



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.10.2015 Bulletin 2015/41

(51) Int Cl.:
B60B 19/04 (2006.01) A45C 5/14 (2006.01)

(21) Application number: **14162732.3**

(22) Date of filing: **31.03.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

• **Cheng, Chi-Cheng**
81356 Koahsiung City (TW)
• **Hsieh, Ker-Chang**
80445 Koahsiung City (TW)

(71) Applicant: **Well & David Corp.**
Kaohsiung City 80450 (TW)

(74) Representative: **Zimmermann, Tankred Klaus et al**
Schoppe, Zimmermann, Stöckeler
Zinkler, Schenk & Partner mbB
Patentanwälte
Radtkoferstrasse 2
81373 München (DE)

(72) Inventors:
• **Ho, New-Jin**
80782 Kahosiung City (TW)

(54) **Rolling device having step-climbing function**

(57) A rolling device (1) includes an axle (2) rotatable about an axis (C), a plurality of first rolling members (3), and a plurality of second rolling members (5). The first rolling members (3) are connected fixedly to the axle (2). Each of the first rolling members (3) includes a first body (30) having a first rolling surface (31) that is contactable with the ground surface and that is spaced apart from the axis (C) by a first radius (L1). Any two adjacent ones of the first rolling members (3) define an accommodating space (4) therebetween. Each of the second rolling members (5) is disposed movably within the accommodating space (4) between two adjacent ones of the first rolling members (3). Each of the second rolling members (5) includes a second body (50) having a second rolling surface (51) that is contactable with the ground surface and that is spaced apart from the axis (C) by a second radius (L2). Each of the second rolling members (5) is movable relative to the first rolling members (3) between a retracted position whereat the second radius (L2) is not more than the first radius (L1), and an extended position whereat the second radius (L2) is more than the first radius (L1).

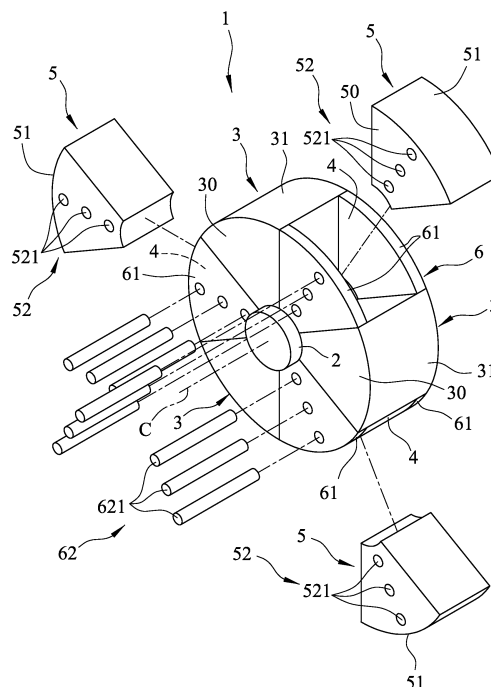


FIG.1

Description

[0001] This invention relates to a rolling device, and more particularly to a rolling device having step-climbing function.

[0002] A wheel or castor is a rolling device, has a circular outline, and is typically rotatable about a rotating axis. When the wheel is mounted to an article to be moved, and when the article is pushed or pulled, the wheel can roll on the ground surface. For example, when a plurality of castors are mounted to a luggage case, the luggage case can be moved conveniently in a labor-saving manner.

[0003] However, such a wheel is only suitable for rolling on a flat surface, and is difficult to use on a stepped surface. In the case of a luggage case, when it is desired to move the luggage case on the stepped surface, the luggage case must be lifted, thereby resulting in difficulty in moving the luggage case.

[0004] The object of this invention is to provide a rolling device having step-climbing function.

[0005] According to this invention, a rolling device includes an axle rotatable about an axis, a plurality of first rolling members, and a plurality of second rolling members. The first rolling members are connected fixedly to the axle. Each of the first rolling members includes a first body having a first rolling surface that is contactable with the ground surface and that is spaced apart from the axis by a first radius. Any two adjacent ones of the first rolling members define an accommodating space therebetween. Each of the second rolling members is disposed movably within the accommodating space between two adjacent ones of the first rolling members. Each of the second rolling members includes a second body having a second rolling surface that is contactable with the ground surface and that is spaced apart from the axis by a second radius. Each of the second rolling members is movable relative to the first rolling members between a retracted position whereat the second radius is not more than the first radius, and an extended position whereat the second radius is more than the first radius.

[0006] As such, in a situation where the rolling device is used on a stepped surface that has a first horizontal surface portion, a second horizontal surface portion higher than the first horizontal surface portion, and a connecting surface portion connected between the first and second horizontal surface portions, when each of the second rolling members is disposed at the extended position, and when the rolling device is rolled on the first horizontal surface portion toward the connecting surface portion, one of the second rolling members may come into contact with the second horizontal surface portion to allow the rolling device to roll onto the second horizontal surface portion.

[0007] These and other features and advantages of this invention will become apparent in the following detailed description of the preferred embodiments of this invention, with reference to the accompanying drawings,

in which:

Fig. 1 is an exploded perspective view of the first preferred embodiment of a rolling device according to this invention;

Fig. 2 is a fragmentary sectional view of the first preferred embodiment, illustrating a retracted position of a second rolling member;

Fig. 3 is a view similar to Fig. 2 but illustrating an extended position of the second rolling member;

Fig. 4 is a fragmentary sectional view illustrating modified first and second positioning mechanisms;

Fig. 5 is a schematic side view of the first preferred embodiment, illustrating that the second rolling member is disposed at the retracted position when the rolling device is moved on a flat surface;

Fig. 6 is schematic side view of the first preferred embodiment, illustrating that the second rolling member is disposed at the extended position when the rolling device is moved on a stepped surface;

Fig. 7 is a schematic side view illustrating that the rolling device may include four second rolling members;

Fig. 8 is a perspective view of the second preferred embodiment of a rolling device according to this invention;

Fig. 9 is a fragmentary sectional view of the second preferred embodiment, illustrating that two pushbuttons are biased to extend from a second body;

Fig. 10 is a view similar to Fig. 9 but illustrating the two pushbuttons are retracted into the second body;

Fig. 11 is a view similar to Fig. 10 but illustrating the two pushbuttons are biased to extend from the second body, and are engaged respectively into two positioning holes; and

Fig. 12 is a view similar to Fig. 11 but illustrating that the two pushbuttons are engaged respectively into another two positioning holes.

