Title: TIRE CHAIN MADE OF HARD WOVEN FABRIC HAVING TRIPLE-LAYER STRUCTURE

Abstract: A tire chain made of a triple-layer warp knitting fabric is disclosed. In the tire chain comprising a main body unit for enclosing an outer surface of a tire and a fastening unit for fastening the main body unit, the main body unit comprises a fabric main body formed of a triple-layer warp knitting fabric knitted by a warp knitting machine. The fabric main body is structured so that a circumferential length thereof is within a range of 85-103% of the maximum circumferential length of the tire. Accordingly, while improving braking power, turning stability and smooth running of a vehicle, the tire chain supplies excellent safety, durability and riding comfort. Also, the tire chain can be easily mounted and dismounted with respect to a tire, and conveniently handled since being lightweight.
Description

TIRE CHAIN MADE OF HARD WOVEN FABRIC HAVING TRIPLE-LAYER STRUCTURE

Technical Field

[1] The present invention relates to a tire chain for a vehicle, and more particularly to a tire chain comprising a main body unit mounted between a tire and a road surface, being made of a warp knit fabric of a triple-layer structure having a predetermined elasticity.

[2] Background Art

[3] In general, a tire chain (also called a 'snow chain') prevents a slip of a vehicle on a snowy or icy road, by being fixed to a tire tread, that is, an outer surface of a tire directly contacting a road surface.

[4] General tire chains are manufactured using various steel materials such as special steel and synthetic resins such as urethane. The tire chains include a steel link chain, a wire chain configured by connecting square, pentagonal or hexagonal rollers, and a urethane chain configured by connecting flat pads on which spikes are protruded.

[5] However, in spite of some differences among them, the aforementioned conventional tire chains are heavy to use, and mounting and dismounting of them are inconvenient. In addition, the conventional tire chains generate serious noise by friction with the road surface, deteriorate a riding comfort due to a rough surface thereof, and also deteriorate a running speed of the vehicle.

[6] Especially, the steel tire chain is inappropriate for a longtime use since it easily rusts and cuts at linking parts and furthermore is too heavy to conveniently handle. The urethane tire chain is inexpensive although being lightweight.

[7] Moreover, since the conventional tire chains are formed by connecting links, rollers and pads one by one, great effort and time are required in manufacturing the tire chain due to the complicated structure.

[8] To this end, recently, a tire chain different from the conventional ones in terms of being made of a thin fabric has been introduced. Although being relatively cheap and lightweight, the fabric tire chain was suitable just for a one-time use because it so easily gets torn, worn or wet.

[9] Accordingly, there has been an increasing need for an improved tire chain capable of overcoming the defects of the conventional tire chains by using a special fabric rather than a mere double cloth or general monolayer fabrics, the special fabric having excellent strength and durability and being effective in preventing hydroplaning.
Disclosure of Invention

Technical Problem

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a tire chain made of a warp knit fabric having a triple-layer structure, capable of being conveniently mounted to and dismounted from a tire by any user and having excellent stability and durability by almost maintaining its initial mounting state during running of a vehicle.

It is another object of the present invention to provide a tire chain made of a warp knit fabric having a triple-layer structure, being excellent in braking power, turning stability and smooth running and capable of promptly and elastically detaching foreign substances such as snow, ice, water and soil therefrom, efficiently preventing hydroplaning and supplying a silent and comfortable ride.

It is still another object of the present invention to provide a tire chain made of a warp knit fabric having a triple-layer structure, capable of improving productivity thereof by simplifying the structure, improving convenience of carriage, maintenance and use, and reducing frequency of repair.

Technical Solution

In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a tire chain comprising a main body unit for enclosing an outer surface of a tire and a fastening unit for fastening the main body unit, wherein the main body unit comprises a fabric main body formed of a triple-layer warp knitting fabric knitted by a warp knitting machine and constituted by an inner skin layer tightly contacting the outer surface of the tire, an outer skin layer contacting a road surface, and an intermediate layer interconnecting the inner and the outer skin layers, and wherein the outer skin layer includes a plurality of hollows arranged thereon.

The fabric main body may comprise a tightening part formed by sewing an elastic band along an outer circumference of an inner side of the fabric main body, and a fixing part formed by sewing a non-elastic band along an outer circumference of an outer side of the fabric main body.

