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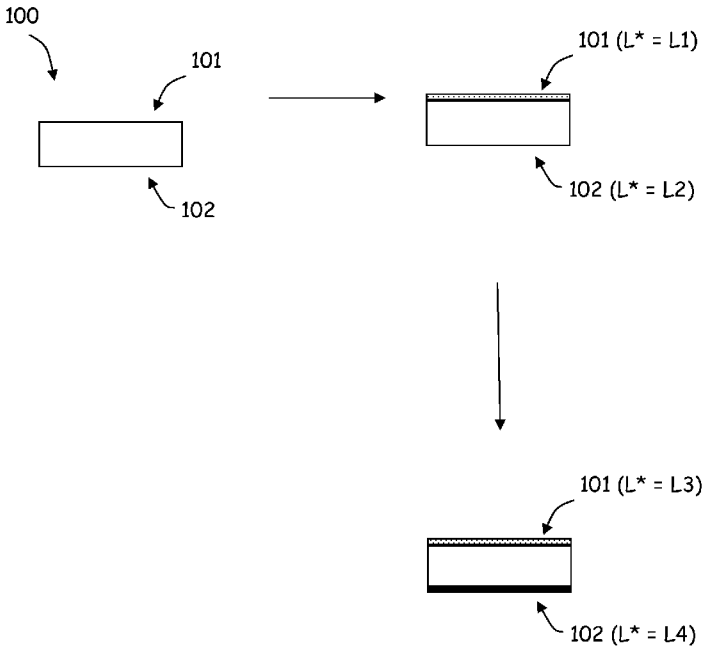
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[Continued on next page]

(54) Title: COLORED PAPER WITH CONTROLLED TINT PENETRATION

FIGURE 1



(57) Abstract: A premium colored paper having high contrast suitable for high-end packaging applications is produced through a controlled penetration of a coloring formulation through the paper. The paper is coated on a first side with a first coloring formulation. Then, a second coloring formulation is applied to a second side (i.e. opposite side) of the paper such that the coloring agent in the second coloring formulation penetrates through the paper sheet but does not significantly interfere with the color or brightness of the first coated side of paper. When desired, the first coloring formulation may be applied on the paper online during papermaking process.

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International Patent Application For

COLORED PAPER WITH CONTROLLED TINT PENETRATION

This non-provisional application relies on the filing date of provisional U.S. Application Serial No. 61/029,610 filed on February 19, 2008, which is incorporated herein by reference, having been filed within twelve (12) months thereof, and priority thereto is claimed under 35 USC § 1.19(e).

BACKGROUND OF THE DISCLOSURE

[0001] Paper or paperboard used in high-end packaging applications, such as cigarette or beauty product packaging, commonly have high contrasts between two sides of the sheets. A contrast may be with black or dark color at one side of the sheet and white or a significantly lighter color on the opposite side. For example, this premium colored paper is produced by laminating on one side of the black colored paper with metallic foil.

[0002] Colored paper is commonly prepared by adding coloring agents, such as dyes and pigments, into paper pulps in the wet-end of papermaking process prior to a formation of paper sheet. This process of preparing colored paper has many drawbacks. Coloring pigments are generally water-insoluble; therefore, alum and/or retention aids are required to retain the pigments in the sheet. Furthermore, poor adhesion of the coloring pigments on paper pulps results in inferior color fastness performance. To address this adhesion drawback, U.S. Patent No. 5,131,981 discloses a process for wet-end coloring paper with coloring pigments and color-fixing agents, wherein the pigment and color-fixing agent are added simultaneously to the paper pulps to be colored. Cationic compounds are used a color-fixing agents to enhance the adhesion of coloring pigments onto the paper pulps. Adding coloring dyes into paper pulps causes coloration of the process water, creating environmental and other process difficulties. The coloration is throughout the thickness of paper; therefore, a high level of coloring agents is needed. This is even if color is only required at the surface of the paper, leading to an unnecessary cost. A large amount of paper is produced for each

papermaking process run. A minimum amount the paper mill generated from each run is much greater than the typical demand for high-end colored paper. As a result, the paper converter is burdened with a large inventory of unused colored paper, or the paper mill will not produce colored paper until the demand for minimum amount for each run is met.