[0008] Before the present invention is described in greater detail in connection with the preferred embodiments, it should be noted that similar elements and structures are designated by like reference numerals throughout the entire disclosure.

[0009] Referring to Fig. 1, the first preferred embodiment of a rolling device 1 according to this invention includes an axle 2 rotatable about an axis (C), a plurality of first rolling members 3 connected fixedly to the axle 2 and angularly spaced apart from each other such that any two adjacent ones of the first rolling members 3 define an accommodating space 4 therebetween, a plurality of second rolling members 5 each disposed movably within the accommodating space 4 between two adjacent first rolling members 3, and a plurality of reinforcing units 6 each connected between two adjacent first rolling members 3. The first rolling members 3 cooperate with the second rolling members 5 to constitute a wheel body disposed around the axle 2. In this embodiment, the number

of the first rolling members 3 is three. That is, the rolling device 1 includes three accommodating spaces 4, three second rolling members 5, and three reinforcing units 6.

[0010] Each first rolling member 3 includes a first body 30 having a first rolling surface 31 that is contactable with the ground surface. Each second rolling member 5 includes a second body 50 having a second rolling surface 51 that is contactable with the ground surface, and a first positioning mechanism 52 disposed at the second body 50. Each second rolling member 5 is movable relative to the first rolling members 3 between a retracted position shown in Fig. 2 and an extended position shown in Fig. 3.

[0011] With particular reference to Figs. 1 and 2, each reinforcing unit 6 includes two reinforcing walls 61 connected respectively to two opposite sides of each of the two adjacent first rolling members 3, and a second positioning mechanism 62 disposed on the two reinforcing walls 61.

[0012] With particular reference to Figs. 2 and 3, each second positioning mechanism 62 cooperates with the first positioning mechanism 52 of the corresponding second rolling member 5 to maintain the corresponding second rolling member 5 at a selected one of the retracted position and the extended position. In this embodiment, each first positioning mechanism 52 includes a plurality of positioning holes 521 formed through the corresponding second body 50, and each second positioning mechanism 62 includes a plurality of positioning pins 621 each extending through the corresponding positioning hole 521 and two corresponding reinforcing walls 61. Alternatively, with particular reference to Fig. 4, each first positioning mechanism 52 may include a plurality of threaded holes 522 formed through the second body 50 of the corresponding second rolling member 5, and each second positioning mechanism 62 may include a plurality of positioning bolts 622 each extending through the corresponding threaded hole 522 and two corresponding reinforcing walls 61.

[0013] With particular reference to Fig. 5, each first rolling surface 31 is spaced apart from the axis (C) by a first radius L1, and each second rolling surface 51 is spaced apart from the axis (C) by a second radius L2. As shown in Fig. 5, when each second rolling member 5 is disposed at the retracted position, it is retracted entirely into the corresponding accommodating space (C), so that the second radius L2 is not more than the first radius L1. In this state, since the second radius L2 is proximate to the first radius L1, the outline of the rolling device 1 is generally circular. As such, the first and second rolling surfaces 31, 51 cooperate to allow the rolling device 1 to roll smoothly on a flat surface (A). The reinforcing walls 61 can promote the structural strength of the rolling device 1.

[0014] With particular reference to Fig. 6, when moved on a stepped surface 7, each second rolling member 5 is disposed at the extended position, and projects partially from the corresponding accommodating space 4, so that the second radius L2 is more than the first radius L1. The stepped surface 7 has a first horizontal surface

portion 71, a second horizontal surface portion 72 higher than the first horizontal surface portion 71, and a connecting surface portion 73 connected between the first and second horizontal surface portions 71, 72. When the rolling device 1 is rolled on the first horizontal surface portion 71 toward the connecting surface portion 73, one of the second rolling members 5 may come into contact with the second horizontal surface portion 72 to allow the rolling device 1 to roll onto the second horizontal surface portion 72. It should be noted that, the step-climbing function of the rolling device 1 can be affected by the height and inclination angle of the connecting surface portion 73.

[0015] With particular reference to Figs. 5 and 6, the rolling device 1 is suitable for use on a luggage case (not shown). When the suitcase is moved on a flat surface (A), each second rolling member 5 is disposed at the retracted position. When the suitcase is moved on a stepped surface 7, each second rolling member 5 is disposed at the extended position.

[0016] Alternatively, the number of the first rolling members 3 may be changed according to different needs. For example, the number of the first rolling members 3 may be increased to four, as shown in Fig. 7. In this case, the number of the accommodating spaces 4, the second rolling members 5, and the reinforcing units 6 must be changed correspondingly.

[0017] Figs. 8 and 9 show the second preferred embodiment of a rolling device according to this invention. Unlike the first preferred embodiment, the rolling device 1 further includes a plurality of resilient members 8 each disposed between the axle 2 and a respective one of the second rolling members 5, each second rolling members 5 further includes two spring-biased balls or pushbuttons 53 that are extendable from and retractable into the second body 50, and each reinforcing wall 61 is formed with a plurality of positioning holes 63.

