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(54) Title: A METHOD OF DIGESTING CELLULOSE FIBROUS MATERIAL IN A CONTINUOUS DIGESTER

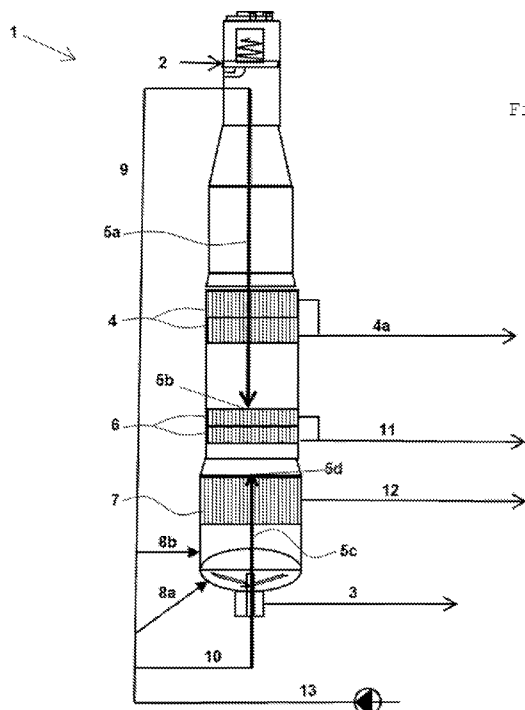


Fig. 1

(57) Abstract: The invention discloses a method of continuous cooking cellulose fibrous material in a digester, said digester having a top and a bottom. The method of the invention comprises the steps of: -feeding a slurry comprising cellulose fibrous material and cooking liquor into the top of the digester, -feeding a first washing liquor into the bottom portion of the digester, which first washing liquor moves counter currently up through at least part of the digester, -removing pulp from the bottom of the digester, -feeding a second washing liquor into the center of the digester at least at the level of a first screen section, -feeding a third washing liquor into the center of the digester at the level of a second screen section, and -withdrawing the cooking liquor and the washing liquors from the first screen section and from the second screen section, which first screen section is arranged in a lower part of the digester and which second screen section is arranged below said first screen section. Thus, in accordance with the invention, a third washing liquor is added to the center of digester at the level of an additional, second extraction screen section arranged in the lower part of the digester. The method makes it possible to increase the production rate in the digester but still maintain or even increase the washing efficiency.

A method of digesting cellulose fibrous material in a continuous digester

Field of invention

The invention relates to an improved method to digest cellulose fibrous material in a continuous digester to produce pulp.

Background

The production of chemical pulp of cellulosic fibers is normally performed by cooking wood material, such as chips, in cooking liquor (or white liquor) comprising chemicals that loosen the fibers from the lignin. The most common cooking process of today is the kraft process (also known as sulphate cooking), wherein the active chemicals in the cooking liquor are sodium hydroxide and sodium sulphide. The cooking takes place in a pressurized vessel, usually designed as a large vertical cylinder, called the digester. In a continuous cooking process, wood chips and cooking liquor are fed into the top of the digester in a continuous stream while cooked pulp is blown out from the bottom of the digester. Thus, the chips/pulp continuously moves downwards in the digester. The cooking is interrupted by the introduction of cooler washing liquid as the pulp is being washed. Typically, continuous cooking is combined with counter-current washing of the cooked pulp in the same vessel. In such an arrangement, the upper part of the cooking vessel forms a cooking zone, where the pulp and the liquor move from the top downwards. The lower part of the cooking vessel forms a washing zone, where the pulp moves further downwards and cooking liquor is displaced with wash liquor and thus moves upwards, counter current up through the chip column. The residual liquors (spent cooking liquor and wash liquor) are drawn off through a screen at the end of the cooking zone and further treated in the evaporator plant.

