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(54) Title: VEHICLE

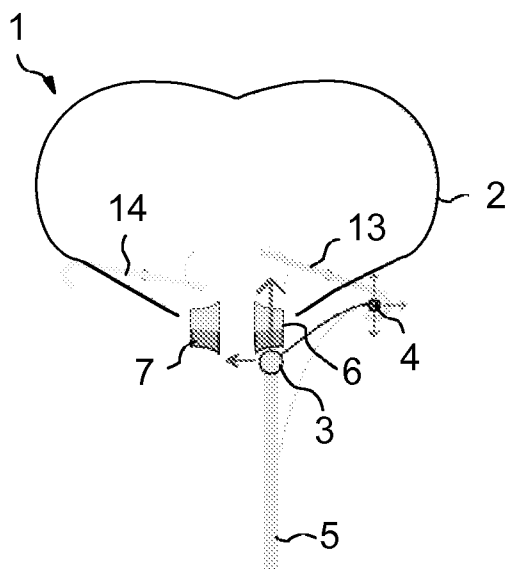


FIG. 3

(57) Abstract: The invention relates to a vehicle (1), comprising a compartment (2) and wheels. In order to obtain a vehicle capable of moving along a track that fits well into the landscape, said wheels are arranged in two longitudinal rows (6, 7), said vehicle (1) comprises support arms (13, 14) arranged on opposite sides of said vehicle for engaging with a guide (4) arranged along a single rail (3). The vehicle (1) comprises a retainer (15) arranged to prevent said row of wheels (6) from contacting a single rail (3) from moving horizontally towards the guide (4) which at that moment is engaged with one of the support arms (13).

VEHICLE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

- 5 [0001] The present invention relates to a vehicle for transportation of persons or goods.

DESCRIPTION OF PRIOR ART

- [0002] Previously there are known PRT (Personal Rapid Transit) vehicles with compartments offering space for a few persons. These known vehicles
10 move on wheels driven by their own motor along a track.

- [0003] A problem in implementing such vehicles into existing infrastructures of cities, for instance, is the track required by these known vehicles. In order to avoid intersections with existing roads, a common concept is to build the tracks several meters above the ground, and to utilize
15 pillars to support this track. In this way the vehicles can be driven on their own tracks without interfering problems from surrounding traffic or traffic jams, for instance.

- [0004] However, the building of a track on pillars a few meters above the ground of an existing city infrastructure (and also outside cities in the
20 surrounding nature) requires that this track fits very well into the landscape. The track should preferably be invisible, which is not possible, naturally. Instead, it is necessary to make the track as simple and small as possible in order to avoid that the track draws a lot of attention and prevents view of the sky.

- 25 [0005] The known solutions have, however, failed to fulfill the above requirements in a satisfactory way.

SUMMARY OF THE INVENTION

- [0006] An object of the present invention is to solve the above mentioned problem and to provide a vehicle capable of being used on a track fitting much
30 better into the landscape of existing infrastructure. This object is achieved with the vehicle of independent claim 1.

[0007] To utilize a solution involving two longitudinal rows of wheels of which only one needs to contact a rail at a time makes it possible to obtain a vehicle capable of utilizing a track that very well fits into a landscape. The support arms and the guide provide additional support for ensuring that the vehicle remains stable on the single track in all situations and under all conditions.

[0008] Preferred embodiments of the vehicle are disclosed in the dependent claims.

BRIEF DESCRIPTION OF DRAWINGS

[0009] In the following the present invention will be described in closer detail by way of example and with reference to the attached drawings, in which

[0010] Figures 1 and 2 illustrate an embodiment of a vehicle,

[0011] Figures 3 to 5 illustrate the base of the vehicle in Figures 1 and 2,

[0012] Figure 6 illustrates an alternative base,

[0013] Figure 7 illustrates the track at a branch,

[0014] Figure 8 illustrates a second alternative base, and

[0015] Figure 9 illustrates an alternative wheel shape.

