

(19)



(11)

**EP 2 409 936 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**25.01.2012 Bulletin 2012/04**

(51) Int Cl.:  
**B65D 90/00 (2006.01) B65D 90/04 (2006.01)**

(21) Application number: **10170135.7**

(22) Date of filing: **20.07.2010**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR**  
 Designated Extension States:  
**BA ME RS**

(71) Applicant: **Avasco Industries N.V.**  
**8600 Diksmuide (BE)**

(72) Inventor: **Kruithof, Gerrit J.**  
**8600 Diksmuide (BE)**

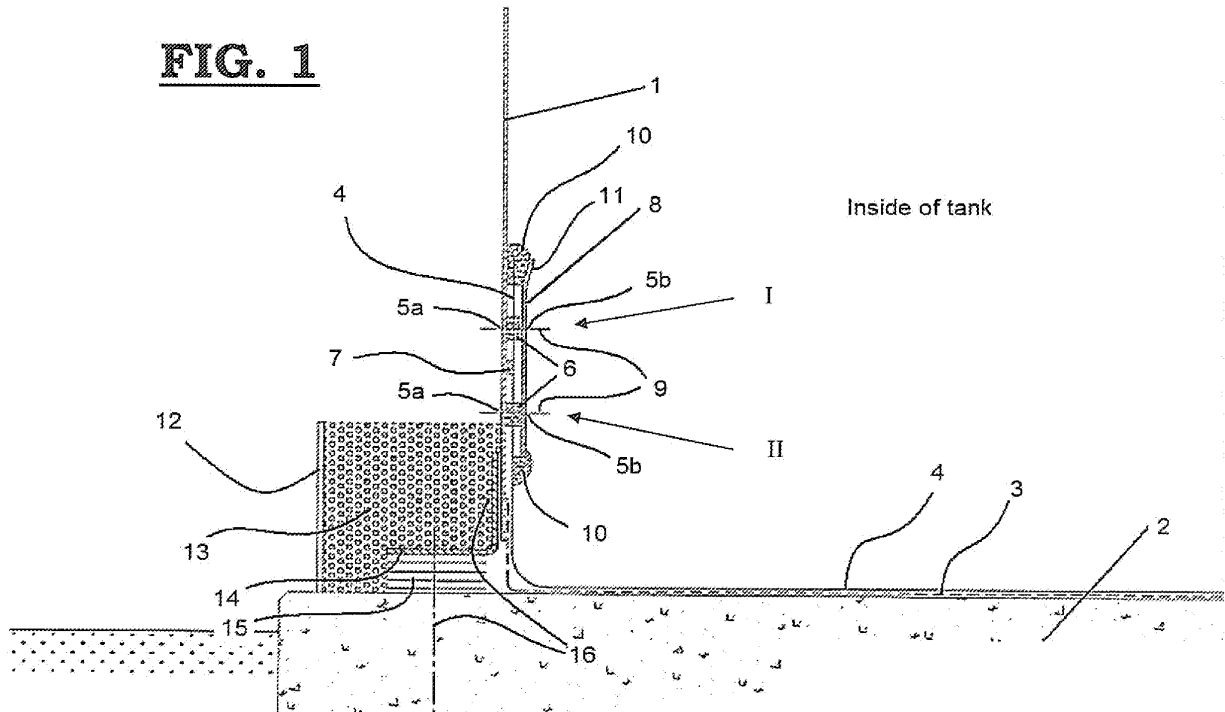
(74) Representative: **Ostyn, Frans et al**  
**KOB NV**  
**Patents**  
**President Kennedypark 31C**  
**8500 Kortrijk (BE)**

(54) **Water tank and method for constructing such a tank**

(57) The invention relates to a water tank for water storage, comprising sidewalls (1) mounted on a foundation (2) and a membrane (4) covering the foundation and extending upwards onto the sidewall (1), whereby the

membrane (4) only extends onto a lower bottom part of the sidewall (1) and ends under the water level. The invention further relates to a method for constructing such a water tank.

**FIG. 1**



**EP 2 409 936 A1**

## Description

### Field of the invention

**[0001]** The invention relates to a watertight bottom of a steel water tank suitable for storage of sprinkler water for fire prevention. The invention also relates to a method for installing said bottom in a steel water tank.

### Background of the Invention

**[0002]** Traditionally a steel water tank is installed with a watertight bottom by providing a concrete filling of about 20 cm thick at the bottom inside the tank. A problem arises however when water tanks need to be installed in isolated regions where supply of concrete is a problem. Another problem may be the quality and reliability of the concrete mixture that must resist cracks and be waterproof. In other words, the process of making and the availability of concrete as such can not be controlled fully by the installer. Moreover concrete makes this a costly installation.

