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(54) **Rail vehicle with self steering running gear**

(57) The invention relates to a rail vehicle, in particular for high-speed travel, comprising a wagon body (103) supported on at least one running gear (102) said wagon body (103) having a nominal load and defining a longitudinal direction, a transverse direction and a height direction. The running gear (102) comprises a wheel unit (104) and a running gear frame (105) supported on said wheel unit (104) via at least one spring device (106, 107), the wheel unit (104) defining a wheel unit axis and comprising two wheel unit bearings (108) spaced in said transverse direction. Each wheel unit (104) bearing is connected to said running gear frame (105) via a lever (109) pivotably connected to said running gear frame

(105) and said wheel unit bearing (108), said levers, under said nominal load of said wagon body (103), being arranged such that a rolling motion of said running gear frame (105) occurring about said longitudinal direction when traveling through a curved track section generates an alteration of an inclination of said lever (109) with respect to said longitudinal direction causing a steering motion of said wheel unit (104) about said height direction providing at least partially curve radial adjustment of said wheel unit (104). Each of said levers is formed as a wing element (109) pivotably connected to said running gear frame (105) and providing a receptacle receiving one of said wheel unit bearings (108).

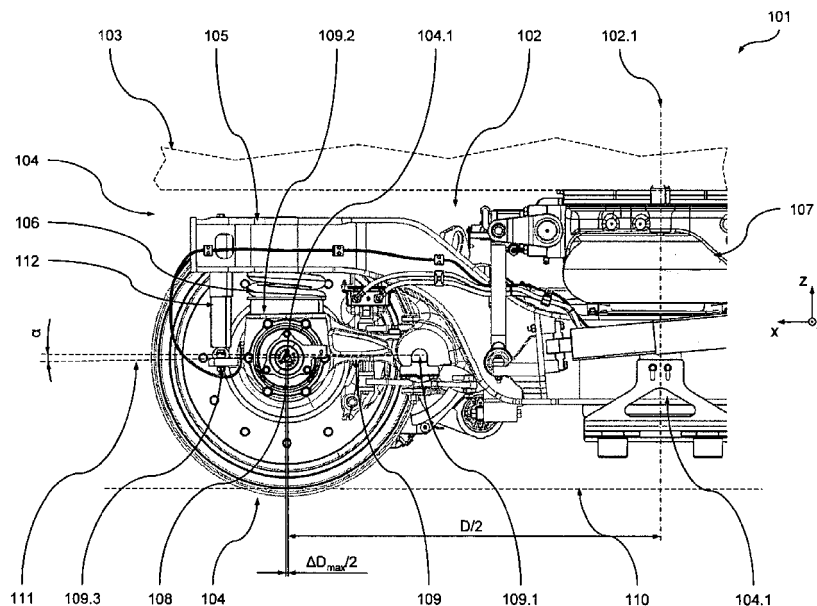


Fig. 1

DescriptionBACKGROUND OF THE INVENTION

[0001] The present invention relates to a rail vehicle, in particular for high-speed travel, comprising a wagon body supported on at least one running gear said wagon body having a nominal load and defining a longitudinal direction, a transverse direction and a height direction. The running gear comprises a wheel unit and a running gear frame supported on the wheel unit via at least one spring device. The wheel unit defines a wheel unit axis and comprises two wheel unit bearings spaced in the transverse direction. Each wheel unit bearing is connected to the running gear frame via a lever pivotably connected to the running gear frame and the wheel unit bearing. Finally, the levers, under the nominal load of the wagon body, are arranged such that a rolling motion of the running gear frame occurring about the longitudinal direction when traveling through a curved track section generates an alteration of an inclination of the lever with respect to the longitudinal direction causing a steering motion of the wheel unit about said height direction providing at least partially curve radial adjustment of the wheel unit. The present invention further relates to a running gear for such a rail vehicle.

[0002] In modern rail vehicles, in particular, modern high-speed rail vehicles, there is a need to provide good and stable running characteristics, in particular at high speeds, while keeping the wear related loads exerted on the components of the rail vehicle, in particular, the components of the running gear, as well as the wear related loads exerted on the components of the infrastructure, such as e.g. the rails of the track, as low as possible in order to achieve maximum lifetime of the respective component.