DESCRIPTION OF AT LEAST ONE EMBODIMENT

[0016] Figure 1 illustrates an embodiment of a vehicle 1. The vehicle may be a vehicle for transporting persons or goods. In the following explanation it will, by way of example be assumed that the vehicle is a PRT (Personal Rapid Transit) vehicle with a compartment having space for a few persons. However, naturally in practical implementations the size and the purpose of use of the vehicle may be different.

[0017] The number of persons which simultaneously may travel with the vehicle 1 of Figure 1 varies depending on the implementation, typically within the range of 2 to 6. In the illustrated example it is assumed, by way of example, that the compartment 2 has seats for four persons.

[0018] The vehicle 1 is designed to travel along a track that fits into the landscape as well as possible. In the example of Figure 1, the vehicle travels along a track consisting of a single rail 3 and it is additionally supported by a guide 4 arranged along the rail 3. The rail 3 and the guide are supported by

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poles 5 in such a way that the rail is mainly located a few meters above the ground. The rail 3 need not have any specific cross sectional shape, as it is not necessary for the wheels to engage with the rail 3 in any particular way. Instead, the rail 3 may have an upper surface that is flat or round, for instance.

5 In the illustrated embodiments it is assumed by way of example that the cross section of the rail is circular.

[0019] In the illustrated example, the vehicle comprises two longitudinal rows of wheels 6 and 7, and a motor 8 coupled to at least some of the wheels for moving said vehicle. The motor 8 may be an electric motor, which can be
10 driven by a battery arranged into the vehicle, or alternatively, it can be connected to an electric network via the rail and/or the guide. It is also possible that the motor is a pneumatic motor operated by pressurized gas (such as air), or that the motor is a combustion engine.

[0020] It should be observed that it is not necessary in all embodiments
15 that the vehicle is equipped with a motor. Instead it is possible that the vehicle is moved along the track by external forces, such as a linear motor arranged along the track, for instance. It is also possible that the track is provided with mechanical engaging elements that tow the vehicle along the track.

[0021] In the following it is assumed by way of example that also a
20 controller, such as a computer carrying out a predetermined program for controlling the operations of the vehicle, is integrated with the motor 8. This controller may include a RF receiver (Radio Frequency) that receives control signals from an external control apparatus, in which case the controller implements the tasks indicated by the received control signals.

[0022] In this example, though not necessarily in all embodiments, the
25 compartment 2 is rotatable in relation to the base (comprising wheels and support arms). To take full advantage of this, the seats 9 have all been turned such that their backrests 10 are in the same direction. An actuator 11, such as an electric motor, is arranged to engage the compartment and to rotate 12 the
30 compartment 2 when the vehicle is driven through a curve. The rotation is carried out in order to turn the compartment 2 and the chairs 9 into such a position that the forces exerted on persons sitting in the chairs 9 due to the curve press the persons towards the backrests 10. In this way higher curve speed and/or tighter curve radius is possible without sacrificing passenger
35 comfort.

[0023] The rotatable compartment 2 is advantageous also when the vehicle arrives at a stop, as the compartment 2 can then be rotated into a position which makes it easy for passengers to enter or exit the vehicle.

[0024] Figures 3 to 5 illustrate the base of the vehicle in Figures 1 and 2.

5 The vehicle of Figures 3 to 5 comprises two longitudinal rows of wheels 6 and 7, of which the wheels of only one row contact a rail 3 at a time. The vehicle 1 also comprises support arms 13 and 14 on opposite sides of the vehicle. These support arms engage with a respective guide 4 arranged along said rail 3. In the illustrated embodiment, support arms 13 are engaged with the guide 4, while the support arms 14 are not at this moment engaged with a guide. The support arms 13 and 14 have been designed to engage with a guide in such a way that they prevent movement of the support arm upwards, downwards and horizontally towards the single rail 3 while being engaged. The change between an engaged status and a disengaged status of the support arm 13 may be carried out with a suitable actuator, such as an eccentric mechanism or with a hydraulic or pneumatic cylinder, for instance. In order to reduce friction between an engaged support arm and a guide, suitable rolls may be employed, or alternatively the support arm and/or the guide may be coated with a material reducing friction.