[0003] Colored paper may be produced by applying coloring formulation onto the surface of paper after the paper is formed. As stated in PCT Publication No. WO 2007/128077, this process provides colored paper with quality suitable for packaging applications, but unfortunately, suffers severely from its high cost. For the premium paper used in high-end packaging applications that requires high contrast between each side of the paper, this process presents further drawback. When the coloring formulation is applied onto the paper surface, coloring agents penetrate into the interior of paper and can interfere with the color on the opposite side of the paper. This drawback is particularly severe when white or lighter color is applied to the paper first, followed by black or dark color on the opposite side. The black or dark coloring agents may penetrate into paper and reduce the brightness on the opposite side being coated with white or lighter coloring agent. As a result, the premium colored paper for high-end packaging applications is typically produced by (a) dying the paper pulps in the wet end of the papermaking process with black or darker coloring pigment, (b) forming colored paper sheet for the dyed paper pulps, (c) rolling the resulting colored paper sheet off the papermaking process, (d) transferring and (e) rewinding the colored sheet for a foil lamination process or an off-line coating with white or lighter coloring formulation. This state of arts process is labor- and time-consuming, complicated, and high cost.

[0004] Accordingly, there is still a need for a production process of premium colored paper having high contrast for high-end packaging applications, that is relatively simpler, lower cost, as well as less time- and labor-consuming, compared to the current state of art process.

[0005] It is also beneficial to have a process of producing premium colored paper having high contrast by applying the coloring formulation onto the formed paper, wherein the penetration of the coloring agents in the formulation may be tailored to achieve a minimum

interference with the brightness of the white or lighter-colored coating on the opposite side of colored paper.

SUMMARY OF THE DISCLOSURE

[0006] A premium colored paper having high contrast suitable for high-end packaging applications is produced through a controlled penetration of a coloring formulation through the paper. The paper is coated on a first side with a first coloring formulation. Then, a second coloring formulation is applied to a second side (i.e. opposite side) of the paper such that the coloring agent in the second coloring formulation penetrates through the paper sheet but does not significantly interfere with the color or brightness on the first coated side of paper. When desired, the first coloring formulation may be applied on the paper on-line during papermaking process.

BRIEF DESCRIPTION OF THE DRAWING

[0007] FIG. 1 shows one embodiment of the disclosed method of producing a premium colored paper having high contrast for high-end packaging applications.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0008] The present disclosures now will be described more fully hereinafter, but not all embodiments of the disclosure are necessarily shown. While the disclosure has been described with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the disclosure. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the disclosure without departing from the essential scope thereof.

[0009] The disclosed method of producing a colored paper-based product comprises steps of:

(a) providing a paper-based substrate having a first side and a second side;

(b) coating the first side of the substrate with a first coloring formulation to afford a whiteness L^* value of L1; and

(c) coating the second side of the substrate having a whiteness L^* value of L2 with a second coloring formulation to provide the colored paper-based product characterized by a whiteness L^* value of the coated first side of L3 and a whiteness L^* value of the coated second side of L4,

wherein L1 is no more than 8 points higher than L3 and L2 is at least 30 points higher than L4, and the whiteness L^* value is determined using CIE $L^*a^*b^*$ color specification having D65 Illuminant lamp and at 10 degree observer.

[0010] FIG. 1 shows one embodiment of the disclosed method of producing a premium colored paper having high contrast suitable for high-end packaging applications. A paper-based substrate 100 having a 101 and a second side 102. A first coloring formulation is applied onto the 101 side of the paper, resulting in a whiteness L^* value of L1 for the coated 101 side. The uncoated second side 102 has a whiteness L^* value of L2. The second coloring formulation is subsequently applied onto the 102 side of the substrate, giving a double-side color-coated paper sheet characterized by whiteness L^* values of the coated 101 and 102 side of L3 and L4, respectively. The resulting premium colored paper has L1 more than 8 points higher than L3 and L2 at least 30 points higher than L4, wherein the whiteness L^* value is determined using CIE $L^*a^*b^*$ color specification having D65 Illuminant lamp and at 10 degree observer.

[0011] In one embodiment of the present disclosure, the second coloring agent in the second coloring formulation penetrates into the treated paper in a controlled manner such that a gradual decrease of the second color intensity from the second coated side to the first coated side may be achieved.

