



- (51) International Patent Classification:
C11D 3/00 (2006.01) *C11D 17/04* (2006.01)
- (21) International Application Number:
PCT/EP2017/050080
- (22) International Filing Date:
3 January 2017 (03.01.2017)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
10 2016 200 169.8
8 January 2016 (08.01.2016) DE
- (71) Applicant: HENKEL AG & CO. KGAA [DE/DE]; Henkelstr. 67, 40589 Düsseldorf (DE).
- (72) Inventors: MCNAMEE, Patrick; 7 Kiltegan Lawn, Rochestown, Cork, Country (IE). SCHMITZ, Kerstin; Jahnstr. 107, 40215 Düsseldorf (DE). GUILMET, Erwan; North link road, Cork (IE).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

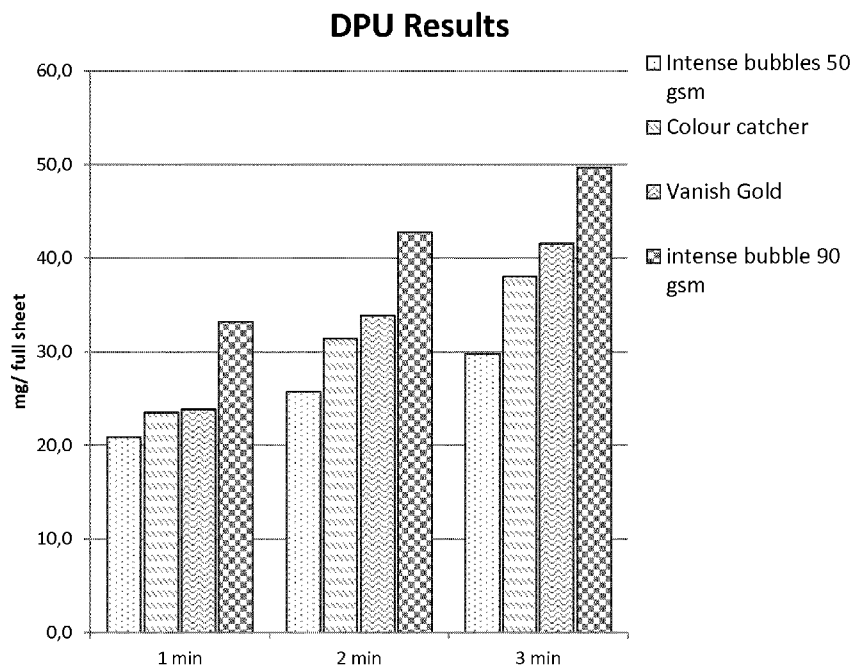
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

- (54) Title: DYE CATCHING LAUNDRY SHEET

Fig. 1



- (57) Abstract: The present application discloses dye catching laundry sheet with improved performance compared with other sheets.

Dye catching laundry sheet

The present application discloses dye catching laundry sheet with improved performance compared with other sheets.

Every day textiles are often coloured to comply with consumer's requirements. Clothing, towels and also bed linen are often of intense colour. When doing laundry, usually white and light coloured textiles are separated from dark, intensively coloured textiles. But mixed washes are increasing, as this is popular for environmental reasons. Bigger loads are possible and the numbers of wash cycles can be reduced. These mixed washes with different colours increases the risk of discolouring textiles. More dye is liberated in mixed washes. Thus, detached colour is in the wash liquor which might cause dye run accidents, meaning that dyes leaching from one fabric can discolour other fabrics present in the same wash liquor.

Laundry aids are known in the prior art which are designed to capture the dyes in the wash liquor and thus preventing them to discolour the fabrics and textiles being present in the wash liquor.

For example US 6,117,191 A discloses a method for the production of a dye scavenging substrate in which a cellulosic substrate is coated with an alkaline solution of an N-trisubstituted ammonium 2-hydroxy-3-halopropyl compound. Even though such substrate is able of catching dyes from a wash liquor, there is still a high amount of remaining dye left in the wash liquor if sheets known from the prior art are used for catching dyes. Thus, there is a need for better performing sheets which are able to catch higher amounts of colour from washing liquors.