20 **[0025]** The vehicle 1 is provided with a retainer 15 arranged to prevent the row of wheels 6 contacting the single rail 3 from moving horizontally towards the guide 4 which at that moment is engaged with support arm 13. In addition, the retainer 15 is designed to allow the row of wheels 6 contacting the single rail 3 to move horizontally away from the guide (in order to ensure that the vehicle can move over to another rail at a branch, as illustrated in Figure 7).

25 **[0026]** In the embodiment illustrated in Figures 3 to 5, the retainer 15 is a part of the wheels in the row of wheels 6. The wheels have a first diameter D1 on the side facing the guide 4 and the retainer 15 consists of a part of the wheels having a larger diameter D2 than the first diameter. In the illustrated embodiment the diameter increases continuously from the first diameter D1 to the second diameter D2. However, in some practical implementations it is also possible to use wheels where the diameter is constant except for at the edge furthest away from the guide 4, where the diameter is larger. In such an embodiment the retainer consists of the 'flange' with the larger diameter.

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[0027] In Figure 5 the length of the support arm 13 has been adjusted in order to incline the vehicle 1 at an angle A towards the guide 4. This makes it possible to lift the second row of wheels 7 slightly, for instance, at a moment when these wheels 7 meet a starting end of a rail on which they will roll on from that moment on. Once the wheels 7 are located above the rail, the length of the support arm can again be increased so that the row of wheels 7 contacts the rail.

[0028] The length adjustment of the support arm 13 can be accomplished with a suitable actuator, such as a pneumatic or hydraulic cylinder, for instance. In this context the term "adjusting the length" of the support arm should be understood as adjusting the actual physical length of the support arm, or alternatively, only the distance that the support arm protrudes from the vehicle. In both cases the result is that the distance between the guide and the vehicle decreases such that the vehicle is inclined.

[0029] A situation when it may be advantageous to incline the vehicle 1 will be when the vehicle is passing through a curved section of the track. In this case the vehicle 1 is preferably inclined towards the inner side of the curve. This will allow dynamic adjustment of banking based i.e. on vehicle speed and/or passenger preference.

[0030] Figure 6 illustrates an alternative base. The embodiment of Figure 6 is very similar to the one of Figures 3 to 5. Therefore the embodiment of Figure 6 will mainly be explained by pointing out the differences between these embodiments.

[0031] In the embodiment of Figure 6, the retainer 15' consists of a protrusion extending downwards between the longitudinal rows of wheels 6' and 7', past a lowest part of said wheels. Similarly, as in the embodiment of Figures 3 to 5, this protrusion prevents the row of wheels 6' from moving horizontally towards the guide 4 which at that moment is engaged with one of the support arms 13, and the retainer 15' also allows said row of wheels to move horizontally away from said guide 4.

[0032] Due to the retainer 15' which is separate from the wheels 6' and 7', the wheels may have a constant diameter over their entire width. Naturally, if desired, similar wheels as those shown in Figures 3 to 5 may be utilized in the embodiment of Figure 6.

[0033] The retainer 15' may also have a second function. In case the track is an upward track to the top of a hill, for instance, the motor of the vehicle (assuming that the vehicle has a motor) does not necessarily have the power needed for moving the vehicle to the top. In that case assisted uphill climb
5 may be provided by linear motors provided along the track. In case of a metallic retainer 15', the linear motors along the track may generate a magnetic field affecting the metallic retainer 15' in such a way that the magnetic field pushes the vehicle along the track towards the top. Instead of linear motors, the track may be provided with a device that mechanically
10 engages with the retainer in this part of the track, and which tows the vehicle upwards to the top of the hill.

