(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 036 835 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.03.2009 Bulletin 2009/12

(51) Int Cl.:
B65D 88/52 *(2006.01)* ***B65D 88/12*** *(2006.01)*

(21) Application number: **07116312.5**

(22) Date of filing: **13.09.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(71) Applicant: **Technische Universiteit Delft**
2628 CN Delft (NL)

(72) Inventors:
- **Kusuma, Gunawan**
  2611 CJ, DELFT (NL)
- **Herder, Justus Laurens**
  2595 ED, DEN HAAG (NL)

(74) Representative: **Van Breda, Jacobus**
Octrooibureau Los en Stigter B.V.,
Weteringschans 96
1017 XS Amsterdam (NL)

(54) **Foldable container**

(57) The invention relates to a foldable container (1) having a bottom plate (2), upstanding long sidewalls (3) and upstanding short sidewalls (4) that are hinged to the bottom plate (2), and a detachable roof (5), wherein at least one of the long sidewalls (3') and short sidewalls (4) and the bottom plate (2) are connected to a balancing mechanism (6) to counteract gravity forces that act upon the at least one of the long sidewalls (3') and short sidewalls (4) when same is being lowered upon the bottom plate (2).

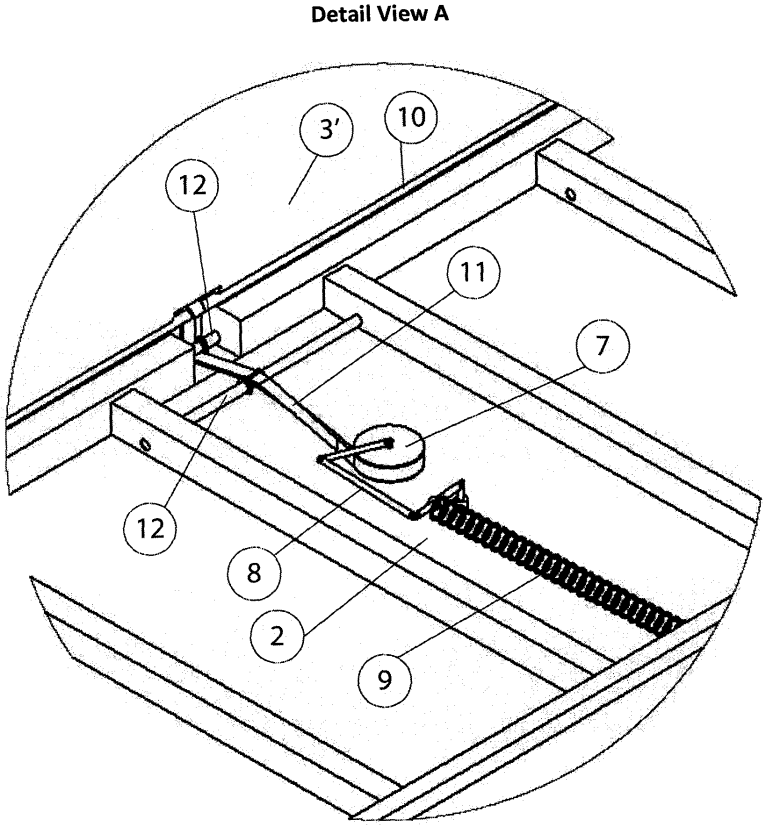

FIG. 3

EP 2 036 835 A1

Description

[0001] The invention relates to a foldable container having a bottom plate, upstanding long sidewalls and upstanding short sidewalls that are hinged to the bottom plate, and an optionally detachable roof.

[0002] Such a foldable container is known from US 2006/0016807.

[0003] Another such foldable container is known from the Dutch patent no. 1017159.

[0004] From the available patent literature it is clear that a quest exists looking for a suitable foldable container allowing that the volume of the container can be minimised by collapsing the container when it is empty. The objective is to economise on space and transportation costs of the empty containers.

[0005] It is the objective of the invention to provide such a foldable container which is easy to convert from the usable position in which all sidewalls are standing up and the roof is applied to the upstanding sidewalls, to a collapsed position in which the sidewalls and the roof are resting on the bottom plate.

[0006] The foldable container of the invention is to this end characterized by one or more of the appended claims.

[0007] In a first aspect of the invention the foldable container is **characterized in that** at least one of the long sidewalls and short sidewalls and the bottom plate are connected to a balancing mechanism to counteract gravity forces that act upon the at least one of the long sidewalls and short sidewalls when same is being lowered upon the bottom plate.

[0008] This feature very much assists in the conversion from the erect container to the collapsed container and vice versa in a manner allowing that the conversion can be carried out by a single person. The roof may or may not be detachable, and in case it is not detachable (i.e. part of the folding mechanism) the roof may or may not be balanced.

[0009] Effectively the foldable container of the invention is embodied such that the balancing mechanism comprises one or more springs and/or torsion bars. The spring or springs may for instance be helical springs or plate springs, or combinations thereof. The torsion bars may be used in a series or in a parallel arrangement or in combinations thereof.

[0010] In order to promote the container's reliability and resistance to malfunctioning it is preferable that the balancing mechanism is housed within the at least one of the long sidewalls and short sidewalls and the bottom plate. The balancing mechanism is thus effectively protected against external disturbances.