**[0003]** Another way of installing a watertight steel water tank is by providing an inner liner, e.g. in rubber. The inner liner covers the entire tank wall of the water tank and reaches up to the top, to above the water level. This solves the problems just mentioned, however there are some major drawbacks. A problem with this type of design is that the water tank starts leaking and becomes useless whenever the liner gets teared or damaged. Another problem is serious corrosion of the tank wall due to condensation between the liner and said wall.

**[0004]** It is therefor an object of the present invention to provide at the same time a cheap and reliable solution for the above mentioned problems, as a solution whereby the installation can be done fully autonomously by the installer, without being dependent on (the quality of) third parties. It is another object of the invention to provide a water tank that is perfectly watertight during the required life span

### Summary of the invention

**[0005]** For this purpose the invention provides a water tank for water storage, comprising sidewalls (1) mounted on a foundation (2) and a membrane (4) covering the foundation and extending upwards onto the inner sidewalls, whereby the membrane (4) edge ends under the water level. The membrane only extends up to a part of the sidewalls, being the part of space necessary for fixing the membrane to the lower part of the inner sidewalls.

**[0006]** The membrane only extends onto a lower part of the sidewalls and does not reach tip to the top level of the tank. Because the membrane edge lies under the water level, there is a need for a watertight sealing of the membrane to the tank wall. This watertight sealing is provided by the embodiments of the present invention.

**[0007]** The advantage of the water tank of the invention

is that it is cheap, simple, easy, reliable and fast to install. Furthermore the water tank is perfectly watertight. A minimum amount of membrane material is used. Due to the small thickness of the membrane in comparison with a tank bottom filled with concrete, the height of the tank may decrease for the same capacity (volume) thereby creating a reasonable cost saving. The process of installation solely relies on one installer from start to end.

**[0008]** In an embodiment according to the invention said membrane (4) is watertightly applied between said inner sidewalls (1) and a fixation means (8) by means of bolts (9) in prepunched holes (5a, 5b) and mastic (6, 7, 10).

**[0009]** In a preferred embodiment said membrane (4) extends 10 to 50 cm up onto the sidewalls (1), preferably 10 to 30 cm, or any suitable distance for fixing the membrane to the sidewalls with a fixation means hereby cost-effectively applying only a minimum amount of membrane needed.

**[0010]** In a specific embodiment at least one row of swell seal mastic (7) is provided in an uninterrupted watertight manner between the sidewalls (1) and the membrane (4).

**[0011]** In a preferred embodiment said fixation means (8) is applied to the sidewalls (1) by means of two or more rows (I, II) of bolts (9). Said two or more rows (I, II) are preferably horizontal, i.e. parallel to the surface of the foundation or the bottom of the tank.

**[0012]** In a specific embodiment a mastic (6) is provided in each hole (5a, 5b) in an uninterrupted watertight manner. A mastic (10) is provided in an uninterrupted watertight manner, between the lower end of the fixation means (8) and the membrane (4), between the upper edge of the fixation means (8) and the membrane (4), and between the membrane upper edge and the sidewalls.

**[0013]** Said fixation means (8) comprises one or more reinforcing ribs (11) extending out of the surface of said fixation means. In a specific embodiment said reinforcing rib (11) is a bent edge or a seal edge.

**[0014]** In a preferred embodiment said fixation means (8) comprises one or more peripheral bands (8) of clamping plates, each band comprising two or more horizontal rows (I, II) of prepunched holes (5b) corresponding to prepunched holes (5a) in the sidewalls.

**[0015]** The membrane (4) is preferably made of EPDM. A protective layer (3) is applied on the bottom between the foundation (2) and the membrane (4).

**[0016]** In a specific embodiment a casing (12) holding gravel (13) is provided around the outside bottom of the tank for hiding a bolted (16) L-profile (14) by which the tank is mounted to the foundation (2).