[0034] Figure 7 illustrates the track at a branch. It is assumed by way of example that the vehicle 1 illustrated in the previous figures moves in direction 16 along the rail 3 supported by the guide 4 with which the support arm 13 is
15 engaged. At the illustrated branch the vehicle should change direction and move in the direction 17 instead. This is achieved such that once both rows of wheels 6 and 7 (or 6' and 7') are located on respective rails 3 and 3', the support arm 14 engages with the second guide 4'. At this stage the support arm 13 may disengage from guide 4. Consequently, once the rails 3 and 3'
20 and guides 4 and 4' turn into different directions, the vehicle proceeds in the direction of the rail 3' and guide 4'.

[0035] In case the vehicle moves on sections of the track where additional support is needed, due to higher speed or the track conditions, for instance, it is possible that this part of the track is provided with two rails and guides. In
25 that case both rows of wheels are simultaneously located on a rail, and support arms on both sides of the vehicle are simultaneously engaged with a guide. Such kind of additional support may be utilized above water or during assisted uphill climb, for instance.

[0036] Figure 8 illustrates a second alternative base. This embodiment is
30 very similar to the one described in connection with Figures 3 to 5, and therefore the embodiment of Figure 8 will mainly be explained by pointing out the differences.

[0037] In Figure 8 the support arm 13' (or support arms) has a different construction. In this example they are shaped to grab the guide from above. A
35 mechanism is utilized which makes it possible to increase the distance

between the 'fingers' (or claws) of the support arm 13' that engage the guide 4 while the support arm is moved into engagement and correspondingly out of engagement with the guide 4. Once engaged, the mechanism moves the 'fingers' towards the guide 4 in order to engage the guide, and in this way
5 keep the guide locked between the 'fingers'.

[0038] Figure 9 illustrates an alternative wheel shape. This embodiment is very similar to the one described in connection with Figures 3 to 5, and therefore the embodiment of Figure 9 will mainly be explained by pointing out the differences.

10 **[0039]** Also in this embodiment the wheel 18 is provided with a retainer 15 that is a part of the wheel, and which has a larger diameter than other parts of the wheel. However, in this embodiment a retainer 15 is provided in both ends of the wheel. In this way the wheel 18 follows the rail 3 in a more secure way than in the previous embodiments.

15 **[0040]** Due to retainers 15 in both ends of the wheel, it is necessary to somehow lift off this wheel from the rail once the vehicle should no longer follow the rail 3, such as in a branching point, as explained in connection with Figure 7. This can be accomplished by adjusting the length of the support arms, for instance, as has been explained in connection with Figure 5, in
20 which case the vehicle is inclined and the row of wheels contacting the rail 3 are lifted off the rail 3.

[0041] It is to be understood that the above description and the accompanying figures are only intended to illustrate the present invention. It will be obvious to a person skilled in the art that the invention can be varied
25 and modified without departing from the scope of the invention.

CLAIMS:

1. A vehicle (1), comprising:
a compartment (2), and
5 wheels, characterized in
that said wheels are arranged in two longitudinal rows (6, 7; 6', 7'),
of which the wheels of only one row (6, 6') contact a rail (3) at a time while
moving along a single rail (3),
that said vehicle (1) comprises support arms (13, 14) arranged on
10 opposite sides of said vehicle for engaging with a guide (4) arranged along
said single rail (3), said support arms (13, 14) and guides (4) being designed
to prevent movement of an engaged support arm (13) at least upwards,
downwards and horizontally towards said single rail (3), and
that said vehicle (1) comprises a retainer (15, 15') arranged to
15 prevent said row of wheels (6, 6') contacting said single rail (3) from moving
horizontally towards the guide (4) which at that moment is engaged with one
of the support arms (13).
2. The vehicle according to claim 1, characterized in that
said retainer (15') is a protrusion extending downwards between said
20 longitudinal rows of wheels (6', 7') and past a lowest part of said wheels.
3. The vehicle according to claim 1, characterized in that
said retainer (15) is a part of at least one of said wheels.
4. The vehicle according to claim 3, characterized in that
said wheel has a first diameter (D1) on a side facing said guide which at that
25 moment is engaged with one of the support arms, and said retainer (15)
consist of a part of said wheel having a larger diameter (D2) than said first
diameter.
5. The vehicle according to one of claims 1 to 4,
characterized in that said vehicle (1) comprises a controller for
30 controlling said engaged support arm (13) to release said engagement and for
controlling a support arm (14) on the opposite side of said of said vehicle (1)
to engage with a second guide (4') on said opposite side when said vehicle (1)
is located in a section with rails (3, 3') under both longitudinal rows of wheels
(6, 7; 6', 7') and guides (4, 4') on both sides of the vehicle (1).

