

(19)



Europäisches Patentamt

European Patent Office

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(11)

EP 0 861 772 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.09.1998 Bulletin 1998/36

(51) Int Cl.⁶: **B63B 35/38**, B63B 3/08
 // E01D15/14, E02B3/06

(21) Application number: **98200516.7**

(22) Date of filing: **18.02.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
 NL PT SE**
 Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
 • **Den Reijer, Anthonius Johannes Maria**
4921 DD Made (NL)
 • **Muis, Hendrik Michael**
4921 VX Made (NL)

(30) Priority: **21.02.1997 NL 1005335**

(74) Representative: **Bartelds, Erik**
Arnold & Siedsma,
Advocaten en Octrooigemachtigden,
Sweelinckplein 1
2517 GK Den Haag (NL)

(71) Applicant: **Scheepswerf Made B.V.**
4921 XH Made (NL)

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

(57) The disclosure relates to a 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). The connection formed by the member (4, 14) arranged in vertical direction can herein then be tensioned, for instance by urging apart the floating bodies (2).

The disclosure also relates to an assembly of floating bodies (2) formed by applying this method, provided with at least two floating bodies (2) and at least one

member (4, 14) connecting the floating bodies (2) and connected thereto in vertical direction. Each floating body can have one or more vertically directed openings (13) for receiving the connecting member (4, 14), and the or each connecting member can comprise a bridge piece (11) and at least two pins (12) protruding therefrom. The assembly can be further provided with means for tensioning the connection formed by the or each connecting member (4, 14), for instance in the form of one or more wedge-shaped pressure members (5, 8) arranged between the floating bodies (2).

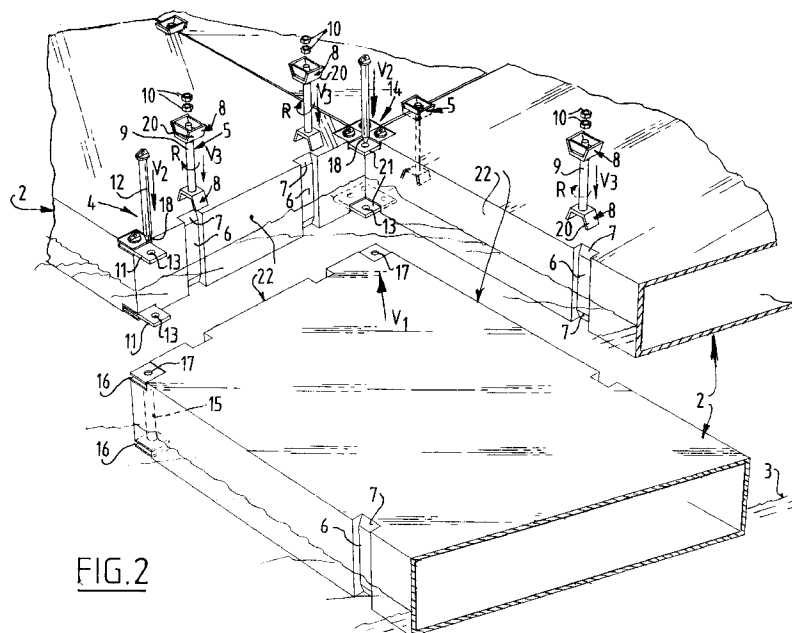


FIG. 2

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Description

The invention relates to a method for releasable assembly of at least two floating bodies. An example of such a connection method is described in the European patent specification EP-A-0 079 911.

In the known method floating bodies are mutually connected to form for instance a pontoon or the like. Use is herein made of floating bodies which are provided on each of the four corner points of their surfaces for mutually connecting with mutually co-acting, protruding connecting elements. Each set of co-acting connecting elements comprises an eye arranged on the one floating body and a hollow pin arranged on the other floating body and fitting into the eye. In the known method the two floating bodies are moved toward each other until the four hollow pins protruding out of the connecting surface of the first component are received in the likewise protruding eyes of the other floating component, whereafter a bolt is placed through each hollow pin and the associated eye and is fastened and tightened using a nut in order to effect a rigid connection between the floating components.

