



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.07.2015 Bulletin 2015/29

(51) Int Cl.:
E01C 13/08^(2006.01)

(21) Application number: **14150647.7**

(22) Date of filing: **09.01.2014**

(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 RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventors:
• **Meuleman, Frank Henry Fedor**
6681 TS Bommel (NL)
• **Haentjens, Geert**
PO BOX 30496
Dubai (AE)

(71) Applicant: **Green Vision Co. Ltd.**
Jeddah 21332 (SA)

(74) Representative: **'t Jong, Bastiaan Jacob**
Inaday Patent B.V.
Hengelsestraat 141
7521 AA Enschede (NL)

(54) **Artificial turf system**

(57) The application relates to an artificial turf system comprising:

- a backing layer having in use a top side and a bottom side;
- a plurality of grass yarns tufted through the backing layer to extend at the top side of the backing layer; and

- a polymeric foam layer arranged on the top side of the backing layer and wherein the plurality of grass yarns extend through the polymeric foam layer.

The application also relates to a method for manufacturing an artificial turf system according to the invention.

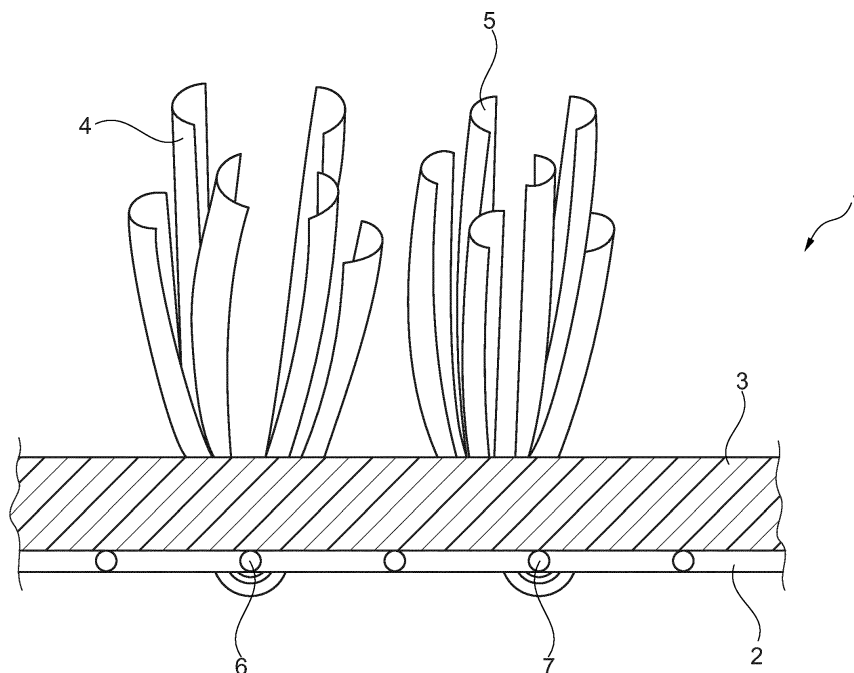


Fig. 1

Description

[0001] The invention relates to an artificial turf system comprising:

- a backing layer having in use a top side and a bottom side;
- a plurality of grass yarns tufted through the backing layer to extend at the top side of the backing layer;

[0002] Such a commonly known artificial turf system is typically laid on a flat base to provide a sports ground or a lawn in landscaping applications. Then an infill material is applied over the artificial turf system. This infill material is typically a base layer of sand and a top layer of particles, such as rubber particles. The infill material is positioned between the grass yarns, wherein at least part of the grass yarns extends over the infill material.

[0003] The infill material improves some properties of the artificial turf system, such as the damping of the mat, the energy restitution as well as grip properties. These properties are relevant when the artificial turf system is used as a sports field. Furthermore, the infill material ensures that the grass yarns stay in a substantial upright position even when the turf system is walked or played.

[0004] The infill material has however some disadvantages. For example, because of the granular structure of the infill material, the infill material is easily moved over the field during a game and taken along outside of the field. As a result, such a known artificial turf system has to be regularly maintained to ensure that the infill material is evenly distributed and is kept at a minimal level.