At the same time, the laundry sheets should be flexible so that they can be added to textiles to be washed without affecting material of the textiles; especially fashion textiles are often made of microfibers or other synthetic materials which might be damaged by stiff material for laundry aids. Further, high water permeability of the sheet should be obtained so that the coloured wash liquor can penetrate the sheet so that the dyes can effectively be removed from the liquor. A two stage application process such as disclosed in US 2003/0118730 A leads to a product with high stiffness and low permeability so that there will be a low acceptance of the consumer. It is thus an object of the present application to avoid or at least reduce the drawbacks of the prior art and to provide a laundry sheet which can bind larger amounts of colours in shorter time compared to known sheets. During a common washing cycle in a washing machine substantially all free colour released from textiles should be caught from the washing liquor by such a sheet. At the same time the sheet should have a soft haptic and a look and feel being attractive for the consumer.

Surprisingly it has been found that a better performance of a dye catching laundry sheet with the same sheets size can be obtained by an increased density of the sheet. Thus, in a first aspect, the present application refers to a dye catching laundry sheet with a density of from 80 g/m² to 180 g/m², preferably from 85 g/m² to 150 g/m² or to 130 g/m², especially preferred from 90 g/m² to 120 g/m². The density is determined according to ISO 9073-1. The laundry sheet of the present application comprises a carrier and a coating. Preferably it consists of a carrier and a coating. The density of the sheet corresponds to the density of the carrier. Surprisingly it has been found that respective sheets have an improved performance compared with commercially available sheets. They can bind larger amounts of dyes from washing liquor in shorter times compared with known dye catching laundry sheets. Thus, the amount of dye absorbed over a certain time from the washing liquor is increased by the sheets of the present invention. At the same time, they are stronger and more robust than known sheets and thus, suitable for all washing machine types including the more aggressive top loader with spindles. With the dye catching laundry sheet of the present application also the production is improved as there were reduced line breaks during production.

At the same time, the sheets according to the present application are still flexible and water permeable, so that the consumer will accept them and also add them to delicate textile fabrics such as fabrics from microfibers or others.

The amount of dye to be caught by the sheets of the present application is preferably in the range of from 0.15 mg/cm² to 0.30 mg/cm², preferably from 0.19 mg/cm² to 0.25 mg/cm² especially preferred from 0.20 mg/cm² to 0.23 mg/cm².

This amount is the dye pick up (DPU) value. Surprisingly it has been found that sheets of the present application with a high density enable high DPU values. The value is here the amount of colour in mg which is caught by 1 cm² of the sheet. It is thus a value in mg colour per cm² sheet (mg/cm² sheet).

To determine the DPU value of the colour catching laundry sheets the following procedure is used. A solution of a Direct Red Dye is prepared (Direct Fast Red F3B (from Sun Colour Industries, China) is diluted in water to receive a dye solution with a concentration of 0.75 g dye/L water at 40 °C). The coated colour catcher laundry sheets are placed in 750 g of the above mentioned solution under agitation. After 3 minutes samples were removed, dried at room temperature and the colour thereof measured with a Hach spectrophotometer at a wavelength of 540 nm.

Using a standard calibration curve correlating the absorbance at 540 nm to the concentration of dye in solution (Beer-Lambert Law $c = A/[\epsilon \times l]$; where c = dye concentration, A = absorbance, ϵ =

molar absorption coefficient, and l = optical path length), the absorbance obtained experimentally is converted into the dye concentration in solution (mg/L). The Dye pick-up (DPU) value is the difference between the concentration of dye measured before and after the immersion of the sample sheet in the solution. The DPU is considered as the amount of dye removed from the solution and adsorbed by the sample sheet and is expressed in mg of dye per cm² of the sample sheet. The DPU values are reported as the average value obtained by the testing of three separate sheets.

