

AN OFFSHORE STORAGE FACILITY

Field Of Invention

5 The present disclosure generally relates to an offshore storage facility which can be deployed, on an offshore basis, for storage of matter (e.g., at sea/ocean). The present disclosure further relates to a deployment method in association with an offshore storage facility.

Background

10 The present disclosure relates to offshore storage facilities which can be deployed on an offshore basis for, for example, storage of matter. Deployment of an offshore storage facility can, for example, be in the context of deployment for storage of matter at a water body such as the sea or ocean.

15 In a more specific example, an offshore storage facility can be deployed for storage of fluids (e.g., crude oil and/or gas) at sea. International Publication number WO2017/091146A1 (i.e., international application published under the Patent Cooperation Treaty) discloses an example of such an offshore storage facility.

20 Notably, the offshore storage facility of WO2017/091146A1 is capable of being buoyant when submerged in the water body. Moreover, the offshore storage facility, when deployed, directly contacts the water body floor (e.g., corresponding to a natural surface such as a sea floor) – the contacting end of the offshore storage facility can, for example, come attached with an anti-rotation means (e.g., in the form
25 of a cross-plate structure) which can, for example, sink into the natural surface. Furthermore, it is contemplated that the offshore storage facility is capable of positional restoration (an analogy provided concerning this characteristic is that of a roly-poly toy).

30 The present disclosure contemplates one or more improvements over conventional offshore storage facilities such as that disclosed by WO2017/091146A1.

Summary of the Invention

In accordance with an aspect of the disclosure, there is provided an offshore storage facility. The offshore storage facility can be capable of being deployed for use in a water body (e.g., sea/ocean) which can be associated with a floor (e.g., a natural surface such as a sea floor).

The offshore storage facility can include a base portion and a container portion. The container portion can be capable of being movably coupled to the base portion. In one embodiment, the container portion can be capable of being movably coupled to the base portion by manner of a curvilinear based coupling arrangement. The curvilinear based coupling arrangement can, for example, be associated with a first curvilinear motion and a second curvilinear motion.

Moreover, when the offshore storage facility has been deployed, the container portion can be in a standing orientation and can be movably coupled to the base portion in a manner such that the base portion carries the container portion. The base portion can be pressed against the floor so as to remain in fixed position on the floor.

In the standing orientation (i.e., which can include the container portion being in either an upright orientation or a tilted orientation), the container portion can be associated with a standing axis.

Furthermore, the container portion, when in the standing orientation, can be movable relative to the base portion based on a plurality of one dimensional motions while remaining coupled to the base portion and while the base portion remains in fixed position on the floor.

The plurality of one dimensional motions can include a first one dimensional motion associable with a first rectilinear axis and a second one dimensional motion associable with a second rectilinear axis. The first and second rectilinear axes can

be capable of being crossed so as to define an intersection point. Additionally, the standing axis can pass through the intersection point.

5 Earlier mentioned, the container portion can be capable of being movably coupled to the base portion by manner of a curvilinear based coupling arrangement which can be associated with a first curvilinear motion and a second curvilinear motion.

10 In one embodiment, the first curvilinear motion can be capable of being translated to the first one dimensional motion and the second curvilinear motion can be capable of being translated to the second one dimensional motion.

15 In relation to one exemplary coupling strategy according to an embodiment of the disclosure, the offshore storage facility can further include an intermediate portion, the container portion can include one end carrying a coupling part and the base portion can include a side carrying a joining part.

20 The intermediate portion can be disposed between the container portion and the base portion. Moreover, the intermediate portion can correspond to a curvilinear based coupling arrangement capable of facilitating movable coupling of the container portion and the base portion.

25 In one embodiment, the intermediate portion can include a first face and a second face. The second face can be opposing the first face. Moreover, the first and second faces can be spaced apart so that a side can be defined between the first and second faces.

The first face can, for example, be capable of carrying a first adapting part and the second face can, for example, be capable of carrying a second adapting part.

30 In one embodiment, the end of the container portion which carries the coupling part can face the first face and the side of the base portion which carries the joining part can face the second face. The coupling part can be capable of mating with the first adapting part in a manner such that the container portion is movable relative to the

intermediate portion based on curvilinear motion. Additionally, the joining part can be capable of mating with the second adapting part in a manner such that the intermediate portion is movable relative to the base portion based on curvilinear motion.

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In accordance with another aspect of the disclosure, there is provided a deployment method. The deployment method can be in association with the offshore storage facility.

- 10 In one embodiment, the deployment method can include a base deployment step, a container deployment step and/or a coupling step.

Moreover, the deployment method can correspond to one or more deployment flows.

15 **Brief Description of the Drawings**

Embodiments of the disclosure are described hereinafter with reference to the following drawings, in which:

- Fig. 1 shows an offshore storage facility which can include a container portion and a
20 base portion, according to an embodiment of the disclosure;

Fig. 2 shows container portion of Fig. 1 being moved based on a first one dimensional motion, according to an embodiment of the disclosure;

- 25 Fig. 3a shows a first exemplary coupling strategy in association with the container portion and the base portion of Fig. 1, according to an embodiment of the disclosure;

- Fig. 3b to Fig. 3e show an exemplary implementation in association with the first exemplary coupling strategy of Fig. 3a, according to an embodiment of the
30 disclosure;

Fig. 4 shows a second exemplary coupling strategy in association with the container portion and the base portion of Fig. 1, according to an embodiment of the disclosure; and

- 5 Fig. 5 shows a deployment method in association with the offshore storage facility of Fig. 1, according to an embodiment of the disclosure.

