated in Figure 3):

In block 33, at least some of the tanks 120 are moved and/or relocated outboard or outside the platform 102. This includes offloading the tanks 120 into a body of water in which the apparatus 100 is arranged.

In **block 34a**, the offloaded tank(s) are arranged in the body of water to provide a useful floating structure.

In one embodiment of block 34a (see Example 4 below), the offloaded tanks 120 are mechanically coupled to each other to provide additional work or storage space, e.g. barge, which may be decoupled or separate from the platform 102.

In one embodiment of block 34a (see Example 5 below), the offloaded tanks 120 are mechanically coupled to each other, e.g. in series, to provide a landing passage, e.g. bridge, from the platform 102 to a destination location, e.g. land, shoreline, pier, quay, another floating, non-floating or fixed platform 102.

Instead of block 34a, **block 34b** may be performed instead, e.g. if it is determined that offloading weight, e.g. tank(s), from the platform 102 or hull is necessary to further increase lifting capacity. Given that the offloading of tanks 120 reduces hull weight, the lifting capacity of the apparatus 100 may be increased, i.e. the platform 102 may be raised to a greater height or elevation which may not have been possible when the tanks 120 were arranged on the platform 102. In **block 34b**, after any of the tanks 120 are offloaded into the body of water, the platform 102 is raised or lifted relative to the supporting legs 104 which may be in the lowered position. This raising or lifting action may be provided by the act of offloading tanks 120 which reduces weight of the platform 102, and/or by its self-elevation capability, e.g. jacking system.

In **block 35**, i.e. after block 34a or 34b is performed, the offloaded tank(s) are returned or loaded or transferred onto the platform 102 to restore and/or increase the submergibility capacity of the mobile docking apparatus 100. If necessary, to further increase submergibility capacity, additional modular tanks 120 may be loaded or transferred onto the platform 102.

It is to be appreciated that sequence of blocks 31, 32, 33, 34a/34b and 35 may be appropriately interchanged or modified, and any of blocks 31 to 35 may be omitted as appropriate. For example, blocks 33 and 34a/34b may be performed prior to blocks 31 and 32, and vice versa; blocks 31 and 32 may be performed without performing blocks 33 and 34a/34b, and vice versa; block 33 may be performed without performing block 34a/34b; blocks 34a and 34b may be both performed; blocks 31, 33, 34a/34b, 35 may be performed in this sequence; blocks 31, 33, 34a, 34b, 35 may be performed in this sequence.

4. Examples

Examples of the invention and its applications will be described below, but are not limited as such.

Example 1: Marine & Offshore Repair and Newbuilding Market

5 Embodiments of the invention may be employed to dock and transport marine vessels 40, e.g. semi-submersible, jack up rigs, lift-boat e.g. for emergency repair and newbuild for launching. Figures 4A and 4B show possible post-relocation arrangements of the modular high buoyancy tanks 120 to accommodate one or more assets 40. In the pre-relocation arrangement (see Figures 1A and 1B) the asset may not have been able to be
10 transferred through a transverse side of the platform due to the dimensions and/or shape of the asset or through a longitudinal side of the platform as the transfer region on the longitudinal side is occupied with tanks.

 Comparing post-relocation arrangement of Figure 4A and pre-relocation arrangement of Figures 1A and 1B, tanks from the longitudinal side, e.g. port side, of the platform 102 are
15 relocated to the transverse sides of the platform 102, e.g. forward and aft, or bow and stern portions, of the platform 120. In particular, the relocated tanks 120 are arranged parallel to the transverse side.

 Comparing post-relocation arrangement of Figure 4A and pre-relocation arrangement of Figure 1, tanks from the longitudinal side, e.g. port side, of the platform are relocated to
20 the transverse sides of the platform, e.g. forward and aft, or bow and stern portions, of the platform. In particular, the relocated tanks 120 are arranged transverse to the transverse side.

 In this example, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side
25 transfer. Thereafter, the asset may be transferred onto the platform, the asset may be transported to a destination and transferred out from the platform. Further, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be substantially flush with a berthing pier, which
30 may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 2: Grand Assembly Yard for Floating Production Unit or Floating Production Storage and Offloading (FPSO) Newbuilding or Conversion

Embodiments of the invention may be employed in loadout, transportation, lifting and installation via side skidding of top-side process modules 50 to its foundation on a FPSO 51.

5 Figure 5A shows a perspective view of a transfer of process module between a reconfigurable mobile docking apparatus 100 and a FPSO 51;

Figure 5B shows a possible post-relocation arrangement of the modular high buoyancy tanks 120 to accommodate one or more assets, e.g. process modules 50. In the pre-relocation arrangement (see Figures 1A and 1B) the asset may not have been able to be
10 transferred through a transverse side of the platform due to the dimensions and/or shape of the asset or through a longitudinal side of the platform as the transfer region on the longitudinal side is occupied with tanks.

