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(54) **Method for assembling floating bodies and assembly of floating bodies thus assembled**

Verfahren zum Verbinden von Schwimkörpern und Gesamtheit von so verbundenen Schwimmkörpern

Méthode pour l'assemblage de corps flottants et ensemble de corps flottants assemblés par cette méthode

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Description

[0001] The invention relates to a method for releasable assembly of at least two floating bodies, by bringing together the floating bodies, and arranging in vertical direction at least one member connecting the floating bodies and subsequently tensioning the connection formed by the member arranged in vertical direction by urging apart the floating bodies. An example of such a connection method is described in US-A-4,604,962.

[0002] In the known method floating bodies are mutually connected to form for instance a dock or the like. Use is herein made of square floating bodies which are provided on each of their four corner points with protruding, apertured lugs, which are arranged at different heights. In the prior art method, the corners of four of such floating bodies are brought together, in such way that the lugs are superposed and the apertures in the lugs are aligned, after which a bolt is inserted through these apertures. A nut is connected to the lowermost lug and secured against rotation, so that the bolt may be fastened in the nut by turning it. The bolt has a head which is cone shaped, and each floating body has correspondingly shaped recesses at the corners, whereby the cone shaped head forces the floating bodies apart when the bolt is tensioned and the head is moved downwards toward the nut.

[0003] This known method has the drawback that the nut and bolt are used both for forming the initial connection and for subsequently tensioning the connection. This combination of functions to be served by the single bolt and nut neccessitates a structure including protruding lugs, which severely affect the transportability of the floating bodies. Especially when the floating bodies are shaped and dimensioned as ISO containers having standard dimensions and standard pick-up points for fastening the floating bodies during transport by road or ship, the presence of protrusions means that these floating bodies cannot be handled in the way of standard containers.

[0004] The invention has for its object to provide a method of the above described type, wherein said drawbacks do not occur. This is achieved according to the invention in that the floating bodies are urged apart by arranging at least one separate pressure member therebetween. Because use is made of a separate pressure member, the configuration of the connecting member may be freely chosen, and the floating bodies do not have to have any protruding parts.

[0005] In order to enable simple tensioning of the connection at the location where the floating bodies will be used, the or each pressure member is preferably placed in vertical direction between the floating bodies and, after placing thereof, is rotated on a vertical axis to a position in which it may be tensioned, urging apart the floating bodies.

[0006] The invention further relates to an assembly of floating bodies formed by applying the above described method. According to the invention, such an assembly, which may comprise at least two floating bodies, at least one member connecting the floating bodies and connected thereto in vertical direction, and means for tensioning the connection formed by the or each connecting member is characterized in that the tensioning means comprise at least one separate pressure member arranged between the floating bodies.

[0007] In a preferred embodiment of the assembly, the pressure member is at least partly wedge-shaped. By urging this pressure member with force between the floating bodies the connection is tensioned in simple manner.

[0008] The pressure member herein advantageously has at least two wedges movable relative to each other, which are preferably mutually connected by for instance a draw bolt. By tightening the draw bolt the wedges between the floating bodies can thus be pulled toward each other and the floating bodies thus pushed apart. Each floating body can herein have at least one recess receiving the pressure member, if desired provided with inclining surfaces co-acting with the wedges. The floating bodies can thus still be assembled in close-fitting manner despite the presence of the pressure members.

[0009] According to a preferred embodiment of the invention each floating body has at least one vertically directed opening for receiving the connecting member. The or each connecting member, which can comprise a bridge piece and at least two pins protruding therefrom, can thus be arranged in simple manner from the top in the openings of the floating bodies for connecting.

[0010] In a structurally simple embodiment at least one of the pins is releasably connected to the bridge piece. In a further simplified embodiment the bridge piece is provided with at least one vertically directed opening which is to be placed in register with the receiving opening of one of the floating bodies and which receives the releasable pin. The bridge piece can thus first be placed in register with the opening in the floating body, whereafter the pin is inserted in simple manner through the openings thus placed in line. A very simple embodiment is characterized in that the bridge piece has a plurality of symmetrically arranged openings in which identical pins are placed. Two or four openings can thus be arranged in the bridge piece depending on the number of floating bodies for mutual connection.

