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(54) **Non-woven fabric and method for fabricating the same**

(57) A non-woven fabric includes a filament fiber web and a composite fiber web that is entangled with the filament fiber web and that includes composite staple fibers and cellulose fibers. The composite staple fibers and the cellulose fibers are fusion-bonded together. A method of fabricating a non-woven fabric includes: (a) air laying and thermally treating composite staple fibers and cellulose

fibers so as to form a composite fiber web, the composite staple fibers and the cellulose fibers in the composite fiber web being fusion-bonded together, and (b) disposing the composite fiber web between two filament fiber webs followed by subjecting to water-jet treatment such that the composite fiber web and the filament fiber webs are entangled with each other.

EP 2 735 632 A1

Description

[0001] This invention relates to a non-woven fabric, more particularly to a hygroscopic non-woven fabric which is composed of filament fibers, staple fibers and cellulose fibers.

[0002] A paper towel is a necessity in daily life, and can be used to wipe and clean a surface of an article.

[0003] The paper towel generally can be classified into dry paper towel and wet paper towel, and should exhibit the properties of softness and good tensile strength and absorbency.

[0004] A conventional paper towel is made of two fiber webs by a water-jet treatment, in which the fiber webs are made of a plurality of filament fibers by a carding treatment. The filament fibers are chemical fibers and have a length ranging from 10 mm to 76 mm. Since the filament fiber is relatively expensive, cost of manufacturing the paper towel becomes high, which does not meet industry requirements.

[0005] Taiwanese patent publication No. 182129 discloses a wet paper towel which includes two wiping layers and an absorbent layer disposed between the wiping layers. The wiping layers and the absorbent layer are entangled using hot rolling treatment. The wiping layers are made of fibers obtained from the kapok tree and having a length ranging from 1.25 mm to 5 mm. The absorbent layer is made by mixing 50wt% rayon and 50wt% polypropylene fibers followed by subjecting to hot wind treatment. The resultant wet paper towel is relatively rigid and is expensive due to high cost of rayon.

[0006] Therefore, it is still required in the art to develop a paper towel which is cost effective.

[0007] Therefore, a first object of the present invention is to provide a non-woven fabric, which is cost effective and exhibits desirable mechanical properties.

[0008] A second object of the present invention is to provide a method of fabricating the non-woven fabric.

[0009] According to a first aspect of this invention, there is provided a non-woven fabric which includes a filament fiber web and a composite fiber web. The composite fiber web is entangled with the filament fiber web and includes composite staple fibers and cellulose fibers. The composite staple fibers and the cellulose fibers are fusion-bonded together.

[0010] According to a second aspect of this invention, there is provided a method of fabricating a non-woven fabric, which includes:

- (a) air laying and thermally treating composite staple fibers and cellulose fibers so as to form a composite fiber web, the composite staple fibers and the cellulose fibers in the composite fiber web being fusion-bonded together; and
- (b) disposing the composite fiber web between two filament fiber webs followed by subjecting to water-jet treatment such that the composite fiber web and the filament fiber webs are entangled with each other.

[0011] A non-woven fabric according to the present invention includes a filament fiber web that is made from filament fibers, and a composite fiber web that is entangled with the filament fiber web and that includes composite staple fibers and cellulose fibers. The composite staple fibers and the cellulose fibers are fusion-bonded together.

[0012] The non-woven fabric has a basis weight ranging from 20 g/m² to 120 g/m² and a thickness ranging from 0.1 mm to 5 mm. The non-woven fabric of the present invention can be applied to manufacture of a paper towel, a facial mask or a panty liner. Each component of the non-woven fabric of the present invention is illustrated as follows.

[0013] The filament fiber suitable for the present invention is a natural fiber, a chemical fiber, or the combination thereof. The natural fiber can be a plant fiber, an animal fiber, or the combination thereof. Examples of the plant fiber include, but are not limited to, seed fibers (such as cotton), bast fibers (such as flax or hemp), nervure fibers (such as Manila hemp), or fruit fibers (such as coconuts). Examples of the animal fiber include, but are not limited to, hide fibers and silk fibers.

