(19) DANMARK

(10) DK/EP 2619065 T3

Patent- og Varemærkestyrelsen

(12) Oversættelse af europæisk patentskrift

(51) Int.Cl.: *B 61 F 5/24 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2018-12-17**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2018-09-26**

(86) Europæisk ansøgning nr.: **11745766.3**

(86) Europæisk indleveringsdag: **2011-08-16**

(87) Den europæiske ansøgnings publiceringsdag: **2013-07-31**

(86) International ansøgning nr.: **EP2011064069**

(87) Internationalt publikationsnr.: **WO2012038157**

(30) Prioritet: **2010-09-21 AT 15672010**

(84) Designerede stater: **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**

(73) Patenthaver: **Siemens AG Österreich, Siemensstrasse 90, 1210 Wien, Østrig**

(72) Opfinder: **HOFFMANN, Thilo, Mariagrüner Str. 81, A-8043 Graz, Østrig**
MEISSL, Thomas, Deiserstr. 12, A-2120 Obersdorf, Østrig
SCHANK, Armin, Waldertgasse 7a 6, A-8020 Graz, Østrig
WEILGUNI, Gerhard, Göstingerstr. 210, A-8051 Graz, Østrig

(74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**

(54) Benævnelse: **Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse**

(56) Fremdragne publikationer:
WO-A1-03/043840
DE-A1- 1 530 155
DE-A1-102005 041 163
DE-C- 833 505
DE-U1-202009 015 736
FR-A1- 2 633 577
US-A- 1 959 704
US-A- 3 670 661
US-A- 3 712 243
US-A- 3 961 584

The invention relates to a rail vehicle with a weight-optimized connection of the chassis to a railcar body.

The manner in which the railcar body of a rail vehicle is connected to the chassis has a significant effect on the dynamic characteristics of a rail vehicle. At the same time said connection must fulfil different requirements. Thus, a “soft” connection is necessary for reasons of comfort, but also to ensure good wheel-rail contact, which is essential with regard to a high level of security against derailment, though such a connection conflicts with constraints due for example to the minimum clearance outline (structure gage) that must be maintained on the line during rolling actions.

Special requirements exist in the case of driven chassis, where tractive and compressive forces must be transmitted to the railcar body in a suitable manner.

A generic rail vehicle with a weight-optimized connection of the chassis to a railcar body is known from the document US 3 961 584 A.

A bogie having a drive or braking system is known from DE 1 530 155, wherein the railcar body is supported on a centre pivot plate which is fixed with respect to the body in relation to the railcar longitudinal direction, but which can rotate about the vertical axis. The centre pivot plate is supported in turn on both sides by way of pivot points on the bogie frame which is tiltable with respect to the centre pivot plate about the transverse axis.

This solution is very complicated and expensive, and furthermore at high speeds longitudinal excitation forces can occur which induce vertical flexural vibrations in the railcar.

DE 833 505 discloses a bogie having wheelsets mounted in suspension arms and a pivot pin arranged in the bogie frame, wherein the pivot pin resting in the centre of the narrow transverse member and embodied as axially spring-loaded is connected via so-called silent blocks to the railcar body by way of guide rods running in the direction of travel.

This solution has disadvantages in respect of running smoothness and stability, particularly at high speeds.

It is therefore an object of the invention to develop the prior art.

This object is achieved according to the invention with a rail vehicle having a weight-optimized connection of the type cited in the introduction, wherein an upwardly projecting, pin-shaped bracket is provided on the chassis frame and projects into a receptacle arrangement provided on the railcar body and wherein the receptacle arrangement limits the freedom of movement of the pin-shaped bracket in such a way that predefined rolling angles of the railcar body are not exceeded in the lateral direction, and pitching angles of a transverse member are not exceeded in the longitudinal direction, wherein a low-lying semitrailing arm is provided in the case of a chassis, by means of which the chassis frame is connected to the railcar body.

This provides a simple, robust and effective connection of the railcar body to the chassis.