One challenge related to the continuous cooking process is to maintain the washing efficiency when increasing the production volume. Normally, it is difficult to keep a high dilution factor in the digester when the production rate is increased. EP1764441 describes process of continuous cooking of pulp, which process is said to increase the washing efficiency at the bottom of a continuous digester. To solve this problem, an extra screen section is arranged above the lowermost screen section and a number of addition positions for washing liquid are distributed around the circumference of the digester between the uppermost part of the lowermost screen section and the lowermost part of the extra screen section. However, in such an arrangement, the extra washing liquid will be added peripherally into the digester, in-between two screen sections, whereby the displacement efficiency will be very

low. Consequently, the effect on the washing efficiency by this arrangement will be very limited.

Thus, there remains a need to provide a method and arrangement to enhance the washing capacity of a continuous digester at an increased production rate.

Description of the invention

One object of the present invention is thus to maintain or increase the washing efficiency in a continuous pulp digester when increasing the production volume.

The invention discloses a method of continuous cooking cellulose fibrous material in a digester, said digester having a top and a bottom. The method of the invention comprises the steps of:

- feeding a slurry comprising cellulosic fibrous material and cooking liquor into the top the digester,
- feeding a first washing liquor into the bottom portion of the digester, which first washing liquor moves counter currently up through at least part of the digester,
- removing pulp from the bottom of the digester,
- feeding a second washing liquor into the center of the digester at least at the level of a first screen section,
- feeding a third washing liquor into the center of the digester at the level of a second screen section, and
- withdrawing the cooking liquor and the washing liquors from the first screen section and from the second screen section, which first screen section is arranged in a lower part of the digester and which second screen section is arranged below said first screen section.

Thus, in accordance with the invention, a third washing liquor is added to the center of digester at the level of an additional, second extraction screen section arranged in the lower part of the digester. The method of the invention ensures that the delignification reaction takes place in as big volume as possible in the digester. The method further makes it possible to increase the production rate in the digester but still maintain or even increase the washing efficiency. The addition of said third, washing liquor to the center of the digester ensures a high displacement efficiency, which further enhances the washing efficiency.

In the context of this application, the expression that the washing liquor is fed "into the center" of the digester means that the washing liquor is fed into the flow of

pulp/liquors from a point or from several points located inside the digester. Thus, the washing liquor is not added in positions distributed around the circumference of the digester. Preferably, the washing liquor is fed or added in the middle, or substantially in the middle, of the vertical flow of pulp/liquors.

The expression “at the level of the extraction screen section” means a level within the area defined by the extraction screen section and 1 meter above the top edge of said screen section.

The term “screen section” includes one screen row or several screen rows arranged sequentially onto each other in the digester in the direction of the main flow of the cellulose fibrous material slurry.

The term “top of the digester” is meant to include the top portion of the digester and the “bottom of the digester” is meant to include the bottom portion of the digester.

The term “lower part of the digester” means the part of the digester where washing of the pulp takes place.

The invention further relates to a continuous digester, having a top and a bottom, for the production of chemical pulp by cooking wood chips in cooking liquor, which digester comprises;

- an inlet arranged at the top of the digester for feeding the wood chips and the cooking liquor into the digester,
- an outlet arranged at the bottom of the digester for removal of the pulp,
- at least a first and a second screen section, which first screen section is arranged in the lower part of the digester and said second screen section is arranged below said first screen section,
- means for feeding a first washing liquor into the bottom of the digester, which first washing liquor moves counter currently up through at least part of the digester,
- means for feeding a second washing liquor into the center of the digester at least at the level of the first screen section, and
- means for feeding a third washing liquor into the center of the digester at the level of the second screen section,
- means for withdrawal of the cooking liquor and the washing liquors from at least the first screen section and from the second screen section.

Said “means” for feeding said first, second and third washing liquor may be, e.g. an inlet pipe or a similar arrangement.

Example

The invention is further described by way of an example.

Fig. 1 shows a schematic view of a digester in accordance with the invention.

