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(54) **A FLOATING DRY DOCK**

(57) A floating dry dock (1) comprises a row of individual pontoons (2) including respective buoyancy chambers and opposite wing walls (3) being supported by the

row of individual pontoons (2). A continuous non-sealed sandwich structure (4) is supported by the row of pontoons (2).

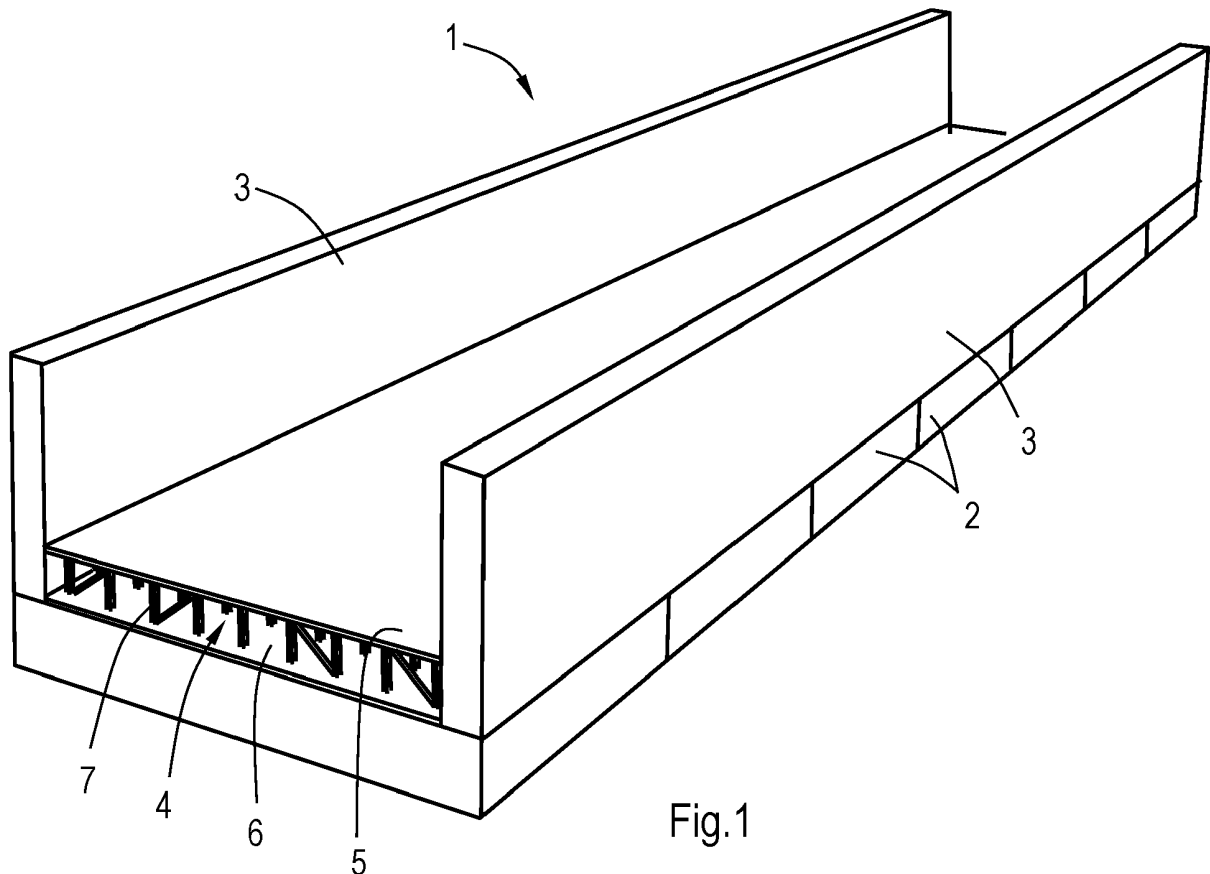


Fig.1

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## Description

**[0001]** The present invention relates to a floating dry dock, comprising a row of individual pontoons including respective buoyancy chambers and opposite wing walls being supported by the row of individual pontoons.

