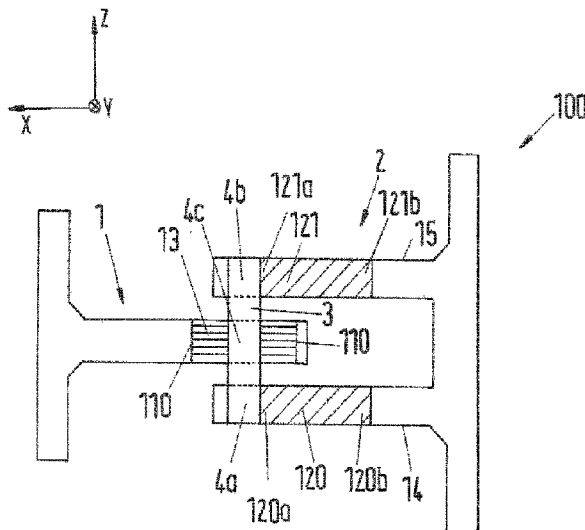




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(54) **Titre : ARTICULATION TOURNANTE POUR LA LIAISON PAR ARTICULATION TOURNANTE DE VEHICULES FERROVIAIRES**
 (54) **Title: SWIVEL JOINT FOR SWIVEL-JOINT CONNECTING OF RAIL VEHICLES**



(57) **Abrégé/Abstract:**

The invention relates to a swivel joint (10; 100; 101) for swivel-joint connecting of rail vehicles or rail vehicle parts, wherein the swivel joint comprises: - a first part (1) and a second part (2), that have at least one longitudinal opening (11, 12; 120, 121; 122, 123) with a first end region (11a, 12a; 120a, 121a; 122a) and a second end region (11b, 12b; 120b, 121b, 122b), a coupling element (3; 30), via which the first part (1) and the second part (2) are rotatably coupled relative to each other, wherein the coupling element (3; 30) engages with an engaging section (4a, 4b; 40b) in the longitudinal opening (11, 12; 120, 121; 122) which in the normal state is arranged in the first end region (11a, 12a; 120a, 121a; 122a) of the longitudinal opening (11, 12; 120, 121; 122, 123), wherein the coupling element (3; 30) can be moved in the direction of the second end region (11b, 12b; 120b, 121b, 122b) when the swivel joint is compressed. The invention further relates to a rail vehicle comprising at least one such swivel joint and a method for swivel-joint connecting of rail vehicles or rail vehicle parts.

ABSTRACT

The invention relates to a swivel joint (10; 100; 101) for swivel-joint connecting of rail vehicles or rail vehicle parts, wherein the swivel joint comprises: - a first part (1) and a second part (2), that have at least one longitudinal opening (11, 12; 120, 121; 122, 123) with a first end region (11a, 12a; 120a, 121a; 122a) and a second end region (11b, 12b; 120b, 121b, 122b), a coupling element (3; 30), via which the first part (1) and the second part (2) are rotatably coupled relative to each other, wherein the coupling element (3; 30) engages with an engaging section (4a, 4b; 40b) in the longitudinal opening (11, 12; 120, 121; 122) which in the normal state is arranged in the first end region (11a, 12a; 120a, 121a; 122a) of the longitudinal opening (11, 12; 120, 121; 122, 123), wherein the coupling element (3; 30) can be moved in the direction of the second end region (11b, 12b; 120b, 121b, 122b) when the swivel joint is compressed. The invention further relates to a rail vehicle comprising at least one such swivel joint and a method for swivel-joint connecting of rail vehicles or rail vehicle parts.

SWIVEL JOINT FOR SWIVEL-JOINT CONNECTING OF RAIL VEHICLES

The invention concerns a swivel joint for the swivel-joint connecting of rail vehicles or rail vehicle parts.

In terms of a collision safety of rail vehicles, the European standard EN 15227 needs to be obeyed. It is required to provide a rail vehicle with energy-absorbing elements. The energy-absorbing elements are designed to absorb or dissipate at least some of the impact energy occurring for example when the rail vehicle strikes an obstacle by a defined deformation or destruction. In this way, the channeling of excessive impact energy into the other, less easily replaced structure of the vehicle and thus the damaging of this other vehicle structure and the risk of injury to the passengers can be at least reduced, but preferably entirely avoided.