[0011] A second aspect of the invention concerns the construction of the foldable container such that in addition to the sidewalls being hinged to the bottom plate, the long sidewalls and the short sidewalls are hinged to each other and that each of the short sidewalls is divided in a lower triangular side-wall portion and an upper triangular side-wall portion and that both long sidewalls have a congruently shaped triangular portion immediately neighbouring to the short sidewalls.

[0012] This construction provides an effective and easy way to convert the container from the erect position to the collapsed position and vice versa. This feature can also be applied independently from the earlier mentioned feature that a balancing mechanism is applied to counteract gravity forces within the construction of the foldable container when effecting the conversion from the erect position to the collapsed position, or vice versa.

[0013] Hereinafter the invention will be further elucidated with reference to preferred embodiments of the foldable container of the invention and with reference to the drawing.

[0014] In the drawing:

- Fig. 1 relates to a foldable container of the invention according to a first embodiment;
- Fig. 2 shows a partly collapsed container of the invention;
- Fig. 3 shows detail view A as shown in Fig. 2;
- Fig. 4 relates to a second embodiment of the foldable container of the invention;
- Fig. 5 shows a first step in collapsing the foldable container of Fig. 4;
- Fig. 6 shows a second step in collapsing the foldable container of Fig. 4;
- Fig. 7 shows a third step in collapsing the foldable container of Fig. 4;
- Fig. 8 shows a fourth step in collapsing the foldable container of Fig. 4;
- Fig. 9 shows the fully collapsed container of Fig. 4, and
- Fig. 10 shows the collapsed container of Fig. 9 completed with the detachable roof.

[0015] Whenever in the figures the same reference numerals are applied these reference numerals pertain to the same parts.

[0016] With reference first to Fig. 1 a foldable container 1 according to a first embodiment is shown. This foldable container 1 has a bottom plate 2, upstanding long sidewalls 3 and upstanding short sidewalls 4. One of the sidewalls may at least partly be convertible to a door.

[0017] The upstanding long sidewalls 3 and the upstanding short sidewalls 4 are hinged to the bottom plate 2. Further there is a roof 5 which may be completely detachable or which may be connected with rods to the short sidewalls 4.

[0018] Fig. 2 shows that one of the long sidewalls 3' is swivelled down on the bottom plate 2. During this process of lowering the long sidewall 3' to the bottom plate 2 the gravity forces that are acting upon the long sidewall 3' are counteracted by a balancing mechanism 6 which is housed partly within the long sidewall 3' on the one hand and in the bottom plate 2 on the other hand. This is more clearly shown in the detail view shown in Fig. 3.

[0019] Fig. 3 shows that the bottom plate 2 and a long side-wall 3' are connected to each other by means of a hinge 10, which in this example also serves as a torsion bar.

[0020] Upon lowering the long sidewall 3' upon the base plate 2 a spring 9 and torsion bar 10 get tensioned which counteracts the lowering movement of the long sidewall 3'. For this purpose the spring 9 is connected to a transmission mechanism 8 and a conversion pulley 7 which is connected to a belt string 11 that in turn connects to an auxiliary pulley 12 making the connection with the long sidewall 3'.

[0021] A further feature which may be employed separate from the balancing mechanism 6 or in combination with this balancing mechanism will be further shown with reference to a second embodiment of the foldable container according to the invention and with reference to Figs. 4-10.

[0022] Fig. 4 shows a schematic representation of the foldable container 1 of the invention having a bottom plate 2, upstanding long sidewalls 3 and upstanding short sidewalls 4 and a detachable roof 5. The long sidewalls 3 and the short sidewalls 4 are hinged to each other by means of hinges 13. The figure shows that the forward long sidewall 3 is hinged to the bottom plate 2 by means of hinge 15.

[0023] Fig. 4 further shows that the short sidewalls 4 are divided in a lower triangular sidewall portion 4' and an upper triangular sidewall portion 4'' and that both long sidewalls 3 have a congruent shaped triangular portion 14 immediately neighbouring to the short sidewalls 4. Either the lower triangular portion 4' and/or the upper triangular sidewall portion 4" may be convertible to a door. To this end the hinge of these triangular portions is detachable by removal of the hinge-pin.

[0024] The operation of collapsing the foldable container 1 from the erect position as shown in Fig. 4 to the completely collapsed position as shown in Fig. 10 develops as follows.

[0025] In a first step Fig. 5 shows detaching of the roof plate 5. It is remarked that the roof plate 5 may be disconnected completely or remain connected to the other parts of the container with connecting rods or by other means.

[0026] As a second step Fig. 6 shows collapsing of one of the long sidewalls 3 which is possible due to the division of the short sidewalls 4 into a lower triangular sidewall portion 4' which remains upright and an upper triangular sidewall portion 4" which gives room for lowering the long sidewall 3 to the bottom plate 2.

[0027] Fig. 7 shows the final position of the first long side-wall 3 resting on the bottom plate 2 of the container.

[0028] In a next step Fig. 8 shows the folding down of the second long sidewall 3 which is allowed due to the folding inward of both the short sidewalls 4. At the completion of this step Fig. 9 shows that both long sidewalls 3 are lying flat on the bottom plate 2 while still being connected to the short sidewalls 4 resting on top thereof.

[0029] Finally Fig. 10 shows that the roof plate 5 is again placed on the collapsed construction making the collapsed container 1 ready for transportation with diminished volume and dimensions.