It is furthermore favourable if the receptacle arrangement has bumpers and positive stops with predefined stiffness characteristic curves. This enables the behaviour of the limiting function to be adapted to the different requirements during routine operation (soft buffer) and in the event of a crash (hard stop).

The pin-shaped bracket can be designed so as to be removable from the chassis frame in order thereby to facilitate assembly. It is mounted in the conventional manner on the transverse member.

For service and assembly purposes it is furthermore favourable if the railcar floor has a closable opening into the interior of the railcar in the region of the receptacle arrangement.

For safety reasons it is beneficial if the receptacle arrangement has an anti-lift stop.

It is furthermore advantageous if the chassis frame is implemented as articulated. A flexible or articulated chassis frame increases the level of security against derailment and allows a higher load to be imposed and consequently a higher payload onto the chassis.

It is also advantageous if the receptacle arrangement is embodied as part of a railcar body transverse member or is connected to the latter.

Three drawings are attached in order to illustrate the invention in more detail.

The drawings show by way of example:

Fig. 1 a schematic view of a first embodiment variant,
Fig. 2 and Fig. 3 a schematic view of a second and third embodiment variant.

The diagram according to Fig. 1 shows a schematic section through a chassis along a longitudinal axis. The chassis has an articulated chassis frame comprising at least one transverse member 1 and two longitudinal members 3 which are connected to one another by way of a frame joint 2.

Although a flexible or articulated chassis frame increases the level of security against derailment and allows a higher load to be imposed and consequently a higher payload onto the chassis, the transverse member of the chassis frame has an additional degree of freedom about its axis transversely to the direction of travel (rolling and/or pitching), as a result of which unacceptably high angles or travel may occur whereby e.g. the minimum clearance outline is infringed or chassis components come into collision with one another.

According to the invention the chassis frame has an upwardly projecting pin-shaped bracket 4 which projects into a receptacle arrangement 5 provided on the railcar body 6. The receptacle arrangement 5 limits the freedom of movement of the pin-shaped

bracket 4 in such a way that predefined rolling angles of the railcar body 6 are not exceeded in the lateral direction, and pitching angles of the transverse member 1 are not exceeded in the longitudinal direction.

It is advantageous in this instance if the receptacle arrangement 5 has bumpers and positive stops with predefined stiffness characteristic curves. This enables the behaviour of the limiting function to be adapted to the different requirements. Accordingly, a soft buffer is beneficial during routine operation, while a hard stop is provided in the event of a crash.

Additionally provided in the case of the illustrated exemplary embodiment is a low-lying semitrailing arm 7 by means of which the chassis frame is connected to the railcar body 6. In the exemplary embodiment the semitrailing arm 7 is secured to the transverse member 1. The low-lying arrangement of the semitrailing arm 7 minimizes the load differences between the wheelsets. A further advantage is that there is no need to breach the transverse member structure.

Figures 2 and 3 show further embodiment variants of the invention with the aid of a schematic illustration of a section transversely through a rail vehicle.

The illustrations comprise a railcar body 6 which is supported on a chassis frame 9 by way of secondary springs 8. Said chassis frame 9 has an upwardly projecting pin-shaped bracket 4 which projects into a receptacle arrangement 5 provided on the railcar body 6. The receptacle arrangement 5 can now be formed either,

as shown in Fig. 2, by means of a (for example collar-shaped) limiting arrangement mounted on the floor of the railcar body 6 or else, as shown in Fig. 3, by means of a corresponding recess in the floor of the railcar body 6.

The following remarks are added by way of explanation:

Under given boundary conditions such as in particular the railcar body mass incl. payload and the associated centres of mass, the speed of travel, the curve radius and the banking of the line, a rail vehicle must also comply with constraints in relation to the track system, i.e. it must not infringe the so-called structure gage or minimum clearance outline.

These conditions are fulfilled when the rolling angle of the railcar body does not exceed a defined limit. The rolling angle is determined in particular by the following chassis components and their parameters:

- primary and secondary spring suspension system: vertical stiffnesses and mounting position,
- anti-roll support (if present): stiffness and mounting position,
- transverse spring suspension system incl. transverse stop: force-displacement characteristic curve and mounting position,
- pneumatic spring suspension controller (if present): characteristic curve.