[0003] In this context it is known from DE 100 47 737 A1 to provide a self steering running gear as outlined above using steering levers articulated to, both, the running gear frame and a wheel set bearing unit receiving the respective wheel set bearing. This known configuration provides at least to some extent curve radial adjustment of the wheel set (i.e. a self steering effect) and, hence, a reduction of the frictional load exerted at the wheel to rail contact area.

[0004] However, this known configuration has the disadvantage that it provides comparatively poor stability properties in terms of the overall guidance of the respective wheel set which are essential for high-speed operation. In particular, special measures have to be taken to avoid pitching vibration of the wheel set bearing unit (i.e. rotational vibration about the transverse direction). Such a configuration does not only increase the effort for achieving good running stability it typically also has the disadvantage that a plurality of components such as dampers etc. is required to achieve this goal. This is particularly disadvantageous considering the fact that, in running gears of modern rail vehicles, typically, there is

comparatively few space available for integrating such components.

SUMMARY OF THE INVENTION

[0005] It is thus an object of the present invention to provide a rail vehicle as outlined above that, at least to some extent, overcomes the above disadvantages. It is a further object of the present invention to provide a rail vehicle with improved running stability properties at a reduced effort.

[0006] The above objects are achieved starting from a rail vehicle according to the preamble of claim 1 by the features of the characterizing part of claim 1.

[0007] The present invention is based on the technical teaching that simple improvement of the running stability at comparatively low effort may be achieved if the levers providing the self steering functionality are formed as wings (e.g. swing- or swivel-arm-like elements) receiving or integrating the wheel unit bearing. This functional integration of both the self steering functionality as well as the wheel unit guiding functionality reduces the number of parts to be used and, hence, the overall effort for achieving proper running stability. Furthermore, the consumption of building space is reduced thereby relaxing the requirements for integrating all necessary components into the running gear.

[0008] It will be appreciated that the present invention may be used in a particularly beneficial way in the context of high-speed rail vehicles. However, the beneficial effects of the present invention may also be useful in vehicles having nominal operating speeds which are (even considerably) lower. In particular, it will be appreciated that the self steering effect, i.e. the curve radial adjustment of the wheel unit (caused by the rolling motion of the components supported on the wheel unit when negotiating a curve), may be tuned to the specific type of vehicle. More precisely, in a vehicle generally traveling at higher speeds, the geometric design and arrangement of the self steering wings is selected such that the optimum steering effect (i.e. the optimum steering angle) is obtained in curves having a high radius of curvature. Contrary to that, in vehicles typically operated at low speeds, such as in light rail vehicles typically operated in an urban environment with comparatively narrow curves, the geometric design and arrangement of the self steering wings is selected such that the optimum steering effect (i.e. the optimum steering angle) is obtained in curves having a low radius of curvature.

[0009] Hence, according to one aspect, the present invention relates to a rail vehicle, in particular for high-speed travel, comprising a wagon body supported on at least one running gear said wagon body having a nominal load and defining a longitudinal direction, a transverse direction and a height direction. The running gear comprises a wheel unit and a running gear frame supported on the wheel unit via at least one spring device. The wheel unit defines a wheel unit axis and comprises two wheel

unit bearings spaced in the transverse direction. Each wheel unit bearing is connected to the running gear frame via a lever pivotably connected to the running gear frame and the wheel unit bearing. Finally, the levers, under the nominal load of the wagon body, are arranged such that a rolling motion of the running gear frame occurring about the longitudinal direction when traveling through a curved track section generates an alteration of an inclination of the lever with respect to the longitudinal direction causing a steering motion of the wheel unit about said height direction providing at least partially curve radial adjustment of the wheel unit. Each of the levers is formed as a wing element pivotably connected to the running gear frame and providing a receptacle receiving one of the wheel unit bearings.

[0010] The self steering functionality may be achieved by any suitable means. Preferably, each of the wing elements is connected to the running gear frame to be pivotable about a pivot point, the wing elements being arranged such that, under the nominal load of the wagon body on a straight level track, a plane defined by the pivot point and the wheel unit axis is inclined with respect to the longitudinal direction. Hence, in this case, a modification of the angle of inclination provides the desired steering motion.