[0018] With particular reference to Fig. 9, when no external force is applied, each resilient member 8 is in a fully stretched state, so that each spring-biased pushbutton 53 is disposed outwardly of the corresponding accommodating space 4 and is biased to project partially from the corresponding second body 50. The two spring-biased pushbuttons 53 can be pressed to allow the corresponding second rolling member 5 to be moved toward the axle (2) such that the two spring-biased pushbuttons 53 are in slidable contact with the corresponding reinforcing walls 61, as shown in Fig. 10. With particular reference to Fig. 11, during movement of the corresponding second rolling member 5 toward the axle 2, as soon as the two spring-biased pushbuttons 53 are aligned respectively with two positioning holes 63, the corresponding second rolling member 5 can be released to maintain the corresponding second rolling member 5 at a first position relative to the axle 2. When a force is applied to further press the corresponding second rolling member 5, with particular reference to Fig. 12, the two spring-biased pushbuttons 53 may move to align respectively

with another two of the positioning holes 63. At this time, when the corresponding second rolling member 5 is released, it can be maintained at a second position.

[0019] As such, by simply moving the second rolling members 5 relative to the axle 2, the positions of the second rolling members 5 can be adjusted easily without removal of the second positioning mechanisms 62 (see Fig. 1), so as to increase convenience during position adjustment. If desired, the number of the positioning holes 63 in each reinforcing wall 61 can be changed.

[0020] In view of the above, when each second rolling member 5 is disposed at the extended position, the rolling device 1 has step-climbing function. Thus, the object of this invention is achieved.

Claims

1. A rolling device (1) including an axle (2) rotatable about an axis (C), and a wheel body disposed around the axle (2), **characterized by** the wheel body including:

a plurality of first rolling members (3) connected fixedly to the axle (2) and angularly spaced apart from each other, each of the first rolling members (3) including a first body (30) having a first rolling surface (31) that is contactable with the ground surface and that is spaced apart from the axis (C) by a first radius (L1), any two adjacent ones of the first rolling members (3) defining an accommodating space (4) therebetween; and

a plurality of second rolling members (5) each disposed movably within the accommodating space (4) between two adjacent ones of the first rolling members (3), each of the second rolling members (5) including a second body (50) having a second rolling surface (51) that is contactable with the ground surface and that is spaced apart from the axis (C) by a second radius (L2), each of the second rolling members (5) being movable relative to the first rolling members (3) between a retracted position whereat the second radius (L2) is not more than the first radius (L1), and an extended position whereat the second radius (L2) is more than the first radius (L1).

2. The rolling device (1) as claimed in Claim 1, further **characterized by** a plurality of reinforcing units (6) each connected between two adjacent ones of the first rolling members (3).
3. The rolling device (1) as claimed in Claim 2, **characterized in that** each of the reinforcing units (6) includes two reinforcing walls (61) connected respectively to two opposite sides of each of two adjacent ones of the first rolling members (3).

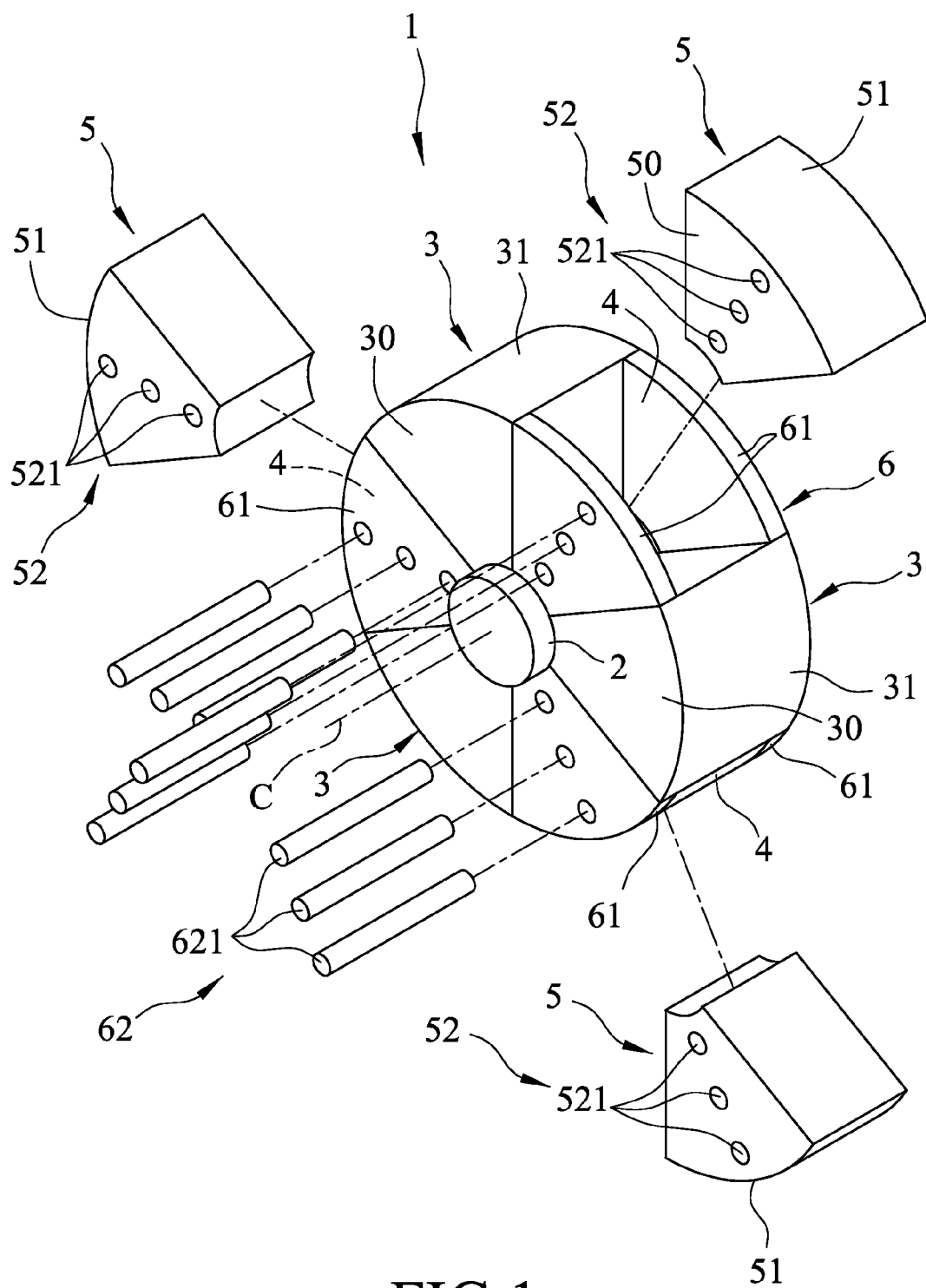
4. The rolling device (1) as claimed in Claim 3, further **characterized in that** each of the second rolling members (5) further includes a first positioning mechanism (52) disposed at the second body (50), each of the reinforcing units (6) further including a second positioning mechanism (62) disposed on the two reinforcing walls (61) and cooperating with the first positioning mechanism (52) of a corresponding one of the second rolling members (5) to maintain a corresponding one of the second rolling members (5) at a selected one of the retracted position and the extended position.