[0005] Another disadvantage is that the typically used rubber particles cause an unpleasant odor when heated by the sun. Also chemicals can be leached out from the rubber particles when subjected to rain, which chemicals will pollute the ground underneath the artificial grass turf.

[0006] US 2008292819 describes an artificial grass system wherein between the grass tufts secondary tufts with damping properties are arranged. These secondary tufts are an alternative for the known granular infill material.

[0007] According to this prior art, it is possible to provide the secondary tufts as a system with a spatial structure, such that the grass yarn tufts extend through openings of the spatial structure of the mat.

[0008] This requires that tufting of the grass yarn tufts has to be aligned with the spatial structure of the mat. Furthermore, one has to adapt the spacing of the spatial structure of the system to the desired spacing of the grass yarn tufts.

[0009] Furthermore, the base of the grass yarns of each tuft will be at a distance of the mat due to the spatial structure of the mat. So, the mat will not be in direct contact with the grass yarns, which is the case when a granular infill material is used

[0010] It is an object of the invention to provide an artificial turf system according to the preamble, in which at

least some of the disadvantages of the prior art are reduced or even removed.

[0011] This object is achieved according to the invention with an artificial turf system, which is characterized by a polymeric foam layer arranged on the top side of the backing layer and wherein the plurality of grass yarns extend through the polymeric foam layer.

[0012] The polymeric foam layer replaces the infill material. As the foam layer is a continuous layer the artificial turf system will require less maintenance. This is because the polymeric foam layer will stay evenly distributed over the system and it is not possible that parts, like with the prior art granular infill material, will be moved over the field simply by walking over the system or having a game on the artificial turf system.

[0013] As the grass yarns are tufted through both the backing layer as well as through the continuous polymeric foam layer, a direct contact between the foam layer and the base of the grass yarn will exist, which resembles the granular infill material of the prior art.

[0014] A person skilled in the art will be able to set the properties of the polymeric foam layer, such that the artificial turf system will obtain the required properties for the specific application. For example, the foam layer can provide a required damping, by ensuring that the foam layer is sufficiently compressible.

[0015] In a preferred embodiment of the artificial turf system according to the invention the polymeric foam layer comprises a gel foam. Gel foams are produced by adding a gel forming agent during the polymerization process. This results in a foam, which after compression slowly returns to its original shape. The advantage of a gel foam in an artificial turf system is that the energy restitution properties can be easily set.

[0016] For example for a soccer field it is required that when a player hits the ground with his leg, not all impact energy is directly returned to the player, as this would cause a severe load on the joints. A gel foam layer arranged on top of the backing layer will delay the return of the impact energy, because the foam will slowly try to return to its original shape.

[0017] Preferred gel foams are for example ammonium acetate gel foams or sodium silicofluoride gel foams.

[0018] Ammonium acetate gel foams are typically based on a blend of natural latex and styrene-butadiene latex, or based solely on styrene-butadiene latex filled with calcium carbonate. A gelling agent of an ammonium acetate solution is used during polymerization of this type of foam.

[0019] Sodium silicofluoride gel foams are typically based on a blend of natural latex and styrene-butadiene latex, filled with an inert filler system. A gelling agent of an sodium fluorosilicate dispersion is used during polymerization of this type of foam.

[0020] For all gel foams a vulcanization agent is required

[0021] In a further embodiment of the artificial turf system according to the invention the polymeric foam layer

comprises embedded filler particles, such as rubber particles, fibers or plastic particles.

[0022] With filler particles it is possible to further set the properties of the polymeric foam. Especially, by adding rubber particles it is possible to provide the foam with a higher stiffness than would be possible to achieve with the foam without the particles.

[0023] By adding fibers to the foam, it is for example possible to provide a better wear resistance to the foam.

[0024] In yet another embodiment of the artificial turf system according to the invention the thickness of the polymeric foam layer is between 1 mm and 40 mm.

[0025] A further preferred embodiment of the artificial turf system according to the invention further comprising a plurality of secondary texturized or thatch fibers arranged on the top side of the backing layer.