Rail vehicles are in particular high-speed, long-distance, commuter, freight trains or trolley cars. By rail vehicle parts are meant in particular cars, car bodies, modules or car parts of a rail vehicle or a rail vehicle assemblage.

DE 102007044745 A1 concerns a rail vehicle with impact energy-absorbing wall structure, with a car body comprising a plurality of structural components which substantially determine the structural strength of the car body, the plurality of structural components comprising at least one wall component which forms at least part of a wall of the car body. The wall component is formed by a sandwich structure of metal, wherein the sandwich structure comprises two outer metallic cover layers and at least one core of a metallic foam material arranged between the cover layers. The drawback here is that the car body is deformed under the action of impact energy.

Starting from this, the problem which the present invention proposes to solve is to indicate an energy-absorbing element for a rail vehicle which does not have this drawback. The energy-absorbing element should be able to absorb impact energy so that the rest of the vehicle structure is not damaged at all, or at most minimally damaged by it.

A swivel joint is proposed for swivel-joint connecting of rail vehicles or rail vehicle parts, wherein the swivel joint comprises:

- a first part and a second part, wherein the first part and/or the second part has at least one oblong opening, wherein the opening has a first end region and a second end region, wherein

the width of the opening decreases from the first end region in the direction of the second end region,

- a coupling element via which the first part and the second part are rotatably coupled relative to each other, wherein the coupling element engages with an engaging section in the oblong opening, and the engaging section in the normal state is arranged in the first end region of the oblong opening,

wherein the coupling element can be moved in the direction of the second end regions when the swivel joint is compressed, wherein the opening can be expanded by moving the coupling element and in this way the first part and/or the second part can be deformed.

The swivel joint is configured so that it can be compressed, for example, by the action of a particular force, such as impact force, acting on the rail vehicle. During the compression, the first and second part can move in translation relative to each other. Thus, the energy can be dissipated by deformation of the first and/or the second part. The deformation of the first and/or the second part occurs in the region of the oblong opening. The deformation of the first and/or second part is preferably irreversible. After a deformation, the swivel joint can be easily removed and replaced with a new swivel joint.

In the swivel joint, the first and the second part are swivel-joint coupled together. The swivel-joint coupling of the first and the second part is made possible by the coupling element. The coupling element can be an integral component of the first or second part. The coupling element can be formed on the first or second part. The coupling element can be non-releasably joined to the first or second part. The coupling element can be form fitted and/or integrally bonded to one of the parts.

With the swivel joint, rail vehicles or rail vehicle parts can be swivel-joint coupled together. At the same time, the swivel joint has an energy-absorbing function.

Especially advantageously, the swivel joint can be arranged in the region above a Jakobs bogie, as described further below.

The coupling element can penetrate the oblong opening with the engaging section.

The coupling element may be able to rotate or not in the oblong opening, as will be described below in various embodiments.

In one embodiment, one of the parts has a recess, in which the coupling element may be placed. In this variant, the part with the recess does not have the oblong opening, and the other part has the oblong opening. the recess is for example a continuous recess, also known as a through hole, in which the coupling element can be inserted. The coupling element can be rotatable in the recess. The recess is preferably circular symmetrical.

In particular, the first part and/or the second part has at least one spring element. The spring element is arranged in particular between the coupling element and the first part or between the coupling element and the second part. If one of the parts has an above-described recess or especially a continuous recess, then the spring element is preferably arranged inside the recess of the respective part, preferably between the coupling element and the part. The spring element may enclose the coupling element.

The spring element is designed to absorb lesser forces, especially impact forces, which are not enough to cause an irreversible deformation of the first and/or second part. The spring element is designed in particular as a reversible energy-absorbing element. After the spring travel of the spring element is used up, a widening of the oblong opening and a preferably irreversible deformation of the swivel joint in the region of the oblong opening may occur by the mechanism of action described above.

Furthermore, the spring element can make possible a pitching motion and/or a rolling motion between the first and the second part of the swivel joint, or a pitching motion and/or a rolling motion between car parts or cars of a rail vehicle which are coupled via the swivel joint. A pitching motion is a relative rotation of the first part and the second part, or coupled car parts, about the transverse axis (y axis). A rolling motion is a relative rotation of the first part and the second part, or coupled car parts, about the longitudinal axis (x axis).

Preferably, the spring element is designed as an elastically deformable element, e.g., an elastomer plastic.