The laundry sheet of the present application comprises a coated carrier, which is water-insoluble. The carrier can be a woven, knitted or non-woven material and is preferably provided in form of a sheet. The carrier provides free hydroxyl-groups at its surface. It can also be of mixtures of different materials. Preferably the carrier is a non-woven. The carrier comprises preferably cellulosic and/or synthetic fibers. Also a blend of viscose and cotton might be used. The fibers might be used alone, e.g. only cellulosic fibers, or as mixtures, such as mixtures of cellulosic and synthetic fibers or cotton and viscose and synthetic fibers.

The carrier is coated with a suitable coating. Said coating is bound to the free hydroxyl-groups of the carrier. The coating itself results in a cationic surface of the dye catching laundry sheet. Preferably the coating comprises or consists of polyamines, especially the coating is GMAC (glycidyl trimethyl ammonium chloride). Surprisingly it has been found that with GMAC the best results in view of the amount of colour bind per time can be achieved. Thus, the dye catching laundry sheet has an overall positive charge in an aqueous medium, especially at pH values of from 6 to 11 and preferably of from 7 to 9, which are the common pH values in washing liquor during cleaning of textiles.

The dye catching laundry sheet of the present application might comprise besides the dye scavenging material further auxiliary agents. Suitable auxiliary agents can e.g., be one or more selected from perfumes, antistatic agents, optical brighteners, detergency boosters, UV-protectors, and anti-redeposit agents. Perfumes are especially preferred as they may increase the consumers acceptance.

Without bound to theory, dyes leaching from fabrics are usually direct dyes. These direct dyes usually are of anionic character. Thus, if those direct dyes come into contact with the dye catching laundry sheet of the present application, they react with the cationic nature of the coating so that the dyes preferably bind to the dye catching laundry sheet instead of other textiles being present in the washing liquor.

The laundry sheet of the present invention preferably has a carrier with an absorption capacity of 2.5 g to 7 g per 277.5 cm² within an absorption time of 1.5 s to 5 s (seconds), preferably it has an absorption capacity of 2.5 g to 6 g per 277.5 cm² within an absorption time of 2 s to 4.5 s. The values refer to a sheet size of 277.5 cm², corresponding to a sheet with a size of 250 mm to 111 mm.

Whereas DPU is a parameter to show the performance of the inventive laundry sheet, the absorption capacity is a process parameter relevant for the production of the sheet. To determine the absorption capacity, an aqueous solution (7.1 %) of a standard cationic compound, GMAC, is prepared and a sheet is put inside said solution. The amount of said aqueous solution absorbed by the sheet within a certain time range at room temperature is determined. Thus, the absorption capacity defines, that a sheet according to the present invention with a sheet size of 277.5 cm² can absorb an amount of 2.5 to 7 grams of a standard cationic compound solution within a time range of 1.5 to 5 seconds and preferably 2.5 g to 6 g solution within 2 s to 4.5 s.

The laundry sheet of the present application is strong and robust to be suitable for all washing machine types. Strength and robustness might be defined by the tensile strength. Tensile strength refers to the resilience of the sheet against ripping. For direction of tensile strength it has to be distinguished between machine direction (MD) and cross direction (CD). When the laundry sheet is produced, the lengthwise direction (direction of production) is the machine direction. The direction rectangular thereto is the cross direction. Relevant is of course also the tensile strength in respect of moisture. Thus, the sheets should be robust and stable if wet – which means a sheet that is immersed for 10 seconds in water – as well as if dry – which means a sheet as can be obtained by a supplier.