[0011] The initial angle of inclination of this plane (i.e. the angle that is present under a static situation under nominal load on a straight level track) may have any suitable value. This initial value, in particular, may depend on the maximum steering action to be achieved. Preferably, the plane defined by the pivot point and the wheel unit axis, under the nominal load of the wagon body on a straight level track, is inclined with respect to the longitudinal direction by an initial angle of inclination, the initial angle of inclination being less than 25°, preferably ranging from 4° to 20°, more preferably ranging from 5° to 17°. By this means particularly good self steering properties may be achieved.

[0012] It will be appreciated that, in a high-speed rail vehicle (in particular traveling at nominal operating speeds above 250 km/h) the initial angle of inclination is preferably selected to range from 4° to 8°, while in a medium-speed rail vehicle (in particular traveling at nominal operating speeds between 120 km/h and 180 km/h) the initial angle of inclination is preferably selected to range from 8° to 12°. Finally, in a low-speed rail vehicle (in particular traveling at nominal operating speeds between 60 km/h and 100 km/h) the initial angle of inclination is preferably selected to range from 12° to 17°.

[0013] The present invention may be used in the context of any type of running gear. Particularly good results may be achieved in running gears having two or more wheel units. It will be appreciated that, a wheel unit in the sense of the present invention may be, for example, a wheel set or a wheel pair as well as units formed by two individual uncoupled wheels.

[0014] Preferably, the wheel unit is a first wheel unit and the running gear comprises a second wheel unit, the

wing elements each being connected to the running gear frame to be pivotable about a pivot point. Furthermore, the wing elements are arranged such that the rolling motion of the running gear frame, at a radially outer side of the curved track section, increases a longitudinal distance between the first wheel unit and the second wheel unit. In addition or as alternative, the wing elements are arranged such that the rolling motion of the running gear frame, at a radially inner side of the curved track section, decreases a longitudinal distance between the first wheel unit and the second wheel unit. In either case, by this means, good steering properties are achieved.

[0015] The extent of the respective longitudinal shift between the two wheel units may be selected as a function of the steering angle to be achieved for the respective vehicle. Preferably, on one side of the running gear, the first wheel unit, at a center of the wheel unit bearing, defines a first axis point on a first wheel unit axis and the second wheel unit, and a center of a wheel unit bearing, defines a second axis point on a second wheel unit axis, the first axis point and the second axis point, in a static condition under the nominal load of the wagon body on a straight level track, have an initial longitudinal distance along the longitudinal direction. In this case, the wing elements are preferably arranged such that the rolling motion of the running gear frame, at the radially outer side of the curved track section, at most generates a maximum increase in the longitudinal distance between the first axis point and the second axis point, the maximum increase ranging from 0.05% to 2%, preferably from 0.1% to 1%, more preferably ranging from 0.2% to 0.5%, of the initial longitudinal distance.

[0016] It will be appreciated that, here as well, depending on the type of vehicle (in particular the nominal operating speed) in which the present invention is used, the maximum increase is adapted to fit the respective radius of curvature of the curves where an optimum curve radial adjustment is to be achieved. In other words, in high-speed vehicles tuned to achieve optimum adjustment in curves having a high radius of curvature, less maximum increase is required than in low-speed vehicles tuned to achieve an optimum curve radial adjustment in curves having a low radius of curvature.

[0017] The wing element may be of any suitable design. In particular, it may be made of the plurality of separate components assembled to provide the wing element. However, with particularly robust embodiment of the present invention, the wing element is a monolithic component.

[0018] Furthermore, the wing element may be manufactured using any suitable manufacturing technique. Again, for example, it may be assembled using any suitable assembling technique. For example, it may be a welded component. Preferably, the wing element is a cast component and/or a forged component, again providing a very robust arrangement.

[0019] With preferred embodiments of the invention, the wing element integrates further functions to increase

the degree of functional integration and to further reduce the building space required within the running gear. Hence, preferably, the wing element forms a spring interface section for a spring device, in particular, a primary spring device, supporting the running gear frame. The spring interface may be located at any suitable location. Preferably, the spring interface section is located between the wheel unit bearing and the running gear frame in the height direction. The spring interface section may have any suitable shape. Preferably, the spring interface section is a substantially planar surface of the wing element such that a very simple configuration is achieved.