In one embodiment, the swivel joint is designed so that the first part is fork-shaped in cross section and the second part is tongue-shaped in cross section, or in other words tab-shaped. Thus, the first fork-shaped part can enclose the second tongue-shaped part.

In one special embodiment, the swivel joint is designed so that the coupling element has a rotationally symmetrical section, so that the first part and the second part can rotate relatively to each other about the axis of rotation of the rotationally symmetrical section. The first and/or the second part can be rotatable about the rotationally symmetrical section. This rotationally symmetrical section is to be distinguished from a section which engages in an oblong opening. A section which engages in an oblong opening may or may not be rotationally symmetrical, as explained further below. In particular, when a section which engages in an oblong opening of a part of the swivel joint is not rotationally symmetrical, a rotationally symmetrical section (not engaging in an oblong opening) may be present which is preferably introduced into an opening in the second part, while the rotationally symmetrical section is preferably fitted exactly to the opening, and thus the opening in the second part is likewise preferably rotationally symmetrical. The opening in the second part may be formed within a yet to be described spring element.

In an even more particular embodiment, the swivel joint is designed so that the engaging section of the coupling element is rotationally symmetrical. The coupling element can be rotatable in the oblong opening. In particular, the coupling element may have a continuous rotationally symmetrical cross section. The coupling element may be designed, e.g., as a bolt. This embodiment proves to be especially advantageous for the manufacture of the coupling element, since circular symmetrical shapes are easier to manufacture than others.

In another embodiment the engaging section of the coupling element may have a first side surface and a second side surface, tapering from the first end region of the at least one oblong opening at a slant to each other in the direction of the second end region of the oblong opening. The engaging section of the coupling element in particular has a trapezoidal cross section. This embodiment affords special benefits in the calculation of the design of the parts of the swivel joint with regard to an impact energy being absorbed. The first side surface of the engaging section may lie against a first inner surface of the oblong opening and the second side surface of the engaging section may lie against a second inner surface of the oblong opening. The first inner surface of the oblong opening and the second inner surface of the oblong opening taper at a slant to each other in the direction of the second end region of the oblong opening. The surfaces of the engaging section of the coupling element and the inner surfaces of the oblong opening are preferably planar surfaces.

The first part and the second part may each have at least one fastening element, with which the first and the second part may be fastened to a rail vehicle or a rail vehicle part. In particular, the fastening element is square or rectangular in top view. However, the invention encompasses all

conceivable shapes of the fastening element. For example, the fastening element may be plate shaped. It is also conceivable for the fastening element to interact with fastening means, such as screws. The fastening element may be formed on the first or on the second part, in particular, formed and especially molded as an integral component of this part.

According to the invention, a rail vehicle is also proposed, having at least one swivel joint as described above. With the swivel joint, neighboring rail vehicle parts in particular, preferably car bodies or modules, are coupled together. The swivel joint may be arranged, e.g., between undercarriages, structural components, especially cross girders, or end walls of neighboring rail vehicle parts, preferably car bodies or modules. It is also conceivable for two or more swivel joints to be present between two rail vehicle parts.

Furthermore, the rail vehicle may have a Jakobs bogie. In a rail vehicle, two neighboring rail vehicle parts, such as car bodies or modules, may be braced against a common so-called Jakobs bogie. In a Jakobs bogie, the two successive rail vehicle parts are braced at the same time against the same bogie, so that the bogie is located directly beneath the transition of two firmly connected rail vehicle parts. In particular, the swivel joint can be arranged across the Jakobs bogie between rail vehicle parts, so that neighboring rail vehicle parts can be coupled together by the Jakobs bogie and by the swivel joint. Of course, the rail vehicle may have several swivel joints and Jakobs bogies. The combination of the swivel joint according to the invention and a Jakobs bogie is advantageous, because an energy-absorbing element is provided in the region of the Jakobs bogie. The swivel joint according to the invention may be designed so that it does not allow any sideways displacement of neighboring car bodies relatively to each other.

Rotational movements are provided about the vertical axis (z axis), optionally rotational movements about the transverse axis (y axis, pitching), optionally rotational movements about the longitudinal axis (x axis, rolling), and in the case of a sufficiently large impact a translatory movement along the longitudinal axis, whereupon an energy dissipation occurs. A translatory movement of neighboring car bodies relatively to each other along the transverse axis is preferably not provided, just as no such translatory movement is provided in the case of Jakobs bogies. Therefore, the swivel joint according to the invention can be advantageously combined with a Jakobs bogie.