[0012] Additionally, the penetration of the second coloring agent in the second coloring formulation may be controlled such that the treated paper is colored throughout its thickness or only partially with the second coloring agent. When desired, the second coloring agent may color from about 10% to about 100% of the thickness of the treated paper.

[0013] In one embodiment of the present disclosure, the paper-based substrate is first coated on the first side with a white or light-coloring formulation. Then, a black or dark-coloring formulation is applied to a second side (i.e. opposite side) of the paper such that the

coloring agent in the black or dark-coloring formulation penetrates through the paper sheet but does not significantly interfere with the color or brightness of the first coated side of paper.

[0014] In one embodiment of the present disclosure, the colored paper having the first side coated with the white or light-coloring formulation may be produced on-line during papermaking process.

[0015] In one embodiment of the present disclosure, the white or light-coloring formulation is a clay-based coating, such as that commonly used in the papermaking industry.

[0016] In one embodiment of the present disclosure, the paper-based substrate is coated on the first side with a clay coating formulation on-line during the papermaking process to provide one-side clay coated paper. A black or dark-coloring formulation is then applied to an uncoated side of the resulting one-side clay coated paper.

[0017] In one embodiment of the present disclosure, the second coloring formulation comprises a coloring agent and a surfactant in such a proportion that the coloring agent may controllably penetrate through the paper sheet without a significant interference with the color or brightness on the other side of the paper. Here, the surfactant is a critical component in controlling the penetration of the coloring agent in the second coloring formulation into the paper sheet. The ratio of the coloring agent and the surfactant in the second coloring formulation may be optimized to affect minimum interference with the color or brightness on the other side of the paper. This ratio may be dependent on many factors, such as the thickness of the paper-based substrate, the applied colors, the type of fiber pulps used in the paper-based substrate, and the particularly type of end-use packaging applications. Therefore, there is a range of the ratio of the coloring agent and the surfactant in the operable, second coloring formulations.

[0018] In one embodiment of the present disclosure, the second coloring formulation comprises, based on weight of the formulation:

(a) from about 1% to about 10% by weight of a coloring agent; and

(b) from about 1% to about 5% by weight of a surfactant.

[0019] In one embodiment of the present disclosure, the second coloring formulation comprises, based on weight of the formulation:

(a) from about 1% to about 10% by weight of a coloring agent; and

(b) from about 0.1% to about 3% by weight of a surfactant.

[0020] Surfactants suitable for the present disclosure may be anionic, cationic, nonionic, amphoteric surfactants, and combinations thereof. Examples of the surfactants include, but are not limited to, polyalkylene glycol, polypropylene oxide/polyethylene oxide copolymers, fatty acid, and fatty derivative-based surfactants.

[0021] In one embodiment of the present disclosure, the coloring formulation comprises a coloring agent and a surfactant, and excludes a binder. Without any intent to adhere to any theory, it seems that the binder inhibits the penetration of the coloring agent into the paper interior.

[0022] The coloring formulations may be applied onto the paper-based substrate by any known application methods. These include, but are not limited to, size press application, brushing, spraying, roll coating, rod-coatings, dipping, spreading, air knife coating, curtain coating, and combinations thereof.

EXPERIMENTS

[0023] Bleach paperboard was used as a paper-based substrate. A clay coating formulation was applied to one side of the paperboard. The resulting clay-coated paperboard is then divided into two groups. The first group is retained as control. For the second group of the clay-coated paperboard, a black coloring formulation containing about 2% weight of surfactant and about 5% weight of black coloring agent was coated onto the uncoated side to afford two-side colored coated paperboard. The caliper, color and shade, and surface smoothness were tested for the disclosed two-side colored coated paperboard and for the control clay-coated paperboard.

[0024] The caliper or thickness of the paperboard was measured according to the test standard TAPPI T 411. Two types were used to determine the surface smoothness of the paperboard: the Parker Print Surf (PPS) test according the test standard TAPPI 555 and the Sheffield test according the test standard TAPPI 538.

[0025] The color and shade of the paperboard were determined for each side of the tested paperboard using the CIE $L^*a^*b^*$ color specification. The L^* value represents whiteness or the total amount of light reflected off the paper's surface, wherein $L^* = 0$ yields black and $L^* = 100$ indicates diffuse white. The a^* value represents the green- red/magenta color axis, wherein a^* of negative values indicate green while positive values indicate magenta. The b^* value represent the blue-yellow color axis, wherein b^* of negative values indicate blue and positive values indicate yellow. The CIE $L^*a^*b^*$ color of the paperboard was tested at 10 degree Observer and the D65 Illuminant was used as a lamp source. Each side of each paperboard were tested three times for color measurment to obtain average L^*, a^*, and b^* values.