[0020] A further increase in the degree of functional integration may be achieved if the wing element, in addition or as alternative, forms a damper interface section for a damper device acting between the running gear frame and the wheel unit. The damper interface section may be placed at any suitable location. Preferably, the damper interface section is located at an end section of the wing element opposite to an articulation of the wing element to the running gear frame.

[0021] It will be appreciated that the receptacle for the wheel unit bearing may only partially received the latter. However, preferably, the wing element comprises a receptacle substantially completely receiving the wheel unit bearing. Furthermore, the connection between the wing element and the wheel unit bearing may be achieved by any suitable means. Preferably, the wheel unit bearing is releasably connected to the wing element.

[0022] It will be further appreciated that the present invention may be used in the context of any type of wheel unit such as wheel sets, wheel pairs or even units formed by two individual uncoupled wheels. Particularly simple configurations with good steering results and running properties are achieved if the wheel unit is a wheel set.

[0023] The rail vehicle according to any one of claims 1 to 11, wherein it is adapted to be used for high-speed operation at nominal operating speeds above 250 km/h, preferably above 300 km/h, more preferably above 350 km/h.

[0024] As mentioned above, implementation of the present invention is particularly beneficial in high-speed rail vehicles. Hence, preferably, the rail vehicle according to the present invention is adapted to be used for high-speed operation at nominal operating speeds above 250 km/h, preferably above 300 km/h, more preferably above 350 km/h.

[0025] With other embodiments of the invention, the rail vehicle is adapted to be used for low-speed operation at nominal operating speeds below 120 km/h, preferably between 60 km/h and 100 km/h. With further embodiments of the invention, the rail vehicle is adapted to be used for medium-speed operation at nominal operating speeds above 120 km/h, preferably between 120 km/h and 200 km/h.

[0026] The present invention furthermore relates to a running gear for a rail vehicle having the properties and features as outlined above, i.e., among others, compris-

ing the wing elements as defined above.

[0027] Further embodiments of the present invention will become apparent from the dependent claims and the following description of preferred embodiments which refers to the appended figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

Figure 1 is a schematic side view of a part of a preferred embodiment of a running gear according to the present invention used in a preferred embodiment of the rail vehicle according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0029] With reference to Figure 1 a preferred embodiment of a rail vehicle 101 according to the present invention comprising a preferred embodiment of a running gear 102 according to the invention will now be described in greater detail. In order to simplify the explanations given below, an xyz-coordinate system has been introduced into the Figure, wherein (on a straight, level track) the x-axis designates the longitudinal direction of the rail vehicle 101, the y-axis designates the transverse direction of the rail vehicle 101 and the z-axis designates the height direction of the rail vehicle 101.

[0030] The vehicle 101 is a high-speed rail vehicle with a nominal operating speed above 250 km/h, more precisely above 300 km/h to 380 km/h. The vehicle 101 comprises a wagon body 103 supported by a suspension system on the running gear 102. The running gear 102 comprises two wheel units in the form of wheel sets 104 supporting a running gear frame 105 via a primary spring unit 106. The running gear frame 105 supports the wagon body 103 via a secondary spring unit 107.

[0031] The running gear frame 105 is of generally H-shaped design with a middle section 105.1 located between the wheel sets 104. As far as the overall design of the running gear frame 105 and the arrangement and support of the wheel sets 104 is concerned, the running gear 102 has a substantially symmetric configuration, a plane of symmetry (parallel to the yz plane) being indicated in Figure 1 by the contour 102.1.

[0032] Each wheel set 104 defines a wheel unit axis which, in the static situation under a nominal load of the wagon body 103, runs substantially parallel to the y axis. Furthermore, the ends of each wheel set 104 are rotatably received within a wheel set bearing 108. Each wheel set bearing, in turn, is substantially fully and releasably received within a receptacle formed in a wing element 109, first end of which is pivotably articulated to the running gear frame 105 at a pivot point 109.1.

[0033] Each wing element 109, in the static situation under the nominal load of the wagon body 103, is arranged such that a plane 111 defined by the pivot point

109.1 and the wheel unit axis (i.e. the axis of rotation of the wheel unit 104 when rolling on the track) is inclined with respect to the longitudinal direction by an initial angle $\alpha = \alpha_0$.