Comparing post-relocation arrangement of Figure 5B and pre-relocation arrangement of Figure 1, tanks from the longitudinal side, e.g. port side, of the platform are relocated to
15 the transverse sides of the platform 102, e.g. forward and aft, or bow and stern portions, of the platform 102. In particular, the relocated tanks 120 may be arranged parallel to the transverse side.

With the arrangement of Figure 5B, the hull or platform 102 may be elevated to the same level as the FPSO 51 main deck and process modules 50 may then be transferred
20 onto the FPSO 51 using the skidding tracks on the platform, e.g. by skidding out from the platform 102 onto the FPSO 51. With the invention, a need for heavy lift floating crane operations for transferring the process modules is eliminated. The invention also provides other advantages, e.g. less stiffening, multiple modules transfer, no need to wait upon high tide for transfer operation, overall cost-saving for module installation.

25 In this example, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side transfer. Thereafter, the asset may be transferred onto the platform, the asset may be transported to a destination and transferred out from the platform. Further, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some
30 of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be substantially flush with the FPSO, which may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform. Further, if necessary,

block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 3: Marine Civil Construction

Embodiments of the invention may be employed to dock, transport and transfer non-marine assets 60, e.g. caisson, concrete structure, concrete gravity base. Construction or fabrication of the non-marine assets may be also be performed on the platform 102.

Figure 6 shows a possible post-relocation arrangement of the modular high buoyancy tanks 120 to accommodate one or more non-marine asset 60. In the pre-relocation arrangement (see Figures 1A and 1B), the asset may not have been able to be transferred through a transverse side of the platform 102 due to the dimensions and/or shape of the asset or through a longitudinal side of the platform 102 as the transfer region on the longitudinal side is occupied with tanks 120.

Comparing post-relocation arrangement of Figure 6 and pre-relocation arrangement of Figures 1A and 1B, tanks from the longitudinal side, e.g. port side, of the platform 102 are relocated to the transverse sides of the platform 102, e.g. forward and aft, or bow and stern portions, of the platform. In particular, the relocated tanks 120 may be arranged parallel to the transverse side.

In this example, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side transfer. Thereafter, the asset may be transferred onto the platform, the asset may be transported to a destination and transferred out from the platform. Further, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be substantially flush with a berthing pier, which may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 4: Offshore Platform Operations Support

Embodiments of the invention may be employed to increase usable deck or platform space on the mobile docking apparatus 100 and/or provide additional floating structure 70, e.g. barge, for providing additional work or deck space which may be separate from or

decoupled from the mobile docking apparatus. This may be achieved by offloading the tanks 120 and coupling the offloaded tanks 120 to produce a large floating structure 70.

Figure 7 shows a possible post-relocation arrangement of the modular high buoyancy tanks for the above-mentioned purpose. Comparing post-relocation arrangement of Figure 7 and pre-relocation arrangement of Figures 1A and 1B, tanks 120 from the longitudinal side, e.g. port side, of the platform are relocated to outside the platform and, more particularly, to a body of water 1 in which the mobile docking apparatus is arranged. The tanks 120 may be mechanically coupled together to provide additional work or deck space 70. The platform of the docking apparatus is removed of the tanks and therefore is provided with additional usable deck or platform space which is reclaimed from a region originally occupied with tanks.

In this example, the method described in blocks 33 and 34a may be performed to provide a useful floating structure, the mobile docking apparatus may be moved away from the floating structure if required. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus. Further, if necessary, block 34b may be performed at an appropriate time, for example, after offloading at least some of the tanks into the body of water.

Example 5: Emergency & Amphibious Operations

Embodiments of the invention may be employed in disaster relief & emergency response and coastal protection purposes , and particularly to logistical support, food / medicine aid, rapid mobilization, and command and control. This may be achieved by offloading the tanks 120 and coupling the offloaded tanks 120 to create seamless sea to land connectivity with speed, stealth and ease.

Figure 8 shows a possible post-relocation arrangement of the modular high buoyancy tanks 120 for the above-mentioned purpose. Comparing post-relocation arrangement of Figures 1A and 1B and pre-relocation arrangement of Figure 1, tanks from the longitudinal side, e.g. port side, of the platform are relocated to outside the platform 102 and, more particularly, to a body of water 1 in which the docking apparatus is arranged. The tanks may be mechanically coupled together to provide a bridge 80 or landing bridge which connects to a destination body 81, e.g. land, shoreline, pier, quay, another floating, non-floating or fixed platform. The bridge 80 provides a landing passage for human and/or vehicular access between the docking apparatus and land.

In this example, the method described in blocks 33 and 34a may be performed to provide a useful floating structure. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus. Further, if necessary, block 34b may be performed at an appropriate time, for example, after offloading at least some of the tanks into the body of water.