Detailed Description

The present disclosure contemplates that general deployment arrangement(s)
10 contemplated in connection with conventional offshore storage facilities such as that of WO2017/091146A1 may not be ideal.

Specifically, concerning situations of direct contact between the water body floor and an offshore storage facility, the present disclosure contemplates that offshore
15 storage facility movement and/or positional shifts about the point/region/area of direct contact can have the undesirable effect of, for example, in-digging (e.g., where the offshore storage facility sinks deeper into the natural surface) and/or terrain erosion (e.g., where soil in association with the natural surface is gradually worn away). Moreover, even with consideration of anti-rotation means, as mentioned
20 earlier, the present disclosure contemplates that prior anti-rotation means may place undue reliance on the natural surface in that the ability to prevent rotation will be, in part, dependent on extent of engagement between the anti-rotation means and the natural surface into which the anti-rotation means can be sunk into.

25 It is appreciable that the anti-rotational effectiveness of prior anti-rotation means may be reliant/dependent of natural surface condition(s)/characteristic(s). For example, in the instance where the natural surface is unable to effectively engage the anti-rotation means (e.g., due to conditions such as shallowness/softness/durability of the natural surface into which the anti-rotation means has been sunk into), the anti-
30 rotation means may not be effective in impeding rotation of the offshore storage facility. Moreover, the present disclosure contemplates that prior anti-rotation means could place undue stress upon the natural surface into which it has been sunk into.

Further appreciably, in the instance of in-digging, extraction of the offshore storage facility would become more tedious. Moreover, in the instance of terrain erosion, the offshore storage facility may be unable to maintain position reliably.

- 5 Therefore, the present disclosure contemplates that it will be helpful to provide an offshore storage facility which positional displacement can be self-corrected reliably and/or which rotational movement can be impeded reliably.

10 The foregoing will be discussed in further detail with reference to Fig. 1 to Fig. 5 hereinafter.

Referring to Fig. 1, an offshore storage facility 100 is shown according to an embodiment of the disclosure.

- 15 Additionally, Fig. 1 shows a water body 100a (e.g., sea or ocean) within which the offshore storage facility 100 can be deployed. The water body 100a can be associated with a floor 100b. The floor 100b can, for example, correspond to a natural surface such as a sea-floor or an ocean-floor. In this regard, the offshore storage facility 100 can be capable of being deployed for use in a water body 100a
20 which can be associated with a floor 100b.

- The offshore storage facility 100 can include a container portion 102 and a base portion 104. The container portion 102 can be coupled to the base portion 104. Specifically, in one embodiment, the container portion 102 can be movably coupled
25 to the base portion 104 as will be discussed later in further detail. In another embodiment, in addition to being movably coupled, the container portion 102 can, further, be coupled to the base portion 104 in a removable manner. In yet another embodiment, the offshore storage facility 100 can, as an option, further include a building 105 which can be carried by the container portion 102 and which can
30 function to store equipment and/or as a docking bay/platform to which a vessel 100c can be docked. In yet a further embodiment, the offshore storage facility 100 can, as an option, further include one or more risers 100d which can be coupled to the container portion 102 and/or the building 105.

As shown, when the offshore storage facility 100 is deployed, the base portion 104 can be positioned/arranged on the floor 100b and the container portion 102 can be in a standing orientation. When in the standing orientation, the container portion 102 can be associated with a standing axis 102a.

Specifically, the base portion 104 can rest on the floor 100b and the container portion 102 can be associated with a standing axis 102a (i.e., in a standing orientation) when the offshore storage facility 100 has been deployed. Moreover, the container portion 102 can, for example, be in the form of an elongate structure shaped and dimensioned to be capable of storing/housing matter (e.g., fluids such as crude oil and/or gas).

Appreciably, when in the standing orientation, the base portion 104 can be considered to be carrying the container portion 102. Effectively, the container portion 102 can be considered to be resting on/pressing against the base portion 104. Moreover, the container portion 102 can be associated with substantial weight (i.e., which can be in tonnes). In this regard, the base portion 104 can be considered to be pressed against the floor 100b by virtue of the weight (which can be in tonnes) of the container portion 102 effectively carried/borne by the base portion 104.

Therefore, when the offshore storage facility 100 is deployed, the base portion 104 can be considered to be rest on the floor 100b in fixed position by virtue of the base portion 104 bearing/carrying the container portion 102 which can be associated with substantial weight (i.e., in tonnes). Specifically, the base portion 104 can be pressed against the floor 100b by the substantial weight associated with the container 102 to the extent that the base portion 104 remains in fixed position on the floor 100b after the offshore storage facility 100 has been deployed.

Specifically, when the offshore storage facility 100 has been deployed, the container portion 102 can be in a standing orientation and can be movably coupled to the base portion 104 in a manner such that:

- the base portion 104 can effectively be carrying (i.e., bearing the weight of) the container portion 102, and
- the base portion 104 can effectively be considered to be pressed against the floor 100b so as to remain in fixed position on the floor 100b.

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Earlier mentioned, the container portion 102 can be movably coupled to the base portion 104.