This known method, which is used particularly for assembling floating constructions such as pontoons, jetties, artificial islands and the like at locations which have poor access, has the main drawback that use is made of connecting elements protruding outside the periphery of the floating bodies. As a result the floating bodies, which generally have dimensions corresponding with those of so-called ISO containers, can be transported only with great difficulty since the standardized container sizes are exceeded due to the protruding parts. In addition, the connecting elements have to be arranged on the floating bodies at precisely determined positions since otherwise no fitting connection can be formed, which can be performed only with great difficulty as the connecting elements are placed between the surfaces for connecting and are thus not easy to access. Great problems are therefore often attendant on the forming of the connection at the location where the pontoon will be used.

In another known system for assembling a floating construction from containers, which is commercially available from B.V. Ravestein in Deest (NL), use is likewise made of connecting elements arranged on the outside of the containers, here however in the form of a wedge and a wedge-shaped-receiving space. The wedge is further locked in the receiving space by a wedge-shaped pin. This system has the same drawbacks as discussed above, while in addition no secure attachment can be guaranteed when wedges are used.

Finally, a method is known from the European patent specification EP-A-0 469 655 for rigid mutual connection of containers to form a floating pontoon, wherein each container is provided at its corner points with special fixing blocks and two blocks at a time are mutually connected by a heavy pull rod which is brought hydrau-

lically to a determined bias. The containers are herein not pulled against each other with their surfaces but a deformable spacer element is arranged between the containers round each pull rod. Although in this method connecting parts protruding outside the container do not have to be applied, it still has a number of drawbacks. The provisions required on the containers are for instance relatively heavy and costly, and biasing of the pull rods by means of hydraulic jacks is difficult work, particularly when it has to be carried out in a corner of a closed container. Fixing of the pull rods also requires special tools.

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 by bringing together the floating bodies and arranging in vertical direction at least one member connecting the floating bodies. Because use is made of a separate connecting member, the floating bodies do not have to have any protruding parts. Further, arranging of the connecting member from the upper side of the floating bodies is simple to carry out. In addition, the connection still has some clearance, whereby the floating bodies can still be moved slightly relative to each other. This is advantageous when use is made of a plurality of connecting members which must be successively positioned relative to each other.

In preference the connection formed by the member arranged in vertical direction is then tensioned in order to form a rigid assembly. This tensioning advantageously takes place by urging the floating bodies away from each other, for instance by arranging at least one pressure member therebetween. The connecting force can thus be adjusted precisely.

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, are rotated on a vertical axis to its tensioned position urging apart the floating bodies.

The invention further relates to an assembly of floating bodies formed by applying the above described method. Such an assembly comprises according to the invention at least two floating bodies and at least one member connecting the floating bodies and connected thereto in vertical direction.

According to a preferred embodiment of the invention each floating body has at least one opening for receiving the connecting member which is advantageously directed vertically. The 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.

In a structurally simple embodiment at least one of the pins is releasably connected to the bridge piece and 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.

According to a preferred embodiment of the invention the assembly further comprises means for tensioning the connection formed by the or each connecting member, whereby a rigid assembly of the floating bodies can be effected. The tensioning means herein preferably comprise at least one pressure member-arranged between the floating bodies which is at least partly wedge-shaped. By urging this pressure member with force between the floating bodies the connection is tensioned in simple manner.

The pressure member herein advantageously has at least two wedges movable relative to each other which are 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.

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

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.

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 $\frac{1}{4}$ quarter-turn (arrow R) prior to being tensioned.

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.

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.

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.

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.

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.