Example 6: Common or Multi-User Yard – Amalgamated Shipyard Facilities

Embodiments of the invention may be employed in specialised fabrications, newbuilding and/or repair & conversion. Particularly, the invention allows reconfiguration of the docking apparatus to perform various operations management on common facilities (see Figure 9), e.g. mobile shipyard, multi-storey slipway building 90, enclosed shipside painting hall – full-recycle of steel shot, central block and module blasting hall, central steel process and warehousing – roofed and open, loading and unloading pier - all quays and piers. Thus, the mobile docking apparatus may be utilized by multiple users and for multiple purposes and therefore land-space requirements at a common yard are reduced and land use efficiency is increased.

Figures 9B and 9C show possible arrangements of the modular high buoyancy tanks 120 for the above-mentioned purpose. In Figure 9B, the docking apparatus 100 is removed of the tanks 120 to increase lifting capacity. Accordingly, when the docking apparatus 100 is berthed at a multi-storey slipway building 90 the platform may be raised or lowered to multiple levels aligned with the building 90 such that asset transfer may be performed between the platform and various levels of the building. In Figure 9C, the tanks 120 are returned to the docking apparatus and arranged at transverse sides of the platform. Accordingly, when the docking apparatus is berthed at a pier, asset transfer may be performed between the longitudinal side of the platform and the pier.

In this example, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side transfer. Thereafter, the asset may be transferred onto the platform, the asset may be transported to a destination and transferred out from the platform. Without performing blocks 31 and 32 or in addition thereto, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be substantially flush with a desired level of a multi-storey slipway building, which may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform. Further,

if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 7: Ship Transfer System – Inland Waterway Logistic

Embodiments of the invention may be employed in transfer asset 1000 between an upstream 1a and downstream 1b of a waterway which is separated by land 2, e.g. at a barrage, as shallow water multi-purpose vessel, and/or inland port terminal, e.g. inland ship repair yard.

Figure 10 shows a possible arrangement of two units of mobile docking apparatuses 100a, 100b. In Figure 10, the hulls or platforms of mobile docking apparatuses 100a, 100b are both elevated to align with land 2. Asset transfer may be performed by skidding out the asset from one docking apparatus to another docking apparatus over the land is removed of the tanks to increase lifting capacity.

In this example, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side transfer. Thereafter, the asset may be transferred onto the platform. Without performing blocks 31 and 32 or in addition thereto, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be substantially flush with a land strip separating the waterways, which may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform and across the land strip. Another mobile docking apparatus may be arranged at the opposed side of the land strip and similarly configured to receive the asset being transferred. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 8: LNG Storage Regasification Terminal

Embodiments of the invention may be employed as three-in-one platform to provide storage, regasification and berthing jetty. LNG carrier 1103 is berthed at the docking apparatus 100 and transfer LNG through loading arms to storage tanks 1100, LNG from storage tanks 1100 is regasified at a vaporizer facility 1102, the LNG gas is transferred through transmission pipe (pipe trestle) 1101 to consumers. The pipe trestle 1101 may be a part of the apparatus 100 and configured to swing out at site; it may be used for light vehicular passage and/or moveable trolley to transport light equipment. This arrangement

is useful for small scale LNG terminal for operation in shallow waters of about 3.0m to about 6.0m, and does not require commissioning at site.

One instance of a reconfigurable mobile docking apparatus 100 as LNG terminal is shown in Figures 11A, 11B and 11C wherein Figure 11B shows a possible arrangement of the modular high buoyancy (sponson) tanks 120. In Figure 11C, a see-through view taken from the starboard of the docking apparatus 100 of Figure 11B is shown wherein the sponson tanks 120 are arranged at an indent region 128 of the platform 102, and ballast or pontoon tanks 125 (in dotted lines) are arranged in the platform 102. Another instance of a reconfigurable mobile docking apparatus 100 as LNG terminal is shown in Figures 11D and 11E.

In certain instances, e.g. at low tide, the sponson tanks 120 will be detached from the platform 102. Two of the sponson tanks 120 will be relocated to the forward portion of the platform 102 and the remaining two tanks 120 will be relocated to the aft portion of the platform 102. The tanks 120 may re-coupled to the forward and aft to form extended mooring dolphins to allow LNG carrier secure itself to the docking apparatus 100 with suitable distance and angle of the mooring rope.

Another instance of a reconfigurable mobile docking apparatus 100 as LNG terminal in shallow water is shown in Figures 11D and 11E. The tanks 120, can be dismounted and arranged as shown in Figure 11D. In such case, the tanks 120 provide berth barges with proper spuds, and/or clean fresh water storage tanks for recirculation of heating water for regasification if the site location up the river has water filled with silt and mud.