[0011] Finally, the invention further relates to the different individual parts of the assembly, in particular the pressure member and the floating body.

[0012] The invention will now be elucidated on the basis of an embodiment, wherein reference is made to the annexed drawing, in which:

Fig. 1 is a perspective view of an assembly according to the invention formed from a number of floating bodies; and

Fig. 2 is a perspective detail view of the assembly according to the arrow II in Fig. 1.

[0013] An assembly 1 of floating bodies 2 is constructed in the water 3 by bringing together floating bodies 2 (arrow VI), mutually connecting them at their corners using connecting members 4, 14 and subsequently tensioning the thus formed connections by pressing floating bodies 2 slightly apart again. Arranged between floating bodies 2 for this purpose are pressure members 5 which are embodied in partly wedge-shaped form. Both connecting members 4, 14 and pressure members 5 are herein arranged in vertical direction between floating bodies 2 (arrows V2 and V3), whereby assembly can be carried out in simple manner at the location of use. After being placed in vertical direction the pressure members 5 are rotated a quarter-turn (arrow R) prior to being tensioned.

[0014] Each connecting member 4, 14 consists of a bridge piece 11, 21 and a number of pins 12 protruding therefrom and releasably connected to bridge piece 11, 21. The number of pins 12 corresponds herein with the number of floating bodies 2 connected by connecting member 4, 14. For receiving pins 12 each bridge piece 11, 21 is provided with a corresponding number of openings 13. Openings 13 can be placed in register with openings 17 arranged in floating bodies 2. In order to also fix floating bodies 2 on the underside, additional bridge pieces 11, 21 can be arranged there. The openings 17 in the upper side of the floating bodies connect for this purpose onto tubes 15 which extend over the whole height of floating bodies 2. In order to connect floating bodies 2 the bridge pieces 11, 21 are placed into recesses 16 on the top and bottom of one of the floating bodies 2 and placed with their openings 13 in register with openings 17 therein. A first pin 12 is then placed successively through the top opening 17 of floating body 2, opening 13 of upper bridge piece 11, 21, tube 15, opening 13 of lower bridge piece 11, 21 and the bottom opening 17, whereby bridge pieces 11, 21 are fixed to one of the floating bodies 2. Another floating body 2 is subsequently navigated against this floating body 2, wherein the protruding parts of bridge pieces 11, 21 are placed in recesses 16 and fixed by means of a subsequent pin 12, whereby a connection is formed between floating bodies 2. This connection is not yet rigid and still displays some clearance, whereby further connecting members 4 can also be arranged in simple manner.

[0015] In order to remove the clearance in connections 4, use is made of pressure members 5 which are urged between floating bodies 2. Each pressure member 5 comprises two wedge-shaped parts 8 which are connected by a draw bolt 9, whereby they can be moved toward each other. Draw bolt 9 is tightened by rotating a nut 10 thereon. Each pressure member 5 is received in recesses 6 in the mutually connected floating bodies 2 so that these latter rest in close-fitting manner against each other with their side surfaces 22 despite the presence of pressure bodies 5. As stated, pressure member 5 is herein first lowered in vertical direction into recess 6 and then rotated a quarter-turn so that the inclining surfaces 20 of the wedge-shaped parts 8 are located opposite inclining surfaces 7 of recesses 6. Nut 10 is then rotated on draw bolt 9, whereby the wedge-shaped parts 8 are moved toward each other and the inclining surfaces 7, and therewith floating bodies 2, are pressed apart. Pins 12 are herein clamped in openings 17 and 13, whereby the connections are tensioned.

[0016] In order to release floating bodies 2 from each other the pressure members 5 are relieved and removed, whereafter pins 12 can be lifted with their heads 19 from openings 17 and 13 and bridge pieces 11, 21 can be taken out of recesses 16.