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, **characterized by** bringing together the floating bodies and arranging in vertical direction at least one member connecting the floating bodies.
2. Method as claimed in claim 1, **characterized in that** the connection formed by the member arranged in vertical direction is subsequently tensioned.
3. Method as claimed in the preamble of claim 1 or as claimed in claim 2, **characterized in that** the or each connection is tensioned by urging apart the floating bodies.
4. Method as claimed in claim 3, **characterized in that** the floating bodies are urged apart by arranging at least one pressure member therebetween.
5. Method as claimed in claim 4, **characterized in that** the or each pressure member is placed in vertical direction between the floating bodies.
6. Method as claimed in claim 5, **characterized in that** the or each pressure member, after placing thereof, is rotated on a vertical axis to its tensioned position urging apart the floating bodies.
7. Assembly of floating bodies formed by applying the method as claimed in any of the foregoing claims, **characterized by** at least two floating bodies and at least one member connecting the floating bodies and connected thereto in vertical direction.
8. Assembly as claimed in claim 7, **characterized in that** each floating body has at least one vertically directed opening for receiving the connecting member.
9. Assembly as claimed in claim 7 or 8, **characterized in that** the or each connecting member comprises a bridge piece and at least two pins protruding therefrom.
10. Assembly as claimed in claim 9, **characterized in that** at least one of the pins is releasably connected to the bridge piece.
11. Assembly as claimed in claim 10, **characterized in that** 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.
12. Assembly as claimed in claim 11, **characterized in that** the bridge piece has a plurality of symmetrically arranged openings in which identical pins are placed.
13. Assembly, particularly as claimed in any of the claims 7-12, **characterized by** means for tensioning the connection formed by the or each connecting member.
14. Assembly as claimed in claim 13, **characterized in that** the tensioning means comprise at least one pressure member arranged between the floating bodies.
15. Assembly as claimed in claim 14, **characterized in that** the pressure member is at least partly wedge-shaped.
16. Assembly as claimed in claim 15, **characterized in that** the pressure member has at least two wedges movable relative to each other.
17. Assembly as claimed in claim 16, **characterized in that** the wedges are mutually connected by a draw bolt.
18. Assembly as claimed in any of the claims 14-17, **characterized in that** each floating body has at least one recess receiving the pressure member.
19. Connecting member evidently intended for use in

an assembly as claimed in any of the claims 7-18.

- 20.** Pressure member evidently intended for use in an assembly as claimed in any of the claims 14-18.

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- 21.** Floating body evidently intended for use in an assembly as claimed in any of the claims 7-18.