10 In this regard, it is appreciable that when the offshore storage facility 100 is deployed, the base portion 104 can contact the floor 100b. Specifically the base portion 104 can remain fixed in position after initial contact with the floor 100b (e.g., by virtue of the weight of the container portion 102 effectively carried/borne by the base portion 104). Meanwhile, the container portion 102 can be movable relative to the base portion 104.

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Specifically, the container portion 102 can be movable while remaining coupled to the base portion 104. Meanwhile, the base portion 104 can remain in substantially fixed position on the floor 100b after the offshore storage facility 100 has been deployed.

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In this regard, the container portion 102 can be considered to be movable about the base portion 104 while remaining coupled to the base portion 104 and while the base portion remains in substantially fixed position on the floor 100b, after the offshore storage facility 100 has been deployed.

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Movement of the container portion 102 can be either caused or influenced by one or more events associated with the water body 100a into which the offshore storage facility 100 has been deployed. The event(s) can include, for example, sea waves crashing against the container portion 102 and/or water currents pushing against the container portion 102. Moreover, such event(s) can be generally referred to as
30 “water body 100a condition(s)”.

Movement of the container portion 102 can be associated with one or more one dimensional motions. Specifically, the container portion 102, when in the standing orientation, can be movable relative to the base portion 104 based on a plurality of one dimensional motions. More specifically, the container portion 102, when in the standing orientation and while remaining coupled to the base portion 104, is capable of being moved relative to the base portion 104 (i.e., which remains in fixed position on the floor 100b) based on a plurality of one dimensional motions.

A one dimensional motion can be generally considered as motion which direction can be considered to be along a straight line. Moreover, direction of motion along a straight line can include either a forward direction based motion or a backward direction based motion along a straight line. Specifically, motion (i.e., which direction can be considered to be along a straight line) can relate to either a first swaying motion or a second swaying motion. The second swaying motion can be in an opposite direction relative to the first swaying motion. For example, the first swaying motion can correspond to a forward direction based swaying motion and the second swaying motion can correspond to a backward direction based swaying motion along a straight line. This will be discussed in further detail according to an embodiment of the disclosure hereinafter.

In one embodiment, movement of the container portion 102 can be associated with one or both of a first one dimensional motion and a second one dimensional motion. The first one dimensional motion can be signified/represented by a first rectilinear axis 102b. The second one dimensional motion can be signified/represented by a second rectilinear axis 102c. In this regard, the first one dimensional motion can be associated with the first rectilinear axis 102b and the second one dimensional motion can be associated with the second rectilinear axis 102c. Moreover, the first and second rectilinear axes 102b/102c can be crossed so that an intersection point 102d can be defined/formed.

In this regard, the plurality of one dimensional motions can include a first one dimensional motion associable with the first rectilinear axis 102b and a second one dimensional motion associable with a second rectilinear axis 102c. Moreover, the

first and second rectilinear axes 102b/102c can be capable being crossed so as to define the intersection point 102d.

Earlier mentioned, when in the standing orientation, the container portion 102 can be associated with a standing axis 102a.

The first rectilinear axis 102b and the second rectilinear axis 102c can intersect at the standing axis 102a. Specifically, the first rectilinear axis 102b can cross the second rectilinear axis 102c to form an intersection point 102d and the standing axis 102a can pass through the intersection point 102d.

Therefore, when the offshore storage facility 100 has been deployed, the container portion 102 can either remain substantially stationary or be moved relative to the base portion 104 depending on water body 100a condition.

In one example, where the water body 100a condition can be considered calm (e.g., calm sea-waters), the container portion 102 can remain substantially stationary such that the container portion 102 can be considered to be in an upright orientation relative to the base portion 104. In the upright orientation, the container portion 102 can be associated with a point of origin 102e. Moreover, in the upright orientation, the aforementioned intersection point 102d can substantially coincide with the point of origin 102e as shown in Fig. 1, according to an embodiment of the disclosure. Specifically, in the upright orientation, the aforementioned intersection point 102d can substantially coincide with the point of origin 102e in position.

In another example, where the water body 100a condition can be associated with disturbance and/or turbulent conditions (e.g., turbulent sea waves crashing against the container portion 102), the container portion 102 can, for example, move (i.e., relative to the base portion 104) in oscillating manner/pendulous manner along one or both of the first rectilinear axis 102b and the second rectilinear axis 102c, depending on water body 100a condition (e.g., direction of sea waves and/or any change in direction thereof). When moved relative to the base portion 104, the container portion 102 can generally be considered to be in tilted orientation. In the

tilted orientation, it is appreciable that the aforementioned intersection point 102d can substantially be displaced with respect to the point of origin 102e. Specifically, in the tilted orientation, the aforementioned intersection point 102d can be displaced from the point of origin 102e in position (i.e., positional displacement).

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Preferably, after the container portion 102 has been moved to be in tilted orientation, the container portion 102 can be self-righted (i.e., self-corrected) in position in a manner so as to return to the upright orientation. Specifically, when moved to be in the tilted orientation, the container portion 102 can preferably be positionally self-corrected from the tilted orientation to the upright orientation (i.e., self-correction of positional displacement of the container portion 102). When positional displacement of the container portion 102 has been self-corrected, it is appreciable that the aforementioned intersection point 102d and the point of origin 102e can substantially coincide in position.