Advantageous Effects

A tire chain according to the embodiment of the present invention does not frequently require repair thereof due to its firm triple-layer structure made of a warp knit fabric and its stable shape. Also, the tire chain is capable of efficiently preventing hydroplaning, thereby enabling a longtime running, and supplying good braking
power, turning stability, smooth running, and riding comfort. In addition, mounting
and dismounting with respect to a tire can be easily performed by any user. Moreover,
since being lightweight, the tire chain can be conveniently handled.

[18]  
Brief Description of the Drawings

[19]  The above and other objects, features and other advantages of the present invention
will be more clearly understood from the following detailed description taken in
conjunction with the accompanying drawings, in which:

[20]  FIG. 1 is a perspective view of a tire chain according to an embodiment of the
present invention;

[21]  FIG. 2 is a perspective view showing the tire chain according to the embodiment of
the present invention as mounted to a tire, with a partial enlarged view of a fabric main
body of the tire chain;

[22]  FIG. 3 is a perspective view showing the tire chain according to the embodiment of
the present invention, in a folded state;

[23]  FIG. 4 is a sectional view showing the structure of the fabric main body of the tire
chain according to the embodiment of the present invention;

[24]  FIG. 5 is a partially enlarged sectional view of an outer skin layer of the fabric main
body of FIG. 4; and

[25]  FIG. 6 is a structural view schematically showing a warp knitting machine knitting
the fabric main body of the tire chain.

[26]  
Best Mode for Carrying Out the Invention

[27]  Hereinafter, an embodiment of the present invention will be described in greater
detail with reference to the accompanying drawings. Throughout the drawings, the
same reference numerals refer to the same functional elements.

[28]  FIG. 1 is a perspective view of a tire chain according to an embodiment of the
present invention, FIG. 2 is a perspective view showing the tire chain according to the
embodiment of the present invention as mounted to a tire, with a partial enlarged view
of a fabric main body of the tire chain, and FIG. 3 is a perspective view showing the
tire chain according to the embodiment of the present invention, in a folded state. FIG.
4 is a sectional view showing the structure of the fabric main body of the tire chain
according to the embodiment of the present invention, and FIG. 5 is a partially enlar
ged sectional view of an outer skin layer of the fabric main body of FIG. 4.

[29]  A tire chain 2 according to the embodiment of the present invention is characterized
in that a main body unit thereof has a triple-layer structure made of a warp knitting
fabric W to have a bit of elasticity. The structure of a fabric main body 10 made of the
warp knitting fabric \( W \) of the triple-layer structure by a warp knitting machine 100 will be described later in detail.

[30] Referring to FIG. 1, the main body unit of the tire chain 2 is configured such that a circumferential length of the fabric main body 10 is in a range of 85-103% of a maximum circumferential length of a tire \( T \) to which the tire chain 2 is mounted.

[31] A fastening unit of the tire chain 2 comprises a fixing part 16 formed by sewing a non-elastic band along an outer circumference of an outer side of the fabric main body 10, the outer side exposed outward when mounted to the tire \( T \), and a tightening part 14 formed by sewing an elastic band along an outer circumference of an inner side of the fabric main body 10.

[32] More specifically, the reason for setting the circumferential length of the fabric main body 10 to 85-103% of the maximum circumferential length of the tire \( T \) is because the fabric main body 10, which is made of the warp knitting fabric \( W \) of the triple-layer structure, has a predetermined ratio of expansion and contraction.

[33] In other words, even though the circumferential length of the fabric main body 10 is formed to be less than the maximum circumferential length of the tire \( T \) by at most 15%, the fabric main body 10 can be expanded enough for mounting to the tire \( T \) and then restored to its initial state upon completion of the mounting. Furthermore, although the circumferential length of the fabric main body 10 is formed to be greater than the maximum circumferential length of the tire \( T \) by at most 3%, the fabric main body 10 can be tightly mounted to the tire \( T \).