The continuous digester shown in fig. 1 is in the form of a pressurized, essentially cylindrical, vessel (1) comprising a top and a bottom. Cellulose fibrous material, e.g. wood chips, and cooking liquor are continuously fed into the digester through an inlet (2). In the vessel, the chips form a porous chip column descending downwardly in the digester. The cooking liquor may e.g. be kraft cooking liquor comprising sodium hydroxide and sodium sulphide. Cooked pulp is continuously removed or blown from the bottom of the digester through an outlet (3). Along the vertical center line of the vessel (1), central pipes (5a, 5c) are arranged, through which pipes separate liquor entry flows may be conveyed to different levels of the vessel. Said central pipes (5) may comprise an upper pipe (5a) and a lower pipe (5c) as shown in fig. 1. The skilled person realizes however that these pipes may be arranged in several different modes, e.g. a first pipe having an outlet in a first level may be concentrically arranged in a second pipe, having an outlet in a second level above said first level.

One or several extraction screen structures (4) may be arranged in the vessel wall of the upper or middle part of the vessel, from which screen structures cooking liquor may be removed (4a) from the digester to be reprocessed at another location.

In accordance with the invention, a first and a second extraction screen section (6 and 7) are arranged in the lower part of the digester, which first extraction screen section (6) is arranged in the lower part of the digester and said second screen section (7) is arranged below, but at a relatively small distance, from the first extraction screen section (6). The vertical distance between the lowermost part of the first extraction screen section (6) and the uppermost part of the second extraction screen section (7) may be, e.g., 0,1 – 15 m, preferably between 0,5 – 5 m. The first extraction screen section (6) may be arranged above said second screen section at a distance corresponding to a retention time of between 0 – 30 minutes, preferably of between 0,1 – 20 minutes and even more preferably of between 5 – 15 minutes.

A first washing liquor (8a, 8b) is pumped into the bottom part of the vessel (1). Said first washing liquor may be added through a single inlet or through several inlets arranged in the bottom part of the vessel. The upwards-flowing washing liquid displaces the cooking liquor towards the extraction screens (6 and 7). A second washing liquor (9) is fed into the center of the digester, and into the middle of the descending chip column, through the upper pipe (5a) having an outlet (5b) at the level of the first extraction screen section (6). A third washing liquor (10) is fed into the center of the digester, and into the middle of the descending chip column,

through the lower central pipe (5c) having an outlet (5d) at the level of the second extraction screen section (7). The first, second and third washing liquors may originate from one, single, liquor fed from an earlier washing stage (13).

Cooking liquor and washing liquor (11,12) are withdrawn from said first extraction screen section (6) and from said second extraction screen section (7) and further treated in a flash and evaporation plant (not shown). Part of the liquor (12a) may be circulated back to the digester in order to enhance the distribution and mixing in the digester.

Preferably, the flow (m³/ADT), or volume per produced ton of pulp, of added washing liquor at the level of each extraction screen section is equal or less than the flow of liquors withdrawn from said extraction screen section. In this way, an efficient displacement is achieved and it is possible to maintain a stable chip column movement at the extraction screen sections. Furthermore, concurrent flow of liquors in the middle part of the digester is maintained. Thus, the flow of the added second washing liquor (9) is equal to or less than the flow of the liquors (11) withdrawn from the first extraction screen section (6). The flow of the added third washing liquor (10) is equal to or less than the flow of the liquors (12) withdrawn from the second extraction screen section (7).

It is to be understood that the invention is not limited to the particular process steps and arrangements described herein. Further extraction screens and washing liquor addition points may e.g. be arranged in sequence above each other. The method of the invention may e.g. comprise drawing off cooking liquor in a third and/or a fourth extraction screen section/s and addition of wash liquor at the level of said third and/or fourth extraction screen section/s.