The masses, heights of centres of gravity, stiffnesses and geometries result in a roll centre and a rolling angle of the railcar body.

At the time of specifying the cited parameters it is also necessary in addition to comply in particular with the predefined constraints in terms of security against derailment and ride comfort.

According to the invention the limiting of the rolling movement is implemented as high as possible – recessed in the vehicle floor. This achieves a higher roll centre above rail level and the rolling angle of the railcar body is reduced. Under the same boundary conditions, given a constant rolling angle, it is possible by means of the solution according to the invention not only to reduce the vertical stiffnesses of primary and/or secondary spring suspension system, and consequently increase the ride comfort, but also to dispense with the anti-roll support.

List of reference characters

Transverse member	1
Frame joint	2
Longitudinal member	3
Pin-shaped bracket	4
Receptacle arrangement	5
Railcar body	6
Semitrailing arm	7
Secondary springs	8
Chassis frame	9
Anti-lift stop	10

Patentkrav

1. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse, hvor der på chassisrammen (9) er tilvejebragt en opad ragende tapformet konsol (4), som rager ind i en optagelsesindretning (5), der er tilvejebragt på vognkassen (6), og hvor optagelsesindretningen (5) begrænser bevægelsesspillerummet for den tapformede konsol (4) på en sådan måde, at forudbestemte rulningsvinkler af vognkassen (6) ikke overskrides i tværretning, og hældningsvinkler af en tværdrager (1) ikke overskrides i længderetning,
kendetegnet ved, at der ved et chassis er tilvejebragt en dybtliggende langsgående stang (7), hvorigennem chassisrammen er forbundet med vognkassen (6).

2. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge krav 1, **kendetegnet ved, at** optagelsesindretningen (5) har buffere og faste stoppere med forudbestemte stivhedskarakteristiklinjer.

3. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge et af kravene 1 til 2,
kendetegnet ved, at den tapformede konsol (4) er udformet således, at den kan tages af chassisrammen (9).

4. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge et af kravene 1 til 3, **kendetegnet ved, at** den tapformede konsol (4) er anbragt på tværdrageren (1).

5. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge et af kravene 1 til 4, **kendetegnet ved, at** undervognen i området af optagelsesindretningen (5) har en lukbar åbning ind i vognens indre.

6. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge et af kravene 1 til 5, **kendetegnet ved, at** optagelsesindretningen (5) har en aftagningssikring (10).

7. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge et af kravene 1 til 6, **kendetegnet ved, at** chassisrammen (9) er ledmæssigt udført.

8. Skinnekøretøj med en vægtoptimeret binding af chassiset til en vognkasse ifølge et af kravene 1 til 7, **kendetegnet ved, at** optagelsesindretningen (5) er udformet som del af en vognkassetværdrager eller er forbundet med denne.

FIG 1

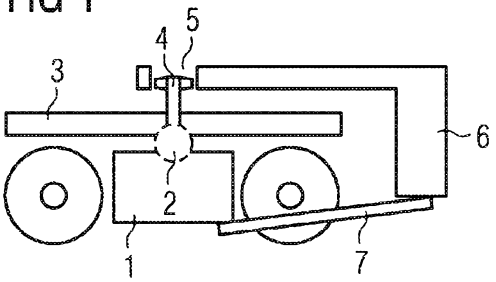


FIG 2

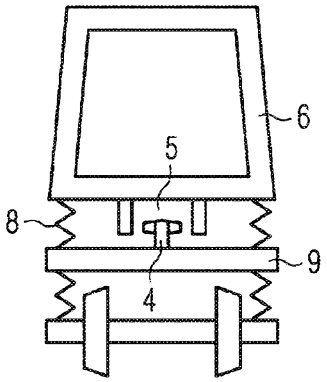


FIG 3