**[0017]** The invention also provides a method for constructing a water tank as described above, said method comprising the steps of: a) mounting the sidewalls (1) of a water tank onto a foundation (2); b) spreading a membrane (4) onto the foundation (2) and extending said membrane onto the inner sidewalls to a level under the

water level; c) applying an uninterrupted swell seal mastic (7) between the membrane (4) and the sidewalls (1); d) applying an uninterrupted mastic (6) between the membrane (4) and the sidewall (1) at the level of the rows (I, II) of holes (5a); e) applying an uninterrupted mastic (6) between the membrane (4) and a clamping plate (8) at the level of the rows (I, II) of holes (5b); f) fixing the clamping plate (8) to the sidewalls (1) by means of bolts (9) through the holes (5a, 5b) and the mastic (6); g) applying mastic (10) to the edges of the clamping plate (8) and the membrane (4), sealing off any space between the edge of the membrane (4) and the sidewalls (1) and any space between the clamping plate (8) and the membrane (4); and h) optionally providing an outer casing around the bottom of the watertank.

**[0018]** The invention also provides for the use of a sprinkler water tank as described above for watertight storage.

**[0019]** The water tank may be installed on any horizontal surface that is strong and stable enough to support the weight of the tank and the water in it. As such, the water tank may be installed (on a concrete slab) on the ground, but may also be installed on a tower, a roof top or any other supporting means.

#### Brief description of drawings

##### **[0020]**

Figure 1 shows a sectional view of a cylindrical water tank according to the invention.

Figure 2 shows a photo detail of a water tank construction according to the invention.

#### Detailed description of preferred embodiments

**[0021]** Figure 1 shows a sectional view of a cylindrical water tank (1) placed on a concrete foundation (2). The tank is mounted level (tolerance of about 10 mm) and secured with anchor bolts into the concrete slab. The water tank is made of galvanized modular steel sheets, assembled with silo bolts and sealed with mastic.

**[0022]** The top surface of the concrete is broomed clean and made free of any parts that could damage the membrane. A protective layer (3) is placed on top of the concrete surface and partly extends up onto the sides of the tank. Examples of protective layers are geotextiles (300 gr/m<sup>2</sup>) or equivalents.

**[0023]** The membrane (4) is first positioned on top of the protective layer, in the center of the tank, in a specially packed embodiment. It is then opened to cover the bottom of the tank hereby partly extending up onto the sides of the tank, preferably 20 to 30 cm. As such the membrane (4) does not reach above the water level, but ends under the water level, inside the tank. The membrane is preferably made of EPDM (1.2 mm thickness) or equivalents.

**[0024]** The tank wall is provided with prepunched holes

(5a), preferably in two horizontal rows (I, II) parallel to the bottom of the tank. A mastic (6) is provided on the inside of the tank in an uninterrupted manner along each of the two horizontal rows (I, II) of prepunched holes. Also in a horizontal row, in between the two horizontal rows of punched holes, a swelling joint with swell seal mastic (7) is applied, also preferably in an uninterrupted manner. The swelling joint may be the same material as the mastic.

**[0025]** The membrane (4) is pressed tightly onto the two rows (I, II) of mastic (6) and the swell seal mastic (7), hereby preventing any leaks of water.

**[0026]** A clamping plate (8) provided with two horizontal rows (I, II) of prepunched holes (5b) is applied on top of the membrane and fixed to the corresponding rows of prepunched holes (5a) in the tank wall. Both rows of holes of the clamping plate (8) are also provided with mastic (6) in uninterrupted horizontal rows.

**[0027]** The clamping plate (8) is fixed onto the tank wall (1) segment by segment by means of silo bolts (9) that fit into the holes (5a, 5b), hereby forming an uninterrupted peripheral clamping band (8).

**[0028]** The upper and lower side of the clamping plate (8) is provided with an uninterrupted row of mastic (10), so as to firmly seal the clamping plate preventing any leakage of water from the tank.

**[0029]** In this embodiment, the clamping plate (8) has an upper edge (11) that is slightly folded open towards the center of the tank. A feature like this, extending out of the plane of the plate, prevents the plate from curving when the bolts are tightened by enhancing the firmness of the plate. Other embodiments of such a feature are possible. This embodiment here also eases the application of the mastic (10) into the space of the folded upper edge (11).

**[0030]** Around the outside of the tank, at the level of the concrete floor bottom, an upstanding casing (12) is applied holding gravel (13) between the casing and the tank. An L-profile (14) is applied on to the tank wall and leveled with shims (15) and fixed by means of silo bolts (16) to tank wall (1) and with anchor bolts (16) to the concrete floor (2) to prevent gravel (13) from piercing through the bottom of the protective liner (3) and the membrane (4). The upstanding casing (12) is preferably about 15 cm high. The filled casing provides an esthetical look of the tank and protects any dirt or other material from entering under the side of the tank.