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Movement of the container portion 102 relative to the base portion 104 based on water body 100a condition(s) will be discussed in further detail with reference to Fig. 2 hereinafter.

20 Fig. 2 shows the container portion 102 moved based on a first one dimensional motion (e.g., in one direction along the first rectilinear axis 102b), according to an embodiment of the disclosure. For simplicity, the aforementioned building 105, vessel 100c and riser(s) 100d etc. are not presented in Fig. 2.

25 Specifically, in one embodiment, as shown in Fig. 2, the container portion 102 can be urged by water body 100a conditions (e.g., sea waves and/or sea currents as represented by block arrows 200) so as to be moved, relative to the base portion 104, based on a first one dimensional motion by manner of, for example, being swung (e.g., a first swaying motion in pendulous fashion) in one direction along the first rectilinear axis 102b. As shown, the container portion 102 can be in tilted orientation and the aforementioned intersection point 102d can be positionally displaced from the point of origin 102e. Moreover, the container portion 102 remains coupled to the

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base portion 104 and the base portion 104 remains positionally fixed on the floor 100b.

In another embodiment (not shown), the container portion 102 can be moved based on a second one dimensional motion (i.e., in one direction along the second rectilinear axis 102c). Specifically, the container portion 102 can be urged by water body 100a conditions (e.g., sea waves) so as to be moved, relative to the base portion 104, based on a second one dimensional motion by manner of, for example, being swung (e.g., a second swaying motion in pendulous fashion) in one direction along the second rectilinear axis 102c. Appreciably, the container portion 102 can be in tilted orientation and the aforementioned intersection point 102d can be positionally displaced from the point of origin 102e. Moreover, the container portion 102 remains coupled to the base portion 104 and the base portion 104 remains positionally fixed on the floor 100b.

In yet another embodiment (not shown), the container portion 102 can be moved based on a combination of a first one dimensional motion and a second one dimensional motion (e.g., in one direction along the first rectilinear axis 102b and in one direction along the second rectilinear axis 102c). Specifically, the container portion 102 can be urged by water body 100a conditions (e.g., sea waves) so as to be moved, relative to the base portion 104, based on a combination of a first one dimensional motion and a second one dimensional motion.

In one example, the container portion 102 can be moved, relative to the base portion 104, based on a first one dimensional motion followed by a second one dimensional motion. In another example, the container portion 102 can be moved, relative to the base portion 104, based on a second one dimensional motion followed by a first one dimensional motion. In yet another example, the container portion 102 can be moved, relative to the base portion 104, based simultaneously on a first and a second one dimensional motion. In regard to the first one dimensional motion, movement can, for example, be by manner of the container portion 102 being swung (e.g., a first swaying motion in pendulous fashion) in one direction along the first rectilinear axis 102b and in regard to the second one dimensional motion, movement

can, for example, be by manner of the container portion 102 being swung (e.g., a first swaying motion in pendulous fashion) in one direction along the second rectilinear axis 102c. Furthermore, it is appreciable that the container portion 102 can be in tilted orientation and the aforementioned intersection point 102d can be positionally displaced from the point of origin 102e. Moreover, the container portion 102 remains coupled to the base portion 104 and the base portion 104 remains positionally fixed on the floor 100b.

In general, regardless of the aforementioned upright and tilted orientations, the container portion 102 can be considered to be in a standing orientation. Specifically, the container portion 102 can be considered to be in the standing orientation when the container portion 102 is either in the upright orientation or the tilted orientation. More specifically, the aforementioned standing orientation can be taken to refer to the upright orientation and/or the tilted orientation. Therefore, the container portion 102 can generally be considered to be associated with a standing axis 102a when in either the upright orientation or the tilted orientation.

Appreciably, since the base portion 104 can remain substantially fixed in position (i.e., on the floor 100b) regardless of movement of the container portion 102 to which the base portion 104 is coupled, impact/stress caused by container portion 102 movement on the floor 100b can be reduced. This can be helpful in connection with the aforementioned concerns such as in-digging and/or terrain erosion.

Moreover, since the container portion 102 is coupled to the base portion 104 so as to be movable (i.e., while remaining coupled to the base portion 104) based on a first one dimensional motion and/or a second one dimensional motion, it can be appreciated rotational based motion can effectively be substantially impeded. Additionally, in such a manner, rotational based motion can effectively be substantially impeded without placing undue stress upon the floor 100b.

The present disclosure contemplates that the container portion 102 can be movably coupled to the base portion 104 based on one or more exemplary coupling strategies.

A first exemplary coupling strategy will be discussed with reference to Fig. 3 and a second exemplary coupling strategy will be discussed with reference to Fig. 4.

Referring to Fig. 3a, in relation to the first exemplary coupling strategy, the offshore storage facility 100 can further include an intermediate portion 302, according to an embodiment of the disclosure.

The intermediate portion 302 can be disposed between the container portion 102 and the base portion 104.

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Specifically, the container portion 102 can be coupled to the intermediate portion 302 (as represented/signified by double-headed arrow 303a) and the intermediate portion 302 can, in turn, be coupled to the base portion 104 (as represented/signified by double-headed arrow 303b). In this regard, the container portion 102 can be coupled to the base portion 104 via the intermediate portion 302, according to an embodiment of the disclosure.