5. The rolling device (1) as claimed in Claim 4, further **characterized in that** the first positioning mechanism (52) of each of the second rolling members (5) includes a plurality of positioning holes (521) formed through the second body (50) of a corresponding one of the second rolling members (5), and the second positioning mechanism (62) of each of the reinforcing units (6) includes a plurality of positioning pins (621) each extending through a corresponding one of the positioning holes (521) and two corresponding ones of the reinforcing walls (61).

6. The rolling device (1) as claimed in Claim 4, further **characterized in that** the first positioning mechanism (52) of each of the second rolling members (5) includes a plurality of threaded holes (522) formed therethrough the second body (50) of a corresponding one of the second rolling members (5), and the second positioning mechanism (62) of each of the reinforcing units (6) includes a plurality of positioning bolts (622) each extending through a corresponding one of the threaded holes (522) and two corresponding ones of the reinforcing walls (61).

7. The rolling device (1) as claimed in Claim 3, further **characterized in that** a plurality of resilient members (8) each disposed between the axle (2) and a respective one of the second rolling members (5), each of the reinforcing walls (61) being formed with a plurality of positioning holes (63), each of the second rolling members (5) further including at least one spring-biased pushbutton (53) that is extendable from the second body (50) into a selected one of the positioning holes (63) and that is operable to retract into the second body (50).

8. The rolling device (1) as claimed in Claim 1, **characterized in that** the number of the first rolling members (3) is three.