In this example, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side transfer. Thereafter, the asset may be transferred onto the platform, the asset may be transported to a destination and transferred out from the platform. Without performing blocks 31 and 32 or in addition thereto, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be substantially flush with a desired level of a pier/terminal, which may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 9: Core platform for Mobilize, Install, Remove and Decommissioning of offshore platform facilities (MIRD)

The reconfigurable mobile docking apparatus 100 may serve the platform facilities in the oil and gas industry, from the beginning stage of oil platform facilities and well-head services (installation), leading to its life enhancement and upgrading stage and subsequently to serve the ending of its life by removal and decommissioning (decommissioning and disposal) which includes disposal to scrap yard or preferably to reef to sea-bed as man-made coral reef.

The apparatus 100 may be used particularly in decommissioning and disposal. This may involve two phases in its execution, complete deck de-installation and jacket removal and each phase has various following steps which are discussed as follows. In simplicity three phases of decommissioning in this paper are

Phase I - topside – deck-box removal,

Phase II - jacket and its substructure removal, and

Phase III – disposal by reefing.

Besides the removal – the apparatus 100 can be a useful asset to mobilize and perform installation of offshore facilities, as installation of work-over rig for shallow water platform, conduct other inspection, maintenance and repair work for subsea pipe and in certain way assist in sub-sea cable laying projects.

Referring to Figures 12A and 12B, the apparatus 100 is provided with a cantilever system or beams 1201, hydraulic power and strand jacks for deck installation and de-installation. This can be retrofitted from used and reconditioned cantilever from old jack-up rig or new installation. The cantilever system 1201 is a X-Y axis movement leverage that is able to extend out over the side of the platform. The cantilevered system 1201 is detachably mounted on the platform 102 and designed to withhold periodic submerging to seawater.

A jacket 1220 may be installed with buoyancy tanks. It is configured to be controlled with remote control & umbilical system for jacket floatation, when the buoyancy tanks are connected to the jacket – leg. This is to ensure jacket floatability after piles of the jacket are removed.

There are usually two operation modes to an offshore removal by two types of apparatus 100:

- Mode 1 – Topside / deck removal (approximately – weight of 2000 ton)
- Mode 2 – Jacket removal (can be higher than 2000-ton weight)

The decommissioning process is to be completed by single unit deployment of apparatus 100 and the key value is in its simplicity without many marine assets spread to perform its role.

Mode 1 – Topside / deck removal

Deck de-installation includes the following steps

- **Step 1 - Mobilization - Sea Passage to Offshore Site**

Apparatus 100 is moved to site on its own propulsion system without being towed by tug boats.

The modular tanks 120 (movable floaters) are skidded and relocated to the aft upon arrival. This is to provide an excellent counterweight balance to for the deck-box load-in operation.

The sea-bed at site may be pre-surveyed and inspected before the arrival of apparatus 100. Like all offshore installation and decommissioning project execution, the weather and sea-state is to be monitored before sail out and operating with significant wave height, e.g. 3m (maximum wave 5m) as designed is important to be observed. One would assume the subsea pipelines are removed and the deck-box is totally gas-freed and all hazardous material are removed and cleaned for removal process. The apparatus 100 is moved to a safe working distance from the oil platform 1230 as planned.

- **Step 2 - Preparation –elevation of apparatus 100**

The legs 104 of the apparatus 100 are pre-loaded first and loaded accordingly into the seabed when arrived on site. Upon completion of loading, the elevation mode is then allowed to commence. The entire hull of apparatus 100 is then raised to the minimum elevation above the sea surface in order to provide a stable work deck and to withstand environmental loads. After the apparatus 100 is fully loaded on its legs, jacking up to the desired elevation will commence in preparation for the cantilever skidding. The height of the cantilever system 1201 reaches underneath of deck box 1201 to allow the skidding process of the cantilever beams just below of the deck box 1201. The final tolerance of the gap between the cantilever beam and the deck box 1201 will be determined and adjusted by the further elevation of the apparatus 100.

- **Step 3 - Cantilever system extension and cutting**

The cantilever system 1201 on platform 102 deck is extended outward (see Figure 12A) in a longitudinal direction in the X-direction. This system 1201 may also move in a transverse direction over the width of the deck and is referred to as the Y-direction. By using these X-Y movements, this cantilever system 1201 is extended accordingly outward and side-ward to suit the deck-box and jacket leg structures beams / reach underneath of jacket deck. At fixed elevated position, the apparatus 100 may not need compensation system and the platform 102 and apparatus 100 do not swing wildly. Once apparatus 100 and its cantilever beam 1201 are secured to the deck box 1202 firmly, diamond wire cutting on jacket leg is deployed to cut deck leg at all corners and to ensure a gap of approximately 100mm clearance between deck legs and pile / jacket cutoff points.