[0014] The chemical fiber suitable for the present invention is a regenerated fiber, a semi-synthetic fiber, a synthetic fiber, or combinations thereof. An example of the regenerated fiber is rayon. The semi-synthetic fiber is, e.g., cellulose acetate fiber. Examples of the synthetic fiber include polyethylene (abbreviated as PE) fiber, polypropylene (abbreviated as PP) fiber, polyethylene terephthalate (abbreviated as PET) fiber, and polyamide fiber. In consideration of cost of the non-woven fabric of the present invention, preferably, the filament fiber is selected from the group consisting of PE fibers, PP fibers, PET fibers, rayon, cotton fibers, and combinations thereof.

[0015] Preferably, the filament fiber is present in an amount ranging from 10wt% to 80wt% based on 100wt% of the hygroscopic non-woven fabric. The filament fiber has a linear density ranging from 1 denier to 6 deniers per filament. The filament fibers have lengths ranging from 10 mm to 76 mm.

[0016] The composite staple fiber has thermofusible ability, and thus can be fusion-bonded with the adjacent cellulose fibers. Thus, the cellulose fibers would not be lost during a subsequent water-jet treatment, thereby eliminating the inferior absorbency problem of the hygroscopic non-woven fabric and difficulty in wastewater treatment.

[0017] The composite staple fiber suitable for the present invention is selected from the group consisting of a polyethylene-polypropylene fiber, a polyethylene-polyethylene terephthalate fiber, a low temperature poly lactic acid-high temperature poly lactic acid fiber, a maleic anhydride modified polyethylene-polypropylene fiber, a maleic anhydride

modified polyethylene-polyethylene terephthalate fiber, and combinations thereof. In an example of this invention, the composite staple fiber is the polyethylene-polypropylene fiber.

[0018] Preferably, the composite staple fiber is present in an amount ranging from 1wt% to 20wt% based on 100wt% of the non-woven fabric. The composite staple fiber has a linear density ranging from 1 denier to 6 deniers per filament.

[0019] In this embodiment, the cellulose fiber is a natural cellulose fiber, and is present in an amount ranging from 5wt% to 60wt% based on 100wt% of the non-woven fabric. The cellulose fiber has a linear density ranging from 0.1 denier to 10 deniers per filament. Preferably, the cellulose fiber has a length ranging from 1 mm to 5 mm.

[0020] The cellulose fiber can be obtained from pulp, e.g., wood pulp.

[0021] A method of fabricating the non-woven fabric of this invention includes the following steps:

- (a) air laying and thermally treating composite staple fibers and cellulose fibers so as to form a composite fiber web, the composite staple fibers and the cellulose fibers in the composite fiber web being fusion-bonded together; and
- (b) disposing the composite fiber web between two filament fiber webs followed by subjecting to water-jet treatment such that the composite fiber web and the filament fiber webs are entangled with each other.

[0022] The air-laying treatment in step (a) is conducted using air as a carrier for the fibers. The composite staple fibers and the cellulose fibers are dispersed evenly in the gas (e.g., air) by air flowing, and are adsorbed onto a screen mesh, so as to form the composite fiber web. The air-laying treatment can be conducted using a traditional air-laying machine.

[0023] The thermal treatment is conducted to fusion-bond the composite staple fibers and the cellulose fibers together. The thermal treatment can be conducted using traditional heating equipment. The heat treatment is conducted at a temperature ranging from 50°C to 180°C. The composite fiber web has a basis weight ranging from 5 g/m² to 100 g/m² and a thickness ranging from 0.1 mm to 10 mm.

[0024] Each of the filament fiber webs used in step (b) is formed by carding the filament fibers.