[0034] As a consequence of this arrangement, a rolling motion of the running gear frame 105 occurring about the longitudinal direction (x axis) when traveling through a curved section of the track 110 generates an alteration of the inclination angle α of the wing element 109 with respect to the longitudinal direction causing a steering motion of the wheel unit 104 about the height direction (z axis) providing an at least partial curve radial adjustment of the wheel unit 104.

[0035] To this end, the wing elements 109 are arranged such that the rolling motion of the running gear frame 105, at a radially outer side of the curved section of the track 110, increases a longitudinal distance D between a first and second axis point 104.1 on the wheel set axes of the first and second wheel unit 104, the respective axis point 104.1 being located at center of the respective wheel set bearing 108. The longitudinal distance herein designates the distance in the longitudinal direction (x axis) between these axis points 104.1 (only half of it, i.e. D/2, being shown in Figure 1). In addition the wing elements 109 are arranged such that the rolling motion of the running gear frame, at a radially inner side of the curved section of the track 110, decreases the longitudinal distance D between the first and second wheel unit 104. In either case, by this means, good steering properties are achieved.

[0036] The extent of the respective maximum longitudinal shift ΔD_{\max} (only half of it, i.e. $\Delta D_{\max}/2$, being shown in Figure 1) achievable between the first and second axis point 104.1 of the two wheel units 104 (starting from the initial longitudinal distance $D = D_0$ as shown in Figure 1) may be selected as a function of the steering angle to be achieved for the respective vehicle 101. Preferably, the maximum increase ΔD_{\max} in the longitudinal distance D ranges from 0.05% to 2%, preferably from 0.1 % to 1%, more preferably ranging from 0.2% to 0.5%, of the initial longitudinal distance.

[0037] Comparable applies to the angle of inclination α . The initial angle of inclination α_0 of the plane 111 (i.e. the angle that is present in the static situation under nominal load on a straight level track) may have any suitable value. This initial value, in particular, may depend on the maximum steering action to be achieved. In the present example, the initial angle of inclination α_0 is about 6°. By this means particularly good self steering properties may be achieved. It should be noted that Figure 1, in this respect, is only used for illustrative purposes given the fact that the angle of inclination α_0 as shown in Figure 1 is less than 6°.

[0038] It will be appreciated however that, with other embodiments of the invention, the initial angle of inclination α_0 may have any other suitable value as it has been outlined above. In particular, the initial angle of inclination α_0 depends on the steering motion to be achieved for the

respective vehicle.

[0039] The wing element 109 is a monolithic forged component, thereby achieving a very robust configuration. It will be appreciated however, that with other embodiments of the invention, any other desired design as outlined above may be chosen.

[0040] In the embodiment shown, the wing element 109 integrates further functions to increase the degree of functional integration and to further reduce the building space required within the running gear 102. More precisely, the wing element 109 has a planar surface located above the receptacle of the with set bearing 108 forming a spring interface section 109.2 for the primary spring device 106 located between the wheel set bearing 108 and the running gear frame 105 in the height direction (z axis).

[0041] A further increase in the degree of functional integration is achieved in the embodiment shown by the fact that the wing element 109 in addition forms a damper interface section 109.3 for a damper device 112 acting between the running gear frame 105 and the wheel set 104. As can be seen from Figure 1, the damper interface section 109.3 is located at an end section of the wing element 109 opposite to its pivot point 109.1 at the running gear frame 105.

[0042] It will be appreciated that the present example, in the static situation under the nominal load of the wagon body 103, the initial height distance between the pivot point 109.1 and the wheel unit axis (i.e. the axis of rotation of the wheel unit 104 when rolling on the track) in the height direction (z axis) is about 50 mm. However, depending on the geometric boundary conditions of the running gear and the optimum steering angle to be achieved at a given running condition (typically selected as a function of the type of vehicle as outlined above), other initial height distances may be chosen.

[0043] Typically, in a low-speed vehicle (such as a light-rail vehicle), initial height distances range from 100 mm to 140 mm, preferably from 110 mm to 130 mm, more preferably from 115 mm to 125 mm. In a medium-speed vehicle initial height distances typically range from 60 mm to 100 mm, preferably from 70 mm to 90 mm, more preferably from 75 mm to 85 mm. In a high-speed vehicle initial height distances typically range from 30 mm to 70 mm, preferably from 40 mm to 60 mm, more preferably from 45 mm to 55 mm.