- **Step 4 - Cantilever system retraction and preparation for sail away and disposal**

The cantilever system 1201 is retracted back to the platform 101 together with the load i.e. deck box 1202 (see Figure 12B). The cantilever system 1201 has to be fully retracted topside carefully from the edge of the hull where it has been integrated into the hull and deck system could skid track to another end. The retracted topside or deck-box is to be secured by structural hold-downs. Once the leg extraction from seabed is completed, apparatus 100 will sail away with the decommissioned deck box 1202 (e.g. topside of oil rig) to scrap yard. It is important to adjust stability & trim of apparatus 100 prior to sail away.

- **Step 5 - Deck box reefing**

Apparatus 100 will be mobilized to work on deck-box reefing activity and buoyancy tanks are required to install below of deck-box. Once the legs 104 are fully preloaded into seabed, apparatus 100 has to be fully submerged. A powerful pull tug is hired to pull out deck box 1201 from apparatus 100. Once the deck box 1202 has been towed to a safe location, buoyancy tanks are deployed to submerge deck-box 1202 on seabed. Ballasting of buoyancy tank operation is observed by crew onboard and controlled by remote control from apparatus 100. Such buoyancy tanks may refer to the aforementioned relocatable and detachable tanks 120 of the apparatus 100. Eventually, deck-box 1202 sits down on seabed completely and safely.

Mode 2 – Jacket Removal

Jacket removal includes the following steps:

- **Step 1 - Offshore arrival**

Prior to mobilization of apparatus 100 to an offshore site, apparatus 100 transports temporary buoyancy tanks onboard. Upon arrival of apparatus 100, the legs 104 are soft-pinned down into seabed. Underwater preparatory activities (i.e. survey debris) around the jacket footprint of the jacket 1220 are carried out. A typical survey would have a radius of 50m around the platform and it is required be performed by a remote-operated vehicle (ROV) to confirm condition of members and prepare the seabed to perform external cutting of piles. In case of the congested area with subsea pipeline facilities, self-propulsion may be preferred to maintain location and heading; and avoid from damage of neighboring pipeline infrastructure when the legs 104 have been jacked down into seabed.

- **Step 2- Buoyancy Tanks Installation**

The jacket removal requires installation of temporary buoyancy tanks and buoyancy tanks installed on the legs of the jacket by using encircling crane of apparatus 100. Such buoyancy tanks may refer to the aforementioned relocatable and detachable tanks 120 of the apparatus 100. The deployment of ROV and diver are needed to monitor a proper installation of buoyancy tanks on jacket. The pipeline and mattresses are removed and transferred onboard apparatus 100 for recycling and other sections trenched into the seabed. The deployment of ROV to remove soil at least 1.2m below seabed has commenced.

- **Step 3 - Full jacket removal – cutting of piles**

Jacket support structure removal requires a detailed engineering & risk assessment and careful inspection by diver. Apparatus 100 has moved to a safe distance of approximately 100m from jacket 1220 to avoid jacket collision with apparatus 100. A single powerful tug is deployed to secure the top of jacket upending pad eye after afloat. The piles have to be cut from the outside, because of there is no easy access on the outside to the pile.

The divers use the diamond wire cutters to cut 100% of skirt or main leg piles at each corner. Also, the buoyancy tanks are de-ballasted by using remote control from apparatus 100. The jacket 1220 will now lift up and float level with the water surface.

- **Step 4 - Jacket afloat**

Once all bottom piles are disconnected away from the seabed, the jacket 1220 starts tilting down and afloat due to attaching buoyancy tank to the legs of the jacket 1220. Before apparatus 100 moves in front of the jacket 1220, the de-ballast remote control system is completely detached from jacket 1220. There is a post removal seabed survey carried out to prove there are no dropped objects and no debris is left behind.

- **Step 5 - Jacket pull in operation**

In this operation, apparatus 100 is moved in front of jacket 1220 and the legs 104 have to be soft pinned to seabed. When apparatus 100 is fully flooded, the tug assists to pull jacket 1220 into apparatus 100 (see Figure 12C). The pull in operation keeps on continuing until the jacket 1220 is fully within the apparatus 100 (see Figure 12D).

- **Step 6 – Jacket pull in, preparation for sail away and disposal**

The load out of the jacket 1220 and skidded onto apparatus 100 have to be planned with great care. Once the jacket 1220 is fully loaded-in, the de-ballast of apparatus 100 is in operation. Apparatus 100 will always have stability against capsizing, as it is designed with legs 104, the consideration for jacket 1220 on apparatus 100 primarily because of the high center of gravity of the jacket 1220. The jacket 1220 may preferably be in horizontal position prior to transportation. The apparatus 100 transports jacket 1220 with the securing system (i.e. tie down structure) and fully extracted legs 104 from seabed, and demobilizes to onshore disposal or dispose as reef leading to the reefing operations (see Figure 12E).

Once jacket 1220 reaches the yard, the jacket structure is divided at the yard into sections weighing between 40 to 60 tons while removing buoyancy tank.