[0025] The carding treatment can be conducted using traditional carding equipment. The filament fiber web has a basis weight ranging from 5 g/m² to 100 g/m² and a thickness ranging from 0.1 mm to 10 mm.

[0026] The water-jet treatment is conducted using a high pressure waterjet to render the fusion-bonded fibers in the composite fiber web to be entangled with the filament fibers in the filament fiber webs. The water-jet treatment can be conducted using traditional water-jet equipment.

[0027] The following examples are provided to illustrate the preferred embodiments of the invention, and should not be construed as limiting the scope of the invention.

Example 1:

[0028] 10wt% polyethylene-polypropylene staple fibers (the average length was 6 mm) and 50wt% pulp were mixed to form a composite fiber mixture, followed by air-laying treatment (the airflow volume was 130 CMM) and thermal treatment at a temperature of 135°C, thereby obtaining a composite fiber web.

[0029] 20wt% solid core polyethylene terephthalate filament fibers and shape 4T polyethylene terephthalate filament fibers (the average length thereof was 38 mm) were subjected to carding treatment so as to obtain filament fiber webs.

[0030] The composite fiber web was disposed between the two filament fiber webs followed by subjecting to water-jet treatment under 50 bar of waterjet pressure so as to obtain a non-woven fabric.

Examples 2 to 6 and Comparative Example:

[0031] Examples 2 to 6 and Comparative Example were conducted in a manner similar to that of Example 1 except for the material and amount of the filament fiber, the composite staple fiber, and/or the cellulose fiber. The material and the amount of each of the fiber components are listed in Table 1.

1. Basis weight (g/m²) :

[0032] The basis weight was measured by ASTM D3776-85 under the following conditions: the temperature of 23±0.5°C, the relative humidity of 65±2% and the normal atmospheric pressure. The results are shown in Table 1.

2. Tensile strength (Kgf/25 mm):

[0033] The non-woven fabrics of Examples 1 to 6 and Comparative Example were cut into samples having 150 mm length and 25.4 mm width, and the tensile strength thereof was measured by ASTM D-1117. The results are shown in

Table 1.

3. Elongation rate (%):

[0034] The non-woven fabrics of Examples 1 to 6 and Comparative Example were cut into samples having 150 mm length and 25.4 mm width and the elongation rate thereof was measured by ASTM D-1117. The results are shown in Table 1.

4. Water content (%):

[0035] Each of the non-woven fabrics of Examples 1 to 6 and Comparative Example was weighed to obtain a weight of W1, and was dried for 2 hours at the temperature of 105 ± 2 °C in a hot-air circulation oven. Each of the dried non-woven fabrics was then cooled for 20 minutes to 30 minutes in a desiccator, and was weighed to obtain a weight of W2. The water content was calculated using the following formula:

$$\text{Water content (\%)} = [(W1 - W2) / W1] \times 100\%$$

5. Absorbency (%):

[0036] According to ISO 9073.6:2000, seven bags made of non-woven fabric and each having a size specification of 26cmx30cmx20cm were weighed respectively to obtain a weight of W1, and an open end of each of the bags was sealed, followed by soaking into pure water for 5 minutes. Each of the bags was then placed onto a wire netting (10 meshes) to drip for 1 minute, followed by weighing to obtain a weight of W2.

[0037] Each of the non-woven fabrics of Examples 1 to 6 and Comparative Example was weighed to obtain a weight of (W3) and was placed into a respective one of the bags, followed by sealing the open ends of the bags, and soaking into pure water for 5 minutes. Each of the bags with the fabric was then placed onto the wire netting (10 meshes) to drip for 1 minute, followed by weighing to obtain a weight of W4. The absorbency is calculated based on the following formula:

$$\text{Absorbency (\%)} = \{ [W4 - W3 - W2 / W3] \} \times 100\%$$

6. Softness (cm):

[0038] The non-woven fabrics of Examples 1 to 6 and Comparative Example were cut into samples with the length of 250 mm and the width of 25 mm, and were placed under the conditions of the temperature of 23°C and the relative humidity of 50% for 24 hours, followed by subjecting to softness test according to ISO 9073-7:1995 and ASTM D-1117.