Claims

1. Foldable container (1) having a bottom plate (2), upstanding long sidewalls (3) and upstanding short sidewalls (4) that are hinged to the bottom plate (2), and an optionally detachable roof (5), **characterized in that** at least one (3') of the long sidewalls (3) and short sidewalls (4) and the bottom plate (2) are connected to a balancing mechanism (6) to counteract gravity forces that act upon the at least one (3') of the long sidewalls (3) and short sidewalls (4) when same is being lowered upon the bottom plate (2).

2. Foldable container (1) according to claim 1, **characterized in that** the balancing mechanism (6) comprises one or more springs (9) and/or one or more torsion bars (10).

3. Foldable container (1) according to claim 1 or 2, **characterized in that** the balancing mechanism is housed within the at least one (3') of the long sidewalls (3) and short sidewalls (4) and the bottom plate (2).

4. Foldable container (1) according to anyone of the preceding claims, wherein the long sidewalls (3) and the short sidewalls (4) are hinged to each other, and that each of the short sidewalls (4) is divided in a lower triangular sidewall portion (4') and an upper triangular sidewall portion (4"), and that both long sidewalls (3) have a congruently shaped triangular portion (14) immediately neighbouring to the short sidewalls (4).

5. Foldable container (1) according to claim 4, wherein the lower triangular sidewall portion (4') and/or the upper triangular sidewall portion (4") are convertible to a door.