In this Example 9, the method described in blocks 31 and 32 may be performed to relocate the tanks to allow the platform interchange between transverse and longitudinal side transfer. Thereafter, the asset may be transferred onto the platform, the asset may be transported to a destination and transferred out from the platform. Without performing blocks 31 and 32 or in addition thereto, if necessary, blocks 33 and/or 34b may be performed at an appropriate time, for example, at least some of the tanks may be offloaded into the body of water to increase lifting capacity, the platform may be raised to a desired elevation, e.g. to be compatible with deck box 1202, which may not have been possible when the offloaded tanks were still arranged on the platform, and thereafter an asset may be transferred onto or out from the platform. Further, if necessary, block 35 may be performed at an appropriate time to restore submergibility capacity of the mobile docking apparatus.

Example 10: Security Outpost Command (SOC)

The reconfigurable mobile docking apparatus 100 may be deployed as a maritime security outpost command within or strategically located to provide maritime security in the ocean, seas, regional coastal water and assisting in the maritime sector. This deployment is developed in response to new threats and increasing challenges in the maritime security, by enhancing the capabilities to counter illicit encounters and operations as follow: - 1) Migration - illegal immigration; 2) Piracy; 3) Drugs trade and its transportation; 5) SAR; 6) Pollution monitoring ensuring compliance to all international legislation; 7) Fishery protection and illegal fishing and destroying coral reefs; 8) Protect its EEZ; 9) Support Satellite Imagery. Hence, SOC is configured to receive a continuous collection of security information from the satellites, air, surface of the seas and underwater to analyse and distinguish potential threats to the legitimate shipping lanes, fishery industry and maritime activities in the open seas and above all must have the capability to detect and track small targets in the air, on the surface or underwater to analyse and propose prompt and swift tactical solutions.

Accordingly, the reconfigurable mobile docking apparatus 100 may include satellite links, and air, surface and underwater coverage for achieving maritime security, reconnaissance and surveillance capabilities. In particular, the apparatus 100 (see Figures 13A and 13B) may include one or more helidecks 1301 – for rapid mobilisation and quick response to maritime distress and rescue operations, fast intervention vessel 1302 which may be launched by lowering the platform 102 of the apparatus 100, Unmanned Surface Vehicle/Vessel (USV) 1303 for sea surface control, Unmanned Aerial Vehicle 1304, e.g. drone, Autonomous Underwater Vehicle for underwater control, and Long Range Acoustic Device (LRAD).

Embodiments of the invention provide several advantages including but not limited to the following:

- Floating and/or non-floating assets may be docked or transferred onto/from the platform of the mobile docking apparatus.
- The reconfigurable modular tank system provides versatility and flexibility to capabilities and functionalities of the mobile docking apparatus thus allowing the apparatus to be useful and employable for various applications by simply reconfiguring the modular ballast tanks. In particular, multiple high buoyancy ballast tanks are relocatable or re-arrangeable into different layouts to achieve different objectives. For example, at least some of the tanks are relocatable from a longitudinal side to a transverse side of the platform, or vice versa, to allow interchangeability between longitudinal and transverse docking or transfer. For

example, at least some of the tanks may be relocated to outside the platform or offloaded into a body of water and arranged therein to provide a useful floating structure. For example, at least some of the tanks may be relocated to outside the platform or offloaded into a body of water to reduce hull weight and thereby increase lifting capacity of the mobile docking apparatus. With reduced hull weight, the hull or platform may be raised to a greater elevation or height which may not have been possible if the offloaded tanks were still arranged on the platform. For example, the offloaded tanks and possibly other modular tanks may be loaded or transferred onto the platform to provide increased variability in platform weight and thus increased variability in submergible depth and elevatable height.

- In embodiments of Figures 1F to 1K, the tanks 120 act as wing sponson tanks to maximize payload during sea passage and achieving shallow draft.
- Accordingly, the invention is capable of, but not limited to, performing the following functions:

- a. Similar to a lift boat, the reconfigurable mobile docking apparatus is capable of submerging to a deeper depth with the tanks ballasted for the purpose of receiving a floating asset.
- b. Similar to a lift boat and/or crane, the reconfigurable mobile docking apparatus is capable of lifting an asset, transporting the asset and offloading the asset to another location/yard. For example, the apparatus can jack up to a desired height and skid off the asset to a destination, e.g. FPSO or multi-level yard.
- c. Similar to an extended dry dock, the reconfigurable mobile docking apparatus is capable of jacking down/up at any suitable yard for job operation. This is useful when there is dry dock congestion or lack of available dry dock.
- d. Similar to a synchrolift, the reconfigurable mobile docking apparatus is capable of lifting or elevating to various heights to match or substantially flush with multi-level fabrication yards or refurbishing vessels to receive or offload asset.
- e. The reconfigurable mobile docking apparatus allows rapid mobilization or fast load out operation by offloading the tanks to create connecting passageway for people and equipment or couple them together to form a large floating structure for additional storage or work space.
- f. The reconfigurable mobile docking apparatus allows the platform to jack up, high and dry, to provide a mobile shipyard/dock for under-hull work. By jacking up to quay level or with the tanks as passage way, the apparatus becomes a floating shipyard/dock.

