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RIGID RECONFIGURABLE FLOATING STRUCTURE

TECHNICAL FIELD

The invention provides a modular scaleable rigid floating assembly of interconnected buoyant platform modules capable of supporting various commercial, industrial and recreational activities.

BACKGROUND OF THE ART

The increase in population in cities is making land increasingly valuable and reducing the space available for public parks, arenas and recreational areas. This is particularly marked where commercial, industrial and residential developments are competing for access to limited waterfront areas. In some cases this pressure can be eased by land reclamation. Using fill materials from seabed, hills, excavations, and construction debris, engineers are able to create relatively land from the sea. Countries such as the Netherlands, Singapore and Japan, all have aggressive land reclamation programmes.

However, land reclamation is not cost effective or technically feasible in deep water or where the seabed is extremely soft. Moreover, land reclamation destroys the marine habitat and may lead to the disturbance of toxic sediments. When faced with these natural conditions and environmental consequences, very large floating structures may offer an attractive alternative solution for increasing living, commercial and recreational space.

A floating structure has the following advantages over land reclamation:

- it is cost effective for deep water or certain seabed conditions that preclude reclamation,
- it is environmentally friendly as they do not damage the marine eco-system, disturb contaminants in harbour bottoms or disrupt the tidal flows,
- it is standard marine construction techniques making them quick to construct, allowing rapid development of the water space,
- it can be easily removed or expanded as required by future activities,
- its location in coastal waters provides all around water access making them suitable for leisure and water sport activities.

The present invention relates to a modular pontoon or to a floating structure capable of being used for many different functions. More specifically, the present invention relates to a floating device having a number of modular units that may be interlinked to form a floating platform of sufficient rigidity, strength and buoyancy to support commercial, industrial and recreational uses such as sporting events, public displays and presentations.

It is common to interlink a number of relatively small floating structures or floats to form one of greater size. One problem associated with linking a number of floats together is that the connection between the floats has a tendency to be unstable, allowing the structure to flex across its length and width.

In order to achieve sufficient rigidity, previous designs used large structural strength members on top of the floats. Whilst these could keep the structure rigid they prevented it



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from being readily reconfigured for other uses or moved between locations. Often the structure had to be completely disassembled on land before being moved.

The present invention allows a rigid structure to be built that is easily reconfigured on the water, without the use of heavy lifting equipment.

Further objects of the invention will be apparent from review of the disclosure and description of the invention below.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be readily understood, one preferred embodiment of the invention will be described by way of example, with reference to the accompanying drawings wherein:

Figure 1 is an isometric view of a single pontoon, or modular member with angularly cut corners, tongue connector and a part of a sidewall locking assembly.

Figure 2 is a view of several pontoons joined together to form a platform.

Figure 3 and Figure 4 is a view of example alternative arrangements of the pontoons to support other activities.

Figure 5 is a partial view of the sidewall locking assembly showing a locking bar and an engagement plate.

Figure 6 is a side view of the locking key adapted for engaging the sidewall locking bars of a pair of adjacent modular pontoons.

Figure 7 is an isometric view of the sidewall locking assembly, with the phantom lines illustrating positioning of the locking key in relation to the locking bars of adjacent pontoons.

Figure 8 is a perspective detail view of the corner locking assembly.

Figure 9 is a side view illustrating engagement of the tongue connectors with the corner locking member.

Figure 10 is a view of how the pontoons are mated and locked together to form an example of a floating structure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 shows details of a single pontoon including the securing arrangements on the sides of the pontoon, the angular cut (mitered) cropped corners and the corner tongue connector.

The pontoon may be produced in various materials provided they have the strength to resist the forces on the connections as well as the forces exerted by the expected use.

Figure 2, Figure 3 and Figure 4 show how the pontoons are arranged to form a large floating platform and how they may be re-arranged to suit other uses such as a canoe polo pool or a floating pier. The arrangements are not all inclusive and the actual uses are limited only by the strength of the platform and the imagination of the designer.

Figure 5 shows the locking arrangement in the pontoon hull. Of particular note is the sidewall locking assembly with the locking bar and the engagement plate, which holds the locking key (Figure 6) in place. The locking key is held in place with an appropriate securing device such as bolts or studs mounted on the pontoon hull.

Figure 7 shows the pontoon sidewall locking assembly and the general arrangement of the adjacent pontoons and the locking key that engages both of the adjacent ones of the modular members to form a substantially gapless adjacent abutment between the modular members.

Figure 8, Figure 9 and Figure 10 show the corner locking assembly. In the embodiment of Figure 8, the corner locking member is square in configuration, while in the embodiment of Figure 9, the corner locking member is generally triangular. The corner locking member is shaped to receive the tongue connector and locks to the pontoon using an appropriate securing device such as pins or bolts. Should a smooth side be required for the application, the square connection float may be replaced with a triangular design as shown in Figure 10.