[0026] The properties of the control paperboard were showed in TABLE 1, and those of disclosed two-side colored coated paperboard were shown in TABLE 2. The CIE $L^*a^*b^*$ color of the clay-coated side of the control paperboard was compared to that of the clay-coated side of the disclosed paperboard. The CIE $L^*a^*b^*$ color of the uncoated side of the control paperboard was compared to the side of the disclosed paperboard coated with the black coloring formulation.

[0027] When the uncoated side of the paperboard was coated with the black coloring formulation, the L^*, a^*, and b^* values reduced significantly confirming a substantial change in the shade and color. The whiteness L^* value for the side of the disclosed paperboard coated with the black coloring formulation (L4) was 66 point lower than the whiteness L^* value of the uncoated side of the control clay-coated paperboard (L3). On the other hand, the whiteness L^* values of the clay-coated side of disclosed paperboard (L2) was about the same as that of the clay-coated side of the control paperboard (L1). This indicates that the black coloring formulation penetrates into the internal of the paperboard to a certain level, but not through the paperboard. If the black coloring formulation had penetrated through the

paperboard to the opposite clay-coated side, the whiteness L4 would reduce significantly.

TABLE 1

Caliper (points)	PPS Smoothness	Sheffield Smoothness	White Coated Side			Uncoated Side		
			L (L1)*	*a**	*b**	*L*(L3)*	*a**	*b**
13.2	1.8	24	94.683	-1.130	2.836	93.623	-1.572	2.237
			94.670	-1.177	2.796	93.654	-1.559	2.210
			94.683	-1.160	2.782	93.690	-1.568	2.212
			94.679	-1.156	2.805	93.656	-1.566	2. 220

TABLE 2

Caliper	PPS Smoothness	Sheffield Smoothness	White Coated Side			The Side Coated with the Disclosed Coloring Formulation		
			L (L2)*	*a**	*b**	*L* (L4)*	*a**	*b**
13.9	1.9	66	92.784	-1.079	2.924	27.364	0.014	-0.886
			93.005	-1.048	2.493	27.323	-0.017	-0.903
			93.326	-0.989	3.043	27.540	-0.002	-0.857
			93.038	-1.039	2.820	27.409	-0.002	-0.882

[0028] TABLEs 1 and 2 show a control diffusion of the black coloring agent into the paperboard with minimum interferece with the shade or color on the clay-coated side.

[0029] In the aforementioned example, the disclosed colored paperboard has a clay-coating on one side and a black color coating on the opposite. It is to be understood, however, that this example is merely one embodiment and not to limit the scopes of the present disclosure.

[0030] While the invention has been described by reference to various specific embodiments, it should be understood that numerous changes may be made within the spirit and scope of the inventive concepts described. It is intended that the invention not be limited to the described embodiments, but will have full scope defined by the language of the following claims.

We claim:

1. A method of producing a colored paper-based product, comprising steps of:
   (a) providing a paper-based substrate having a first side and a second side;
   (b) coating the first side of the substrate with a first coloring formulation to afford a whiteness L^* value of L1; and
   (c) coating the second side of the substrate having a whiteness L^* value of L2 with a second coloring formulation to provide the colored paper-based product characterized by a whiteness L^* value of the coated first side of L3 and a whiteness L^* value of the coated second side of L4,

   wherein L1 is no more than 8 points higher than L3 and L2 is at least 30 points higher than L4, and the whiteness L^* value is determined using CIE $L^*a^*b^*$ color specification having D65 Illuminant lamp and at 10 degree observer.

2. The method of Claim 1, wherein L1 is no more than 5 points higher than the L3.

3. The method of Claim 1, wherein L1 is no more than 3 points higher than the L3.

4. The method of Claim 1, wherein L2 is at least 40 points higher than L4.

5. The method of Claim 1, wherein L2 is at least 50 points higher than L4.

6. The method of Claim 1, wherein L1 is no more than 3 points higher than the L3 and L2 is at least 50 points higher than L4.