**[0002]** Such a dry dock is known in the state of the art and is suitable for lifting a vessel out of water and properly support it for repair. The pontoons of the known dry dock are mounted to the wing walls. The dry dock comprises ballasting equipment including pumps and drains for filling and draining the pontoons in order to lower and raise the dry dock, respectively. An advantage of the dry dock having individual pontoons is that it facilitates self-docking. For example, when the pontoons need maintenance each of the pontoons can alternately be released from the wing walls, then filled with water to lower the pontoon and displace it from below the remaining dry dock and subsequently moving it into the remaining dry dock after lowering the remaining dry dock; after lifting the remaining dry dock the separate pontoon can be cleaned and painted or the like. Afterwards, the repaired pontoon can be placed back in reverse order and a next pontoon of the row can be treated in a similar way. The application of individual pontoons, however, limits the length of the dry dock since an increasing length introduces high load concentrations at transitions between adjacent pontoons.

**[0003]** An object of the invention is to provide a floating dry dock for docking relatively large vessels.

**[0004]** This object is achieved with the floating dry dock according to the invention, which is characterized in that a continuous non-sealed sandwich structure is supported by the row of pontoons.

**[0005]** The continuous sandwich structure provides a relatively high bending stiffness, which allows a relatively large number of individual pontoons. Hence, the floating dry dock according to the invention is suitable for lifting relatively large vessels, for example longer than 100 m. An additional advantage is that the pontoons may be relatively small since they are used for buoyancy rather than for contributing to bending stiffness of the dry dock. The sandwich structure is non-sealed, which means that it has an open structure, i.e. open to the environment; upon lowering the dry dock water will automatically enter into the sandwich structure and upon lifting the dry dock water will automatically flow from the sandwich structure. In other words, the sandwich structure is free from a controllable buoyancy chamber like the pontoons. In practice the sandwich structure may be made of steel.

**[0006]** In a practical embodiment the sandwich structure comprises two face plates which are fixed to each other through beams, for example arranged in a framework structure. The two face plates may comprise a lower face plate which rests on the row of pontoons and an upper face plate which forms a working deck.

**[0007]** The individual pontoons may be located at a distance from each other, which facilitates to release an

individual pontoon from between two neighbouring pontoons when it needs to be docked itself. The distance between two neighbouring pontoons may be smaller than the length of one of the pontoons in longitudinal direction of the dry dock. Furthermore, the number of pontoons may be adjusted to the length of the drydock.

**[0008]** In a specific embodiment the sandwich structure is directly mounted on top of the row of pontoons, for example through welding.

**[0009]** The wing walls may be directly mounted on top of the row of pontoons at either side of the sandwich structure, for example through welding.

**[0010]** In an alternative embodiment the continuous non-sealed sandwich structure is an upper sandwich structure, wherein the floating dry dock is also provided with a continuous intermediate sandwich structure which is sandwiched between the upper sandwich structure and the row of pontoons, wherein the intermediate sandwich structure is sealable so as to provide buoyancy. Hence, the upper sandwich structure is supported by the row of pontoons through the intermediate sandwich structure.

**[0011]** The wing walls may be mounted on top of the intermediate sandwich structure at either side of the upper sandwich structure.

**[0012]** Preferably, if the pontoons have similar dimensions, their number is uneven, in order to avoid an excessive bending load at a transition between adjacent pontoons in the middle of the dry dock.

**[0013]** The invention will hereafter be elucidated with reference to very schematic drawings showing embodiments of the invention by way of example.

Fig. 1 is a perspective view of an embodiment of a floating dry dock according to the invention.

**[0014]** Fig. 2 is a cross-sectional view of the embodiment as shown in Fig. 1.

Fig. 3 is a similar view as Fig. 2, but showing an alternative embodiment.

**[0014]** Figs. 1 and 2 show an embodiment of a floating dry dock 1 according to the invention. The dry dock 1 is intended for lifting a vessel out of water, usually for cleaning and/or repairing an external lower side of the vessel. The dry dock 1 comprises a row of individual pontoons 2 arranged behind each other in longitudinal direction of the dry dock 1, in this case seven pontoons 2, but any alternative number larger than two is conceivable. Although not visible in Fig. 1 the pontoons 2 are located at a distance from each other. The intention of using individual pontoons 2 is to be able to separate them from the remainder of the dry dock 1 in order to provide the opportunity to dock one or more of the pontoons 2. Hence, the floating dry dock 1 is self-docking. Each of the pontoons 2 includes a buoyancy chamber and docking devices (not shown) for filling and draining the buoyancy chamber, such as a pump and piping.