The design of the pontoons, connection floats and the securing arrangements make it possible to disconnect and reconnect the elements without additional equipment. The only tools required are those needed to connect and disconnect the fasteners and lifting assists for the locking bars if required due to size and weight.

The floating platform is assembled by securing one pontoon in a suitable area. Two or more connection floats are connected to the pontoon by pulling or pushing by hand or mechanical power depending on the size of the float. Once the corner locking members are in place, one or more pontoons are secured first by connecting to the corner locking members and then by locking the sidewall locking assemblies. Once the locking keys are in place and securely connected to the lower locking bars, the upper engagement plate of the sidewall locking assembly and the top plate of the locking key are fastened into place and the pontoons are connected into a rigid platform.

Although the above description and accompanying drawings relate to a specific preferred embodiment as presently contemplated by the inventor, it will be understood that the invention in its broad aspect includes mechanical and functional equivalents of the elements described and illustrated.

We claim:

1. A floating marine structure comprising:
a plurality of floatable modular members rigidly releasably secured together to form a floating structure, each modular member comprising a top surface, a bottom surface and a sidewall interconnecting the top surface and the bottom surface, each of the modular members being capable of being secured in a substantially gapless adjacent position along at least a portion of its respective sidewalls to at least one of adjacent ones of said modular members.
2. The apparatus of Claim 1, further comprising a means for rigidly connecting the modular members, the connecting means restraining relative vertical and lateral movement between adjacent ones of said modular members.
3. The apparatus of Claim 1, wherein each of said modular members has a generally parallelepiped configuration.
4. The apparatus of Claim 1, wherein said floating marine structure is a floating pier.
5. The apparatus of Claim 1, wherein said floating structure is a canoe polo pool.
6. The apparatus of Claim 1, wherein each of said modular members is a buoyant pontoon.
7. The apparatus of Claim 1, wherein said connecting means comprises:
at least one sidewall locking assembly for engaging an upper portion and a lower portion of adjacent ones of said plurality of modular members and at least one corner locking assembly capable of engaging corners of at least a pair of adjacent modular members.
8. The apparatus of Claim 7, wherein said at least one locking assembly comprises a locking bar mounted in a lower portion of the sidewall of each of said modular members, an engagement plate secured to an upper part of the sidewall of each of said modular members and a locking key capable of being fixedly secured with said locking bar and said engagement plate.
9. The apparatus of Claim 7, wherein said at least one corner locking assembly comprises a tongue connector extending outwardly from a corner of the modular member and a corner locking member capable of engaging tongue connectors of at least a pair of adjacent ones of said modular members.
10. The apparatus of Claim 9, wherein said corner locking member comprises a buoyant body having a generally rectangular cross-section.
11. The apparatus of Claim 9, wherein said corner locking member comprises a buoyant body having a generally triangular cross-section.
12. The apparatus of Claim 9, wherein said corner locking member comprises grooves for matingly engaging the tongue connectors of adjacent ones of the modular members.

13. The apparatus of Claim 1, wherein top surfaces of said modular members are oriented in a substantially co-planar relationship when the modular members are secured in an abutting relationship to each other.

14. The apparatus of Claim 1, wherein each of said modular members comprises a buoyant body.

15. The apparatus of Claim 1, wherein said modular members are interchangeable with each other.

16. A floating marine structure comprising:
a plurality of interchangeable buoyant modular members rigidly releasably securable together to form a floating structure, each modular member comprising a top surface, a bottom surface and a sidewall interconnecting the top surface and the bottom surface, each of the modular members being capable of being secured in a substantially gapless adjacent position along at least a portion of its sidewall to at least one of adjacent ones of said modular members, such that top surfaces of adjacent ones of said modular members extend in a substantially co-planar relationship to each other.

17. The apparatus of Claim 16, further comprising a means for rigidly connecting the modular members, the connecting means restraining relative vertical and lateral movement between adjacent ones of said modular members.

18. The apparatus of Claim 16, wherein each of said modular members is a buoyant pontoon.

19. The apparatus of Claim 16, wherein said connecting means comprises:

at least one sidewall locking assembly for engaging an upper portion and a lower portion of adjacent ones of said plurality of modular members and at least one corner locking assembly capable of engaging corners of at least a pair of adjacent modular members, said at least one locking assembly comprising a locking bar mounted in a lower portion of the sidewall of each of said modular members, an engagement plate secured to an upper part of the sidewall of each of said modular members and a locking key capable of being fixedly secured with said locking bar and said engagement plate.

20. The apparatus of Claim 19, wherein said at least one corner locking assembly comprises a tongue connector extending outwardly from a corner of the modular member and a corner locking member capable of engaging tongue connectors of at least a pair of adjacent ones of said modular members.