More specifically, the container portion 102 can be movably coupled to the intermediate portion 302 and the intermediate portion 302 can, in turn, be movably coupled to the base portion 104. In this regard, the container portion 102 can be movably coupled to the base portion 104 via the intermediate portion 302, according to an embodiment of the disclosure.

In one embodiment, the intermediate portion 302 can be an integral part of either the container portion 102 or the base portion 104. In one example, the intermediate portion 302 and the container portion 102 can be a combination which forms an element of the offshore storage facility 100 whereas the base portion 104 can be another element of the offshore storage facility 100. In another example, the intermediate portion 302 and the base portion 104 can be a combination which forms an element of the offshore storage facility 100 whereas the container portion 102 can be another element of the offshore storage facility 100.

In another embodiment, the container portion 102, the base portion 104 and the intermediate portion 302 can each be distinct individual elements of the offshore storage facility 100. For example, the container portion 102, the base portion 104 and the intermediate portion 302 can, respectively, correspond to a first element, a second element and a third element of the offshore storage facility 100. The first element, the second element and the third element can, for example, be considered to correspond to individual and distinct parts of the offshore storage facility 100.

The intermediate portion 302 can include a first face 302a and a second face 302b. The first face 302a can be opposing the second face 302b. Specifically, the first and second faces 302a/302b can be considered opposite faces of the intermediate portion 302. Moreover, the first and second faces 302a/302b can be spaced apart in a manner so as to define a side 302c. Specifically, a side 302c can be defined between the first and second faces 302a/302b.

Furthermore, the first face 302a can carry a first adapting part 304a and the second face 302b can carry a second adapting part 304b. For example, the first face 302a can be shaped and dimensioned in a manner so as to form/define the first adapting part 304a and the second face 302b can be shaped and dimensioned in a manner so as to form/define the second adapting part 304b.

Generally, when the container portion 102 is coupled to the base portion 104 via the intermediate portion 302, the first face 302a can be facing the container portion 102 and the second face 302b can be facing the base portion 104.

In one embodiment, the container portion 102 can, at one end facing the intermediate portion 302, carry a coupling part 306. For example, the container portion 102 can, at one of its ends facing the first face 302a, be shaped and dimensioned in a manner so as to form/define the coupling part 306.

In one embodiment, the base portion 104 can, at one side facing the intermediate portion 302, carry a joining part 308. Appreciably, the base portion 104 can include an opposite side which faces, and can be pressed against, the floor 100b. For

example, the base portion 104 can, at one of its sides facing the second face 302b, be shaped and dimensioned in a manner so as to form/define the joining part 308.

5 The coupling part 306 can be shaped and dimensioned in a manner so as to mate with the first adapting part 304a and the joining part 308 can be shaped and dimensioned in a manner so as to mate with the second adapting part 304b.

10 In this regard, the container portion 102 can be coupled to the base portion 104 via the intermediate portion 302 by manner of the coupling part 306 mating with the first adapting part 304a and the joining part 308 mating with the second adapting part 304b.

15 Moreover, the coupling part 306 can be mated with the first adapting part 304a in a manner such that the container portion 102 is movable relative to the intermediate portion 302. The joining part 308 can be mated with the second adapting part 304b in a manner such that the intermediate portion 302 is movable relative to the base portion 104. Preferably, the base portion 104 remains substantially stationary relative to the floor 100b.

20 In one embodiment, the coupling part 306 can be mated with the first adapting part 304a in a manner such that the container portion 102 is movable relative to the intermediate portion 302 based on curvilinear motion. The joining part 308 can be mated with the second adapting part 304b in a manner such that the intermediate portion 302 is movable relative to the base portion 104 based on curvilinear motion.

25 In one example, the coupling part 306 can correspond to a curved based protrusion, the first adapting part 304a can correspond to a curved based trench/groove, the second adapting part 304b can correspond to a curved based protrusion and the joining part 308 can correspond to a curved based trench/groove.

30 In another example, the coupling part 306 can correspond to a curved based trench/groove, the first adapting part 304a can correspond to a curved based

protrusion, the second adapting part 304b can correspond to a curved based protrusion and the joining part 308 can correspond to a curved based trench/groove.

In yet another example, the coupling part 306 can correspond to a curved based trench/groove, the first adapting part 304a can correspond to a curved based protrusion, the second adapting part 304b can correspond to a curved based trench/groove and the joining part 308 can correspond to a curved based protrusion.

In general, it is appreciable that each of the first and second adapting parts 304a/304b can correspond to either a curved based trench/groove or a curved based protrusion depending of the corresponding form of the coupling part 306 (e.g., curved based trench/groove or a curved based protrusion) and the joining part 308 (e.g., curved based trench/groove or a curved based protrusion) respectively.

The first exemplary coupling strategy will be discussed with reference to an exemplary implementation 380 as shown in Fig. 3b, Fig. 3c, Fig. 3d and Fig. 3e hereinafter.

In the exemplary implementation 380, the curved based protrusion can, for example, be in the form of a half cylindrical protrusion and the curved based trench/groove can, for example, be in the form of a half cylindrical trench/groove. The half cylindrical protrusion and the half cylindrical trench/groove can be shaped and dimensioned in a manner so as to be capable of mating with each other. Specifically, the half cylindrical protrusion can be shaped and dimensioned in a manner so as to be capable of mating with the half cylindrical trench/groove. More specifically, the half cylindrical protrusion can, for example, be shaped and dimensioned in a manner so as to be capable of perfectly mating with the half cylindrical trench/groove.