Thus, the laundry sheet of the present application has preferably a tensile strength of from 500 N/m to 2100 N/m in machine direction and/or of from 450 N/m to 1300 N/m in cross direction if wet. In a first embodiment the laundry sheet preferably has a tensile strength of from 1600 N/m to 2100 N/m, more preferably from 1720 N/m to 1960 N/m in machine direction and/or of from 800 N/m to 1300 N/m, more preferably from 1000 N/m to 1150 N/m in cross direction if wet. In a second embodiment the laundry sheet preferably has a tensile strength of from 500 N/m to 950 N/m, more preferably from 600 N/m to 850 N/m in machine direction, and/or of 450 N/m to 900 N/m, more preferably from 550 N/m to 700 N/m in cross direction if wet.

In a dry state, the inventive laundry sheet has a tensile strength of from 2000 N/m to 4000 N/m in machine direction and/or of from 900 N/m to 3500 N/m in cross direction. In a first embodiment the laundry sheet preferably has a tensile strength of from 2000 N/m to 3000 N/m, more preferably from 2300 N/m to 2700 N/m in machine direction and/or of from 900 N/m to 2400 N/m, more

preferably from 1350 N/m to 1850 N/m in cross direction if dry. In a second embodiment the laundry sheet preferably has a tensile strength of from 2950 N/m to 4000 N/m, more preferably from 3100 N/m to 3500 N/m in machine direction, and/or from 2000 N/m to 3500 N/m, more preferably from 2500 N/m to 3000 N/m in cross direction if dry.

It has been found that respective tensile strengths enable stable and robust products which are at the same time flexible and permeable to washing liquor. At the same time, the tactile is good so that consumers' requirements are also fulfilled here.

All values for tensile strength, wet and dry, as well as cross direction and machine direction, have been and can be determined using a standard testing machine from Zwick GmbH, Ulm, Germany. The tensile strength according to the present invention is determined according to ISO 9073-3.

With respect to the look and feel of the sheet, the thickness of the sheet is preferably from 0.62 mm to 1.5 mm, preferably from 1.0 mm to 1.2 mm. The thickness is especially relevant for the question of permeability. Thicker sheets might not be permeable to washing liquor. Thinner sheets might not be robust enough; especially in aggressive top loaders with spindles they might be destroyed. This would not lead to a reduced efficacy of the dye catching laundry sheet but in reduced approval by the consumer.

Due to the high DPU value, dye catching laundry sheets of the present invention might be used not only once but several times as long as there is still some colour binding capacity of the sheet left.

Experiments:

Commercially available laundry sheets were cut into half. Afterwards, the sheets had the following sizes:

Vanish Gold (75 gsm):	100 mm*150 mm (150 cm ²) (prior art)
Colour Catcher (60 gsm):	125 mm*111 mm (138.75 cm ²) (prior art)
Intense Bubble (50 gsm):	122.5 mm*130 mm (159.25 cm ²) (prior art)

A sheet according to the present application was produced and also cut into half to have approximately the same size as the prior art sheets:

Intense Bubble (90 gsm):	122.5 mm*130 mm (159.25 cm ²) (according to the present invention)
--------------------------	--

GSM is the density of the sheet in g/m² (gram per squaremeter).

The density of the sheet increases due to coating with GMAC, corresponding data is reported in the following table:

Laundry sheet	Density of the uncoated carrier	Density of the finalized laundry sheet
Vanish Gold	75 gsm	78 gsm
Colour Catcher	60 gsm	63 gsm
Intense Bubble	50 gsm	53 gsm
Intense Bubble (according to the present invention)	90 gsm	94 gsm

A solution of a Direct Red Dye was prepared (Direct Fast Red F3B (from Sun Colour Industries, China) was diluted in water to receive a dye solution with a concentration of 0.75 g dye/L water at 40 °C). The coated colour catcher laundry sheets were placed in 750 g of the above mentioned solution under agitation. After 1, 2, and 3 minutes respectively, samples were removed, dried at room temperature and the colour thereof measured with a Hach spectrophotometer at a wavelength of 540 nm.

The results are shown in Fig. 1.