Patent claims

1. A method of continuous cooking cellulose fibrous material in a digester, said digester having a top and a bottom, comprising the steps of
 - feeding a slurry comprising cellulosic fibrous material and cooking liquor into the top of the digester,
 - feeding a first washing liquor into the bottom of the digester, which first washing liquor moves counter currently up through at least part of the digester,
 - removing pulp from the bottom of the digester,
 - feeding a second washing liquor into the center of the digester at least at the level of a first screen section,
 - feeding a third washing liquor into the center of the digester at the level of a second screen section, and
 - withdrawing the cooking liquor and the washing liquors at least from the first screen section and from the second extraction screen section, which first screen section is arranged in a lower part of the digester and the second screen section is arranged below said first screen section.
2. A method according to patent claim 1, wherein the digester comprises at least one central pipe and wherein the second and/or the third washing liquor is fed into the center of the digester through said central pipe.
3. A method according to any one of the preceding claims, wherein said first screen section is arranged above said second screen section at a distance corresponding to a retention time of between 0 – 30 minutes, preferably of between 0,1 – 20 minutes and even more preferably of between 5 – 15 minutes.
4. A method according to any one of the preceding claims, wherein said first screen section is arranged above said first screen section at a distance of between 0,1 – 15 m, preferably of between 0,5 – 5 m from the first screen section.
5. A method according to any one of embodiments 1 – 3, wherein cooking and wash liquor is withdrawn from the digester in an additional third screen section and wherein wash liquor is fed into the digester at the level of or close to said third screen section.

6. A continuous digester, having a top and a bottom, for the production of chemical pulp by cooking wood chips in cooking liquor, which digester comprises;
- an inlet arranged at the top of the digester for feeding the wood chips and the cooking liquor into the digester,
 - an outlet arranged at the bottom of the digester for removal of the pulp,
 - at least a first and a second screen section, which first screen section is arranged in the lower part of the digester and said second screen section is arranged below said first screen section,
 - means for feeding a first washing liquor into the bottom of the digester, which first washing liquor moves counter currently up through at least part of the digester,
 - means for feeding a second washing liquor into the center of the digester at least at the level of the first screen section, and
 - means for feeding a third washing liquor into the center of the digester at the level of the second screen section,
 - means for withdrawal of the cooking liquor and the washing liquors from at least the first screen section and from the second screen section.