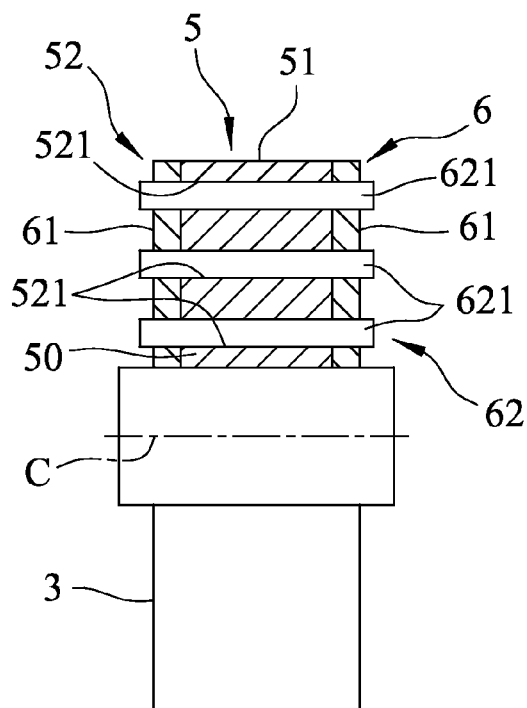


FIG.2

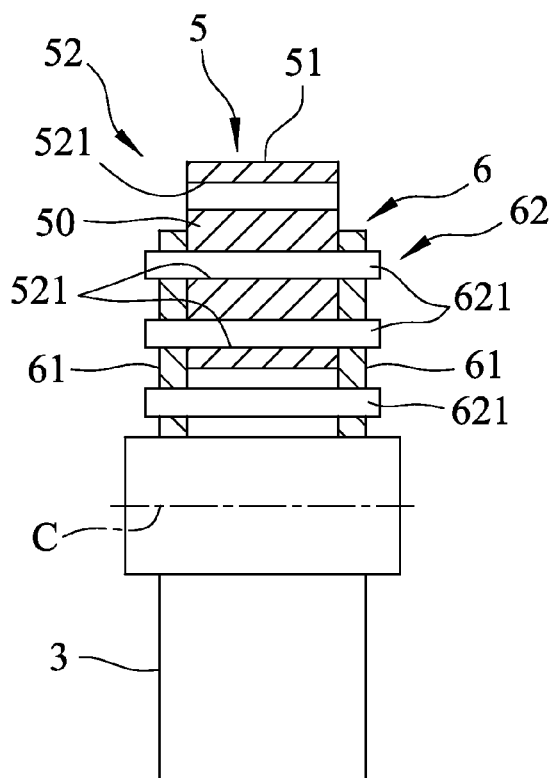


FIG.3

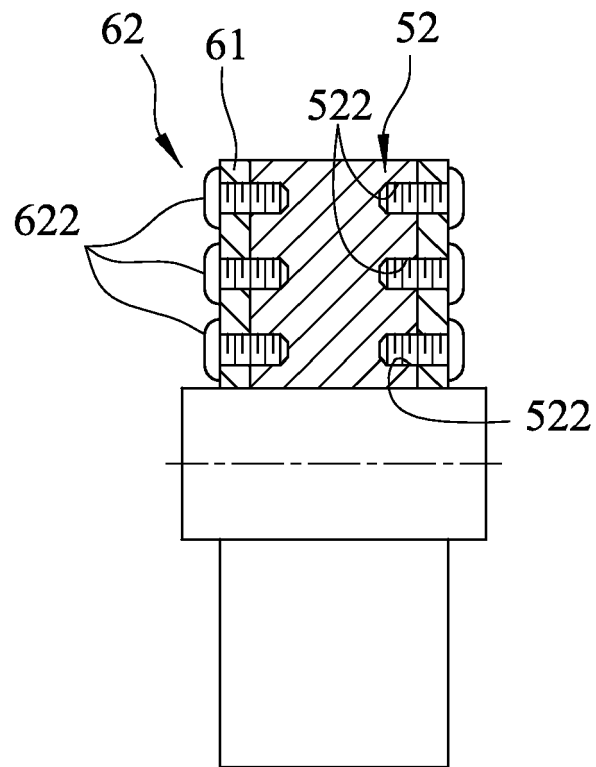


FIG.4

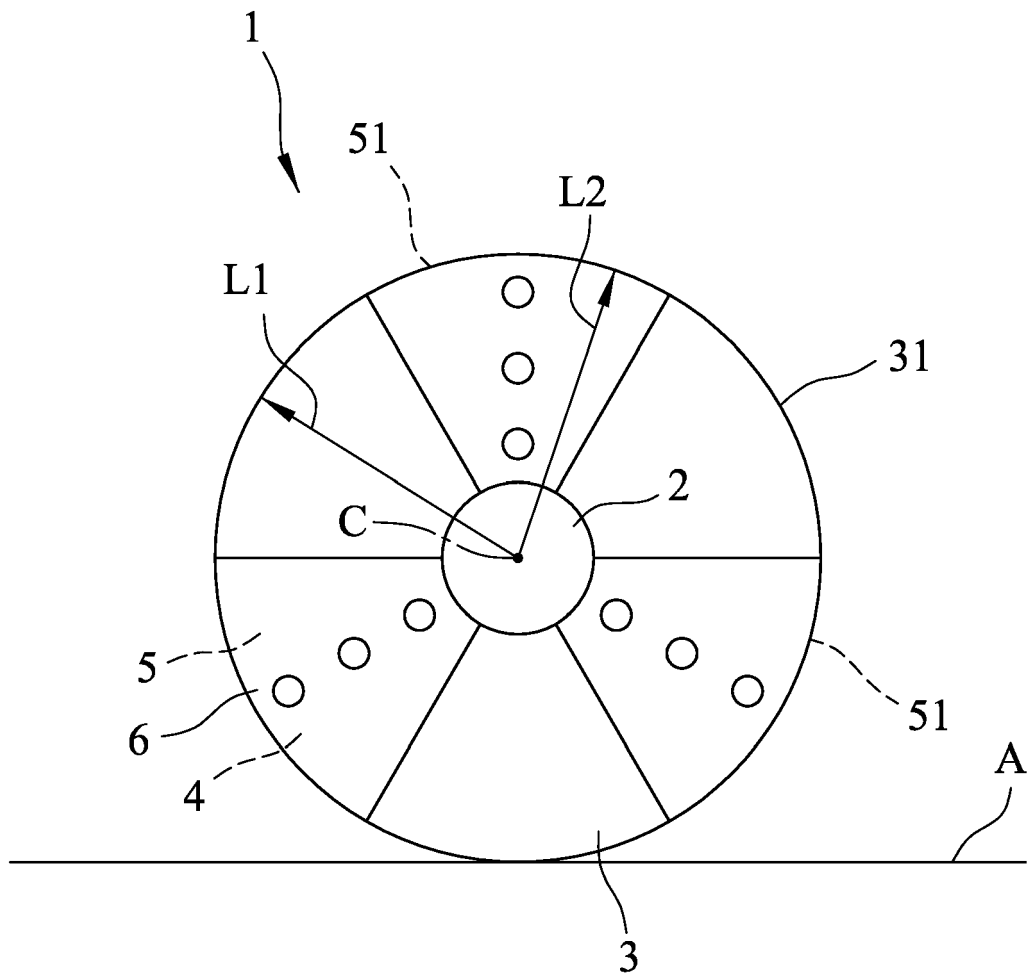


FIG.5

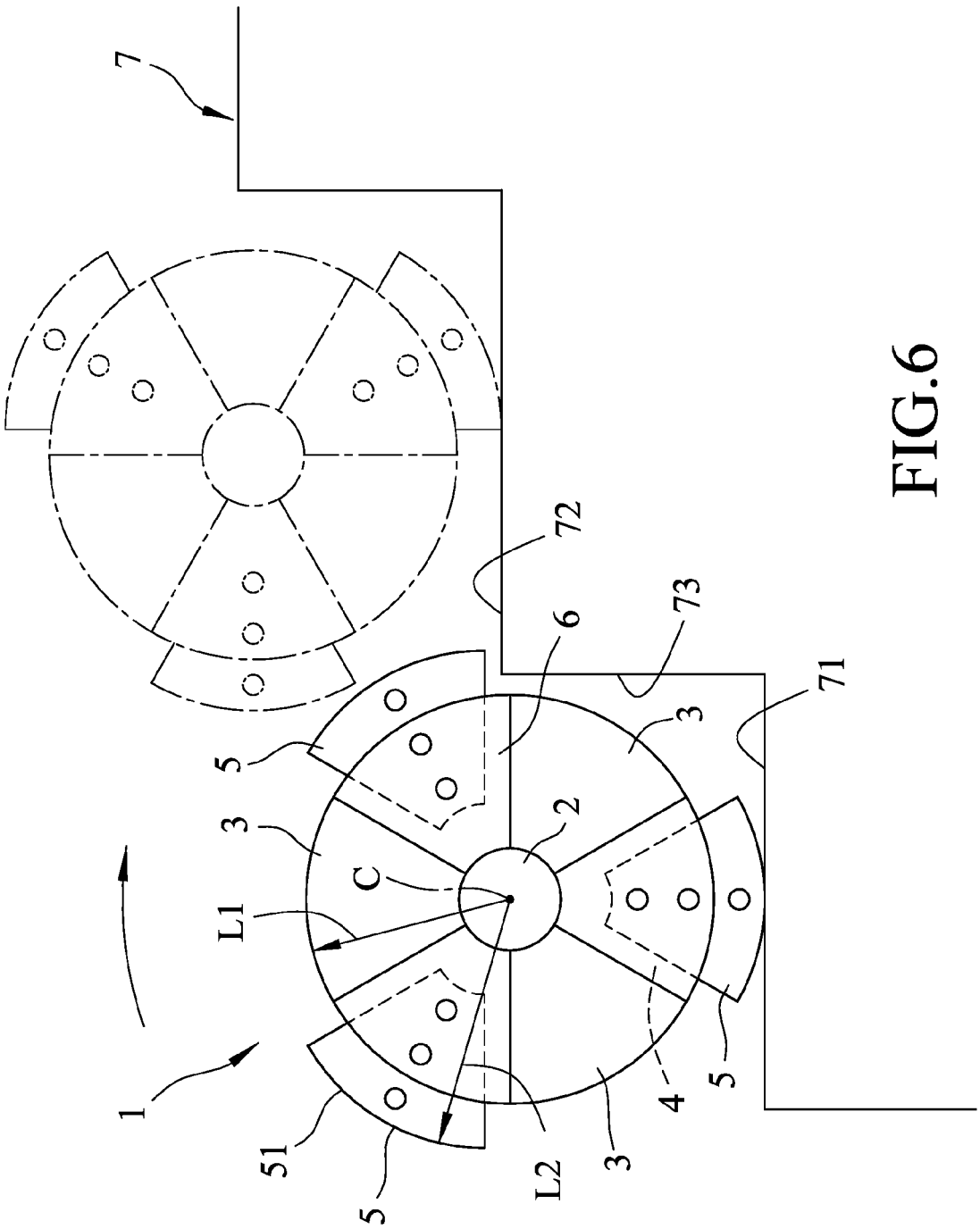


FIG.6

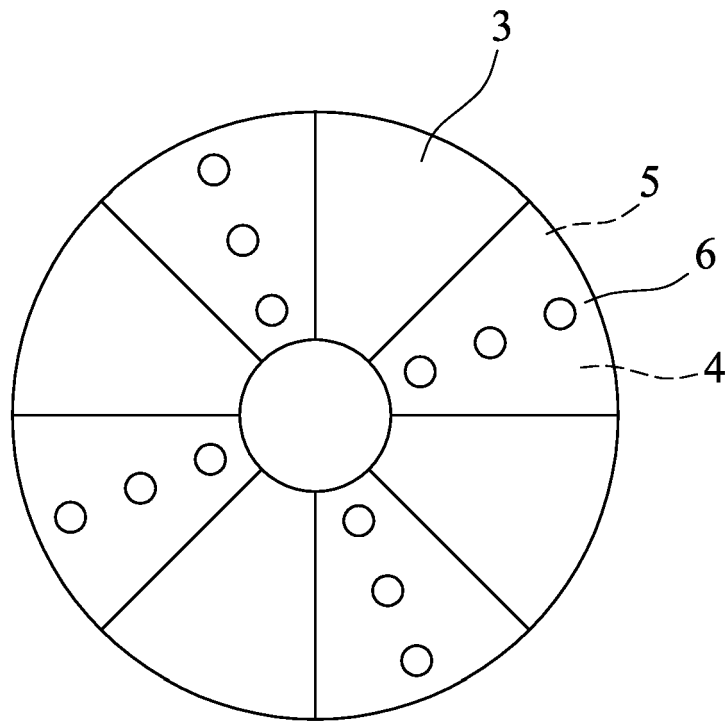


FIG.7

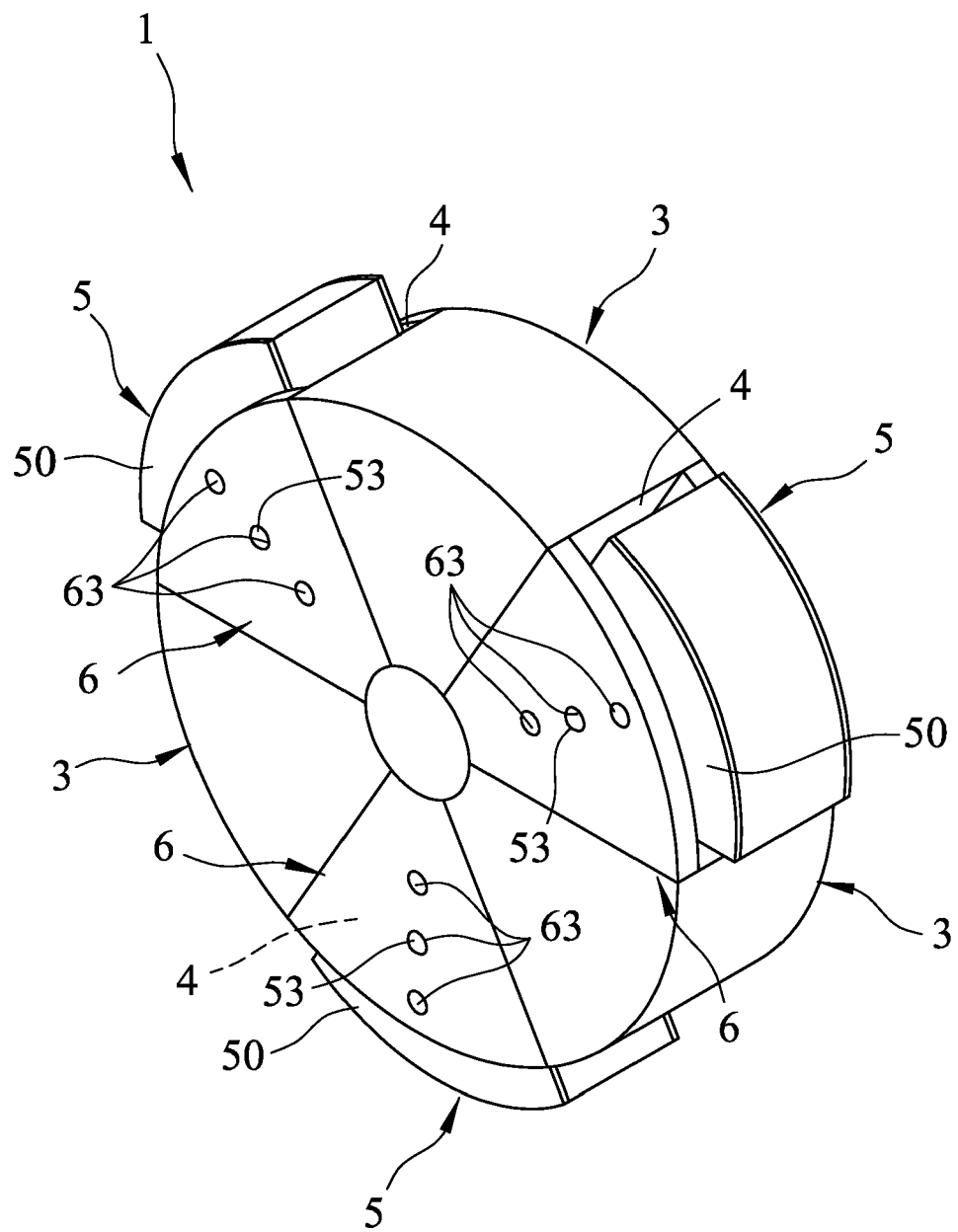


FIG.8

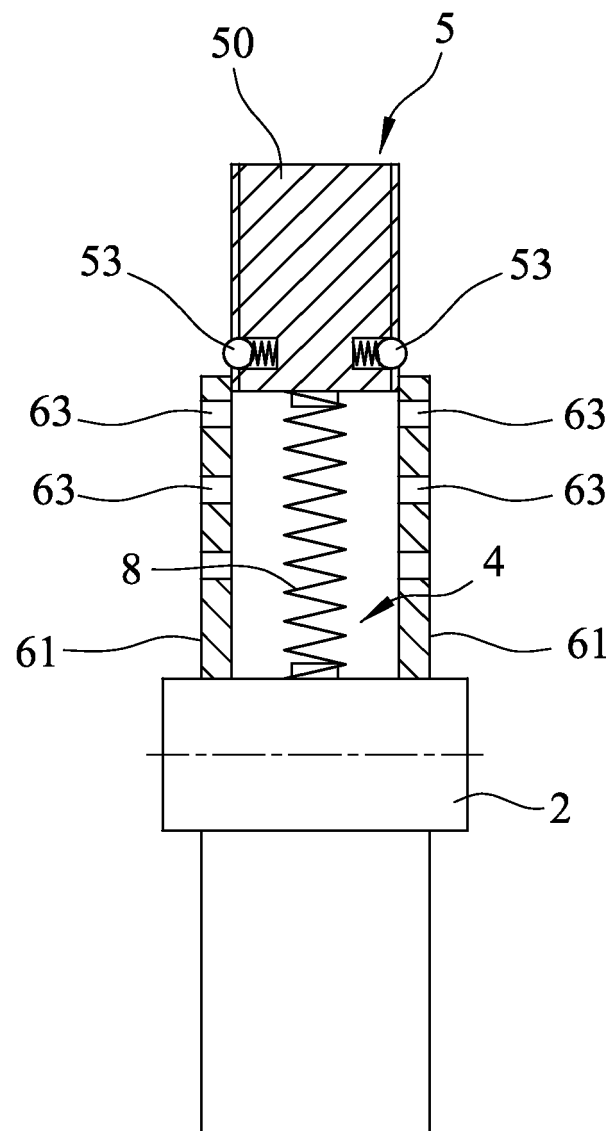


FIG.9

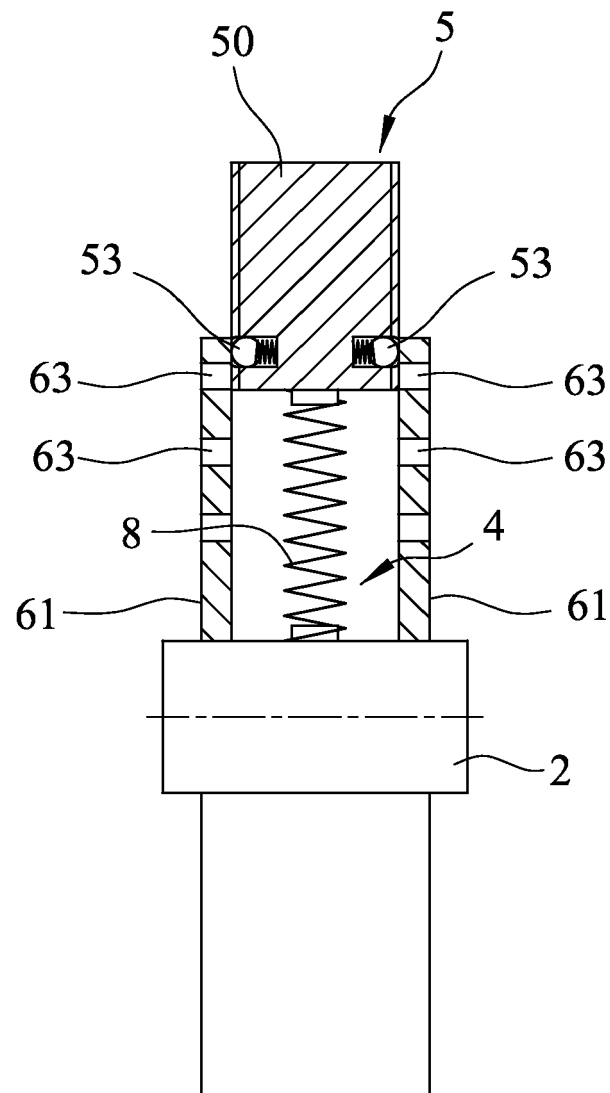


FIG.10

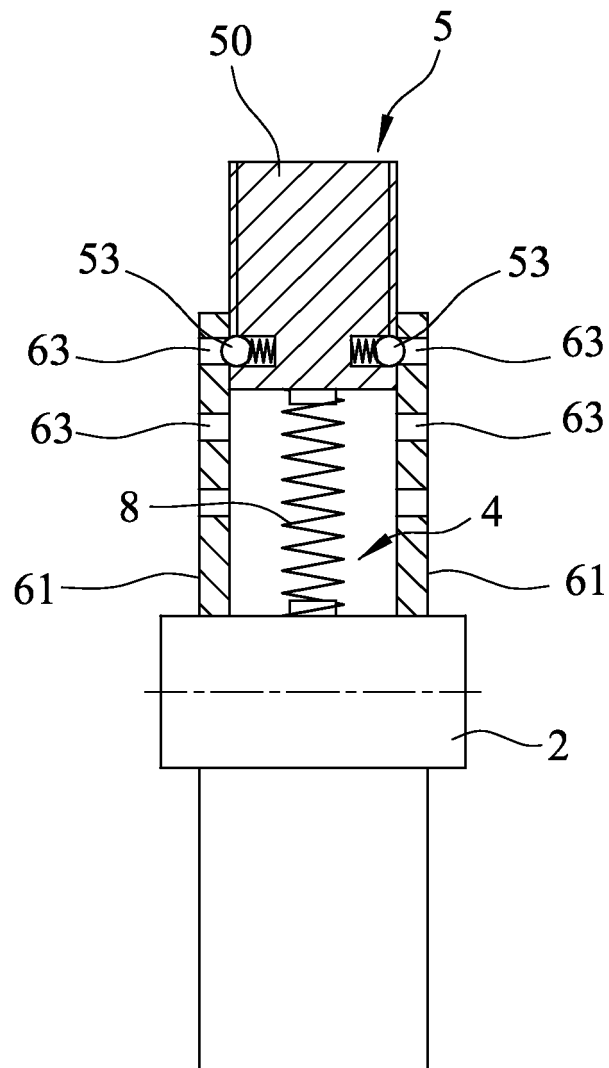


FIG. 11