[0026] The texturized fibers are arranged between the grass yarns and fill the spaces between the grass yarns, such that the polymeric foam layer will get less in to contact with sunlight, such that the aging process of the foam layer is slowed down and the artificial turf system will have a better durability, as well as better grip properties.

[0027] The texturized fibers have the additional advantage, that the appearance of the artificial turf system will be more natural.

[0028] Yet another embodiment of the artificial turf system according to the invention further comprising a coating layer arranged on the bottom side of the backing layer for fixating the grass yarns. This coating layer could comprises polyurethane, latex, hot melt and other adhesive like materials.

[0029] Still a further embodiment of the artificial turf system according to the invention further comprising a padding layer, such as a foam layer, arranged on the bottom side of the backing layer.

[0030] The padding layer can further contribute to the properties of the turf system, like the damping of the mat, the energy restitution.

[0031] The invention also relates to a method for manufacturing an artificial turf system according to any of the preceding claims, wherein the method comprises the steps:

- providing a backing layer, for example a fabric web;
- providing a continuous polymeric foam layer on one side of the backing layer;
- tufting grass yarns from the other side of the backing layer through the backing layer and through the continuous polymeric foam layer.

[0032] So, with the method according to the invention, both the backing layer as well as the continuous polymeric foam layer are pierced by the tufting device to push the grass yarns through the backing layer and the continuous polymeric foam layer.

[0033] In a preferred embodiment of the method according to the invention the continuous polymeric foam layer is applied in liquid state to the backing layer and

subsequently polymerized.

[0034] These and other features of the invention will be elucidated in conjunction with the accompanying drawings.

Figure 1 shows a cross sectional view of a first embodiment of an artificial turf system according to the invention.

Figure 2 shows a cross sectional view of a second embodiment of an artificial turf system according to the invention.

Figure 3 shows a cross sectional view of a third embodiment of an artificial turf system according to the invention.

[0035] Figure 1 shows a first embodiment of an artificial grass system 1. This grass system 1 has a backing layer 2 which is typically a fabric. On the top side of the backing layer 2, a polymeric foam layer 3 is arranged.

[0036] The combination of backing layer 2 and polymeric foam layer 3 is provided with tufts 4, 5. The tufts 4, 5 are shown with only three grass yarns, but in typical applications a tuft comprises between 1 - 12 grass yarns.

[0037] The grass yarns of each tuft 4, 5 are wrapped around a thread 6, 7 of the fabric of the backing layer 2 and extend through the backing layer 2 and the polymeric foam layer 3. As will be clear, the polymeric foam layer 3 is positioned at the same location, at which infill material would be positioned in prior art grass mats. As a result, the polymeric foam layer 3 provides the functions such as damping, energy restitution and grip enhancement, which would in the prior art be provided by the granular infill material.

[0038] Figure 2 shows a second embodiment of an artificial grass system 10 having a backing layer 11. A polymeric foam layer 12 is arranged on the top side of the backing layer 11. In this embodiment, the polymeric foam layer 12 has embedded filler particles 13, for example rubber particles. These filler particles 13 contribute to the desired properties of the polymeric foam layer 12.

[0039] Tufts of grass yarns 14, 15 extend through the backing layer 11 and polymeric foam layer 12 and at the top side of the backing layer 11.

[0040] A coating layer 16 is furthermore arranged on the bottom side of the backing layer 11 to fixate the tufts of grass yarns 14, 15. In addition a padding layer 17 is arranged on the bottom side of the backing layer 11 over the coating layer 16. This padding layer 17 could for example provide added shock absorption, further resilience to the artificial grass system 10 and / or provide anti-slip properties of the artificial grass system 10 in relation to the base on which the system 10 is laid.

[0041] Figure 3 shows a cross sectional view of a third embodiment of an artificial turf system 20 according to the invention, which corresponds largely with the embodiment 10 of figure 2. The same features are provided with the same reference signs.

[0042] Next to the tufts of grass yarns 14, 15 a plurality

of secondary texturized fibers 21 are arranged on the top side of the backing layer 11 and foam layer 12. These secondary texturized fibers 21 fill the gaps between the separate tufts 14, 15 of grass yarns. This provides a more natural look of the artificial turf system 20, but also shields the polymeric foam layer 12 from sunlight, such that the durability is increased.