- 5 g. The reconfigurable mobile docking apparatus is able to provide a low cost, and multiple purpose storage, regasification terminal which does not require commissioning at site and is able to operate in shallow waters. This is useful for areas with low LNG demand but storage and regasification capacity is scalable by adding employing additional units of docking apparatus.
- 10 h. The reconfigurable mobile docking apparatus is able to provide a single apparatus for Mobilisation, Installation, Removal and Decommissioning operations. The apparatus may be provided with two “plug & play” accessories of cantilever system for deck installation and de-installation operations and of portable buoyancy tanks which can be installed for jacket removal. The principle of high floatability for counter-weight balance combined with the inventive concept will offer good advantage to the reconfigurable mobile docking apparatus in order to conduct offshore decommissioning services in faster project execution.

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It is to be further appreciated that the reconfigurable mobile docking apparatus according to the invention has various applications including but not limited to Table 1 below.

Table 1

Market & Its Applications	Description	Value Proposition
MARITIME	Ship-Lift Transporter	Mobile, easy to redeploy - Float / Elevate or Hybrid operation of Lift-Dock. With the dismountable high buoyancy wing hulls, it is versatile and have many other applications for maritime sector.
	Ship Transfer System	
OIL & GAS	Installation, Decommission & Removal	Cost-saving with minimal offshore assets and speed to complete the installation and removal of used or new platform.
	Mobile Production Unit	All the process modules can be commissioned in Yard, sail to field-site and elevate to work. Reduce cost and speed to delivery of project first oil.
ENERGY	Storage Regasification Terminal Concept	Act as a terminal for importing LNG, speed to completion and cost saving.
	Wind Turbine	Completed fully commissioned Wind Turbines are

	Transporter	transported to Farm for installation. Speed and cost saving and less wait-on-weather.
DRILLING	Mobile Drilling Unit	Commissioning in yard with Land-rigs, sail to field-site and elevate to work.
	Liquid Mud Pump Plant	Receive, process and recycle liquid mud from drilling rig.
AGRO-CULTURE	Eco-Farming Establishment	Using Eco-Ark in floating fish farm, Eco-Buoy to hold a number of Eco-Arks producing more with less space. Direct farm to amalgamated fish facility, shortening supply chain, lowering operating cost.
	Amalgamated Livestock Facilities	Improved profits for all parties and quality of meat. It houses the Cattletel (Holding area for arriving livestock) and state-of-the-art Abattoir. Use of waste to energy technology.
COASTAL PROTECTION	Security Outpost Command	Offer surveillance, monitoring and take immediate response to any security hazards and risks.
	Infrastructure Development Support	Versatile and cost saving - trench dredging, rock-filling of trench, screeding, transporting and installation of all sizes of caissons. Toe protection and ballasting of caissons.

Other embodiments will be apparent to those skilled in the art from consideration of the specification and practice of the invention. Furthermore, certain terminology has been used for the purposes of descriptive clarity, and not to limit the disclosed embodiments of the invention. The embodiments and features described above should be considered exemplary.

Claims

1. A reconfigurable mobile docking apparatus comprising:

a platform having at least a longitudinal side and a transverse side, and arranged to receive an asset;

5 a plurality of supporting legs movably coupled to the platform and configurable to be lowered to the bottom of a body of water to anchor and/or support the apparatus, wherein the platform is operable cooperatively with the lowered supporting legs to be adaptively raised or lowered with reference to a water-level; and

a reconfigurable modular tank system which includes a plurality of high buoyancy
10 ballast tanks which are removably supported by the platform and relocatable at least between a first and a second position, wherein in the first position, asset transfer to or from the platform is permitted through the longitudinal side, wherein in the second position, asset transfer to or from the platform is permitted through the transverse side, and wherein the reconfigurable modular tank system is configured to allow any of the tanks offload into the body of water.

15 2. The apparatus of claim 1, wherein the longitudinal side is provided with at least one an indent region which extends partially along a length and a width of the platform and extends through a height of the platform, wherein the indent region is configured to accommodate one or more tanks.

3. The apparatus of any one of claims 1 to 2, wherein the reconfigurable modular tank system
20 further includes a plurality of skidding tracks arranged on the platform, wherein the tracks are configured to movably support the tanks at least during relocation of the tanks within the platform.

4. The apparatus of any one of claims 1 to 3, wherein the reconfigurable modular tank system
25 is configured to allow at least some of the tanks relocate from the longitudinal side to the transverse side such that a first region occupied by the at least some of the tanks prior to relocation is converted into a first unoccupied region after relocation to permit asset transfer therethrough.