[0044] Although the present invention in the foregoing has only a described in the context of high-speed rail vehicles, it will be appreciated that it may also be applied to any other type of rail vehicle in order to overcome similar problems with respect to a simple solution for optimum steering and running stability properties at the respective running conditions.

Claims

1. A rail vehicle, in particular for high-speed travel, com-

prising

- a wagon body (103) supported on at least one running gear (102)
 - said wagon body (103) having a nominal load and defining a longitudinal direction, a transverse direction and a height direction;
 - said running gear (102) comprising a wheel unit (104) and a running gear frame (105) supported on said wheel unit (104) via at least one spring device (106, 107);
 - said wheel unit (104) defining a wheel unit axis and comprising two wheel unit bearings (108) spaced in said transverse direction,
 - each wheel unit (104) bearing being connected to said running gear frame (105) via a lever (109) pivotably connected to said running gear frame (105) and said wheel unit bearing (108),
 - said levers, under said nominal load of said wagon body (103), being arranged such that a rolling motion of said running gear frame (105) occurring about said longitudinal direction when traveling through a curved track section generates an alteration of an inclination of said lever (109) with respect to said longitudinal direction causing a steering motion of said wheel unit (104) about said height direction providing at least partially curve radial adjustment of said wheel unit (104),
- characterized in that**
- each of said levers is formed as a wing element (109) pivotably connected to said running gear frame (105) and providing a receptacle receiving one of said wheel unit bearings (108).

2. The rail vehicle according to claim 1, wherein

- each of said wing elements is connected to said running gear frame (105) to be pivotable about a pivot point (109.1);
- said wing elements being arranged such that, under said nominal load of said wagon body (103) on a straight level track, a plane (111) defined by said pivot point (109.1) and said wheel unit axis is inclined with respect to said longitudinal direction.

3. The rail vehicle according to claim 2, wherein

- said plane defined by said pivot point (109.1) and said wheel unit axis, under said nominal load of said wagon body (103) on a straight level track, is inclined with respect to said longitudinal direction by an initial angle of inclination;
- said initial angle of inclination being less than 25°, preferably ranging from 4° to 20°, more preferably ranging from 5° to 17°.

4. The rail vehicle according to any one of claims 1 to 3, wherein

- said wheel unit (104) is a first wheel unit and said running gear (102) comprises a second wheel unit;
- said wing elements (109) each being connected to said running gear frame (105) to be pivotable about a pivot point;
- said wing elements (109) being arranged such that said rolling motion of said running gear frame (105), at a radially outer side of said curved track section, increases a longitudinal distance between said first wheel unit (104) and said second wheel unit (104) and/or, at a radially inner side of said curved track section, decreases a longitudinal distance between said first wheel unit (104) and said second wheel unit (104).

5. The rail vehicle according to claim 4, wherein

- on one side of said running gear, said first wheel unit (104), at a center of said wheel unit bearing (108), defines a first axis point (104.1) on a first wheel unit axis and said second wheel unit, and a center of a wheel unit bearing (108), defines a second axis point (104.1) on a second wheel unit axis,
- said first axis point and said second axis point, in a static condition under said nominal load of said wagon body (103) on a straight level track, have an initial longitudinal distance along said longitudinal direction;
- said wing elements (109) being arranged such that said rolling motion of said running gear frame (105), at said radially outer side of said curved track section, at most generates a maximum increase in said longitudinal distance between said first axis point (104.1) and said second axis point (104.1);
- said maximum increase ranging from 0.05% to 2%, preferably from 0.1 % to 1%, more preferably ranging from 0.2% to 0.5%, of said initial longitudinal distance.

6. The rail vehicle according to any one of claims 1 to 5, wherein said wing element (109) is a monolithic component.

7. The rail vehicle according to any one of claims 1 to 6, wherein said wing element (109) is a cast component and/or a forged component.