[34] On the other hand, if the circumferential length of the fabric main body 10 is less than the maximum circumferential length of the tire \( T \) by more than 15%, it is very difficult to mount the fabric main body 10 to the tire \( T \) and although being mounted, the fabric main body 10 is highly tensed. When the circumferential length of the fabric main body 10 is greater than the maximum circumferential length of the tire \( T \) by more than 3%, the fabric main body 10 is hardly able to keep airtight contact with a surface of the tire \( T \). In this case, a rear part of the fabric main body 10 would be gradually loosened according to running of a vehicle, and even separated from the tire \( T \).

[35] Here, the fabric main body 10 of the tire chain 2 preferably has approximately 2-15% of ratio of expansion and contraction. Such a degree of expansion and contraction ratio is for optimum foreign substance removal efficiency, braking power, turning stability and smooth running, as experimentally proven by the present inventor.

[36] The warp knitting fabric \( W \) of the triple-layer structure constituting the fabric main body 10 already has a predetermined elasticity due to its knitting structure. To increase the expansion and contraction ratio up to 2-15%, inner and outer skin layers 40 and 20 of the warp knitting fabric \( W \) are knitted using synthetic filament yarn, especially having good elasticity, such as urethane, spandex, Lycra and so on.
The fixing part 16 of the fastening unit provided at both sides of the fabric main body 10 is formed by a webbing made of a synthetic resin such as nylon to have no elasticity at all but high strength, such that the circumferential length of the fixing part 16 is 10-90%, and more preferably 50-80% of the maximum circumferential length of the tire T.

Alternatively, the fixing part 16 may be formed by interconnecting two or more belts across one another at a front center of the tire T. Also, as shown in FIG. 2, a wing part 12a formed of a non-elastic fabric may be further provided between the fixing part 16 and the fabric main body 10.

The tightening part 14 disposed opposite to the fixing part 16 is formed of a rubber band having high strength so that the tire chain 2 can be force-fitted with the tire T. In addition, a wing part 12 may be further formed between the tightening part 14 and the fabric main body 10 using an elastic fabric.

More particularly, the wing part 12 between the tightening part 14 and the fabric main body 10 is made of a warp knitting fabric or another fabric, having a 2-10% greater expansion and contraction ratio than the fabric main body 10. The wing part 12 is formed in width of 5~15cm and connected to the fabric main body 10 by sewing. Thus, the wing parts are formed at both sides of the fabric main body 10 in the same manner.

As described above, the tire chain 2 according to the embodiment of the present invention is wholly formed of a relatively soft material and therefore can be folded into a desired form as shown in FIG. 3.

Also, by configuring the tire chain 2 as described above, the fabric main body 10 is capable of efficiently detaching foreign substances including snow, ice, water and soil therefrom and preventing hydroplaning. In addition, since the fabric main body 10 can be mounted in tight contact with the tire T, any space would not be generated between the fabric main body 10 and the outer surface of the tire T even during running. Therefore, the tire chain 2 is not affected by a centrifugal force.

Furthermore, at one side of the fabric main body 10, the tightening part 14 pulls the fabric main body 10 by elastic attraction in cooperation with the wing part 12. At the other side of the fabric main body 10, the fixing part 16 prevents the fabric main body 10 from rolling in, by its high strength and fixing force. Accordingly, the initial mounting state of the tire chain 2 can be maintained while the vehicle is running, thereby elongating the life span of the tire chain 2.

Additionally, a cylindrical wick may be inserted in an end of the fixing part 16 of the tire chain 2, the wick which is made of any one of Kevlar, urethane and steel to have a less circumferential length than the fixing part 16 by 2-10%, and preferably 2-3%. Here, the wick enhances the fixing force of the fixing part 16.
The fabric main body 10 of the tire chain 2 may have different colors of the inner skin layer 40 and the outer skin layer 20. In this case, the user can easily check a worn degree of the tire chain 2 by the color of the inner skin layer 40 seen through the worn outer skin layer 20, and timely perform the replacement.

Hereinafter, the structure of the fabric main body 10 of the tire chain 2 according to the embodiment of the present invention, formed of the warp knitting fabric W of one sheet comprising three layers will be described in detail.

As shown in FIG. 2 and FIG. 4, the fabric main body 10 formed of the warp knitting fabric W comprises the inner skin layer 40 brought into tight contact with a tire tread, the outer skin layer 20 contacting a road surface, and an intermediate layer 30 having elasticity and connecting the inner skin layer 40 with the outer skin layer 20, while forming fine spaces between the inner and the outer skin layers 40 and 20. The three layers of the fabric main body 10 are knitted at one time.