5. The apparatus of any one of claims 1 to 3, wherein the reconfigurable modular tank system
30 is configured to allow at least some of the tanks relocate from the transverse side to the longitudinal side such that a second region occupied by the at least some of the tanks prior to relocation is converted into a second unoccupied region after relocation to permit asset transfer therethrough.

6. The apparatus of any one of claims 1 to 3, wherein the reconfigurable modular tank system is configured to allow at least some of the tanks relocate from a port or starboard side of the platform to a bow or stern side of the platform, or vice versa.

7. The apparatus of claim 1, wherein the any of the tanks offloaded into the body of water are configured to provide a floating structure selected from the group consisting of:

a barge configured to provide work space or storage space separate from the platform, and

a bridge configured to provide a landing passage from the platform to a destination body which is separated from the platform by the body of water.

8. The apparatus of any one of claims 3 to 7, wherein the reconfigurable modular tank system further includes a driving unit configured to move the at least some of the tanks on the tracks.

9. The apparatus of any one of claims 1 to 6, wherein the asset is a floating asset selected from the group consisting of a semi-submersible, a jack-up rig, a lift-boat and a marine vessel, or a non-floating asset selected from the group consisting of a caisson, a concrete structure, a concrete gravity base, a process module, and a Liquefied Natural Gas (LNG) tank.

10. A method of operating a mobile docking apparatus which comprises a platform having at least a longitudinal side and a transverse side, and arranged to receive an asset; a plurality of supporting legs movably coupled to the platform and configurable to be lowered to the bottom of a body of water to anchor and/or support the apparatus, wherein the platform is operable cooperatively with the lowered supporting legs to be adaptively raised or lowered with reference to a water-level; and a reconfigurable modular tank system comprising a plurality of high buoyancy ballast tanks, the method comprising:

removably arranging the tanks to be supported by the platform;

relocating at least some of the tanks between a first and a second position, wherein in the first position, asset transfer to or from the platform is permitted through the longitudinal side, and wherein in the second position, asset transfer to or from the platform is permitted through the transverse side; and

offloading any of the tanks into a body of water in which the apparatus is arranged.

11. The method of claim 10, wherein removably arranging the tanks to be supported by the platform further includes:

accommodating one or more tanks in an indent region provided at the longitudinal side, wherein the indent region extends partially along a length and a width of the platform and extends through a height of the platform; and

mechanically coupling the one or more tanks to the platform.

12. The method of any one of claims 10 to 11, wherein relocating at least some of the tanks between a first and a second position further includes:

using skidding tracks which are arranged on the platform, supporting and moving the at least some of the tanks to be relocated within the platform.

13. The method of any one of claims 10 to 12, wherein relocating at least some of the tanks between a first and a second position further includes:

offloading the at least some of the tanks into the body of water; and

while the platform is submerged, transferring the at least some of the tanks onto the platform by moving the at least some of the tanks through the body of water, arranging the at least some of the tanks in the body of water and over the submerged platform, and elevating the platform until the platform comes into supporting contact with the at least some of the tanks.

14. The method of any one of claims 10 to 13, wherein relocating at least some of the tanks between a first and a second position further includes:

relocating the at least some of the tanks from the longitudinal side to the transverse side of the platform to convert a first region occupied by the at least some of the tanks prior to relocation into a first unoccupied region after relocation.

15. The method of claim 14, further comprising:

transferring the asset through the first unoccupied region along the longitudinal side of the platform.

16. The method of any of claims 10 to 13, wherein relocating at least some of the tanks between a first and a second position further includes:

relocating the at least some of the tanks from the transverse side to the longitudinal side of the platform to convert a second region occupied by the at least some of the tanks prior to relocation into a second unoccupied region after relocation.

17. The method of claim 16, further comprising:

transferring the asset through the second unoccupied region along the transverse side of the platform.

18. The method of any one of claims 10 to 13, wherein relocating at least some of the tanks between a first and a second position further includes:

relocating at least some of the tanks from a port or starboard side of the platform to a bow or stern of the platform, or vice versa.

19. The method of claim 10, further comprising:

arranging the any of the tanks in the body of water to provide a floating structure selected from the group consisting of:

a barge configured to provide work space or storage space separate from the platform, and

a bridge configured to provide a landing passage from the platform to a destination body which is separated from the platform by the body of water.

20. The method of claim 19, further comprising:

after offloading the any of the tanks into the body of water, elevating the platform relative to the supporting legs.

21. The method of any one of claims 10 to 20, wherein the asset is a floating asset selected from the group consisting of a semi-submersible, a jack-up rig, a lift-boat and a marine vessel, or a non-floating asset selected from the group consisting of a caisson, a concrete structure, a concrete gravity base, a process module and a Liquefied Natural Gas (LNG) tank.