**[0015]** Figs. 1 and 2 show two opposite wing walls 3, which are fixed on top of the individual pontoons 2, for

example through welding. Furthermore, a continuous non-sealed sandwich structure 4 is fixed on top of the row of pontoons 2, for example through welding. The sandwich structure 4 is at least open at its opposite ends in longitudinal direction thereof and does not have a buoyancy chamber, but will usually extend above water level when the floating dock 1 is in a lifted condition. The sandwich structure 4 extends between the wing walls 3 and may be fixed to the wing walls 3 as well, for example through welding. The wing walls 3 may be closed, but may be provided with drain holes to allow water to flow to and from the inner side of the sandwich structure 4.

**[0016]** The sandwich structure 4 is made from steel in this case, but alternative materials are conceivable. It comprises an upper face plate 5 and a lower face plate 6 which are fixed to each other through beams 7. The upper face plate 5 may be a closed working deck. The lower face plate 6 may be provided with drain holes to allow water to flow to and from the inner side of the sandwich structure 4; the drain holes may be provided at locations between two neighbouring pontoons 2. The beams 7 may form trusses or a framework, but numerous shapes of the sandwich structure 4 are conceivable. The lower face plate 6 is supported by and fixed to upper decks of the pontoons 2. Hence, the continuous face plate 6 lies on a discontinuous deck which is formed by the row of individual pontoons 2. This structure appears to create a great bending strength allowing to design a floating dry dock 1 of relatively great length. It is noted that the sandwich structure 4 may have such dimensions that an operator can enter the inner side thereof for maintenance and inspection.

**[0017]** In the event that a pontoon 2 is docked for maintenance, any debris removed from the pontoon 2 falls on the upper face plate 5 and can be collected easily without polluting the water in the region of the dry dock 1.

**[0018]** Fig. 3 shows an alternative embodiment of the floating dry dock 1. In this case the continuous non-sealed sandwich structure 4 forms an upper sandwich structure, which is supported by the row of pontoons 2 through a continuous intermediate sandwich structure 8 which is sandwiched between the upper sandwich structure 4 and the row of pontoons 2. The intermediate sandwich structure 8 is similar to the upper sandwich structure 4 except in that it is sealable so as to provide buoyancy. Alternatively, the structure may be different, as well. In the embodiment as shown in Fig. 3 the wing walls 3 are fixed on top of the intermediate sandwich structure 8 and located at either side of the upper sandwich structure 4.

**[0019]** The invention is not limited to the embodiments shown in the drawings and described hereinbefore, which may be varied in different manners within the scope of the claims and their technical equivalents.

pontoons (2) including respective buoyancy chambers and opposite wing walls (3) being supported by the row of individual pontoons (2), **characterized in that** a continuous non-sealed sandwich structure (4) is supported by the row of pontoons (2).

2. A floating dry dock (1) according to claim 1, wherein the sandwich structure (4) comprises two face plates (5, 6) which are fixed to each other through beams (7).
3. A floating dry dock (1) according to claim 1 or 2, wherein the individual pontoons (2) are located at a distance from each other.
4. A floating dry dock (1) according to any one of the preceding claims, wherein the sandwich structure (4) is directly mounted on top of the row of pontoons (2).
5. A floating dry dock (1) according to claim 4, wherein the wing walls (3) are directly mounted on top of the row of pontoons (2) at either side of the sandwich structure (4).
6. A floating dry dock (1) according to any one of the claims 1-3, wherein the continuous non-sealed sandwich structure (4) is an upper sandwich structure, wherein the floating dry dock (1) is also provided with a continuous intermediate sandwich structure (8) which is sandwiched between the upper sandwich structure and the row of pontoons (2), wherein the intermediate sandwich structure (8) is sealable so as to provide buoyancy.
7. A floating dry dock (1) according to claim 6, wherein the wing walls (3) are mounted on top of the intermediate sandwich structure (8) at either side of the upper sandwich structure (4).
8. A floating dry dock (1) according to any one of the preceding claims, wherein the pontoons (2) have similar dimensions and their number is uneven.