[0017] The system according to the invention thus enables the assembly of relatively compact floating bodies 2 in simple manner and making use of inexpensive means in order to form a relatively large surface, for instance a work platform. Floating bodies 2 can herein be dimensioned such that they can be transported by road.

[0018] Although the system is described above with reference to an embodiment wherein the connecting members for vertical arrangement are applied in combination with the pressure members for tensioning the connection, it will be apparent to the skilled person that the connecting members could also be applied without tensioning means, for instance in situations where some movement of the floating bodies relative to each other is permissible or in situations where the connections are tensioned in natural manner by a load placed on the floating bodies, whereby the floating bodies are pressed against each other at the top or bottom and the assembly thus takes on a concave or convex, rigid form.

[0019] In addition, it will be apparent that the tensioning means according to the invention, while retaining all the advantages associated therewith, could also be applied in combination with other types of connecting member. The scope of the invention is not therefore limited in any way to the shown embodiment but is defined solely by the annexed claims.

Claims

1. Method for releasable assembly of at least two floating bodies (2), by bringing together the floating bodies (2), and arranging in vertical direction at least one member (4;14) connecting the floating bodies (2) and subsequently tensioning the connection formed by the member (4;14) arranged in vertical direction by urging apart the floating bodies (2), **characterized in that** the floating bodies (2) are urged apart by arranging at least one separate pressure member (5) therebetween.

2. Method as claimed in claim 1, **characterized in that** the or each pressure member (5) is placed in vertical direction between the floating bodies (2).

3. Method as claimed in claim 2, **characterized in**

that the or each pressure member (5), after placing thereof, is rotated on a vertical axis to a position in which it may be tensioned, urging apart the floating bodies (2).

4. Assembly (1) of floating bodies (2), comprising at least two floating bodies (2), at least one member (4;14) connecting the floating bodies (2) and connected thereto in vertical direction, and means for tensioning the connection formed by the or each connecting member (4;14), **characterized in that** the tensioning means comprise at least one separate pressure member (5) arranged between the floating bodies (2).

5. Assembly (1) as claimed in claim 4, **characterized in that** the pressure member (5) is at least partly wedge-shaped.

6. Assembly (1) as claimed in claim 5, **characterized in that** the pressure member (5) has at least two wedges (8) movable relative to each other.

7. Assembly (1) as claimed in claim 6, **characterized in that** the wedges (8) are mutually connected by a draw bolt (9).

8. Assembly (1) as claimed in any of the claims 4-7, **characterized in that** each floating body (2) has at least one recess (6) receiving the pressure member (5).

9. Assembly (1) as claimed in any of the claims 4-8, **characterized in that** each floating body (2) has at least one vertically directed opening (17) for receiving the connecting member (4;14).

10. Assembly (1) as claimed in claim,9, **characterized in that** the or each connecting member (4;14) comprises a bridge piece (11;21) and at least two pins (12) protruding therefrom.

11. Assembly (1) as claimed in claim 10, **characterized in that** at least one of the pins (12) is releasably connected to the bridge piece (11;21).

12. Assembly (1) as claimed in claim 11, **characterized in that** the bridge piece (11;21) is provided with at least one vertically directed opening (13) which is to be placed in register with the receiving opening (17) of one of the floating bodies (2) and which receives the releasable pin (12).

13. Assembly (1) as claimed in claim 12, **characterized in that** the bridge piece (11;21) has a plurality of symmetrically arranged openings (13) in which identical pins (12) are placed.

14. Floating body (2) for use in an assembly (1) as claimed in any of the claims 4-13, comprising at least one vertically directed opening (17) for receiving a connecting member (4;14) and at least one recess (6) for receiving a pressure member (5).