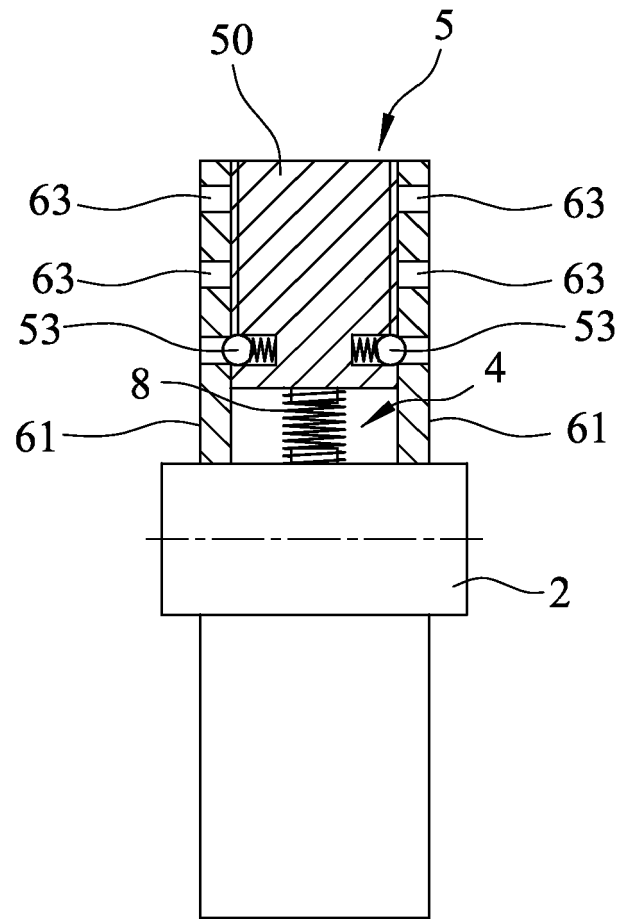


FIG. 12



EUROPEAN SEARCH REPORT

 Application Number
 EP 14 16 2732

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2011/127732 A1 (MANN KEVIN [US] ET AL) 2 June 2011 (2011-06-02)	1-4,7,8	INV. B60B19/04 A45C5/14
A	* paragraphs [0015] - [0017], [0023], [0025] - [0030]; figures * -----	5,6	
X	US 2006/185911 A1 (GUNDERSON LOUISE F [US] ET AL) 24 August 2006 (2006-08-24) * paragraphs [0028], [0029]; figures *	1	
X	EP 2 444 256 A1 (OTO MELARA SPA [IT]) 25 April 2012 (2012-04-25) * abstract; figures * * paragraph [0006]; claims * -----	1-3	
A	CN 203 016 107 U (LAI BAIWEN) 26 June 2013 (2013-06-26) * figure * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B60B A45C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 October 2014	Examiner van Overbeek, Kajsa
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
 EPO FORM 1503 03.82 (P04C01)

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

EP 14 16 2732

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-10-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011127732 A1	02-06-2011	NONE	
US 2006185911 A1	24-08-2006	AT 489278 T EP 1885595 A2 ES 2359429 T3 US 2006185911 A1 US 2008288128 A1 WO 2006091402 A2	15-12-2010 13-02-2008 23-05-2011 24-08-2006 20-11-2008 31-08-2006
EP 2444256 A1	25-04-2012	CA 2755912 A1 DK 2444256 T3 EP 2444256 A1 ES 2427047 T3 KR 20120041126 A SG 180117 A1 US 2012104834 A1	20-04-2012 02-09-2013 25-04-2012 28-10-2013 30-04-2012 30-05-2012 03-05-2012
CN 203016107 U	26-06-2013	NONE	