8. The rail vehicle according to any one of claims 1 to 7, wherein

- said wing element (109) forms a spring inter-

- face section (109.2) for a spring device (106), in particular, a primary spring device, supporting said running gear frame (105);
- said spring interface section (109.2), in particular, being located between said wheel unit bearing (108) and said running gear frame (105) in said height direction; 5
 - said spring interface section (109.2), in particular, being a substantially planar surface of said wing element (109). 10
- 9.** The rail vehicle according to any one of claims 1 to 8, wherein
- said wing element (109) forms a damper interface section (109.3) for a damper device (112) acting between said running gear frame (105) and said wheel unit (104); 15
 - said damper interface section (109.3), in particular, being located at an end section of said wing element (109) opposite to an articulation (109.1) of said wing element (109) to said running gear frame (105). 20
- 10.** The rail vehicle according to any one of claims 1 to 9, wherein 25
- said wing element (109) comprises a receptacle substantially completely receiving said wheel unit bearing (108); 30
 - said wheel unit bearing (108), in particular, being releasably connected to said wing element (109).
- 11.** The rail vehicle according to any one of claims 1 to 10, wherein said wheel unit (104) is a wheel set. 35
- 12.** The rail vehicle according to any one of claims 1 to 11, wherein it is adapted to be used for high-speed operation at nominal operating speeds above 250 km/h, preferably above 300 km/h, more preferably above 350 km/h. 40
- 13.** The rail vehicle according to any one of claims 1 to 11, wherein it is adapted to be used for low-speed operation at nominal operating speeds below 120 km/h, preferably between 60 km/h and 100 km/h. 45
- 14.** The rail vehicle according to any one of claims 1 to 11, wherein it is adapted to be used for medium-speed operation at nominal operating speeds above 120 km/h, preferably between 120 km/h and 200 km/h. 50
- 15.** A running gear for a rail vehicle according to any one of claims 1 to 14 comprising said wing elements (109). 55