Patentansprüche

1. Verfahren zum lösbaren Zusammenbauen von mindestens zwei Schwimmkörpern (2), durch Zusammenbringen der Schwimmkörper (2) und Anordnen mindestens eines Elements (4; 14) in vertikaler Richtung, das die Schwimmkörper (2) verbindet, und nachfolgendes Spannen der von dem Element (4; 14) ausgebildeten, in vertikaler Richtung angeordneten Kupplung durch Auseinanderdrücken der Schwimmkörper (2), **dadurch gekennzeichnet, dass** die Schwimmkörper (2) auseinandergedrückt werden durch Anordnen mindestens eines gesonderten Druckelements (5) zwischen denselben.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das oder jedes Druckelement (5) in vertikaler Richtung zwischen die Schwimmkörper (2) eingesetzt wird.

3. Verfahren gemäß Anspruch 2, **dadurch gekennzeichnet, dass** das oder jedes Druckelement (5) nach dessen Einsetzen um eine vertikale Achse in eine Position gedreht wird, in welcher es gespannt werden kann, so dass die Schwimmkörper (2) auseinandergedrückt werden.

4. Anordnung (1) von Schwimmkörpern (2), die mindestens zwei Schwimmkörper (2), mindestens ein Element (4; 14), von dem die Schwimmkörper (2) aneinandergekuppelt werden und das in vertikaler Richtung daran gekuppelt ist, und Mittel zum Spannen der von dem oder jedem Kupplungselement (4; 14) ausgebildeten Kupplung aufweist, **dadurch gekennzeichnet, dass** die Spannmittel mindestens ein zwischen den Schwimmkörpern (2) angeordnetes gesondertes Druckelement (5) aufweisen.

5. Anordnung (1) gemäß Anspruch 4, **dadurch gekennzeichnet, dass** das Druckelement (5) mindestens teilweise keilförmig ist.

6. Anordnung (1) gemäß Anspruch 5, **dadurch gekennzeichnet, dass** das Druckelement (5) mindestens zwei relativ zueinander bewegbare Keile (8) aufweist.

7. Anordnung (1) gemäß Anspruch 6, **dadurch gekennzeichnet, dass** die Keile (8) mittels eines Zugbolzens (9) miteinander verbunden sind.

8. Anordnung (1) gemäß einem der Ansprüche 4 - 7, **dadurch gekennzeichnet, dass** jeder Schwimmkörper (2) mindestens eine Ausnehmung (6) aufweist, die das Druckelement (5) aufnimmt.

9. Anordnung (1) gemäß einem der Ansprüche 4 - 8, **dadurch gekennzeichnet, dass** jeder Schwimmkörper (2) eine vertikal ausgerichtete Öffnung (17) zum Aufnehmen des Kupplungselements (4; 14) aufweist.

10. Anordnung (1) gemäß Anspruch 9, **dadurch gekennzeichnet, dass** das oder jedes Kupplungselement (4; 14) ein Überbrückungsstück (11; 21) und mindestens zwei davon abstehende Bolzen (12) aufweist.

11. Anordnung (1) gemäß Anspruch 10, **dadurch gekennzeichnet, dass** mindestens einer der Bolzen (12) lösbar an das Überbrückungsstück (11; 21) gekuppelt ist.

12. Anordnung (1) gemäß Anspruch 11, **dadurch gekennzeichnet, dass** das Überbrückungsstück (11; 21) mit mindestens einer vertikal ausgerichteten Öffnung (13) versehen ist, welche auf die Aufnahmeöffnung (17) eines der Schwimmkörper (2) ausrichtbar ist und welche den lösbaren Bolzen (12) aufnimmt.

13. Anordnung (1) gemäß Anspruch 12, **dadurch gekennzeichnet, dass** das Überbrückungsstück (11; 21) eine Mehrzahl symmetrisch angeordneter Öffnungen (13) hat, in welchen gleiche Bolzen (12) platziert sind.

14. Schwimmkörper (2) zur Verwendung in einer Anordnung (1) gemäß einem der Ansprüche 4 - 13, mit mindestens einer vertikal ausgerichteten Öffnung (17) zum Aufnehmen eines Kupplungselements (4; 14) und mit mindestens einer Ausnehmung (6) zum Aufnehmen eines Druckelements (5).