[0039] The softness test was conducted based on the following procedure using a flexural rigidity tester which included a horizontal platform and an inclined surface that was inclined at 45° relative to the horizontal platform.

[0040] Each of the aforesaid samples was placed onto a horizontal platform of the flexural rigidity tester and moved gradually on the horizontal platform toward the inclined surface of the flexural rigidity tester until a leading edge of the sample dropped and touched the inclined surface. The length (mm) of the sample from the leading edge to a junction of the horizontal platform and the inclined surface was measured. The above steps were repeated six times and an average (C) of the length was computed. In addition, this whole procedure was performed once with either side of each of the samples facing upward and with either of the lengthwise and widthwise edges leading the way. The average length (mm) used to stand for softness was shown in Table 1.

Table 1

		Examples						Comp. Exp.
		1	2	3	4	5	6	
Filament Fiber (wt%)	rayon	--	10	--	--	--	--	40
	PET	20	30	50	55	40	45	60
	Shape 4T PET	20	--	--	--	--	--	--
Staple Fiber (wt%)	PE/PP	10	10	10	5	10	5	--

(continued)

		Examples						Comp. Exp.
		1	2	3	4	5	6	
5	Cellulose Fiber (wt%)	50	50	40	40	50	50	--
	Basis Weight (g/m ²)	45.08	48.4	54.3	51.2	55.5	46.4	49.9
	Thickness (mm)	0.52	0.53	0.63	0.52	0.53	0.56	0.58
10	Tensile Strength in Longitudinal Direction (Kgf/25mm)	1.55	1.40	3.57	3.47	2.49	2.57	5.10
	Elongation Rate in Longitudinal Direction (%)	51	49	63.6	60.8	58.6	54.9	44
	Tensile Strength in Lateral Direction (Kgf/25mm)	0.27	0.26	0.74	0.85	0.37	0.62	1.48
15	Elongation Rate in Lateral Direction (%)	178.9	139.6	188.1	186.9	181.5	169.5	141
	Water Content (%)	5.89	5.81	3.19	3.14	4.64	4.15	4.13
	Softness (mm)	55.5	57.4	57.4	63.4	61.8	55.6	45.0
20	Absorbency (%)	1038	1032	1051	1064	1041	1103	996

[0041] As shown in Table 1, the non-woven fabric of the present invention that uses composite staple fibers and cellulose fiber to replace some of the filament fibers has superior elongation rate and absorbency as compared to the non-woven fabric of the comparative example. Other properties, e.g., tensile strength, water content, and softness also meet industrial requirements.

[0042] To sum up, the non-woven fabric of the present invention that uses composite staple fibers and cellulose fibers has reduced cost and superior elongation rate and improved absorbency. Furthermore, the air-laying treatment, thermal treatment, carding treatment and water-jet treatment can be combined in a production line to efficiently fabricate the non-woven fabric of the present invention.

Claims

1. A non-woven fabric **characterized by:**

a filament fiber web; and
a composite fiber web that is entangled with the filament fiber web and that includes composite staple fibers and cellulose fibers, said composite staple fibers and said cellulose fibers being fusion-bonded together.

2. The non-woven fabric of claim 1, **characterized in that** said filament fiber web includes filament fibers selected from the group consisting of polyethylene fibers, polypropylene fibers, polyethylene terephthalate fibers, rayon, cotton fibers and combinations thereof.

3. The non-woven fabric of claim 2, **characterized in that** said filament fibers have lengths ranging from 10 mm to 76 mm.

4. The non-woven fabric as claimed in any one of Claims 2 and 3, **characterized in that** said filament fibers are present in an amount ranging from 10 wt% to 80 wt% based on the total weight of said non-woven fabric.