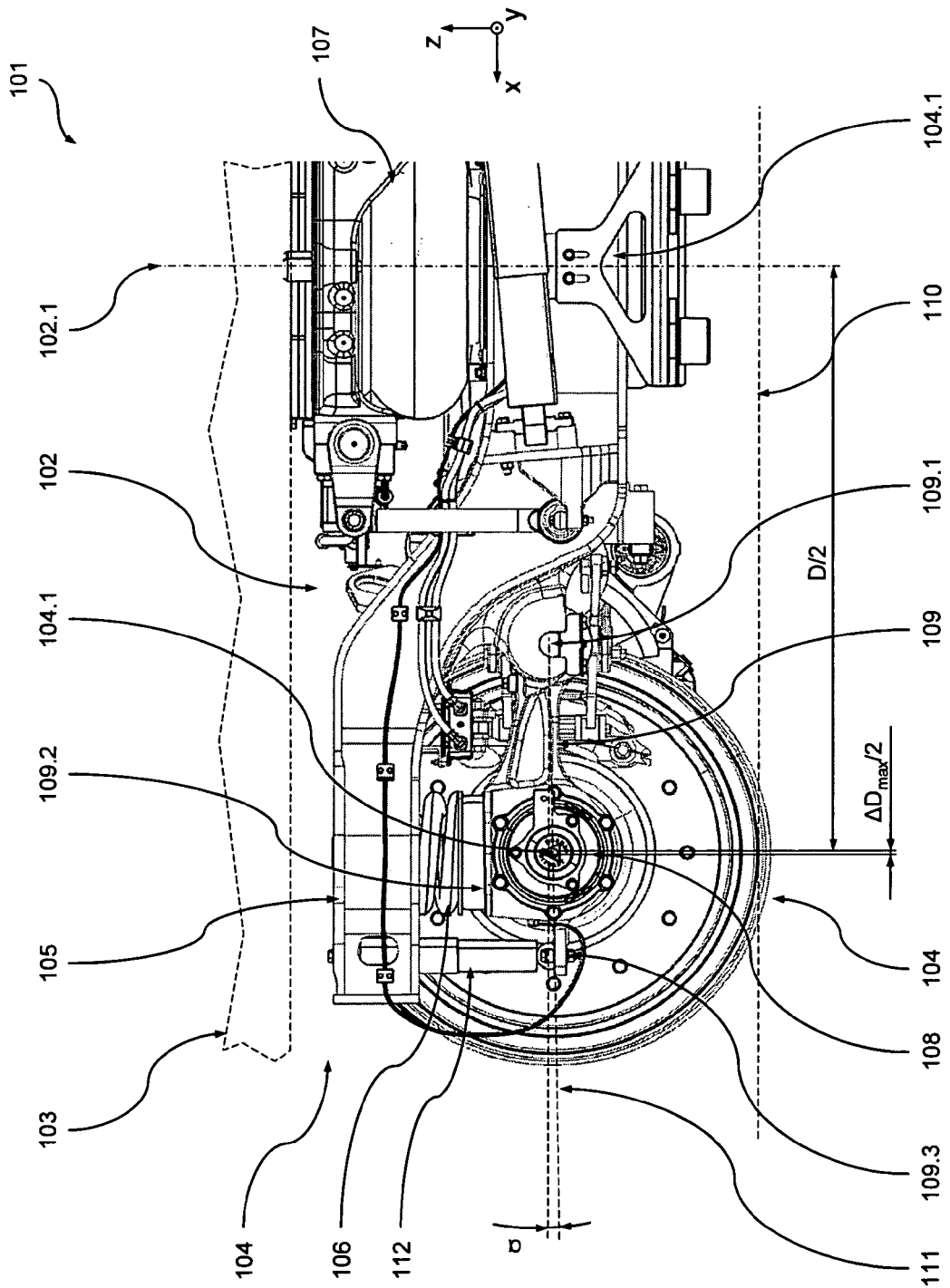


Fig. 1



PARTIAL EUROPEAN SEARCH REPORT

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of subsequent proceedings, as the European search report

EP 11 17 5869

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 02/26542 A1 (DAIMLERCHRYSLER RAIL SYSTEMS [DE]; AUGSBURG FRANK [DE]; SCHUELLER UWE) 4 April 2002 (2002-04-04) * page 4, line 4 - page 9, line 31; figures 1-8 *	1	INV. B61F5/38 B61F5/44
A	US 5 909 711 A (VOGEL HANS HEINER [CH] ET AL) 8 June 1999 (1999-06-08) * column 3, line 12 - column 8, line 67; figures 1-12 *	1	
A	US 4 742 779 A (BEVAND JACQUES [FR]) 10 May 1988 (1988-05-10) * column 1, line 63 - column 4, line 42; figures 1-5 *	1	
A	EP 1 767 430 A1 (BOMBARDIER TRANSP GMBH [DE]) 28 March 2007 (2007-03-28) * column 6, paragraph 27 - column 15, paragraph 88; figures 1-5 *	1	
----- -/--			TECHNICAL FIELDS SEARCHED (IPC)
			B61F
INCOMPLETE SEARCH			
<p>The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.</p> <p>Claims searched completely :</p> <p>Claims searched incompletely :</p> <p>Claims not searched :</p> <p>Reason for the limitation of the search: see sheet C</p>			
Place of search		Date of completion of the search	Examiner
Munich		24 January 2012	Lendfers, Paul
CATEGORY OF CITED DOCUMENTS		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	
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			

2
EPO FORM 1503 03.02 (P04E07)



PARTIAL EUROPEAN SEARCH REPORT

Application Number
EP 11 17 5869

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
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A	----- EP 0 614 793 A1 (SCHEFFEL HERBERT [ZA]) 14 September 1994 (1994-09-14) * page 4, line 24 - page 7, line 43; figures 1-5,6A-F,7-9 *	1	
A	----- US 2002/098034 A1 (CONAWAY JERRY LEE [US] ET AL) 25 July 2002 (2002-07-25) * page 2, paragraph 20 - page 5, paragraph 41; figures 1-10 *	1	
	-----		TECHNICAL FIELDS SEARCHED (IPC)

EPO FORM 1503 03.82 (P04C10) 2

**INCOMPLETE SEARCH
SHEET C**Application Number
EP 11 17 5869Claim(s) completely searchable:
1-14Claim(s) not searched:
15

Reason for the limitation of the search:

The subject-matter of claim 15 is directed towards a running gear for a rail vehicle according to any one of claims 1 to 14 comprising said wing elements. Insofar, the rail vehicle according to any of claims 1 to 14 does not form part of the claimed subject-matter. However, in present independent claim 15, the only constructional feature of the claimed running gear is defined in relation with a feature of the rail vehicle according to any of claims 1 to 14, namely "comprising said wing elements". As the claimed running gear is not further defined by any technical features, claim 15 does not meet the requirements of Article 84 EPC, and can therefore not be searched.

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