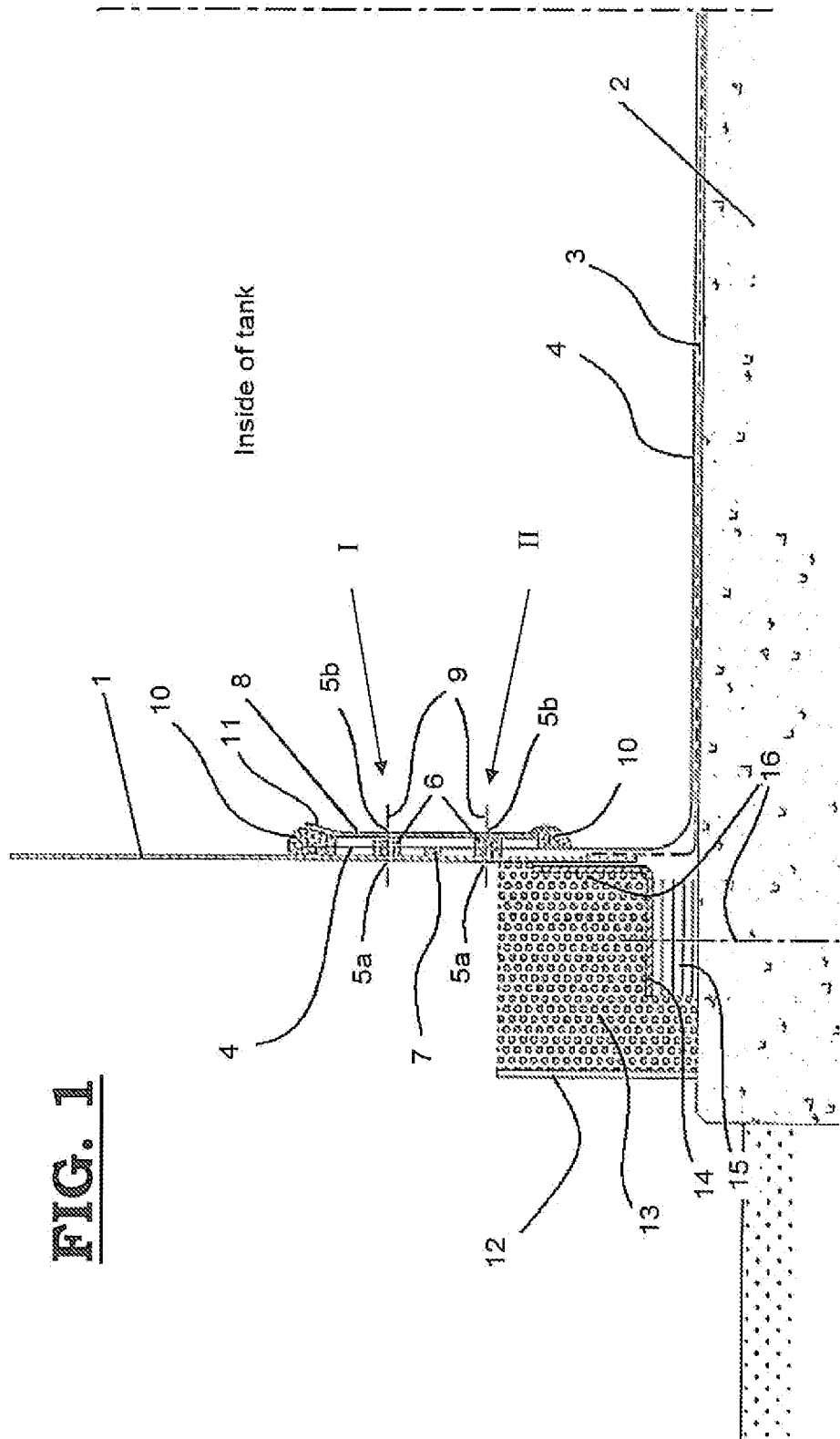
**[0031]** The mastic (6, 7, 10) used for sealing is specially made for good adherence to both the galvanized steel tank and the (EPDM) membrane. Examples of mastics suitable for this purpose are AvascoFlex and AvascoRub or equivalents.