5. The non-woven fabric as claimed in any one of Claims 1 to 4, **characterized in that** said composite staple fibers are selected from the group consisting of polyethylene-polypropylene fibers, polyethylene-polyethylene terephthalate fibers, low temperature poly lactic acid-high temperature poly lactic acid fibers, maleic anhydride modified polyethylene-polypropylene fibers, maleic anhydride modified polyethylene-polyethylene terephthalate fibers, and combinations thereof.

6. The non-woven fabric as claimed in any one of Claims 1 to 5, **characterized in that** said composite staple fibers have lengths ranging from 1 mm to 10 mm.

7. The non-woven fabric as claimed in any one of Claims 1 to 6, **characterized in that** said composite staple fibers are present in an amount ranging from 1 wt% to 20 wt% based on the total weight of said non-woven fabric.

8. The non-woven fabric as claimed in any one of Claims 1 to 7, **characterized in that** said cellulose fibers are present in an amount ranging from 5 wt% to 60 wt% based on the total weight of said non-woven fabric.

9. The non-woven fabric as claimed in any one of Claims 1 to 8, **characterized in that** said cellulose fibers have lengths ranging from 1 mm to 5 mm.

10. A method of fabricating a non-woven fabric, **characterized by:**

(a) air laying and thermally treating composite staple fibers and cellulose fibers so as to form a composite fiber web, the composite staple fibers and the cellulose fibers in the composite fiber web being fusion-bonded together; and

(b) disposing the composite fiber web between two filament fiber webs followed by subjecting to water-jet treatment such that the composite fiber web and the filament fiber webs are entangled with each other.

11. The method of claim 10, **characterized in that** the filament fiber web includes filament fibers as defined in any of claims 2-4.

12. The method of claim as claimed in any one of Claims 10 or 11, **characterized in that** the composite staple fibers are defined as in any of claims 5-7.

13. The method as claimed in any one of Claims 10 to 12, **characterized in that** the cellulose fibers are present in an amount ranging from 5 wt% to 60 wt% based on the total weight of said non-woven fabric.

14. The method as claimed in any one of Claims 10 to 13, **characterized in that** the cellulose fibers have lengths ranging from 1 mm to 5 mm.



EUROPEAN SEARCH REPORT

Application Number
EP 13 00 3474

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	US 6 375 773 B1 (ANDERSEN JENS OLE BROECHNER [DK]) 23 April 2002 (2002-04-23) * column 3, line 64 - column 4, line 4; claims 6-8; figures 3,4; examples 1,2 * * column 5, line 55 - column 6, line 17 * -----	1-14	INV. D04H1/26 D04H1/425 D04H1/4258 D04H1/485 D04H1/49 D04H1/498 D04H1/541 D04H1/74
A	US 5 375 306 A (ROUSSIN-MOYNIER YVES [FR]) 27 December 1994 (1994-12-27) * claims; figure * -----	1,10	
A	WO 2011/009997 A2 (AHLSTROEM OY [FI]; ESCAFFRE PASCALE [FR]; MEIKLE GORDON [GB]; NORTMAN) 27 January 2011 (2011-01-27) * page 4, line 21 - page 5, line 11 * -----	1-14	
A	EP 0 992 338 A2 (FORT JAMES CORP [US] GEORGIA PACIFIC CONSUMER OPERA [US]) 12 April 2000 (2000-04-12) * paragraphs [0022], [0023]; figure 9; example sample 4; table 1 * -----	1,10	
A	US 2003/101556 A1 (FLEISSNER GEROLD [CH]) 5 June 2003 (2003-06-05) * paragraphs [0004], [0011], [0012]; figures 1,2 * -----	1-14	TECHNICAL FIELDS SEARCHED (IPC) D04H
A	WO 2004/063451 A1 (AHLSTROM BRIGNOUD [FR]; AHLSTROEM OY [FI]; JEAMBAR PATRICK [FR]) 29 July 2004 (2004-07-29) * the whole document * -----	1,10	
A	EP 0 964 093 A1 (SUOMINEN OY J W [FI] SUOMINEN NONWOVENS LTD [FI]) 15 December 1999 (1999-12-15) * paragraphs [0026] - [0033], [0057], [0058]; claims * ----- -/--	1-14	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 October 2013	Examiner Barathe, Rainier
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)