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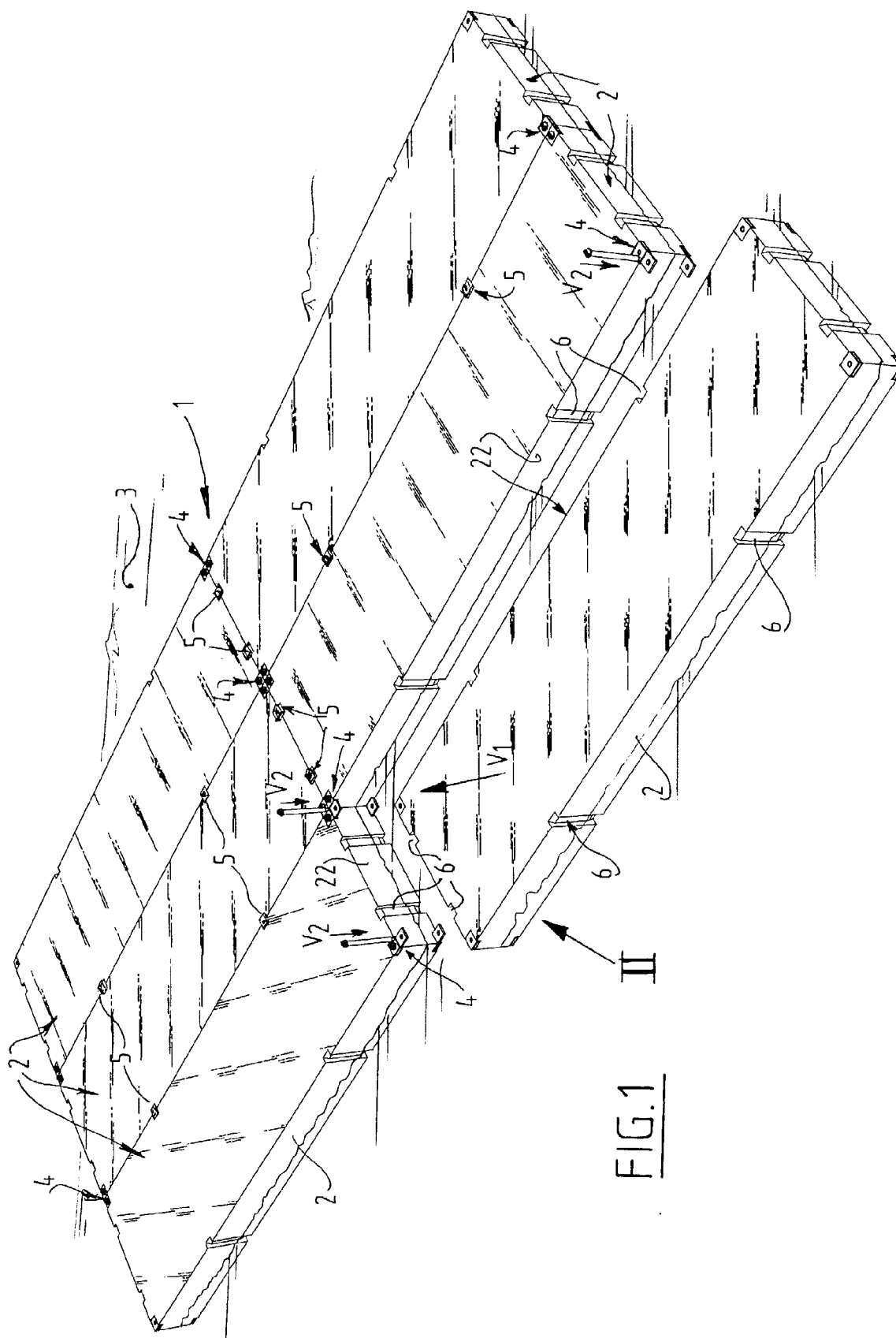
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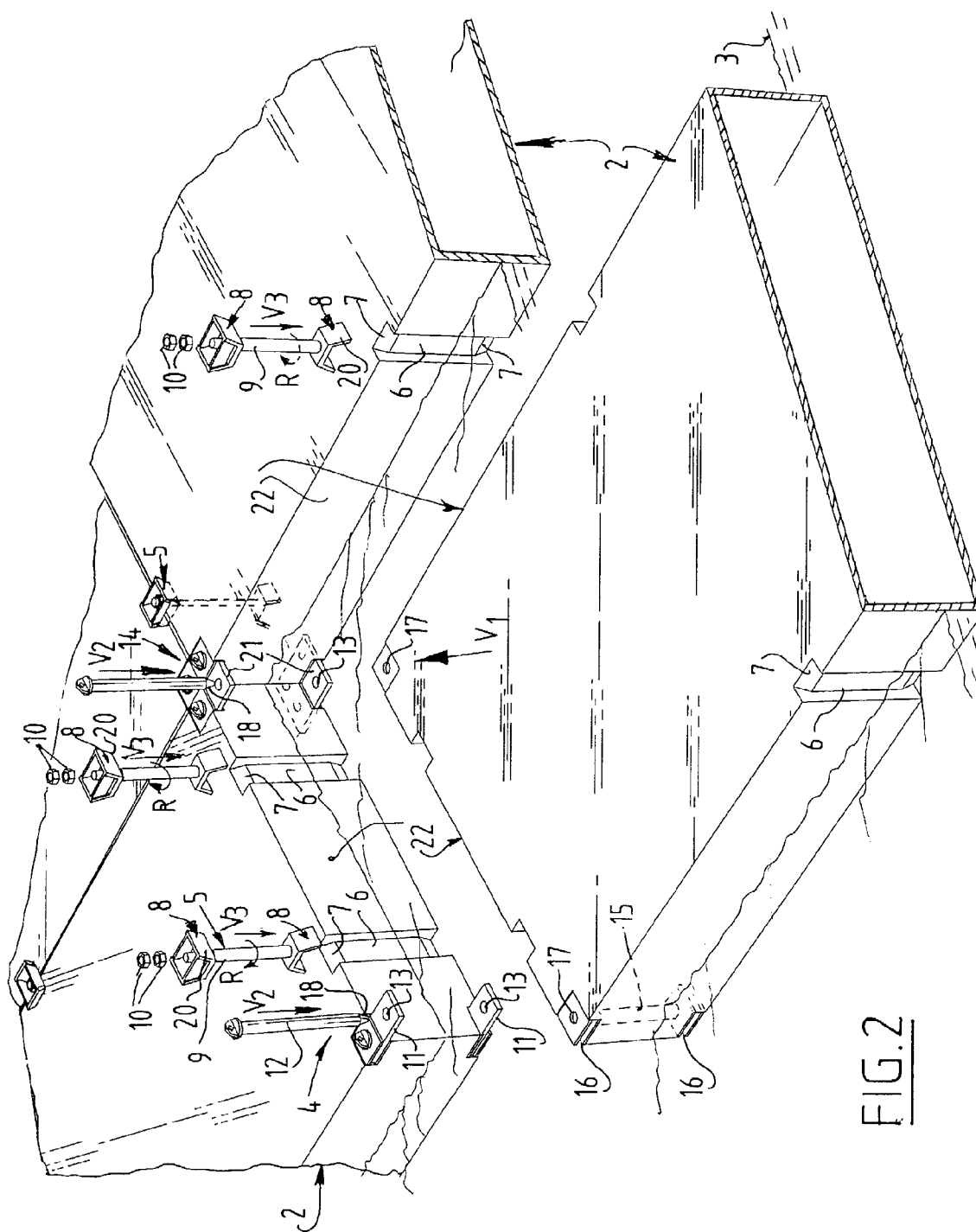