On the outer skin layer 20, a plurality of hollows 20a are arranged in a regular pattern as shown in FIG. 2, FIG. 4 and FIG. 5. The hollows 20a may have any one shape selected from a circle, an oval, a square, a pentagon and a hexagon. Here, a hexagonal honeycomb shape is most preferable because a hexagonal hollow 20a maximizes a contacting area with the road surface, thereby maximizing friction with the road surface and effectively preventing a slip or sway of a vehicle body. Accordingly, in addition, running, turning and stopping of the vehicle can be safely performed.

The maximum size of the hollow 20a, that is, the maximum diameter or diagonal is preferably within a range of 2-10mm because if the diameter or diagonal of the hollow 20a is beyond the above range, foreign substances such as snow, ice, water and soil attached to the tire chain 2 are caught in the hollow 20a and are not easily removed. Therefore, the friction may be deteriorated so that the tire chain 2 may not normally function.

The inner skin layer 40 of the fabric main body 10 is formed into various types of compact structures in order for the tight contact with the tire T. The intermediate layer 30 connects the outer skin layer 20 and the inner skin layer 40 to each other through a compact and straight structure. Especially at the hollows 20a of the outer skin layer 20, the intermediate layer 30 is formed along an outline of a bottom of the hollows 20a.

The fabric main body 10 formed of the triple-layer warp knitting fabric W thus has a predetermined elasticity by existence of the hollows 20a of the outer skin layer 20 and the intermediate layer 30. Such elasticity helps prevent and relieve the hydroplaning during use of the tire chain 2 comprising the fabric main body 10.

More specifically, when the tire chain 2 is used on a snowy road, foreign substances such as snow, ice, water and soil are attached to the outer skin layer 20 and the hollows 20a of the fabric main body 10 interposed between the tire T and the road surface.
While the tire T is rotating, as the outer skin layer 20 is exposed to the outside, the intermediate layer 30 being compressed simultaneously expands to its initial state, thereby elastically shaking off the foreign substances. Therefore, the tire chain 2 according to the embodiment of the present invention is not easily wetted in spite of a longtime use.

Especially, the fabric main body 10 of the tire chain 2 needs to be structured to have proper thickness and weight to achieve the optimum condition of the tire chain 2.

For this purpose, the three layers of the fabric main body 10 formed of the warp knitting fabric W are knitted by synthetic filament yarn into respectively different thicknesses from one another according to the functions of each. For example, the yarn forming the inner skin 20 has thickness of 50-400 deniers, the yarn of the intermediate layer 30 has relatively smaller thickness, that is, 20-150 deniers, and the yarn of the outer skin layer 40 has the greatest thickness, that is, 70-1,000 deniers to maximize strength, abrasiveness and friction. In addition, the fabric main body 10 is formed to have thickness of 2~8mm and weight of 0.1-lkg.

Here, the thickness of the synthetic filament yarn constituting the respective layers of the fabric main body 10 enhances the friction of the tire chain 2. In case that the thickness and the weight of the fabric main body 10 are greater than the above ranges, the yarn of the intermediate layer 30 may be cut as being compressed by the vehicle body during use. When the thickness and the weight are smaller than the above ranges, the elasticity of the tire chain 2 becomes insufficient to effectively detach the foreign substances.

When the fabric main body 10 is manufactured to satisfy the above conditions, the tire chain 2 comes to have proper elasticity. If the fabric main body 10 is manufactured to have greater elasticity, the tight contact between the fabric main body 10 and the tire T may not be achieved. Moreover, a rear part of the fabric main body 10 may be loosened by centrifugal force when the tire T rotates.

Thus, the fabric main body 10 constituting the tire chain 2 is formed by the triple-layer warp knitting fabric W which is knitted at one time by a warp knitting machine 100 as shown in FIG. 6 to have a predetermined elasticity.

FIG. 6 schematically shows the structure of the warp knitting machine 100 for structuring the fabric main body 10. Main parts of the warp knitting machine 100 for structuring the triple-layer warp knitting fabric W will be briefly described with reference to FIG. 6.