EUROPEAN SEARCH REPORT

Application Number
EP 13 00 3474

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2001/005926 A1 (NOELLE FREDERIC [FR] NOELLE FRREDERIC [FR]) 5 July 2001 (2001-07-05) * the whole document *	1,10	
A	EP 1 195 459 A1 (POLYMER GROUP INC [US]) 10 April 2002 (2002-04-10) * paragraph [0012]; figure 1 *	1-14	
A	WO 01/66345 A1 (PROCTER & GAMBLE [US]; BRENNAN JONATHAN PAUL [US]; GORLEY RONALD THOMA) 13 September 2001 (2001-09-13) * page 1 - page 3; figures 1,2 *	1-14	
A	US 2004/087237 A1 (GARNIER GIL BERNARD DIDIER [US] ET AL) 6 May 2004 (2004-05-06) * paragraphs [0040] - [0042]; figure 5 *	1,10	
A	WO 98/02608 A1 (KIMBERLY CLARK CO [US]) 22 January 1998 (1998-01-22) * page 1 - page 6 * * page 12 - pages 13-15; examples 1-4 *	1,10	
A	WO 00/18996 A1 (KIMBERLY CLARK CO [US]) 6 April 2000 (2000-04-06) * claims; figures 1,2 *	1,10	
A	WO 2011/053946 A1 (PROCTER & GAMBLE [US]; BARNHOLTZ STEVEN LEE [US]; SUER MICHAEL DONALD) 5 May 2011 (2011-05-05) * claims; figures 1,4,6 *	1-14	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search The Hague		Date of completion of the search 29 October 2013	Examiner Barathe, Rainier
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 13 00 3474

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.

29-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6375773 B1	23-04-2002	AT 500367 T	15-03-2011
		AU 9434298 A	03-05-1999
		CA 2306186 A1	22-04-1999
		CA 2592610 A1	22-04-1999
		CN 1276028 A	06-12-2000
		DK 1023478 T3	20-06-2011
		EP 1023478 A1	02-08-2000
		JP 2001520326 A	30-10-2001
		US RE42765 E1	04-10-2011
		US 6375773 B1	23-04-2002
		WO 9919551 A1	22-04-1999
US 5375306 A	27-12-1994	AT 141964 T	15-09-1996
		CA 2070773 A1	09-04-1992
		DE 69121694 D1	02-10-1996
		DE 69121694 T2	23-01-1997
		EP 0504368 A1	23-09-1992
		FR 2667622 A1	10-04-1992
		US 5375306 A	27-12-1994
		WO 9206237 A1	16-04-1992
WO 2011009997 A2	27-01-2011	EP 2456585 A2	30-05-2012
		RU 2012105927 A	27-08-2013
		US 2012177888 A1	12-07-2012
		WO 2011009997 A2	27-01-2011
EP 0992338 A2	12-04-2000	AT 371535 T	15-09-2007
		CA 2285113 A1	09-04-2000
		DE 69936962 T2	15-05-2008
		EP 0992338 A2	12-04-2000
		EP 1775116 A2	18-04-2007
		ES 2291009 T3	16-02-2008
		US 6110848 A	29-08-2000
US 2003101556 A1	05-06-2003	AT 291656 T	15-04-2005
		BR 0107670 A	08-10-2002
		CA 2396976 A1	26-07-2001
		CN 1395636 A	05-02-2003
		DE 10001957 A1	19-07-2001
		EP 1294971 A1	26-03-2003
		ES 2239125 T3	16-09-2005
		IL 150720 A	04-07-2007
		JP 2003527495 A	16-09-2003
		US 2003101556 A1	05-06-2003
		WO 0153589 A1	26-07-2001

EPO FORM P0459

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

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

EP 13 00 3474

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.