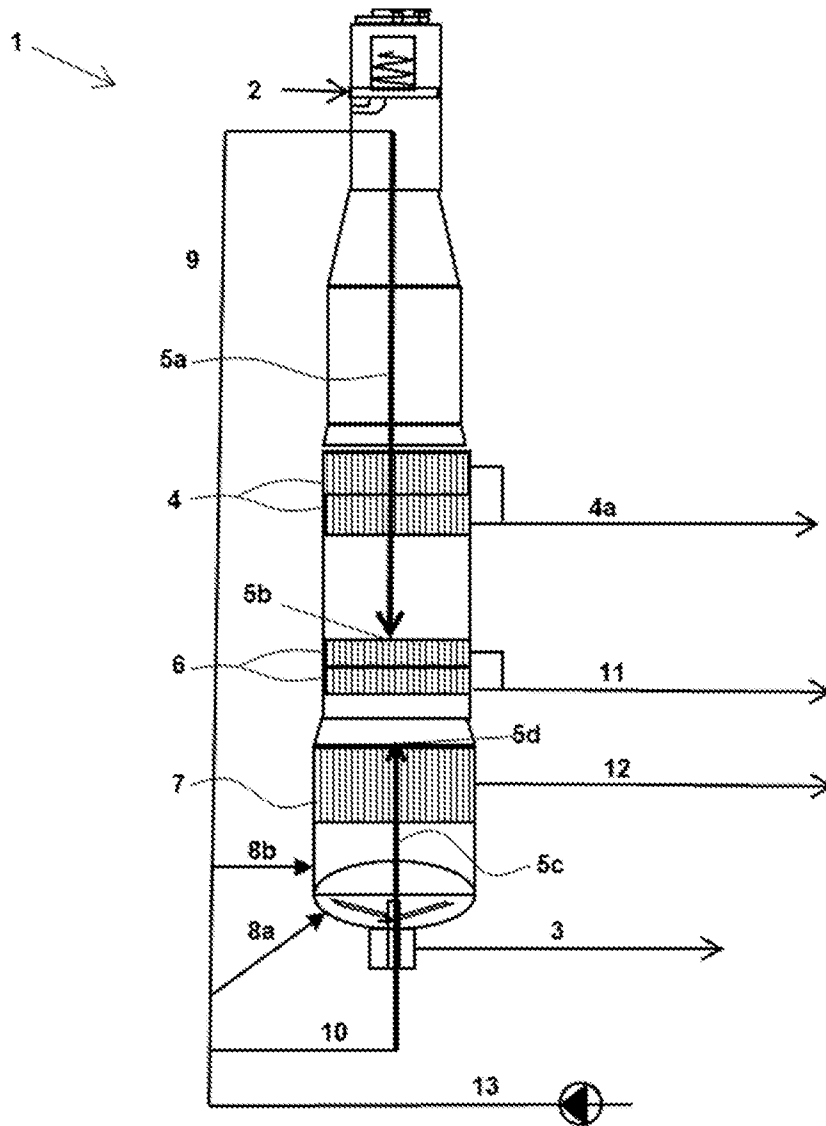


Fig. 1

INTERNATIONAL SEARCH REPORT

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<p>A. CLASSIFICATION OF SUBJECT MATTER</p> <p>IPC: see extra sheet</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>														
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols)</p> <p>IPC: D21C</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>SE, DK, FI, NO classes as above</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p> <p>EPO-Internal, PAJ, WPI data</p>														
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 5px;">Category*</th> <th style="width: 70%; padding: 5px;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%; padding: 5px;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US 3298899 A (LAAKSO OLIVER A), 17 January 1967 (1967-01-17); column 1, line 21 - line 31; column 1, line 39 - line 47; column 2, line 32 - line 46; column 3, line 40 - line 62; column 4, line 1 - line 44; figure 1</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">EP 1764441 A1 (KVAERNER PULPING TECH - (B1) METSO FIBER KARLSTAD AB [SE]), 21 March 2007 (2007-03-21); abstract; paragraphs [0004]-[0007], [0021]-[0024], [0026]-[0027]; figures 2,4</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1, 6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="text-align: center; vertical-align: top; padding: 5px;">--</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 3298899 A (LAAKSO OLIVER A), 17 January 1967 (1967-01-17); column 1, line 21 - line 31; column 1, line 39 - line 47; column 2, line 32 - line 46; column 3, line 40 - line 62; column 4, line 1 - line 44; figure 1	1-6	X	EP 1764441 A1 (KVAERNER PULPING TECH - (B1) METSO FIBER KARLSTAD AB [SE]), 21 March 2007 (2007-03-21); abstract; paragraphs [0004]-[0007], [0021]-[0024], [0026]-[0027]; figures 2,4	1, 6	Y	--	1-6
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<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p>														
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; border: none; vertical-align: top;"> <p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p> </td> </tr> </table>			<p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p>										
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<p>Date of the actual completion of the international search</p> <p>08-07-2015</p>		<p>Date of mailing of the international search report</p> <p>09-07-2015</p>												
<p>Name and mailing address of the ISA/SE</p> <p>Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86</p>		<p>Authorized officer</p> <p>Karin Bengtsson</p> <p>Telephone No. + 46 8 782 28 00</p>												

INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CA 927164 A (ERIKSSON E), 29 May 1973 (1973-05-29); page 2, line 6 - page 3, line 15; page 4, line 1 - page 5, line 3; figure 1 --	1-6
A	WO 2005116327 A1 (METSO PAPER INC ET AL), 8 December 2005 (2005-12-08); page 2, line 1 - page 3, line 13; page 11, line 11 - line 18; page 14, line 1 - line 31; figure 3 --	1-6
A	US 6123808 A (BECHARD GRANT E ET AL), 26 September 2000 (2000-09-26); whole document --	1-6
A	WO 9411566 A1 (KAMYR AB ET AL), 26 May 1994 (1994-05- 26); whole document --	1-6
A	WO 2012102650 A1 (METSO PAPER SWEDEN AB ET AL), 2 August 2012 (2012-08-02); whole document --	1-6
A	WO 2010110724 A1 (METSO FIBER KARLSTAD AB ET AL), 30 September 2010 (2010-09-30); whole document -- -----	1-6