Claims

1. Artificial turf system comprising:

- a backing layer having in use a top side and a bottom side;
- a plurality of grass yarns tufted through the backing layer to extend at the top side of the backing layer;

characterized by

- a polymeric foam layer arranged on the top side of the backing layer and wherein the plurality of grass yarns extend through the polymeric foam layer.

2. Artificial turf system according to claim 1, wherein the polymeric foam layer comprises a gel foam.

3. Artificial turf system according to claim 1 or 2, wherein the polymeric foam layer comprises embedded filler particles, such as rubber particles, fibers or plastic particles.

4. Artificial turf system according to any of the preceding claims, wherein the thickness of the polymeric foam layer is between 1 mm and 40 mm.

5. Artificial turf system according to any of the preceding claims further comprising a plurality of secondary texturized fibers arranged on the top side of the backing layer.

6. Artificial turf system according to any of the preceding claims, further comprising a coating layer arranged on the bottom side of the backing layer for fixating the grass yarns.

7. Artificial turf system according to any of the preceding claims, further comprising a padding layer, such as a foam layer, arranged on the bottom side of the backing layer.

8. Method for manufacturing an artificial turf system according to any of the preceding claims, wherein the method comprises the steps:

- providing a backing layer, for example a fabric

web;

- providing a continuous polymeric foam layer on one side of the backing layer;
- tufting grass yarns from the other side of the backing layer through the backing layer and through the continuous polymeric foam layer.

9. Method according to claim 8, wherein the continuous polymeric foam layer is applied in liquid state to the backing layer and subsequently polymerized.