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6. The vehicle according to one of claims 1 to 5, characterized in that said vehicle (1) comprises an actuator for adjusting the length of said engaged support arm (13) for inclining said vehicle (1).

5 7. The vehicle according to claim 6, characterized in that said actuator inclines the vehicle (1) towards the inside of a curve while said vehicle (1) is driven through said curve.

8. The vehicle according to one of claims 1 to 7, characterized in

10 that said compartment (2) comprises seats (9) with backrests (10) that are all directed in a same direction,

that said compartment (2) is rotatable, and

that said vehicle comprises a second actuator (11) for rotating said compartment before said vehicle (1) is driven through a curve or heavily
15 decelerated in order to turn said compartment into a position where forces generated due to the curve or due to deceleration on persons sitting in said seats (9) press said persons towards the backrests (10).

9. The vehicle according to one of claims 1 to 8, characterized in that said vehicle comprises seats for a few persons.

20 10. The vehicle according to one of claims 1 to 9, characterized in that said vehicle comprises a motor (8) coupled to at least some of said wheels for moving said vehicle (1).

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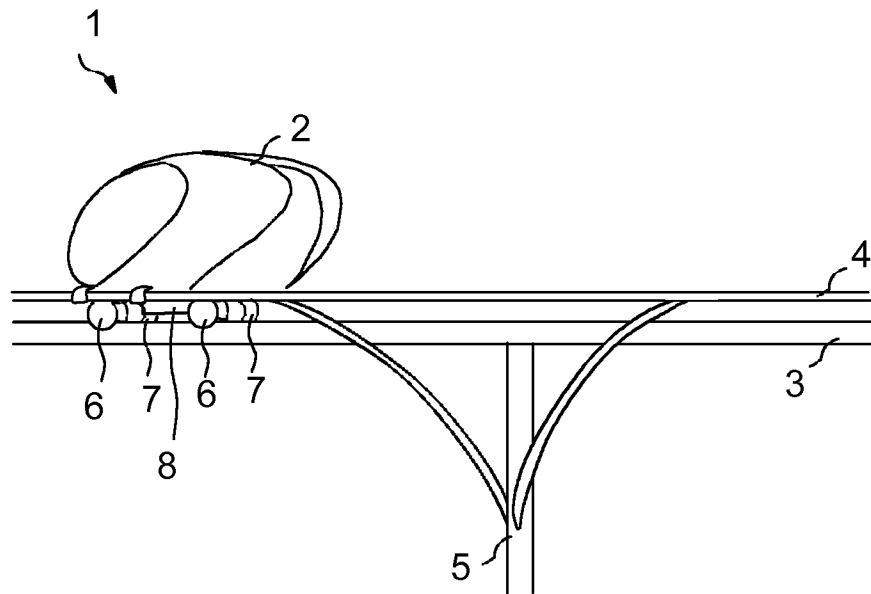