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 0516

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR 2 349 493 A (D. SIMONNEAU ET AL.) 25 November 1977 * figures 4-9 * * page 6, line 40 - page 10, line 4 * * page 11, line 16 - line 21 *	1,7-12, 19,21	B63B35/38 B63B3/08 //E01D15/14, E02B3/06
X	US 4 604 962 A (D. GUIBAULT) 12 August 1986 * figures 1-5 * * column 2, line 48 - column 3, line 15 *	1-8,13, 14,19-21	
A	----	15,17,18	
X	EP 0 065 921 A (MULTI) 1 December 1982 * claims 1,4,5; figures 1,4-6 * * page 3, line 1 - line 8 * * page 4, line 4 - page 5, line 11 *	1,2,7, 13,19,21	
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X	FR 2 335 717 A (ATELIERS BREHERET ET CIE S.A.R.L.) 15 July 1977 * claim 1; figures 4-6 *	1,2,7,8, 13,19,21	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 May 1998	Examiner Häusler, F.U.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/92 (P04C01)



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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 0516

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 714 042 A (F. SCHULTE) 22 December 1987	1,2, 7-10,13, 19,21	
A	* abstract; figure 3 *	5,12,15, 16	
X	US 2 328 693 A (A.L.TAYLOR) 7 September 1943	1,2, 7-13,19, 21	
A	* figures 1-4 *	15,16,18	
X	WO 87 02961 A (AB CASSETTEBOATS) 21 May 1987	1,2,7,8, 13,19,21	
A	* abstract; figures 2-4 *	9,18	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search THE HAGUE		Date of completion of the search 14 May 1998	Examiner Häusler, F.U.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P4/C01)