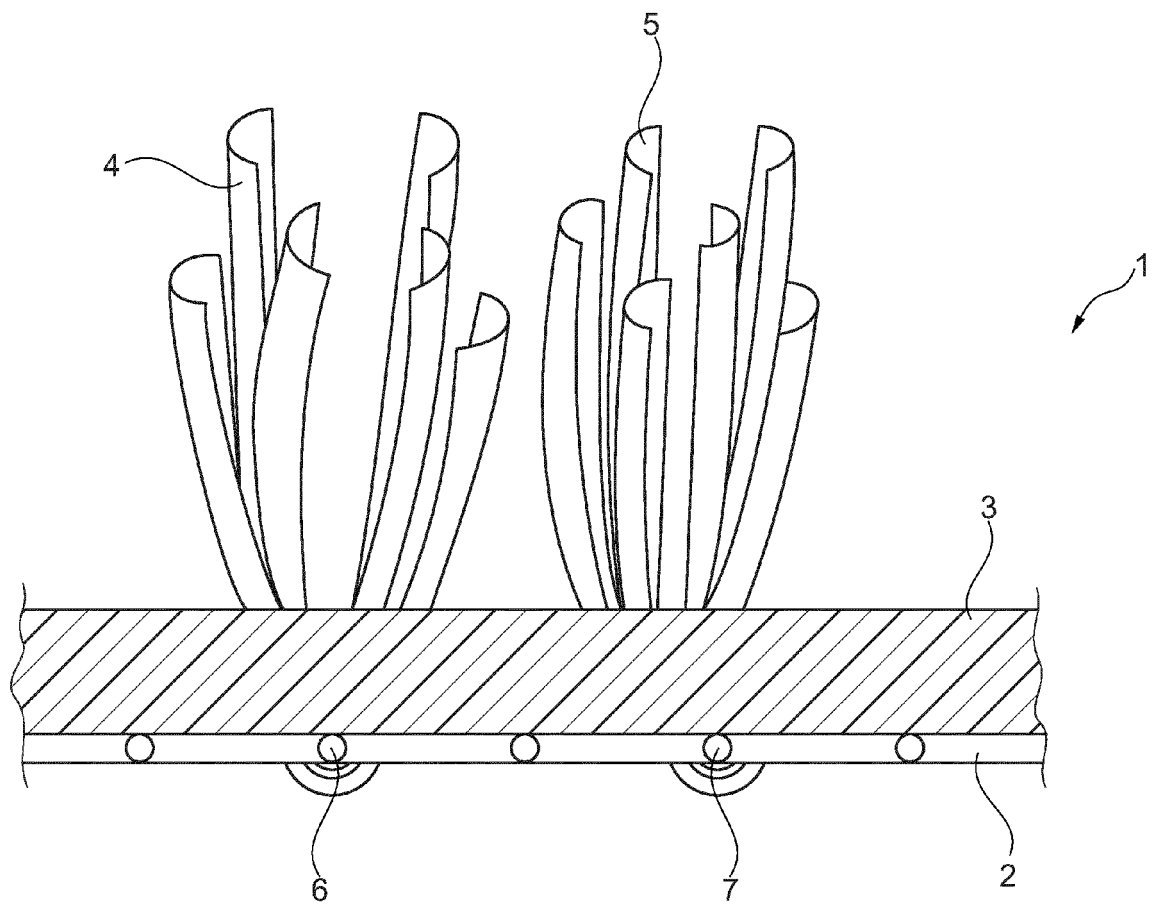


Fig. 1

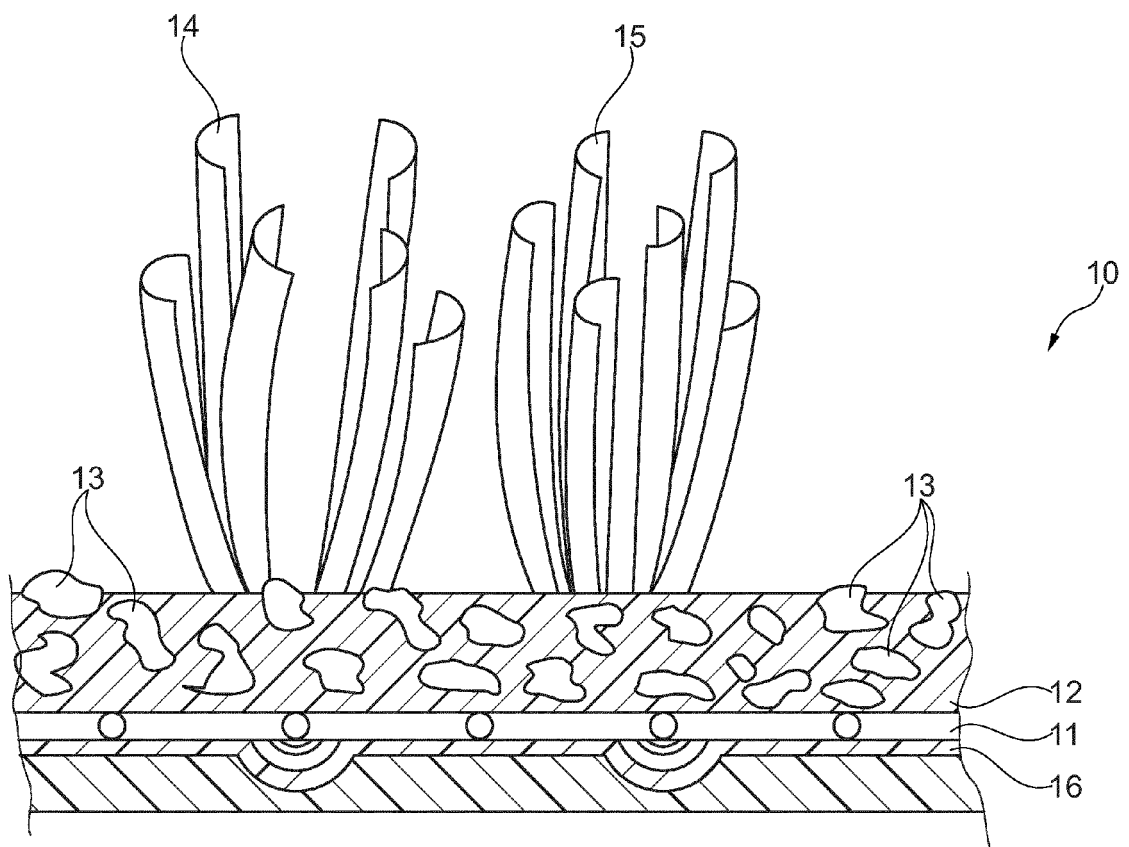


Fig. 2

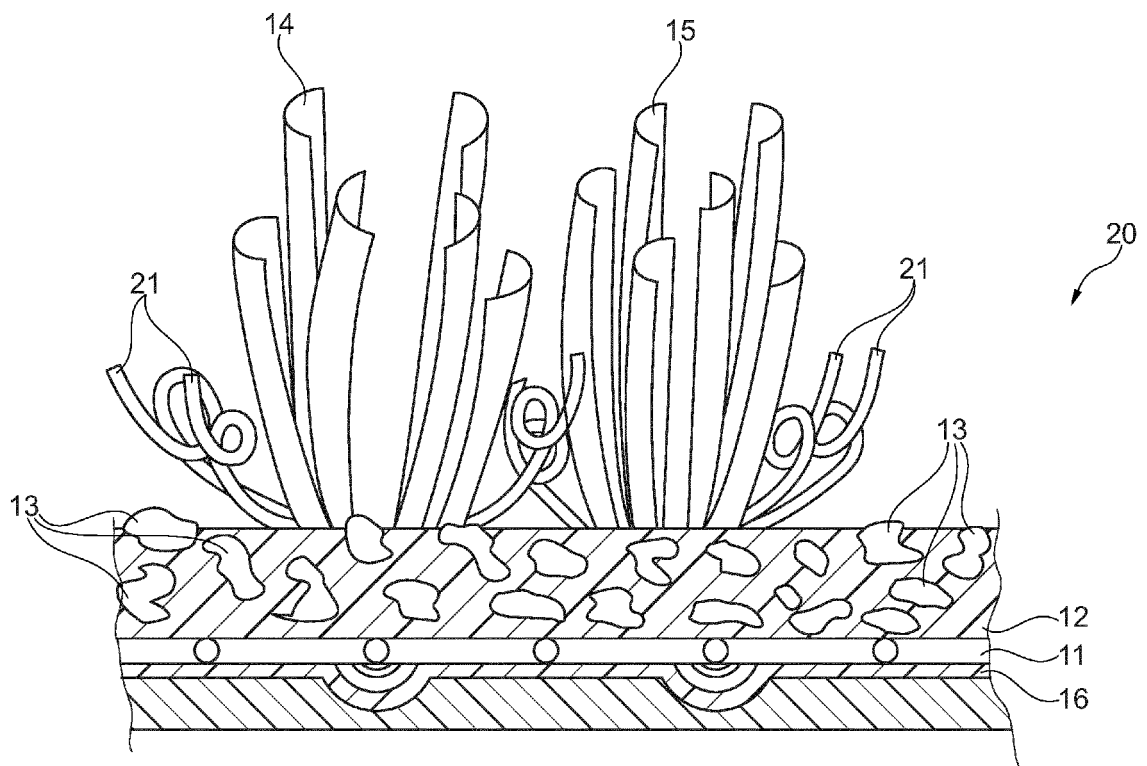


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 14 15 0647

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,D	US 2008/292819 A1 (WEGHUIS MARINUS HENDRIKUS OLDE [NL] ET AL) 27 November 2008 (2008-11-27) * figure 1f * * paragraphs [0018], [0029] - paragraph [0042] * * the whole document *	1-9	INV. E01C13/08
X	US 4 337 283 A (HAAS JR FREDERICK T) 29 June 1982 (1982-06-29) * figure 1 * * column 3, line 24 - line 35 * * column 4, line 28 - line 38 * * column 4, line 55 - line 59 * * column 5, line 27 - line 29 * * claim 20 * * the whole document *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			E01C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 June 2014	Examiner Klein, A
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			

2
EPO FORM 1503 03.82 (P04C01)

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

EP 14 15 0647

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.

05-06-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008292819 A1	27-11-2008	AU 7467201 A	24-12-2001
		EP 1290279 A1	12-03-2003
		NL 1015451 C2	19-12-2001
		US 2003157275 A1	21-08-2003
		US 2005238823 A1	27-10-2005
		US 2008292819 A1	27-11-2008
		WO 0196664 A1	20-12-2001

US 4337283 A	29-06-1982	NONE	

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 2008292819 A [0006]