Specifically, in one exemplary implementation 380, the coupling part 306 can correspond to a curved based protrusion in the form of a half cylindrical protrusion running across the end of the container portion 102 which faces the first face 302a, the first adapting part 304a can correspond to a curved based trench/groove in the form of a half cylindrical trench/groove running across the first face 302a, the second

adapting part 304b can correspond to a curved based protrusion in the form of a half cylindrical protrusion running across the second face 302b and the joining part 308 can correspond to a curved based trench/groove in the form of a half cylindrical trench/groove running across the side of the base portion 104 which faces the
5 second face 302b.

In the exemplary implementation 380, the half cylindrical protrusion (i.e., the coupling part 306) carried by the container portion 102 can be received and mated with the half cylindrical trench/groove (i.e., the first adapting part 304a) carried by the
10 intermediate portion 302 at its first face 302a. The half cylindrical protrusion (i.e., the second adapting part 304b) carried by the intermediate portion 302 at its second face 302b can be received and mated with the half cylindrical trench/groove (i.e., the joining part 308) carried by the base portion 104.

15 Earlier mentioned, the coupling part 306 can be mated with the first adapting part 304a in a manner such that the container portion 102 is movable relative to the intermediate portion 302 based on curvilinear motion. The joining part 308 can be mated with the second adapting part 304b in a manner such that the intermediate portion 302 is movable relative to the base portion 104 based on curvilinear motion.

20 In the exemplary implementation 380, the half cylindrical protrusion(s) (e.g., the coupling part 306 and the second adapting part 304b) can be received and mated with the half cylindrical trench(es)/groove(s) (e.g., the joining part 308 and the first adapting part 304a) in a fashion so as to facilitate curvilinear motion.

25 Furthermore, in the exemplary implementation 380, the first adapting part 304a and the second adapting part 304b can be carried by the intermediate portion 302 by manner of, for example, an orthogonal arrangement. Specifically, the first adapting part 304a can be arranged to run across the first face 302a in an orientation which is
30 orthogonal with respect to the orientation in which the second adapting part 304b is arranged to run across the second face 302b. Therefore, the first and second adapting parts 304a/304b can effectively be arranged to form an imaginary "cross" (i.e., an imaginary "+" sign) where the first adapting part 304a can, for example, form

the horizontal part of the imaginary “cross” and the second adapting part 304b can, for example, form the vertical part of the imaginary “cross”.

Therefore, in general, curvilinear motion associated with the mating between the coupling part 306 and the first adapting part 304a (i.e., also referable to as “first curvilinear motion”) can facilitate/enable the aforementioned first dimensional motion (i.e., which can be signified/represented by a first rectilinear axis 102b). Moreover, curvilinear motion associated with the mating between the second adapting part 304b and the joining part 308 (i.e., also referable to as “second curvilinear motion”) can facilitate/enable the aforementioned second dimensional motion (i.e., which can be signified/represented by a second rectilinear axis 102c).

Generally, the first and second curvilinear motions can be associated with, respectively, the first and second one dimensional motions. Specifically, the first curvilinear motion can, in general, be considered to be capable of being translated to the first one dimensional motion and the second curvilinear motion can, in general, be considered to be capable of being translated to the second one dimensional motion.

Therefore, the first exemplary coupling strategy can generally be associated with an intermediate portion 302 which can correspond to a curvilinear based coupling arrangement 390. The curvilinear based coupling arrangement 390 can be associated with a first curvilinear based coupling (i.e., between the coupling part 306 and the first adapting part 304a) in association with the first curvilinear motion and a second curvilinear based coupling (i.e., between the second adapting part 304b and the joining part 308) in association with the second curvilinear motion.

Earlier mentioned, the intermediate portion 302 can be disposed between the container portion 102 and the base portion 104. Therefore, it is appreciable that the intermediate portion 302 can correspond to a curvilinear based coupling arrangement 390 which can be capable of facilitating movable coupling of the container portion 102 and the base portion 104 (i.e., per the first exemplary coupling strategy). The curvilinear based coupling arrangement 390 can be disposed

between the container portion 102 and the base portion 104, according to an embodiment of the disclosure.

Referring to Fig. 4, in relation to the second exemplary coupling strategy, the
5 offshore storage facility 100 can further include a coupler 400, according to an embodiment of the disclosure.

The coupler 400 can be disposed (not shown) between the container portion 102 and the base portion 104. More specifically, the container portion 102 can be
10 coupled (not shown) to the coupler 400 and the coupler 400 can, in turn, be coupled (not shown) to the base portion 104.

In one embodiment, the coupler 400 can be a dual-axis type coupler. In this regard, the coupler 400 can be associated with a first coupling axis 400a and a second
15 coupling axis 400b. The first coupling axis 400a can cross the second coupling axis 400b. Specifically, the first coupling axis 400a can intersect with the second coupling axis 400b at an intersection spot 400c.

Moreover, the coupler 400 can include a first coupler part 402, a second coupler part
20 404 and a joint 406. Each of the first and second coupler parts 402/404 can be coupled to the joint 406. The first coupler part 402 can, for example, be coupled to the container portion 102 and the second coupler part 404 can, for example, be coupled to the base portion 104.