7. The method of Claim 1, wherein the second coloring formulation comprises a second coloring agent, and a color intensity of the second coloring agent in the colored paper-based product decreases gradually from the second coated side to the first coated side.

8. The method of Claim 1, wherein the second coloring formulation comprises a coloring agent that colors from about 10% to about 100% of a thickness of the colored paper-based product.

9. The method of Claim 1, wherein the first coloring formulation includes a clay-based coating.

10. The method of Claim 1, wherein the first coloring formulation is applied onto the substrate during a papermaking process.

11. The method of Claim 1, wherein the second coloring formulation comprises, based on the formulation weight:

(11.a) from about 1% to about 10% by weight of a coloring agent; and

(11.b) from about 1% to about 5% by weight of a surfactant.

12. The method of Claim 11, wherein the second coloring formulation comprises, based on the formulation weight:

(12.a) from about 1% to about 10% by weight of the coloring component, and

(12.b) from about 0.1% to about 3% by weight of the surfactant.

13. The method of Claim 11, wherein the second coloring formulation is absence of a binder.

14. A colored paper-based product obtained from a process comprising steps of:

(a) providing a paper-based substrate having a first side and a second side;

(b) coating the first side of the substrate with a first coloring formulation to afford a whiteness L^* value of L1; and

(c) coating the second side of the substrate having a whiteness L^* value of L2 with a second coloring formulation,

wherein

(i) the coated first side of the product has a whiteness L^* value of L3 and the coated second side has a whiteness L^* value of L4,

(ii) L1 is no more than 8 points higher than L3 and L2 is at least 30 points higher than L4, and the whiteness L values are determined by CIE $L^*a^*b^*$ color specification having D65 Illuminant lamp and at 10 degree observer.

15. The product of Claim 14, characterized by L1 of no more than 5 points higher than the L3.

16. The product of Claim 14, characterized by L2 of at least 50 points higher than L4.

17. The product of Claim 14, characterized by an increase in Parker Smoothness value of no more than 1 point after an application of the second coloring formulation in step (c).

18. The product of Claim 14, characterized by an increase in caliper value of no more than 1 point after an application of the second coloring formulation in step (c).

19. The product of Claim 14, wherein the second coloring formulation comprises a second coloring agent, and the product further characterized by a gradual decrease in an color intensity of the second coloring agent from the second coated side to the first coated side.

20. The product of Claim 14, wherein the second coloring formulation comprises a second coloring agent, and the product further characterized by from about 10% to about 100% of its thickness being colored by the second coloring agent.

21. The product of Claim 14, wherein the first coloring formulation includes a clay-based coating.

22. The product of Claim 14, wherein the first coloring formulation is applied onto the substrate during a papermaking process.