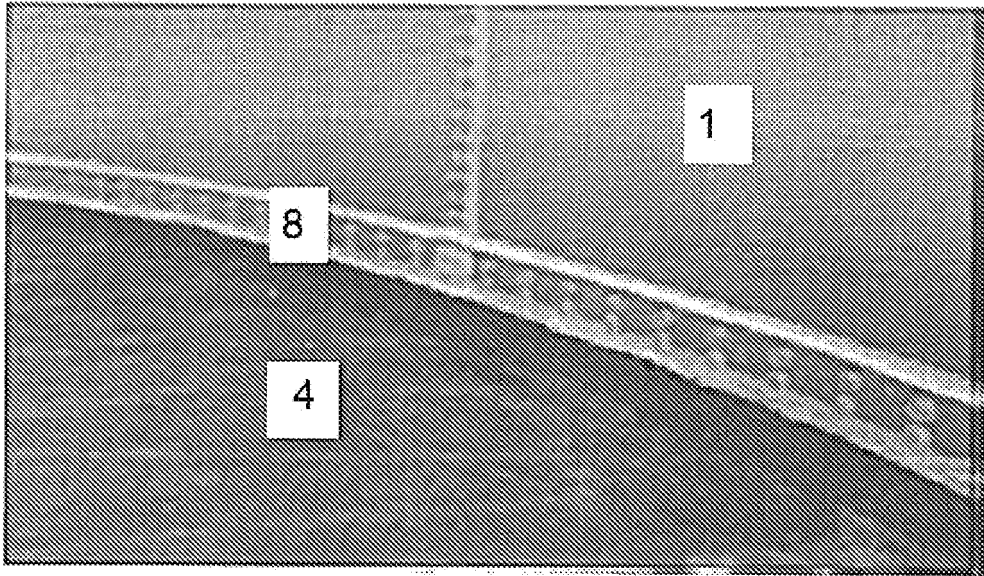
**[0032]** The inside of the tank (1) may be protected against corrosion and fouling. The water inside the tank may also be treated against fouling. The tank is preferably grounded. Figure 2 shows a detailed view of the tank bottom, showing the sidewalls (1) and the membrane (4) on the bottom. The clamping plate (8) is mounted close

to the bottom of the tank, but could also be mounted at any higher level. Figure 2 shows the empty watertight water tank which is ready for receiving water. As can be seen, the clamping plate is mounted at the lower bottom of the tank.

### Claims

1. A water tank for water storage, comprising sidewalls (1) mounted on a foundation (2) and a membrane (4) covering the foundation and extending upwards onto the inner sidewalls, **characterized in that** the membrane (4) edge ends under the water level.
2. Water tank according to claim 1, **characterized in that** said membrane (4) is watertightly applied between said inner sidewalls (1) and a fixation means (8) by means of bolts (9) in prepunched holes (5a, 5b) and mastic (6, 7, 10).
3. Water tank according to claim 1 or 2, **characterized in that** said membrane (4) extends 10 to 50 cm up onto the sidewalls (1), preferably 10 to 30 cm.
4. Water tank according to claim 2 or 3, **characterized in that** at least one row of swell seal mastic (7) is provided in an uninterrupted watertight manner between the sidewalls (1) and the membrane (4).
5. Water tank according to any of claims 2 to 4, **characterized in that** said fixation means (8) is applied to the sidewalls (1) by means of two or more rows (I, II) of bolts (9).
6. Water tank according to claim 5, **characterized in that** said two or more rows (I, II) are horizontal.
7. Water tank according to any of claims 2 to 6, **characterized in that** a mastic (6) is provided in each hole (5a, 5b) in an uninterrupted watertight manner.
8. Water tank according to any of claims 2 to 7, **characterized in that** a mastic (10) is provided in an uninterrupted watertight manner, between the lower end of the fixation means (8) and the membrane (4), between the upper edge of the fixation means (8) and the membrane (4), and between the membrane upper edge and the sidewalls.
9. Water tank according to any of claims 2 to 8, **characterized in that** said fixation means (8) comprises one or more reinforcing ribs (11) extending out of the surface of said fixation means.
10. Water tank according to claim 9, **characterized in that** said reinforcing rib (11) is a bent edge or a seal edge.
11. Water tank according to any of claims 2 to 10, **characterized in that** said fixation means (8) comprises one or more peripheral bands (8) of clamping plates each band comprising two or more horizontal rows (I, II) of prepunched holes (5b) corresponding to prepunched holes (5a) in the sidewalls.
12. Water tank according to any of claims 1 to 11, **characterized in that** the membrane (4) is made of EP-DM.
13. Water tank according to any of claims 1 to 12, **characterized in that** a protective layer (3) is applied on the bottom between the foundation (2) and the membrane (4).
14. A method for constructing a water tank of claims 1 to 13, said method comprising the steps of:
  - a. Mounting the sidewalls (1) of a water tank onto a foundation (2);
  - b. Spreading a membrane (4) onto the foundation (2) and extending said membrane onto the inner sidewalls to a level under the water level;
  - c. Applying an uninterrupted swell seal mastic (7) between the membrane (4) and the sidewalls (1);
  - d. Applying an uninterrupted mastic (6) between the membrane (4) and the sidewall (1) at the level of the rows (I, II) of holes (5a);
  - e. Applying an uninterrupted mastic (6) between the membrane (4) and a clamping plate (8) at the level of the rows (I, II) of holes (5b);
  - f. Fixing the clamping plate (8) to the sidewalls (1) by means of bolts (9) through the holes (5a, 5b) and the mastic (6);
  - g. Applying mastic (10) to the edges of the clamping plate (8) and the membrane (4), sealing off any space between the edge of the membrane (4) and the sidewalls (1) and any space between the clamping plate (8) and the membrane (4);
  - h. Optionally providing an outer casing around the bottom of the watertank.
15. Use of a water tank according to any of claims 1 to 13 for watertight storage.