## Claims

1. A floating dry dock (1), comprising a row of individual

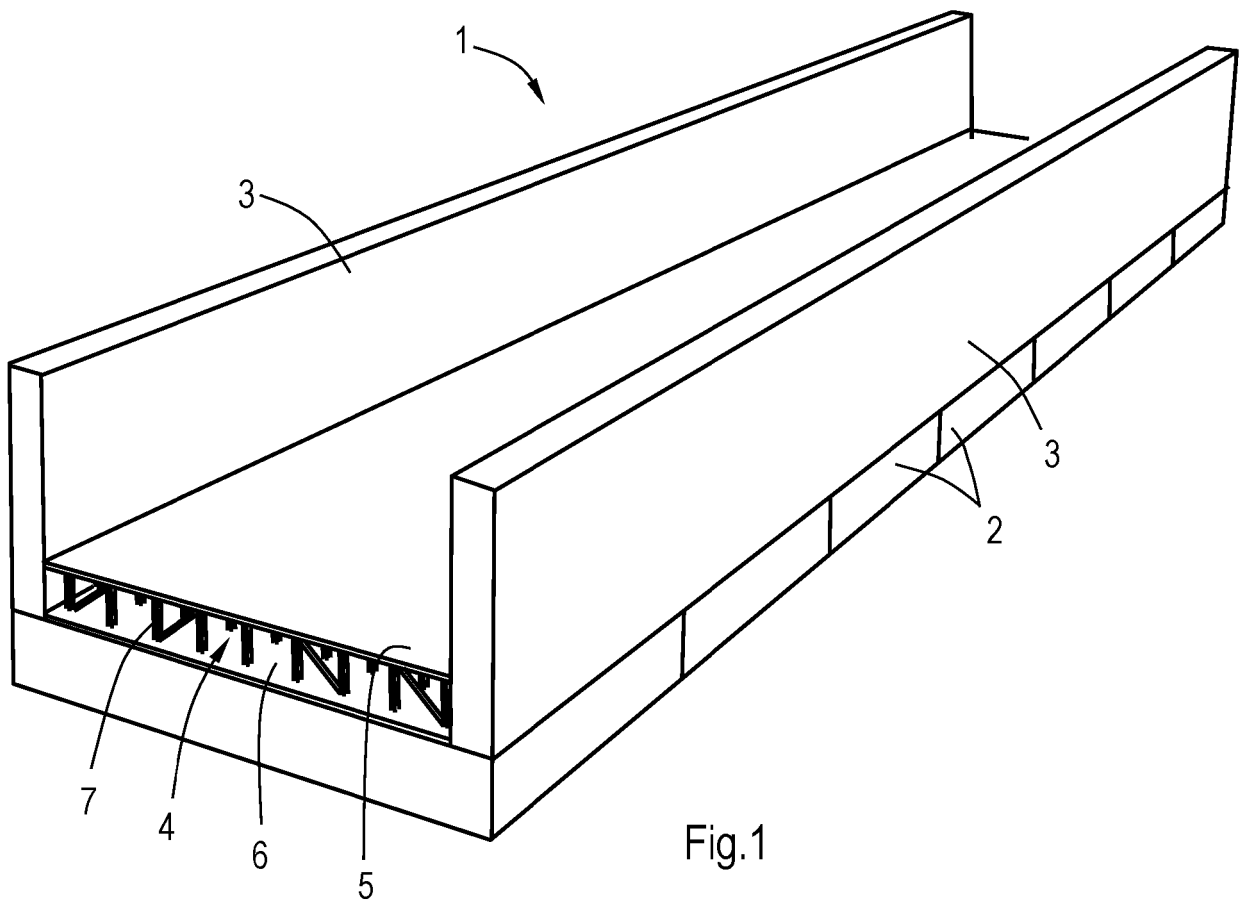


Fig.1