Using a standard calibration curve correlating the absorbance at 540 nm to the concentration of dye in solution (Beer-Lambert Law $c = A/[\epsilon \times l]$; where c = dye concentration, A = absorbance, ϵ =

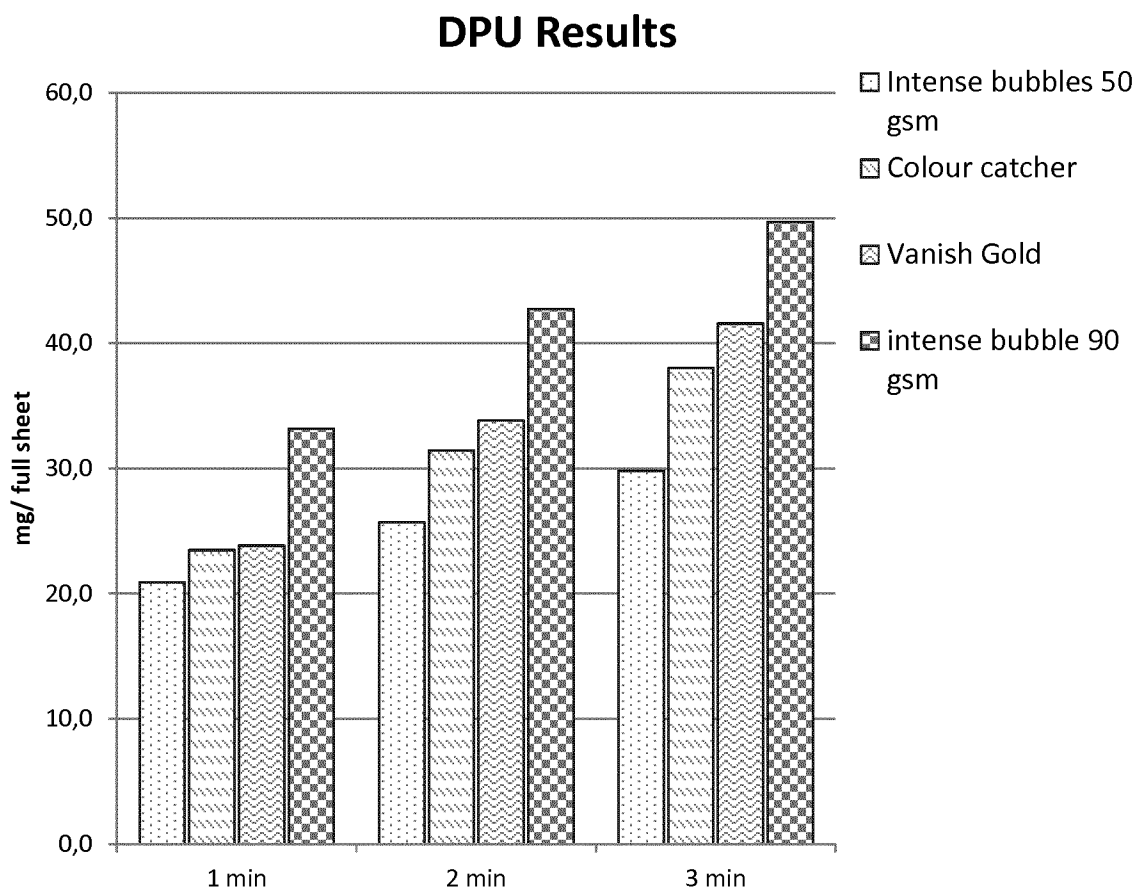
molar absorption coefficient, and l = optical path length), the absorbance obtained experimentally was converted into the dye concentration in solution (mg/L). The Dye pick-up (DPU) value is the difference between the concentration of dye measured before and after the immersion of the sample sheet in the solution. The DPU is considered as the amount of dye removed from the solution and adsorbed by the sample sheet and is expressed in mg of dye per cm^2 of the sample sheet. The DPU values are reported as the average value obtained by the testing of three separate sheets.