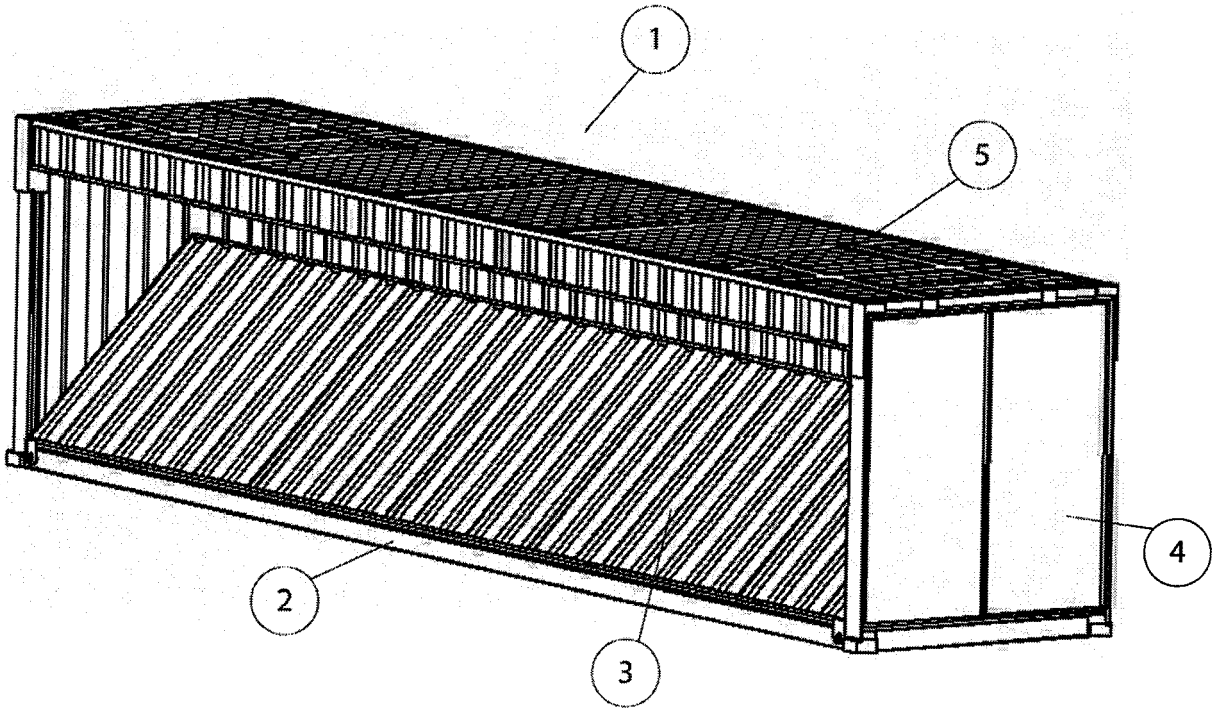

FIG.1

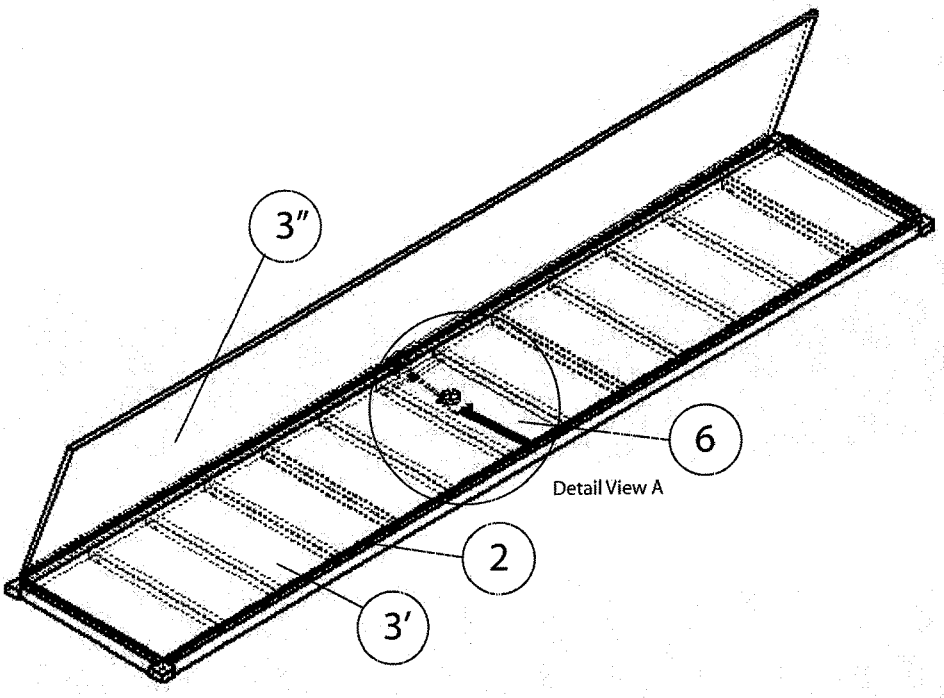

FIG.2

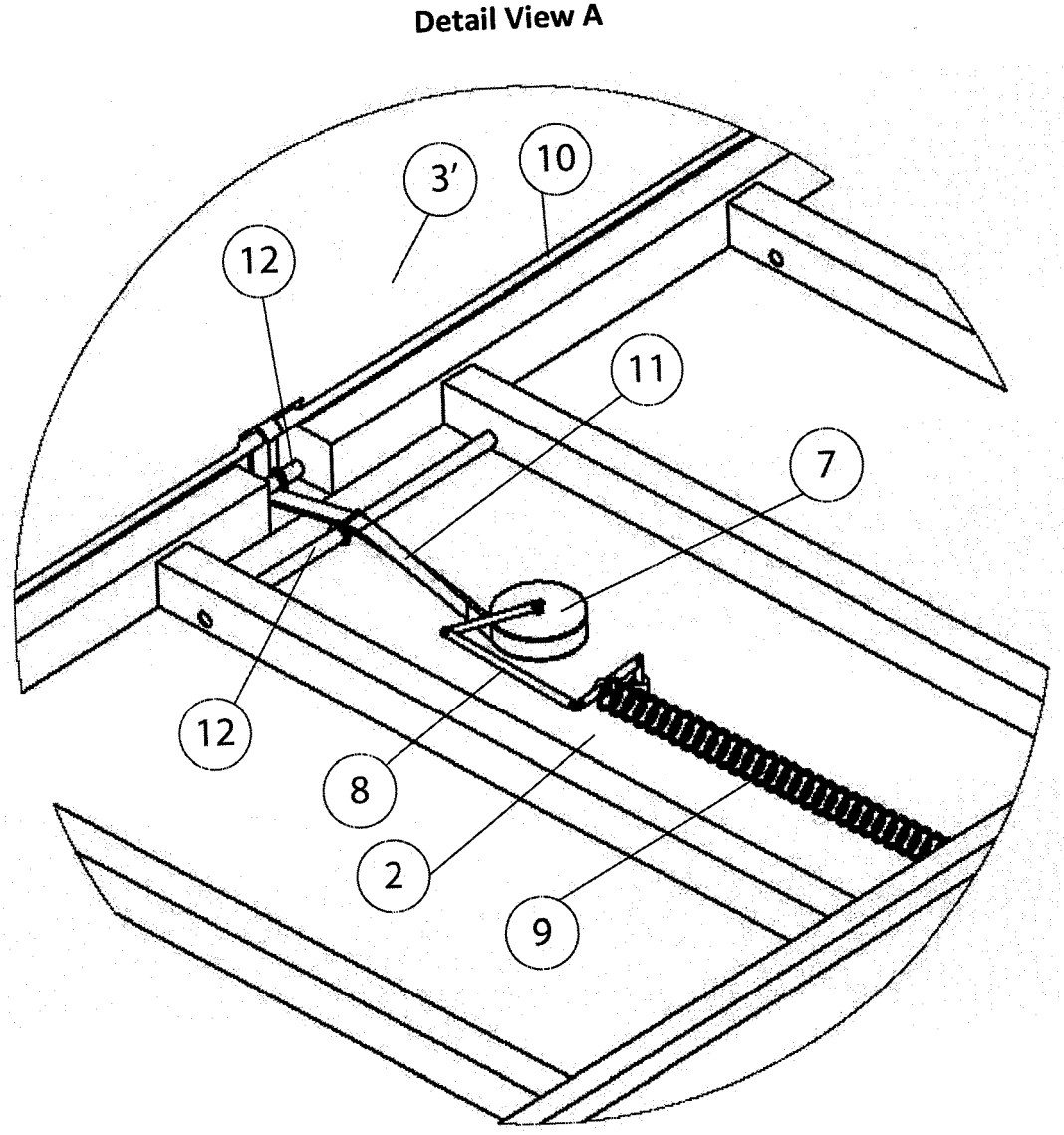

FIG. 3

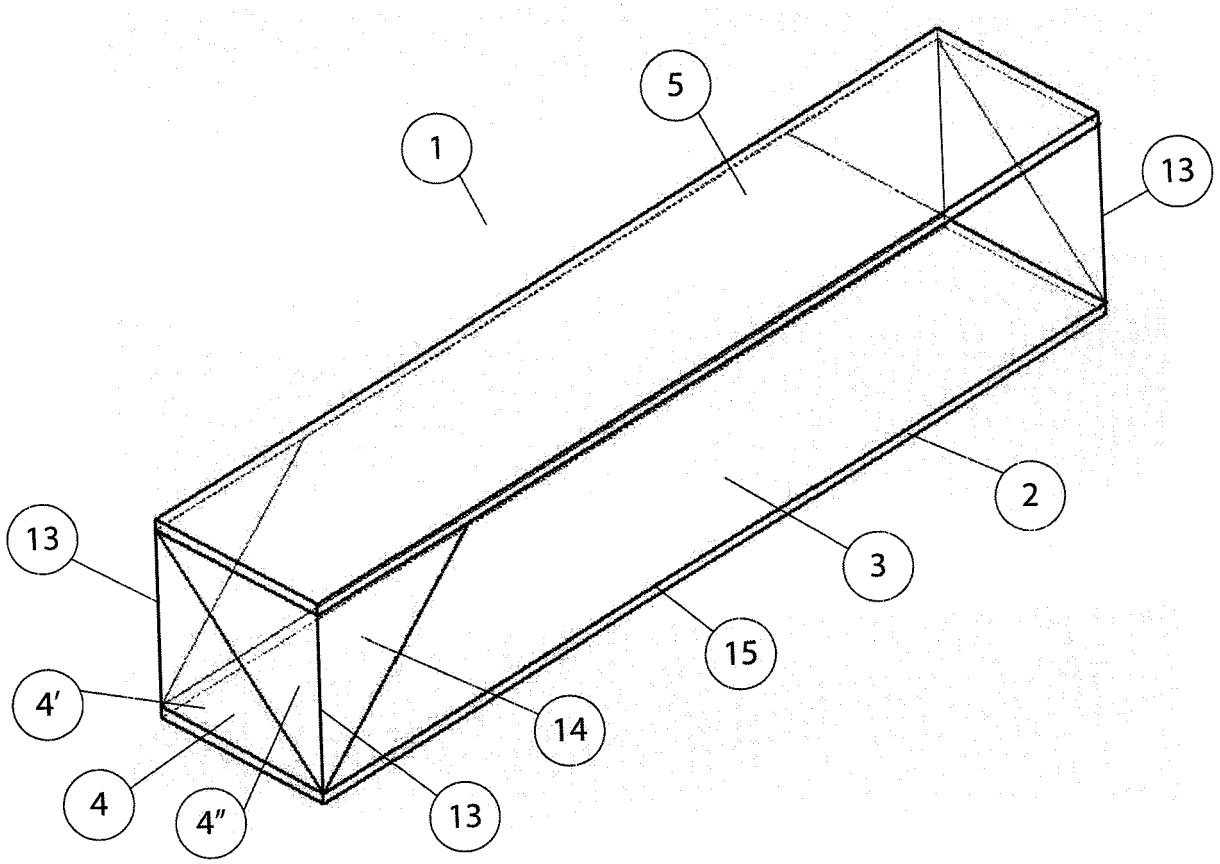

FIG.4

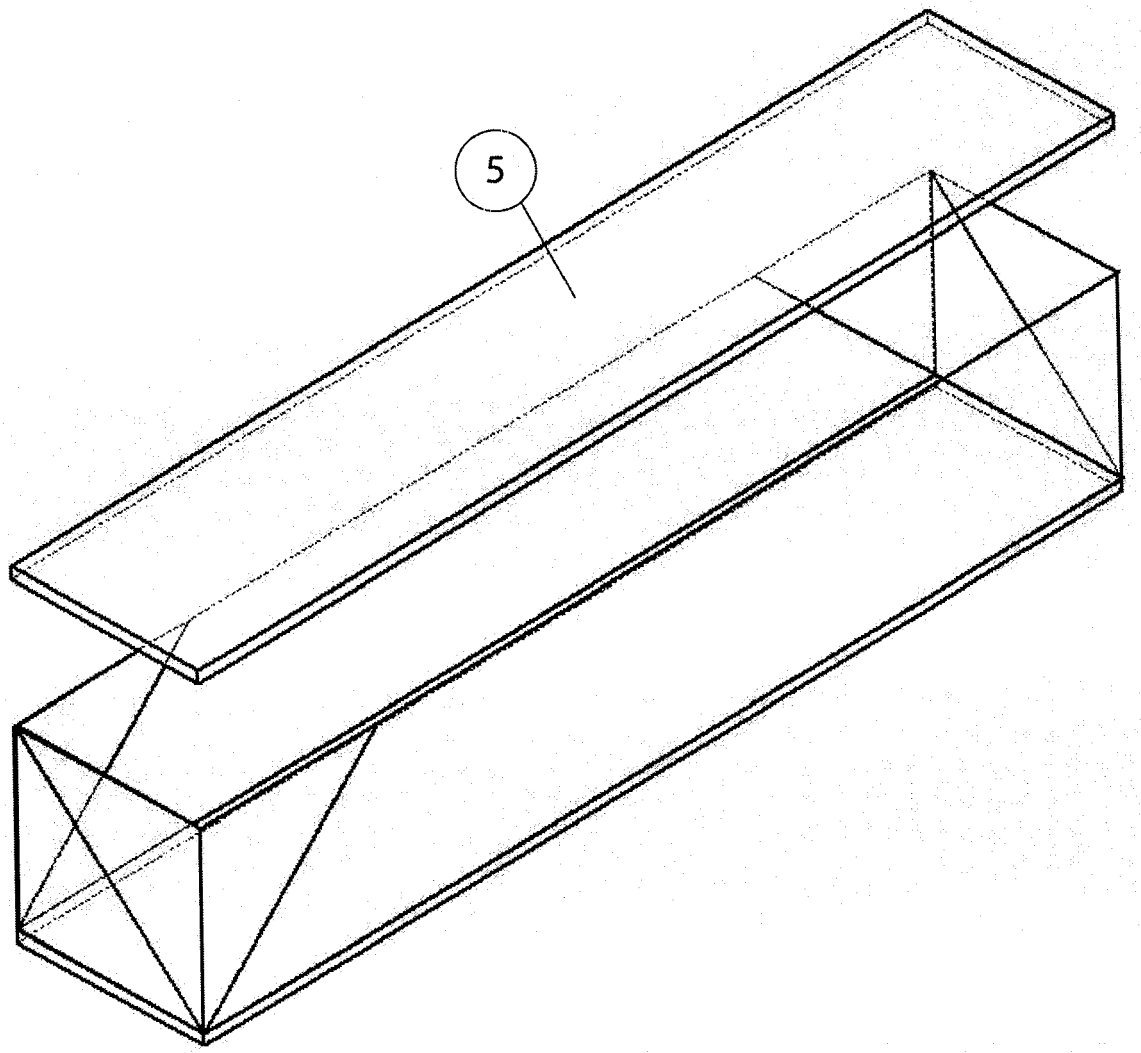

FIG.5

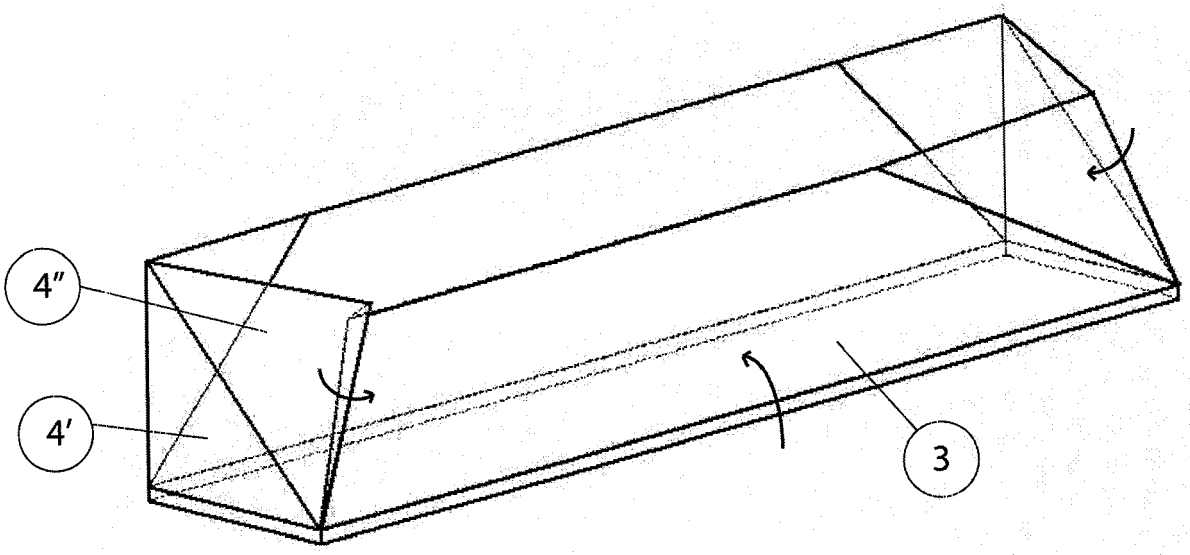

FIG.6

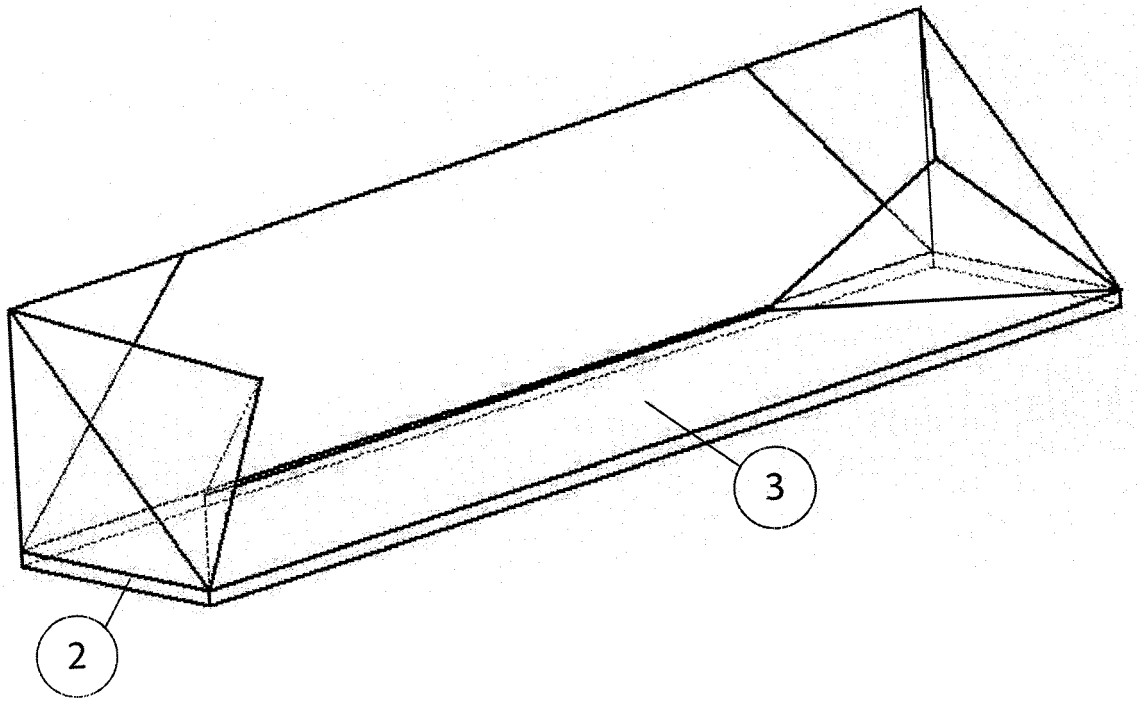

FIG.7

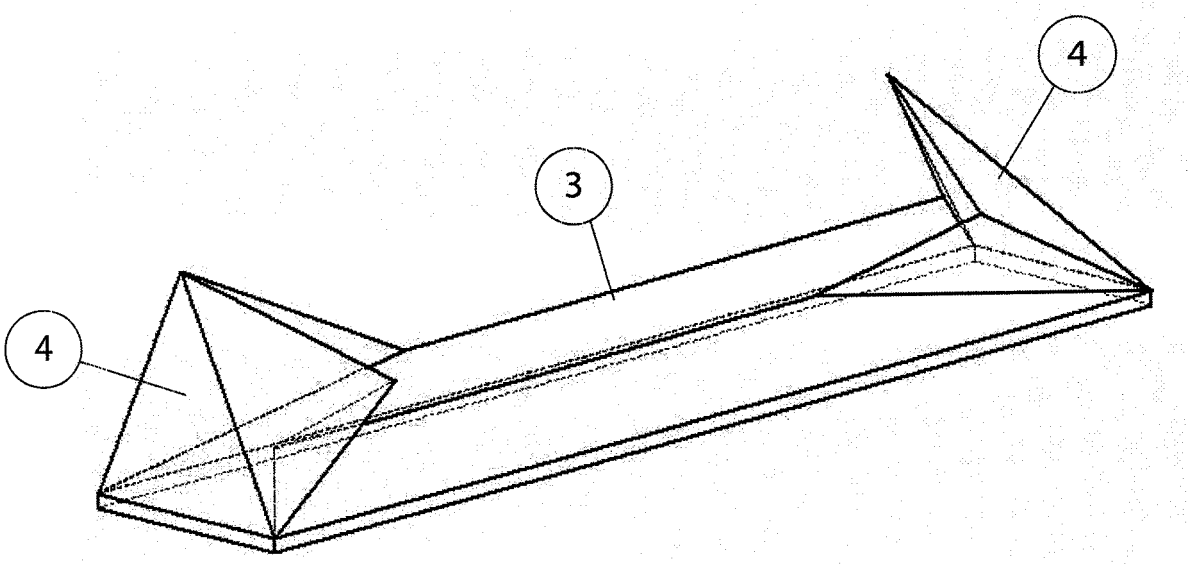

FIG.8

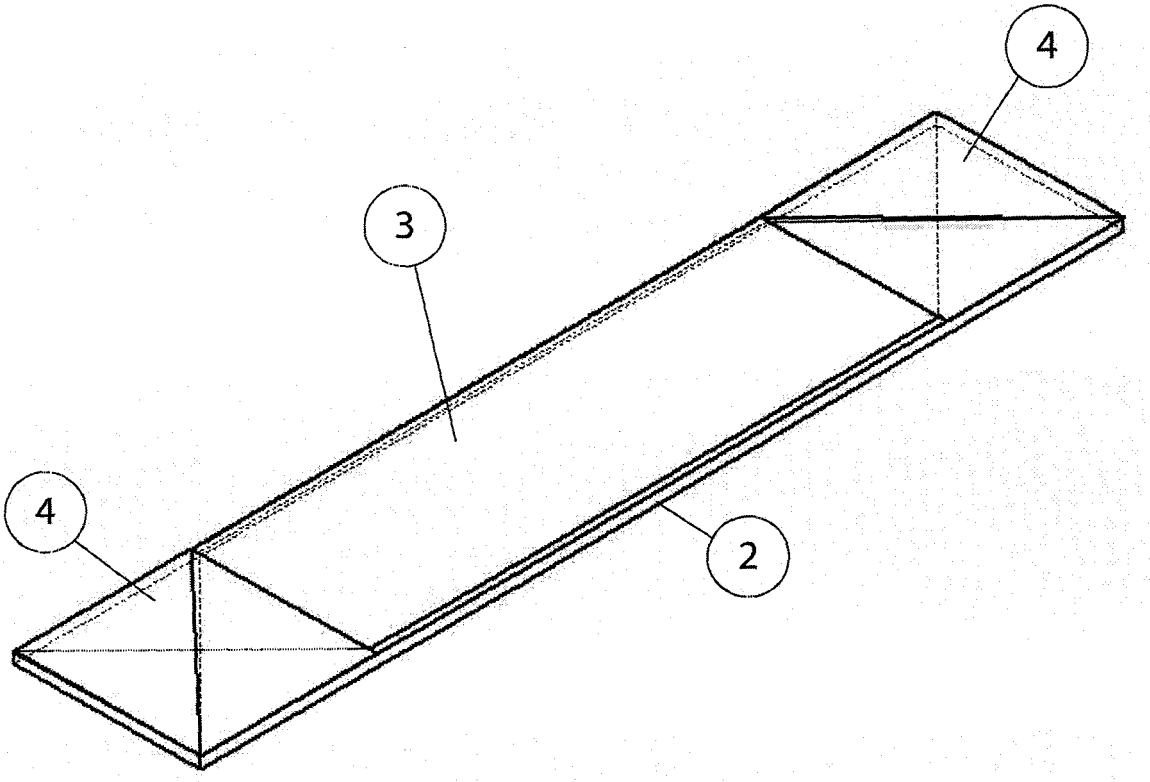

FIG.9

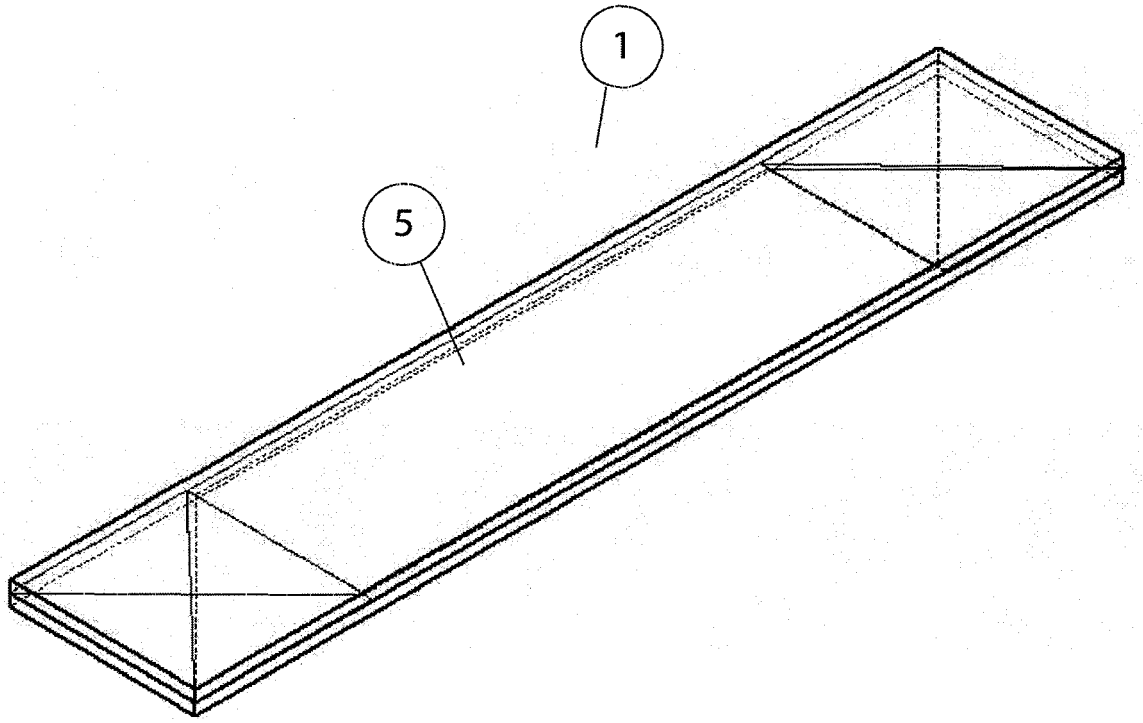