Revendications

1. Procédé d'assemblage, de manière détachable, d'au moins deux corps flottants (2), en rapprochant l'un de l'autre les corps flottants (2) et en disposant, dans le sens vertical, au moins un élément (4 ; 14) pour relier les corps flottants (2), et en tendant ensuite la connexion formée par l'élément (4 ; 14) disposé dans le sens vertical, en poussant les corps flottants (2) à s'écarter l'un de l'autre, **caractérisé en ce que** les corps flottants (2) sont poussés à s'écarter l'un de l'autre, en disposant entre eux au moins un élément séparé de pression (5).

2. Procédé selon la revendication 1, **caractérisé en ce que** l'élément ou chaque élément de pression (5) est placé dans le sens vertical entre les corps flottants (2).

3. Procédé selon la revendication 2, **caractérisé en ce que**, après sa mise en place, l'élément ou chaque élément de pression (5) est amené à tourner autour d'un axe vertical pour prendre une position dans laquelle il peut être tendu, pour ainsi pousser les corps flottants (2) à s'écarter l'un de l'autre.

4. Ensemble (1) de corps flottants (2), comprenant au moins deux corps flottants (2), au moins un élément (4 ; 14) reliant les corps flottants (2) et reliés à ceux-ci dans le sens vertical, et des moyens pour tendre la connexion formée par l'élément ou par chaque élément de liaison (4 ; 14), **caractérisé en ce que** les moyens tensionneurs comprennent au moins un élément séparé de pression (5), disposé entre les corps flottants (2).

5. Ensemble (1) selon la revendication 4, **caractérisé en ce que** l'élément de pression (5) est au moins en partie en forme de coin.

6. Ensemble (1) selon la revendication 5, **caractérisé en ce que** l'élément de pression (5) présente au moins deux coins (8) mobiles l'un par rapport à l'autre.

7. Ensemble (1) selon la revendication 6, **caractérisé en ce que** les coins (8) sont mutuellement reliés par un boulon de traction (9).

8. Ensemble (1) selon l'une quelconque des revendications 4 à 7, **caractérisé en ce que** chaque corps flottant (2) comporte au moins un évidement (6) destiné à recevoir l'élément de pression (5).

9. Ensemble (1) selon l'une quelconque des revendications 4 à 8, **caractérisé en ce que** chaque corps flottant (2) comporte au moins une ouverture (17), orientée dans le sens vertical et destinée à recevoir l'élément de liaison (4 ; 14).

10. Ensemble (1) selon la revendication 9, **caractérisé en ce que** l'élément ou chaque élément de liaison (4 ; 14) comprend une pièce de pontage (11 ; 21) et au moins deux broches (12) faisant saillie à partir de celle-ci.

11. Ensemble (1) selon la revendication 10, **caractérisé en ce qu'**au moins l'une des broches (12) est reliée, de manière libérable, à la pièce de pontage (11 ; 21) .

12. Ensemble (1) selon la revendication 11, **caractéri-**

sé en ce que la pièce de pontage (11 ; 21) est pourvue d'au moins une ouverture (13), orientée dans le sens vertical et prévue pour être mise en alignement avec l'ouverture réceptrice (17) de l'un des corps flottants (2), et qui reçoit la broche (12) libérable.

13. Ensemble (1) selon la revendication 12, **caractérisé en ce que** la pièce de pontage (11 ; 21) présente une pluralité d'ouvertures (13) disposées de manière symétrique et dans lesquelles sont placées des broches (12) identiques.

14. Corps flottant (2) destiné à être utilisé dans un ensemble (1) selon l'une quelconque des revendications 4 à 13, et comprenant au moins une ouverture (17), orientée dans le sens vertical et prévue pour recevoir un élément de liaison (4 ; 14), et au moins un évidement (6) servant à recevoir un élément de pression (5).