Claims

1. Dye catching laundry sheet comprising a carrier and a coating, wherein the sheet has a density of from 80 g/m² to 180 g/m².
2. Laundry sheet according to claim 1, wherein the density is within a range of from 85 g/cm² to 150 g/m², especially of from 85 g/m² to 130 g/m², preferably of from 90 g/m² to 120 g/m².
3. Laundry sheet according to claim 1 or 2, wherein the amount of dye to be caught by the sheet is within the range of from 0.15 mg/cm² to 0.30 mg/cm², preferably from 0.20 mg/cm² to 0.23 mg/cm².
4. Laundry sheet according to any of claims 1 to 3 with a carrier having an absorption capacity of 2.5 g to 7 g per 277.5 cm² within an absorption time of 1.5 s to 5 s, preferably with an absorption capacity of 2.5 g to 6 g per 277.5 cm² within an absorption time of 2 s to 4.5 s.
5. Laundry sheet according to any of claims 1 to 4, if wet, with a tensile strength of from 500 N/m to 2100 N/m in machine direction (MD) and/or of from 450 N/m to 1300 N/m in cross direction (CD).
6. Laundry sheet according to any of claims 1 to 5, if wet, with a tensile strength of from 1600 N/m to 2100 N/m, preferably from 1720 N/m to 1960 N/m in machine direction (MD) and/or of from 800 N/m to 1300 N/m, preferably from 1000 N/m to 1150 N/m in cross direction (CD).
7. Laundry sheet according to any of claims 1 to 6, if dry, has a tensile strength of from 2000 N/m to 4000 N/m in machine direction (MD) and/or of from 900 N/m to 3500 N/m in cross direction (CD).
8. Laundry sheet according to any of claims 1 to 7, if dry, has a tensile strength of from 2000 N/m to 3000 N/m, preferably from 2300 N/m to 2700 N/m in machine direction (MD) and/or of from 900 N/m to 2400 N/m, preferably from 1350 N/m to 1850 N/m in cross direction (CD).
9. Laundry sheet according to any of claims 1 to 8, wherein the thickness of the sheet is of from 0.62 mm to 1.5 mm, preferably from 1.0 mm to 1.2 mm.

Figures

Fig. 1



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/050080

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D3/00 C11D17/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/088149 A1 (LAMBERTI SPA [IT]; LUONI MARCO [IT]; LI BASSI GIUSEPPE [IT]) 9 August 2007 (2007-08-09) examples 3, 5 paragraphs [0018] - [0019], [0037], [0047], [0052], [0074] - [0080] -----	1-9
X	US 2002/119721 A1 (PANANDIKER RAJAN KESHAV [US] ET AL) 29 August 2002 (2002-08-29) examples 1-4 paragraphs [0017], [0060], [0063], [0065] - [0078] -----	1-9
X	EP 2 835 419 A1 (AHLSTROEM OY [FI]) 11 February 2015 (2015-02-11) examples 6, 7; tables 6, 7 paragraphs [0091] - [0094], [0120] - [0124] -----	1,3-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

22 March 2017

Date of mailing of the international search report

30/03/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Agra-Gutierrez, C

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/050080

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2007088149	A1	09-08-2007	EP 1979530 A1	15-10-2008
			US 2009137170 A1	28-05-2009
			WO 2007088149 A1	09-08-2007

US 2002119721	A1	29-08-2002	AT 452962 T	15-01-2010
			AU 1463902 A	22-04-2002
			CA 2420453 A1	18-04-2002
			EP 1325106 A2	09-07-2003
			ES 2338634 T3	11-05-2010
			JP 2004518829 A	24-06-2004
			US 2002119721 A1	29-08-2002
			US 2006019564 A1	26-01-2006
			WO 0231246 A2	18-04-2002

EP 2835419	A1	11-02-2015	CA 2920076 A1	12-02-2015
			EP 2835419 A1	11-02-2015
			KR 20160042999 A	20-04-2016
			US 2016186097 A1	30-06-2016
			WO 2015018981 A1	12-02-2015