**FIG. 2**



Europäisches  
Patentamt  
European  
Patent Office  
Office européen  
des brevets

## EUROPEAN SEARCH REPORT

Application Number  
EP 10 17 0135

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 298 07 285 U1 (UTEK UMWELTSCHUTZTECHNOLOGIEN [DE]) 30 July 1998 (1998-07-30) * page 4, paragraph 3 - page 6, paragraph 1 * * page 6, paragraph 5-6 * * figures 1, 2, 4, 5 *	1-15	INV. B65D90/00 B65D90/04
X	US 3 545 640 A (DELAHUNT JOHN F ET AL) 8 December 1970 (1970-12-08) * column 2, line 33 - column 4, line 34 * * figures 1, 2 *	1,3,15	
A		14	
X	DE 22 02 096 A1 (J00S ERHARD) 2 August 1973 (1973-08-02) * page 6, paragraph 2 - page 7, paragraph 1 * * figure 2 *	1,13,15	
A		9,10,14	
X	CH 484 798 A (IRONFLEX AG [CH]) 31 January 1970 (1970-01-31) * column 2, line 32 - column 4, line 27 * * figures 1, 2 *	1,13,15	TECHNICAL FIELDS SEARCHED (IPC)
A		14	B65D
X	US 4 068 777 A (HUMPHREY FREDERICK H ET AL) 17 January 1978 (1978-01-17) * column 2, line 63 - column 6, line 53 * * figures 1-5 *	1,13,15	
A		14	
X	DE 201 04 828 U1 (UTEK UMWELTSCHUTZTECHNOLOGIEN [DE]) 5 July 2001 (2001-07-05) * abstract; figures 1-3 *	1,13,15	
A		14	
A	US 2004/217118 A1 (NASH JOHN [US]) 4 November 2004 (2004-11-04) * page 3, paragraph 27 *	1,12,14,15	
3 The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 October 2010	Examiner Piolat, Olivier
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 (P04001)

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 10 17 0135

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.

19-10-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 29807285	U1	30-07-1998	AT 219746 T	15-07-2002
			AT 219745 T	15-07-2002
			AU 3816499 A	08-11-1999
			CA 2328162 A1	28-10-1999
			CZ 20003893 A3	12-12-2001
			DK 1073597 T3	14-10-2002
			WO 9954236 A1	28-10-1999
			EP 1073597 A1	07-02-2001
			ES 2178435 T3	16-12-2002
			HU 0103865 A2	28-03-2002
			NO 20005064 A	21-12-2000
			PL 343621 A1	27-08-2001
			US 2001025853 A1	04-10-2001
US 3545640	A	08-12-1970	NONE	
DE 2202096	A1	02-08-1973	NONE	
CH 484798	A	31-01-1970	NONE	
US 4068777	A	17-01-1978	AR 213105 A1	15-12-1978
			BR 7607808 A	11-10-1977
			CA 1037680 A1	05-09-1978
			DE 2653638 A1	02-06-1977
			FR 2332918 A1	24-06-1977
			GB 1520959 A	09-08-1978
			IT 1064567 B	18-02-1985
			JP 52065313 A	30-05-1977
			MX 144608 A	30-10-1981
			DE 20104828	U1
AU 2002310957 A1	05-11-2002			
CZ 20032877 A3	18-05-2005			
WO 02085715 A2	31-10-2002			
EP 1373075 A2	02-01-2004			
PL 365387 A1	10-01-2005			
US 2004217118	A1	04-11-2004	NONE	

EPO FORM P0459

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