25 As shown, the first coupler part 402 and the joint 406 can be coupled along the first coupling axis 400a. The second coupler part 404 and the joint 406 can be coupled along the second coupling axis 400b.

In one embodiment, each of the first and second coupler parts 402/404 can be
30 movably coupled to the joint 406. Moreover, the first coupler part 402 can, for example, be coupled to the container portion 102 in a fixed manner (i.e., non-movable) and the second coupler part 404 can, for example, be coupled to the base portion 104 in a fixed manner (i.e., non-movable).

Specifically, the first coupler part 402 can be movably coupled to the joint 406 in a manner so as to allow a first curvilinear motion (as represented by curved double-headed arrow 408a) with respect to the first coupling axis 400a. The second coupler part 404 can be movably coupled to the joint 406 in a manner so as to allow a second curvilinear motion (as represented by curved double-headed arrow 408b) with respect to the second coupling axis 400b.

In this regard, coupling of the container portion 102 and the coupler 400 can generally be associated with a curvilinear motion (e.g., the first curvilinear motion as represented by curved double-headed arrow 408a). Additionally, coupling of the base portion 104 and the coupler 400 can generally be associated with another curvilinear motion (e.g., the second curvilinear motion as represented by curved double-headed arrow 408b). Appreciably, the coupler 400 can correspond to a curvilinear based coupling arrangement.

Therefore, curvilinear motion associated with coupling of the container portion 102 and the coupler 400 can facilitate/enable the aforementioned first dimensional motion (i.e., which can be signified/represented by a first rectilinear axis 102b). Moreover, curvilinear motion associated with coupling of the base portion 104 and the coupler 400 can facilitate/enable the aforementioned second dimensional motion (i.e., which can be signified/represented by a second rectilinear axis 102c).

In analogous manner with reference to the earlier discussed first exemplary coupling strategy, the first and second curvilinear motions per the second exemplary coupling strategy can be associated with, respectively, the first and second one dimensional motions. Specifically, the first curvilinear motion can, in general, be considered to be capable of being translated to the first one dimensional motion and the second curvilinear motion can, in general, be considered to be capable of being translated to the second one dimensional motion.

In this regard, the second exemplary coupling strategy can generally be associated with a coupler 400 which can correspond to a curvilinear based coupling

arrangement 390. The curvilinear arrangement 390 can be associated with a first curvilinear based coupling (i.e., in association with coupling of the container portion 102 and the coupler 400) in association with the first curvilinear motion and a second curvilinear based coupling (i.e., in association with coupling of the base portion 104 and the coupler 400) in association with the second curvilinear motion.

In view of the forgoing discussion concerning the first and/or second exemplary coupling strategies, it is appreciable that the container portion 102 can be capable of being movably coupled to the base portion 104, generally, by manner of a curvilinear based coupling arrangement 390. The curvilinear based coupling arrangement 390 can correspond to one or both of the intermediate portion 302 and the coupler 400, according to an embodiment of the disclosure. Moreover, the curvilinear based coupling arrangement 390 can, for example, be disposed between the container portion 102 and the base portion 104, according to an embodiment of the disclosure.

In one embodiment, the container portion 102 and the curvilinear based coupling arrangement 390 can be considered to correspond to one element (i.e., a single element where, for example, the container portion 102 can be integrated with the curvilinear based coupling arrangement 390) of the offshore storage facility 100 and the base portion 104 can be considered as another element of the offshore storage facility 100.

In another embodiment, the base portion 104 and the curvilinear based coupling arrangement 390 can be considered to correspond to one element (i.e., a single element where, for example, the base portion 104 can be integrated with the curvilinear based coupling arrangement 390) of the offshore storage facility 100 and the container portion 102 can be considered as another element of the offshore storage facility 100.

In yet another embodiment, the container portion 102 can be considered to correspond to a first element of the offshore storage facility 100, the base portion 104 can be considered to correspond to a second element of the offshore storage facility 100 and the curvilinear based coupling arrangement 390 can be considered

to correspond to a third element of the offshore storage facility 100. The first element, the second element and the third element can, for example, be considered to correspond to individual and distinct parts of the offshore storage facility 100.

- 5 Referring to Fig. 5, a deployment method 500 in association with the offshore storage facility 100 is shown, according to an embodiment of the disclosure.

The deployment method 500 can include a base deployment step 502 and a container deployment step 504, according to an embodiment of the disclosure. The
10 deployment method 500 can further include a coupling step 506, according to an embodiment of the disclosure.

With regard to the base deployment step 502, the base portion 104 can be provided.

- 15 With regard to the container deployment step 504, the container portion 102 can be provided.

With regard to the coupling step 506, one or both of the intermediate portion 302 and the coupler 400 can be provided.

20

The deployment method 500 will be discussed in further detail in the context of the intermediate portion 302 being provided, according to an embodiment of the disclosure, hereinafter.

- 25 In one embodiment, the base portion 104 and the intermediate portion 302 can be considered to correspond to one element (i.e., a single element where, for example, the base portion 104 can be integrated with the intermediate portion 302) of the offshore storage facility 100 and the container portion 102 can be considered as another element of the offshore storage facility 100.

30

In another embodiment, the container portion 102 and the intermediate portion 302 can be considered to correspond to one element (i.e., a single element where, for example, the container portion 102 can be integrated with the intermediate portion

302) of the offshore storage facility 100 and the base portion 104 can be considered as another element of the offshore storage facility 100.