23. The product of Claim 14, wherein the second coloring formulation includes a black coloring agent.

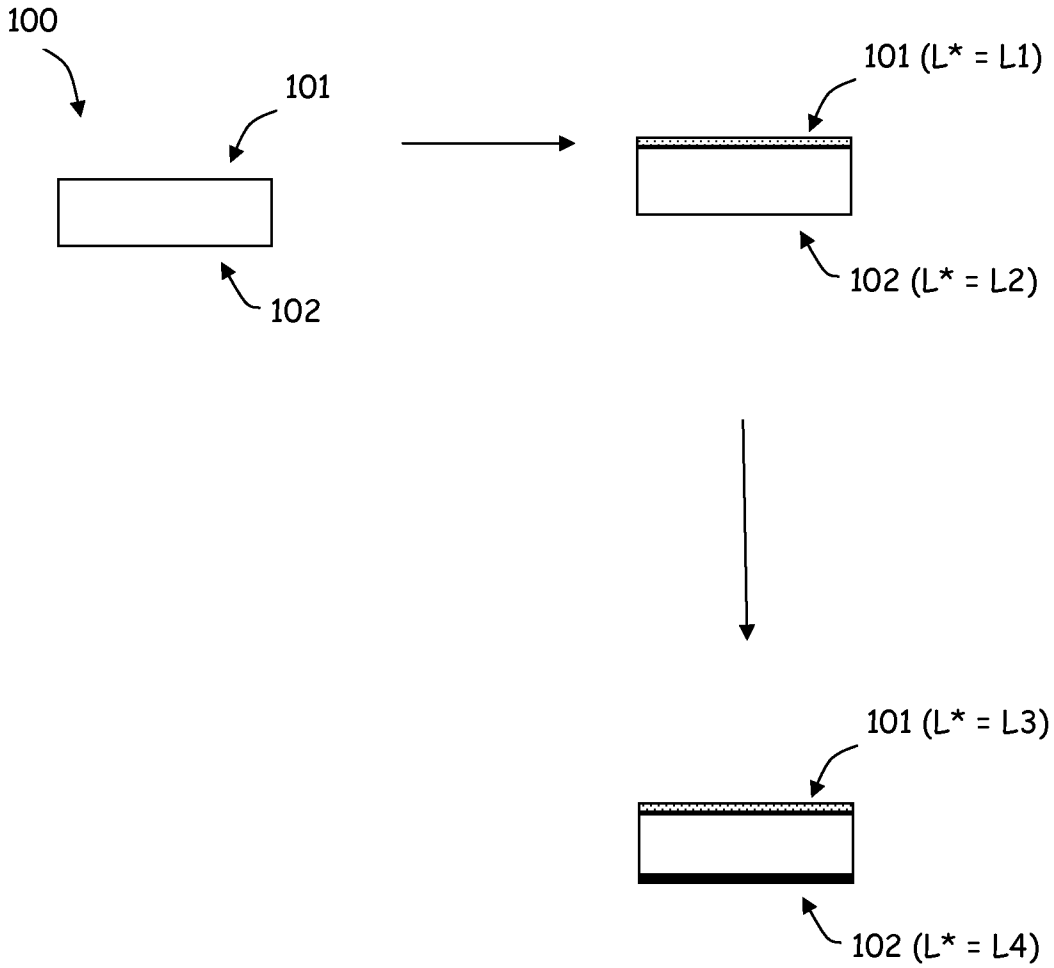
24. The product of Claim 14, wherein the second coloring formulation comprises, based on the formulation weight:

(24.a) from about 1% to about 10% by weight of a coloring agent; and

(24.b) from about 1% to about 5% by weight of a surfactant.

25. The product of Claim 24, wherein the second coloring formulation is absence of a binder.

FIGURE 1



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/033856

A. CLASSIFICATION OF SUBJECT MATTER
INV. D21H21/28

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)
D21H

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/048878 A (DRYAD LTD OY [FI]; SUNDHOLM PATRICK [FI]) 3 May 2007 (2007-05-03) paragraphs [0046] - [0048], [0058]; claims 1-23	1,14
A	WO 2007/101203 A (DEGUSSA CORP [US]; NELLI LEO M [US]) 7 September 2007 (2007-09-07) the whole document	1-25
A	EP 1 464 484 A (DAINIPPON PRINTING CO LTD [JP]) 6 October 2004 (2004-10-06) the whole document	1-25
A	EP 0 947 348 A (CANON KK [JP]) 6 October 1999 (1999-10-06) the whole document	1-25

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[X] Further documents are listed in the continuation of Box C.

[X] 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

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Date of the actual completion of the international search	Date of mailing of the international search report
9 June 2009	23/06/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Karlsson, Lennart

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/033856

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/178514 A1 (PRING GRAHAM [GB] ET AL. PRING GRAHAM [GB] ET AL) 18 August 2005 (2005-08-18) the whole document	1-25
A	US 3 775 353 A (KOHNE H ET AL) 27 November 1973 (1973-11-27) the whole document	1-25

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/033856

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007048878 A	03-05-2007	EP 1941100 A1	09-07-2008
WO 2007101203 A	07-09-2007	CA 2643858 A1	07-09-2007
		CN 101415882 A	22-04-2009
		EP 1989356 A2	12-11-2008
EP 1464484 A	06-10-2004	DE 60219691 T2	17-01-2008
		WO 03053692 A1	03-07-2003
		JP 4090731 B2	28-05-2008
		JP 2003170539 A	17-06-2003
		US 2004265569 A1	30-12-2004
EP 0947348 A	06-10-1999	AT 252985 T	15-11-2003
		DE 69912339 D1	04-12-2003
		DE 69912339 T2	19-08-2004
		US 6177188 B1	23-01-2001
US 2005178514 A1	18-08-2005	NONE	
US 3775353 A	27-11-1973	NONE	