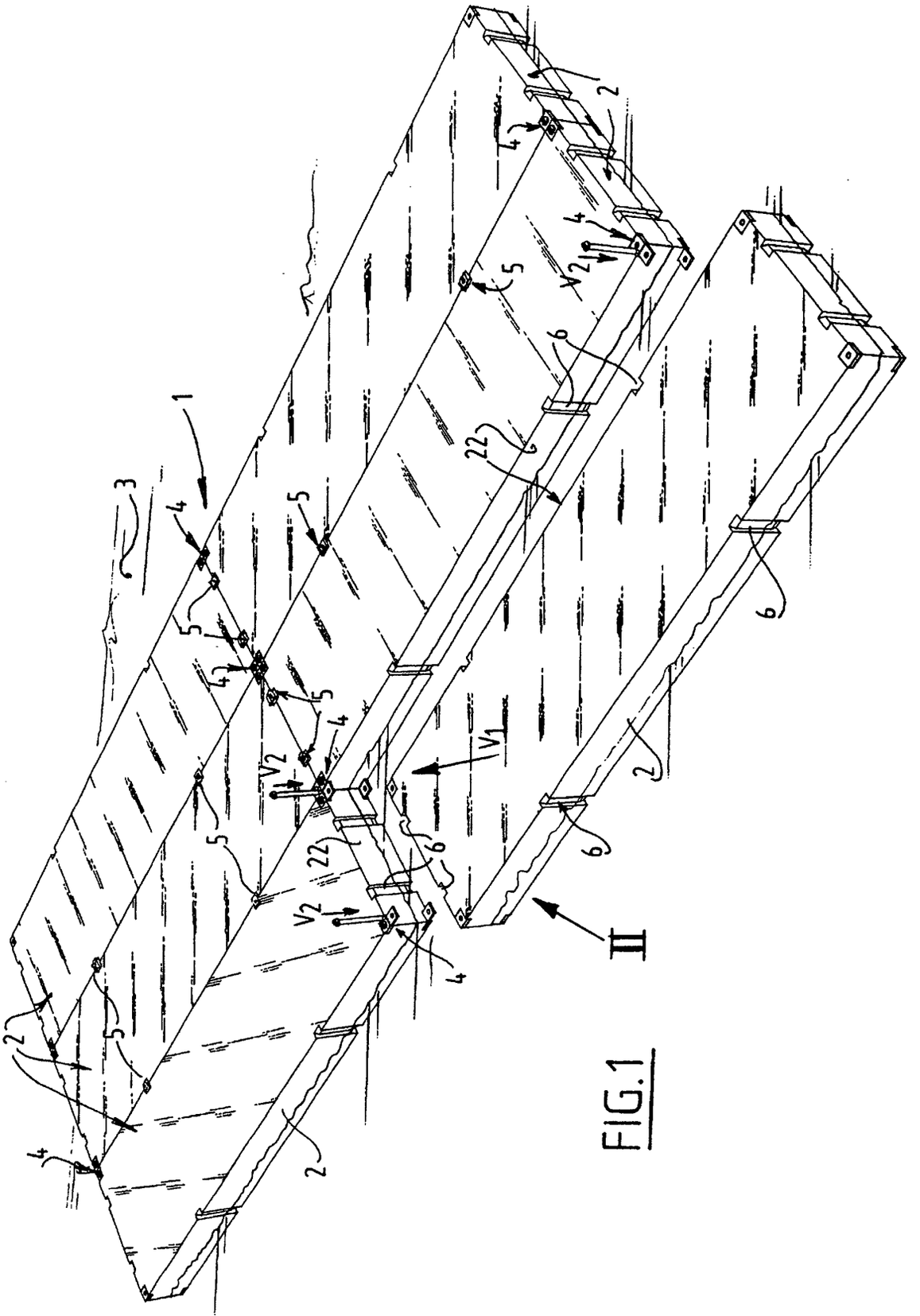


FIG.1