In the warp knitting machine 100, first to sixth yarns 101, 102, ... , 106 reeled from six beams are connected respectively to first to sixth guide bars 101a, 102a, ..., 106a moved vertically and horizontally by a pattern heel (not shown) in accordance with a shape of the triple-layer warp knitting fabric W. At a lower part of the first to sixth
guide bars 101a, 102a, …, 106a which perform vertical and horizontal movements, first and second needles 120a and 120b performing vertical movements sequentially draw the first to sixth yarns 101, 102, …, 106 being guided by the first to sixth guide bars 101a, 102a, …, 106a, and thereby knit the triple-layer warp knitting fabric W in a horizontal direction.

For example, as shown in an enlarged view at a lower part of FIG. 6, the first yarn 101 and the second yarn 102 having the greatest thickness form the outer skin layer 20, the fifth yarn 105 and the sixth yarn 106 having medium thickness form the inner skin layer 40, and the third yarn 103 and the fourth yarn 104 having the smallest thickness form the intermediate layer 30. Here, the first and the second yarns 101 and 102 are knitted by the first needle 120a, and the fifth and the sixth yarns 105 and 106 are knitted by the second needle 120b. The third and the fourth yarns 103 and 104 are knitted alternately using the first and the second needles 120a and 120b, such that the intermediate layer 30 can interconnect the inner skin layer 40 and the outer skin layer 20.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Industrial Applicability

The present invention can be applied to manufacturing of a tire chain.
Claims

[1] A tire chain comprising a main body unit for enclosing an outer surface of a tire and a fastening unit for fastening the main body unit, wherein the main body unit comprises a fabric main body formed of a triple-layer warp knitting fabric knitted by a warp knitting machine and constituted by an inner skin layer tightly contacting the outer surface of the tire, an outer skin layer contacting a road surface, and an intermediate layer interconnecting the inner and the outer skin layers, and the outer skin layer includes a plurality of hollows arranged thereon.

[2] The tire chain made of a triple-layer warp knitting fabric according to claim 1, wherein a circumferential length of the fabric main body is within a range of 85-103% of the maximum circumferential length of the tire.

[3] The tire chain made of a triple-layer warp knitting fabric according to claim 1 or claim 2, wherein the fabric main body has 2-15% of ratio of expansion and contraction.

[4] The tire chain made of a triple-layer warp knitting fabric according to claim 1 or claim 2, wherein the fabric main body is knitted by synthetic filament yarns of different thicknesses so that a yarn forming the inner skin has thickness of 50-400 deniers, a yarn forming the intermediate layer has thickness of 20-150 deniers, and a yarn forming the outer skin layer has thickness of 70-1,000 deniers and so that the fabric main body has thickness of 2~8mm.

[5] The tire chain made of a triple-layer warp knitting fabric according to claim 1, wherein the hollows have any one shape selected from a circle, an oval, a square, a pentagon and a hexagon, and have the maximum diameter or diagonal of 2~10mm.

[6] The tire chain made of a triple-layer warp knitting fabric according to claim 1, wherein the fabric main body comprises a tightening part formed by sewing an elastic band along an outer circumference of an inner side of the fabric main body, and a fixing part formed by sewing a non-elastic band along an outer circumference of an outer side of the fabric main body.

[7] The tire chain made of a triple-layer warp knitting fabric according to claim 6, wherein a circumferential length of the fixing part is within a range of 10-90% of the maximum circumferential length of the tire.

[8] The tire chain made of a triple-layer warp knitting fabric according to claim 6, further comprising a wing part formed by a fabric having a 2-10% greater ratio of expansion and contraction than the fabric main body, and disposed between the tightening part and the fabric main body.
The tire chain made of a triple-layer warp knitting fabric according to claim 6, further comprising a wing part formed by a non-elastic fabric and disposed between the fixing part and the fabric main body.
**INTERNATIONAL SEARCH REPORT**

**International application No**

PCTYKR2008/001639

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### A. CLASSIFICATION OF SUBJECT MATTER

**B60C 27/18(2006.01)i**

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

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### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC B60C 27/00, B60C 27/16, B60C 27/18

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

- Korean Utility models and applications for Utility models since 1975
- Japanese Utility models and applications for Utility models since 1975

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

eKIPASS (KIPO internal)

Keywords: "snow", "non shp", "anti-skid", "textile"