FIG. 1

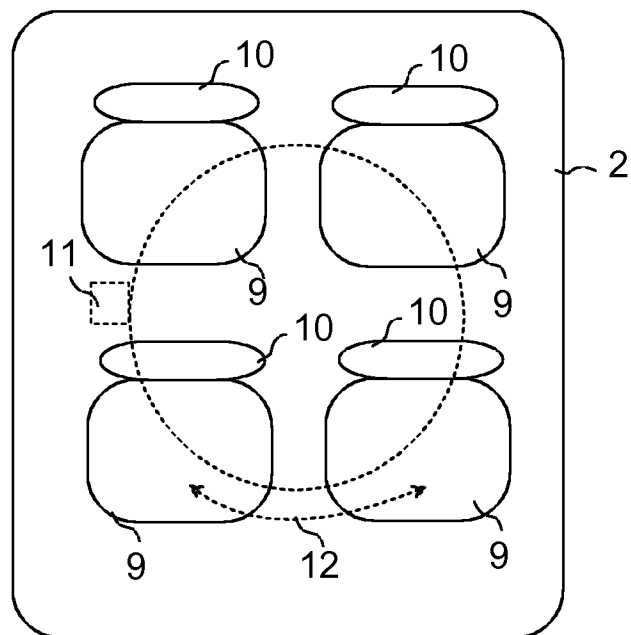


FIG. 2



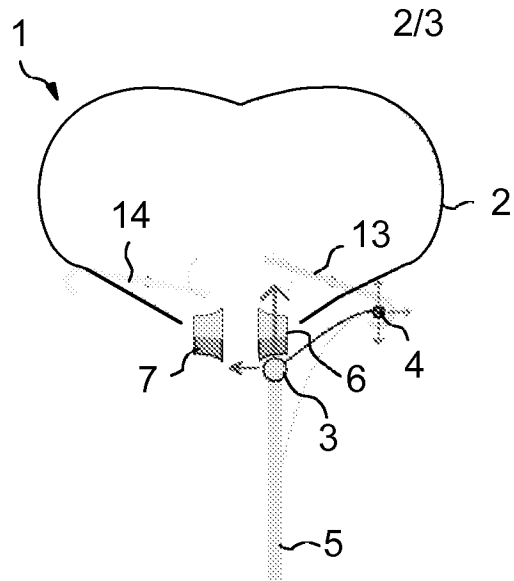


FIG. 3

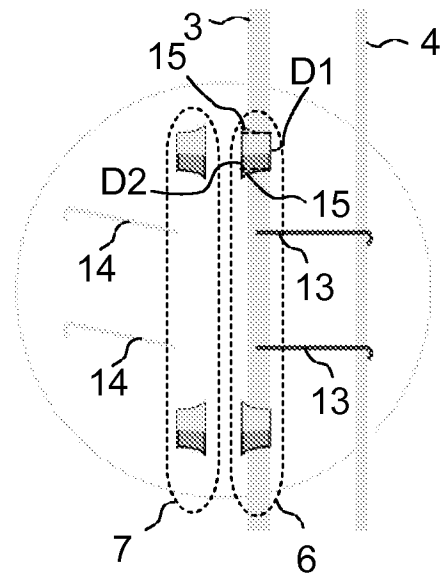


FIG. 4

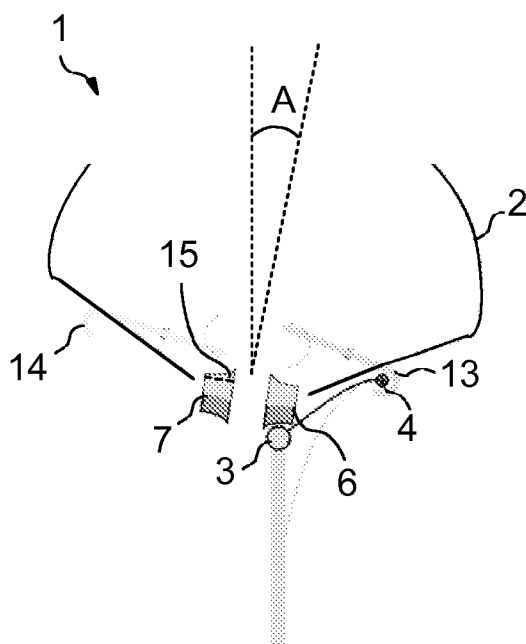


FIG. 5

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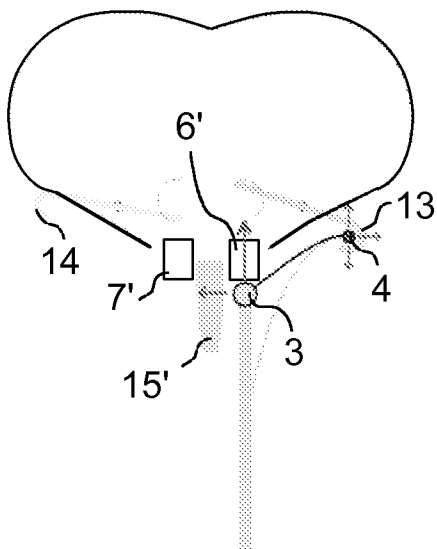


FIG. 6

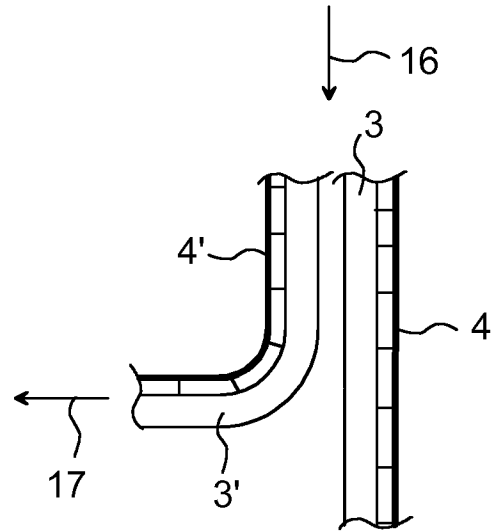


FIG. 7

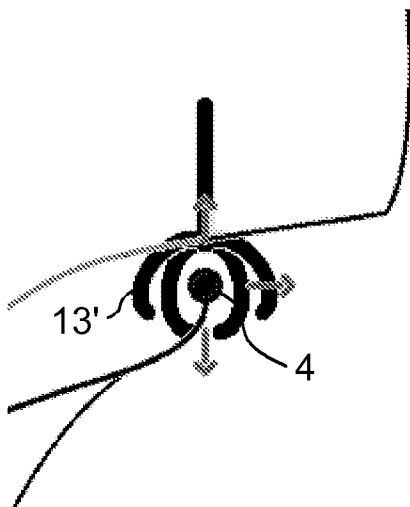


FIG. 8

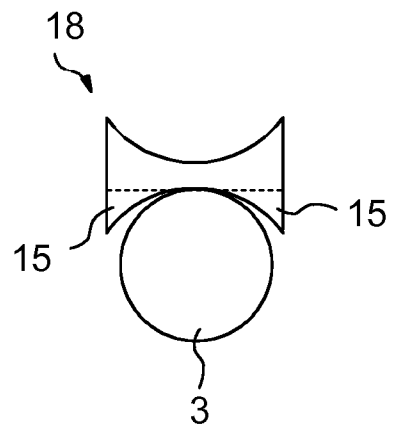


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2010/050221

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: B61B, E01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DK

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

EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FI 830188 A (FLYDA LTD) 23 July 1983 (23.07.1983) page 2, lines 14-24; page 8, lines 17-22; page 10, lines 31-34; page 11, line 34 – page 13, line 25; figures 5-7 and 9-12	1, 5, 9-10
A	US 2003140817 A1 (NOVACEK MILAN) 31 July 2003 (31.07.2003) chapters 0032, 0045, 0048-0049 and 0051; figures 1, 3B, 4, 7 and 8	1
A	GB 2209318 A (MUNOZ SAIZ MANUEL) 10 May 1989 (10.05.1989) figures 4 and 5	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

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

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"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

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Date of the actual completion of the international search

10 November 2010 (10.11.2010)

Date of mailing of the international search report

14 December 2010 (14.12.2010)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI2010/050221

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INTERNATIONAL SEARCH REPORT

International application No.

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CLASSIFICATION OF SUBJECT MATTER

Int.Cl.

B61B 13/04 (2006.01)

E01B 25/10 (2006.01)