5 In yet another embodiment, the container portion 102 can be considered to correspond to a first element of the offshore storage facility 100, the base portion 104 can be considered to correspond to a second element of the offshore storage facility 100 and the intermediate portion 302 can be considered to correspond to a third element of the offshore storage facility 100. The first element, the second element and the third element can, for example, be considered to correspond to
10 individual and distinct parts of the offshore storage facility 100.

According to an embodiment of the disclosure, the deployment method 500 can correspond to a deployment flow where the base portion 104 can be provided and positioned/arranged on the floor 100b. Thereafter, the container portion 102 can be
15 provided and positioned/arranged atop the base portion 104.

According to another embodiment of the disclosure, the deployment method 500 can correspond to a deployment flow where the base portion 104 can be provided and positioned/arranged on the floor 100b followed by the intermediate portion 302 being
20 provided and arranged/positioned atop the base portion 104. Thereafter, the container portion 102 can be provided and arranged/positioned atop the intermediate portion 302.

It should be further appreciated by the person skilled in the art that variations and
25 combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments.

In one example, a first exemplary coupling strategy was earlier discussed with reference to Fig. 3 and a second exemplary coupling strategy was earlier discussed
30 with reference to Fig. 4. The present disclosure contemplates that a third exemplary coupling strategy based on a combination/mixture of the first and second coupling strategies can be possible.

In another example, it was earlier mentioned that in one embodiment, the base portion 104 can, at one side facing the intermediate portion 302, carry a joining part 308. Appreciably, the base portion 104 can include an opposite side which faces, and can be pressed against, the floor 100b.

5

The present disclosure contemplates that, in one embodiment, the opposite of the base portion 104 can carry one or more teeth portions (not shown) and/or anchor portions (not shown) to aid in holding the base portion 104 in fixed position onto the floor 100b. Specifically, the teeth portion(s) and/or anchor portion(s) can, for example, be shaped and dimensioned in a manner so as to allow the base portion 104 to grip the floor 100b when the base portion 104 is pressed against the floor 100b.

In yet another example, the container portion 102, the base portion 104 and the curvilinear based coupling arrangement 390 can, in combination/totally, be considered a single element of the offshore storage facility 100. Specifically, the container portion 102, the base portion 104 and the curvilinear based coupling arrangement 390 can be integral and considered as a single part of the offshore storage facility 100, according to an embodiment of the disclosure.

20

In the foregoing manner, various embodiments of the disclosure are described for addressing at least one of the foregoing disadvantages. Such embodiments are intended to be encompassed by the following claims, and are not to be limited to specific forms or arrangements of parts so described and it will be apparent to one skilled in the art in view of this disclosure that numerous changes and/or modification can be made, which are also intended to be encompassed by the following claims.

30

Claim(s)

1. An offshore storage facility capable of being deployed for use in a water body associable with a floor, the offshore storage facility comprising:

5 a base portion;

a container portion capable of being movably coupled to the base portion;

10 wherein when the offshore storage facility has been deployed, the container portion is in a standing orientation and is movably coupled to the base portion in a manner such that the base portion carries the container portion, and the base portion is pressed against the floor so as to remain in fixed position on the floor,

15 wherein the container portion, when in the standing orientation, is movable relative to the base portion based on a plurality of one dimensional motions while remaining coupled to the base portion and while the base portion remains in fixed position on the floor, and

20 wherein the plurality of one dimensional motions comprise a first one dimensional motion associable with a first rectilinear axis and a second one dimensional motion associable with a second rectilinear axis, the first and second rectilinear axes capable being crossed so as to define an intersection point.

2. The offshore storage facility as in claim 1,

wherein when in the standing orientation the container portion is:

25 associable with a standing axis, and

capable of being in one of an upright orientation and a tilted orientation, and

wherein the standing axis passes through the intersection point.

30 3. The offshore storage facility as in claim 1, wherein the container portion is capable of being movably coupled to the base portion by manner of a curvilinear based coupling arrangement.

4. The offshore storage facility as in claim 3

wherein the curvilinear based coupling arrangement can be associated with a first curvilinear motion and a second curvilinear motion, and

wherein the first curvilinear motion is capable of being translated to the first one dimensional motion and the second curvilinear motion is capable of being translated to the second one dimensional motion.

5. The offshore storage facility as in claim 1 further comprising an intermediate portion disposed between the container portion and the base portion, wherein the intermediate portion corresponds to a curvilinear based coupling arrangement capable of facilitating movable coupling of the container portion and the base portion.

6. The offshore storage facility as in claim 5, the intermediate portion comprising: a first face and a second face opposing the first face, the first and second faces being spaced apart so as to define a side therebetween,

wherein the first face is capable of carrying a first adapting part and the second face is capable of carrying a second adapting part.

7. The offshore storage facility as in claim 6,

the container portion comprises one end which faces the first face of the intermediate portion and the base portion comprises one side which faces the second face of the intermediate portion,

wherein the container portion carries a coupling part at the end facing the first face and the base portion carries a joining part at the side facing the second face,

wherein the coupling part is capable of mating with the first adapting part in a manner such that the container portion is movable relative to the intermediate portion based on curvilinear motion, and

wherein the joining part is capable of mating with the second adapting part in a manner such that the intermediate portion is movable relative to the base portion based on curvilinear motion.