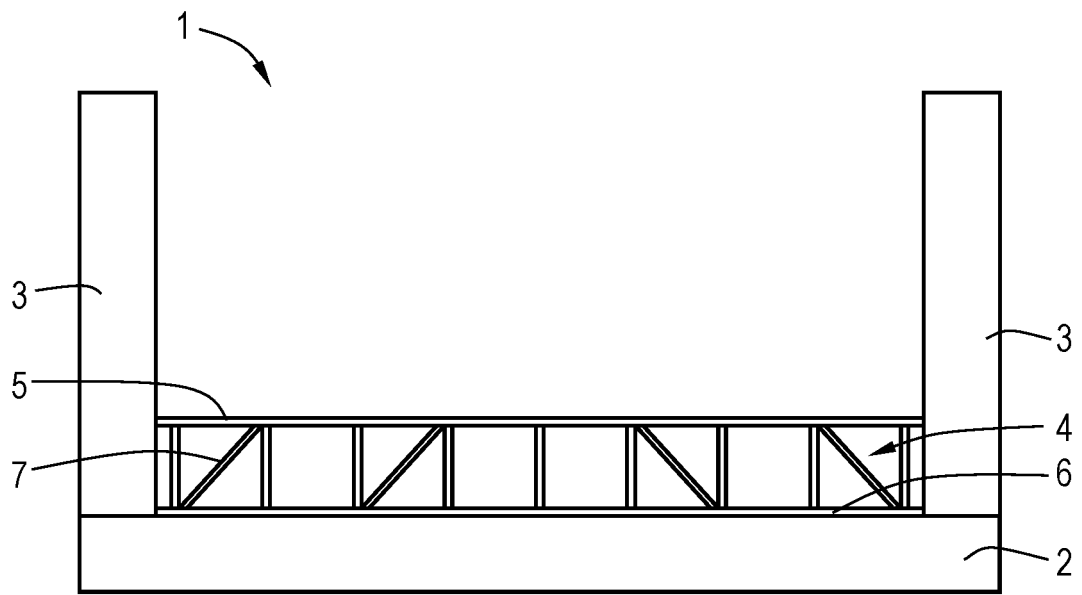


Fig.2

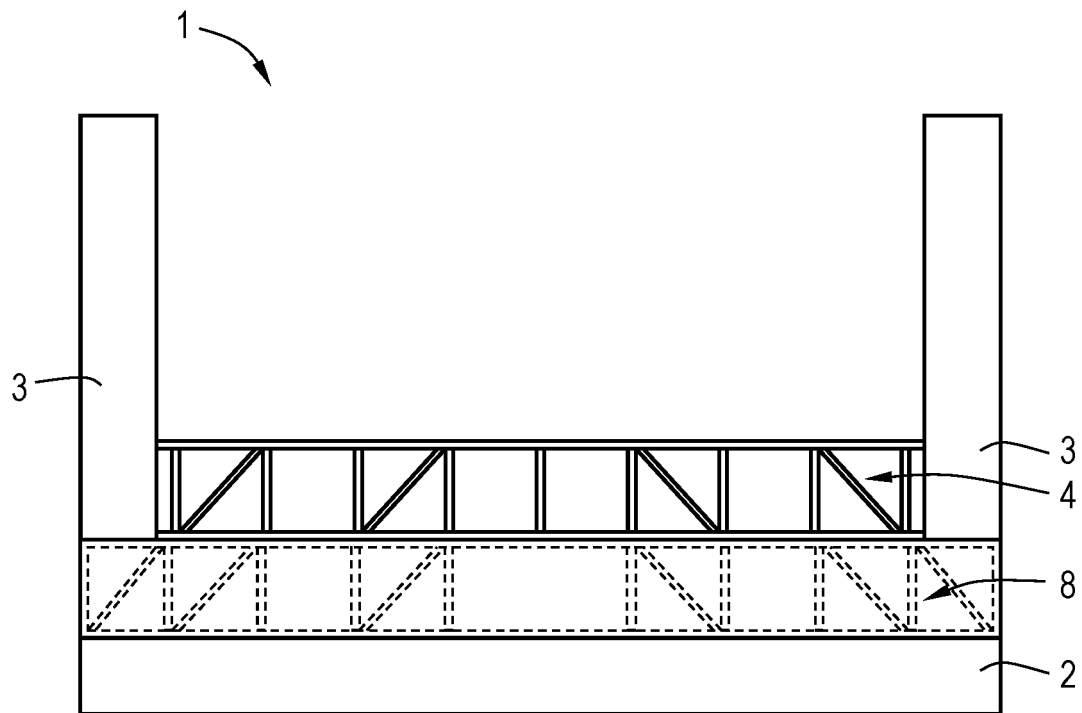


Fig.3



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