FIG.10

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 6312

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 33 17 221 A1 (SCHLICKER LEONHARD) 15 November 1984 (1984-11-15) * page 11, last paragraph; figures 1,4 *	1-3	INV. B65D88/52 B65D88/12
X	DE 20 2004 020452 U1 (NEW LOGISTICS GMBH [DE]) 23 June 2005 (2005-06-23) * paragraphs [0021], [0031], [0033]; figures *	1-3	
X	EP 0 010 944 A (FLASHSTAR LTD [GB]) 14 May 1980 (1980-05-14) * page 2, line 10 - line 27 *	1-3	
A	US 2002/070267 A1 (OKAMURA KOUSAKU [JP] ET AL) 13 June 2002 (2002-06-13) * abstract; figures 1,9 *	4	
X	WO 86/01788 A (SCANDINAVIAN TRANSSHIPMENT AB [SE]) 27 March 1986 (1986-03-27) * page 6, line 34 - page 7, line 2 *	1	
X	WO 95/30586 A (REES OPERATIONS PTY LTD [AU]; COOGAN JAMES DEANE [AU]) 16 November 1995 (1995-11-16) * abstract; figure 1 *	1,2	TECHNICAL FIELDS SEARCHED (IPC) B65D E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 February 2008	Zanghi, Amedeo

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 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 11 6312

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-02-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3317221 A1	15-11-1984	NONE	
DE 202004020452 U1	23-06-2005	NONE	
EP 0010944 A	14-05-1980	DE 2966202 D1	27-10-1983
		US 4319732 A	16-03-1982
		ZA 7905781 A	29-10-1980
US 2002070267 A1	13-06-2002	EP 1221416 A2	10-07-2002
WO 8601788 A	27-03-1986	AU 584385 B2	25-05-1989
		AU 5258586 A	23-07-1987
		DE 3574581 D1	11-01-1990
		DK 223086 A	14-05-1986
		EP 0195798 A1	01-10-1986
		FI 861999 A	13-05-1986
		JP 7010716 B	08-02-1995
		NO 861906 A	13-05-1986
		SE 449339 B	27-04-1987
		SE 8404627 A	15-03-1986
		US 4858779 A	22-08-1989
WO 9530586 A	16-11-1995	GB 2303353 A	19-02-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20060016807 A **[0002]**
- DE 1017159 **[0003]**