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D21C 7/00 (2006.01)

D21C 9/02 (2006.01)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2015/052419

US	3298899 A	17/01/1967	DE	1517144 A1	13/03/1969
			FI	44081 B	30/04/1971
			FR	1348964 A	10/01/1964
			NO	115278 B	09/09/1968
EP	1764441 A1	21/03/2007	AT	478188 T	15/09/2010
			BR	PI0603809 A	14/08/2007
			DE	602006016202 D1	30/09/2010
			JP	2007077564 A	29/03/2007
			JP	4922706 B2	25/04/2012
			SE	0502042 L	16/03/2007
			SE	531067 C2	09/12/2008
			US	7566380 B2	28/07/2009
			US	7497927 B2	03/03/2009
			US	20090071615 A1	19/03/2009
			US	20070056707 A1	15/03/2007
CA	927164 A	29/05/1973	SE	356775 B	04/06/1973
WO	2005116327 A1	08/12/2005	CA	2567046 A1	08/12/2005
			EP	1778912 A1	02/05/2007
			US	20050274468 A1	15/12/2005
US	6123808 A	26/09/2000	CA	2251483 A1	09/06/1999
			FI	982467 A0	16/11/1998
			JP	11217785 A	10/08/1999
			SE	520796 C2	26/08/2003
			SE	9803982 L	10/06/1999

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2015/052419

WO	9411566 A1	26/05/1994	AT	156538 T	15/08/1997
			AT	153398 T	15/06/1997
			AT	164400 T	15/04/1998
			AU	673392 B2	07/11/1996
			AU	684759 B2	08/01/1998
			AU	680194 B2	24/07/1997
			AU	6396594 A	08/06/1994
			AU	5435594 A	08/06/1994
			AU	4096693 A	08/06/1994
			BR	9307478 A	24/08/1999
			BR	9307480 A	24/08/1999
			BR	9307479 A	24/08/1999
			CA	2149423 C	16/03/2004
			CA	2149535 C	06/07/2004
			CA	2149434 C	13/07/2004
			CN	1091792 A	07/09/1994
			CN	1036728 C	17/12/1997
			DE	69310929 D1	26/06/1997
			DE	673453 T1	29/02/1996
			DE	69312955 T3	11/04/2002
			DE	69317670 T2	20/08/1998
			EP	0669998 B1	06/08/1997
			EP	0673453 A1	27/09/1995
			EP	0673452 B1	21/05/1997
			ES	2077548 T1	01/12/1995
			ES	2103082 T3	16/08/1997
			ES	2105269 T5	01/03/2002
			FI	114718 B	15/12/2004
			FI	113186 B	15/03/2004
			FI	952389 A0	17/05/1995
			FI	952388 A0	17/05/1995
			FI	952387 A0	17/05/1995
			FI	115142 B	15/03/2005
			JP	3223285 B2	29/10/2001
			JP	08504238 A	07/05/1996
			JP	08503268 A	09/04/1996
			JP	08503030 A	02/04/1996
			JP	3287849 B2	04/06/2002
			JP	3287848 B2	04/06/2002
			MA	23034 A1	17/11/1993
			NO	306478 B1	08/11/1999
			NO	306477 B1	08/11/1999
			NO	951974 A	18/05/1995
			NO	951979 A	18/05/1995

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2015/052419

WO	2012102650 A1	02/08/2012	US	8647473 B2	11/02/2014
			US	20130319628 A1	05/12/2013
WO	2010110724 A1	30/09/2010	CN	102365405 A	29/02/2012
			EP	2411576 A1	01/02/2012
			SE	533610 C2	02/11/2010
			SE	0950193 A1	27/09/2010
			US	8366875 B2	05/02/2013
			US	20120061042 A1	15/03/2012