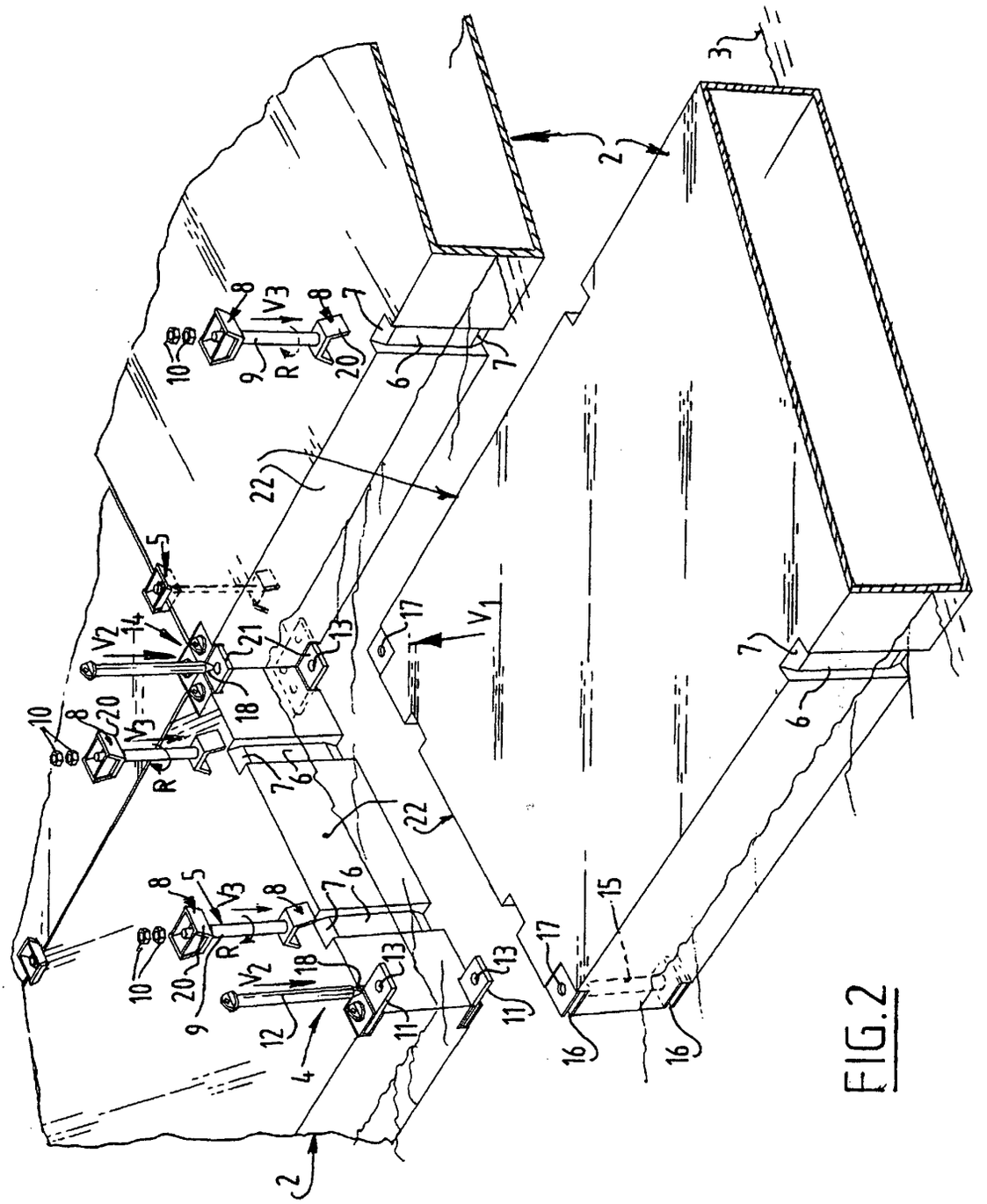


FIG.2