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### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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</tr>
<tr>
<td>A</td>
<td>JP 2003-54232 A (TAKAGI TARO) 26 FEBRUARY 2003 See Figure 2 and related descriptions</td>
<td>1-9</td>
</tr>
<tr>
<td>A</td>
<td>KR 10-2002-0073369 A (TRUST &amp; OB EY CO., LTD ) 26 SEPTEMBER 2002 See Figure 6b and related descriptions</td>
<td>1-9</td>
</tr>
</tbody>
</table>

* 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 citation or other special reason (as specified)

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**Date of the actual completion of the international search**

30 JUNE 2008 (30 06 2008)

**Date of mailing of the international search report**

30 JUNE 2008 (30.06.2008)

**Name and mailing address of the ISA/KR**

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seomsa-ro, Seogu, Daejeon 302-701, Republic of Korea

Facsimile No 82-42-472-7140

**Authorized officer**

JEONG JI Deok

Telephone No 82-42-481-8420

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<th>Patent family member(s)</th>
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<tr>
<td></td>
<td></td>
<td>CA 2368722 AA</td>
<td>12. 10.2000</td>
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<td></td>
<td>CN 1268505 C</td>
<td>09.08.2006</td>
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<td></td>
<td></td>
<td>CN 13463 I8</td>
<td>24.04.2002</td>
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<td>CN 1915695 A</td>
<td>2 1.02.2007</td>
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<td>DE 20023870 U1</td>
<td>15.03.2007</td>
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<td>19.01.2006</td>
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<td>DE 60024792 T1</td>
<td>06.07.2006</td>
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<td>DK 1165329 T3</td>
<td>03.04.2006</td>
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<td></td>
<td>EA 2653 B1</td>
<td>29.08.2002</td>
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<td></td>
<td>EP 0915597 TD</td>
<td>04.05.2005</td>
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<tr>
<td></td>
<td></td>
<td>EP 1165329 A1</td>
<td>02.01.2002</td>
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<tr>
<td></td>
<td></td>
<td>EP 1165329 B9</td>
<td>22.03.2006</td>
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<td>EP 1621370 A2</td>
<td>01.02.2006</td>
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<td>EP 1621370 A3</td>
<td>08.02.2006</td>
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<td>EP 5023588 TD</td>
<td>22.06.2006</td>
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<td>EP 1165329 A1</td>
<td>02.01.2002</td>
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<td></td>
<td>EP 1165329 B9</td>
<td>22.03.2006</td>
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<td>EP 1165329 A1</td>
<td>02.01.2002</td>
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<td>EP 1621370 A2</td>
<td>01.02.2006</td>
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<td>EP 1621370 A3</td>
<td>08.02.2006</td>
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<tr>
<td></td>
<td></td>
<td>ES 2228290 T1</td>
<td>16.04.2005</td>
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<td></td>
<td></td>
<td>ES 2228290 T3</td>
<td>01.04.2006</td>
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<td></td>
<td>ES 2250025 T1</td>
<td>16.04.2006</td>
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<td></td>
<td>HK 1045827 A1</td>
<td>12.01.2007</td>
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<td>ID 30324 A</td>
<td>22. 11.2001</td>
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<tr>
<td></td>
<td></td>
<td>JP 2002-54100/ 7</td>
<td>03. 12.2002</td>
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<td></td>
<td>JP 2002-54100/ 7 T2</td>
<td>03. 12.2002</td>
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<tr>
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<td></td>
<td>NO 309184 B1</td>
<td>27. 12.2000</td>
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<td>NO 99163 1 AO</td>
<td>06.04.1999</td>
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<td>NO 99163 1 A</td>
<td>09. 10.2000</td>
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<td>SI 1165329 T1</td>
<td>30.04.2006</td>
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<td>US 7013548</td>
<td>2.1 03.2006</td>
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<td>US 2006-09082f  AA</td>
<td>04.05.2006</td>
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<td>US 7013548 BA</td>
<td>2.1 03.2006</td>
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<td></td>
<td>wO 00-99745 A1</td>
<td>12. 10.2000</td>
</tr>
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<td></td>
<td>ep 1745948 A1</td>
<td>24.01.2007</td>
</tr>
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Form PCT/ISA/210 (patent family annex) (April 2007)