29-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2004063451 A1	29-07-2004	AT 371761 T	15-09-2007
		CN 1738936 A	22-02-2006
		DE 602004008578 T2	21-05-2008
		DK 1587979 T3	27-12-2007
		EP 1587979 A1	26-10-2005
		ES 2293205 T3	16-03-2008
		FR 2849869 A1	16-07-2004
		JP 4855922 B2	18-01-2012
		JP 2006517263 A	20-07-2006
		PT 1587979 E	20-11-2007
		RU 2331724 C2	20-08-2008
		US 2007000107 A1	04-01-2007
		WO 2004063451 A1	29-07-2004
EP 0964093 A1	15-12-1999	AT 368762 T	15-08-2007
		DE 69936684 T2	30-04-2008
		EP 0964093 A1	15-12-1999
		FI 981366 A	13-12-1999
US 2001005926 A1	05-07-2001	AT 225876 T	15-10-2002
		AU 4517599 A	28-02-2000
		CN 1311832 A	05-09-2001
		DE 69903462 D1	14-11-2002
		DE 69903462 T2	20-03-2003
		DK 1117860 T3	04-11-2002
		EP 1117860 A1	25-07-2001
		ES 2183572 T3	16-03-2003
		FR 2781818 A1	04-02-2000
		JP 2002522655 A	23-07-2002
		US 2001005926 A1	05-07-2001
		WO 0008245 A1	17-02-2000
EP 1195459 A1	10-04-2002	AU 779226 B2	13-01-2005
		AU 6251000 A	12-04-2001
		CN 1296094 A	23-05-2001
		EP 1195459 A1	10-04-2002
		KR 20010067289 A	12-07-2001
		US 6893522 B1	17-05-2005
		US 2005170728 A1	04-08-2005
WO 0166345 A1	13-09-2001	AU 4542101 A	17-09-2001
		WO 0166345 A1	13-09-2001
US 2004087237 A1	06-05-2004	AU 2003249176 A1	03-06-2004
		BR 0315602 A	23-08-2005
		EP 1558814 A1	03-08-2005

EPO FORM P0459

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

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

EP 13 00 3474

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.

29-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
		KR 20050072447 A	11-07-2005	
		MX PA05004174 A	08-06-2005	
		US 2004087237 A1	06-05-2004	
		WO 2004044328 A1	27-05-2004	

WO 9802608	A1	22-01-1998	AU 6457496 A	09-02-1998
			WO 9802608 A1	22-01-1998

WO 0018996	A1	06-04-2000	AR 021487 A1	24-07-2002
			AT 458845 T	15-03-2010
			AU 760428 B2	15-05-2003
			AU 6253199 A	17-04-2000
			CA 2344831 A1	06-04-2000
			CO 5140135 A1	22-03-2002
			EG 22044 A	30-06-2002
			EP 1131480 A1	12-09-2001
			JP 4378468 B2	09-12-2009
			JP 2002525450 A	13-08-2002
			PA 8482801 A1	29-09-2000
			PE 12042000 A1	06-11-2000
			SV 1999000139 A	05-09-2000
			US 6177370 B1	23-01-2001
			US 6550115 B1	22-04-2003
			WO 0018996 A1	06-04-2000

WO 2011053946	A1	05-05-2011	AU 2010313160 A1	24-05-2012
			CA 2779098 A1	05-05-2011
			EP 2496768 A1	12-09-2012
			US 2011104970 A1	05-05-2011
			WO 2011053946 A1	05-05-2011

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- TW 182129 [0005]