The invention furthermore concerns a method for the swivel-joint connecting of rail vehicles or rail vehicle parts, wherein a swivel joint is used, comprising:

- a first part and a second part, wherein the first part and/or the second part has at least one oblong opening, wherein the opening has a first end region and a second end region, wherein the width of the opening decreases from the first end region in the direction of the second end region,

- a coupling element via which the first part and the second part are rotatably coupled relative to each other, wherein the coupling element engages with an engaging section in the oblong opening, and the engaging section in the normal state is arranged in the first end region of the oblong opening,

wherein the coupling element can be moved in the direction of the second end regions when the swivel joint is compressed, wherein the opening can be expanded by moving the coupling element and in this way the first part and/or the second part can be deformed.

Further advantages as well as details of the swivel joint according to the invention will emerge from the following description of sample embodiments with the aid of the enclosed figures. There are shown:

Fig. 1, a side view of one embodiment of a swivel joint, in longitudinal section,

Fig. 2, a top view of the design in Fig. 1,

Fig. 3a, a side view of a second embodiment of a swivel joint, in longitudinal section,

Fig. 3b, a top view of the first part in Fig. 3a,

Fig. 3c, a view of an oblong opening, from above,

Fig. 4, a perspective view of the swivel joint according to the invention from Fig. 3a,

Fig. 5, a perspective view of another embodiment, modified with respect to the embodiment of Fig. 3, with a different design of coupling element from that in Fig. 3,

Fig. 6, a top view of the swivel joint according to the invention in Fig. 5,

Fig. 7, schematically, two cars of a rail vehicle, which are coupled together by a Jakobs bogie and a swivel joint.

Fig. 1 shows schematically a side view of a swivel joint 10. The swivel joint 10 comprises a first part 1 and a second part 2. The first part 1 and the second part 2 have fastening elements 6a and 6b, which are bent into a T shape. The first part 1 and the second part 2 are coupled together by the coupling element 3, designed as a bolt. The first part 1 and the second part 2 in this sample embodiment are tab-shaped. The coupling element 3 has engaging sections 4a and 4b and two end sections 5, which are formed as broadened heads of the coupling element 3.

The first 1 and second part have oblong openings 11, 12 (shown especially in Fig. 3). The coupling element 3 is situated with its first engaging section 4a in the oblong opening 11 of the first part 1 and with its second engaging section 4b in the oblong opening 12 of the second part 2. In this sample embodiment, the oblong openings 11, 12 are formed continuous, i.e., they each penetrate the first part 1 and the second part 2. The coupling element 3 makes it possible for the first part 1 and the second part 2 to be rotatable relatively to each other about the longitudinal axis 21 of the coupling element 3.

Fig. 2 shows the embodiment of the swivel joint represented in Fig. 1, now in top view, where the first part 1 has the oblong opening 11 and the second part the oblong opening 12. The width of the oblong opening 11 of the first part 1 decreases from the first end region 11a of the oblong opening 11 of the first part 1 in the direction of the second end region 11b of the oblong opening 11 of the first part 1.

Similarly, the width of the oblong opening 12 of the second part 2 decreases from the first end region 12a of the oblong opening 12 of the second part 2 in the direction of the second end region 12b of the oblong opening 12 of the second part 2. The coupling element 3 is inserted into the first end region 11a of the oblong opening 11 of the first part 1 and into the first end region 12a of the oblong opening 12 of the second part 2, as can be seen in the top view of Fig. 2, in which the end section 5 is not shown. The coupling element 3 is shown hatched here in order to represent its presence in the cross section. In this sample embodiment, the coupling element, including its sections 4a, 4b engaging in the oblong openings 11, 12, is formed rotationally symmetrical in top view.

In event of a crash, the first part 1 and second part 2 move toward each other. The coupling element 3 may execute a preferably linear movement from the first end region 12a of the oblong opening 12 in the direction of the second end region 12b of the oblong opening 12 of the second part 2. Thanks to this movement of the coupling element 3, the oblong opening 12 of the second part 2, especially in the second end region 12b of the oblong opening 12, is widened. Thanks to the widening of the oblong opening 12 of the second part 2 and the resulting deformation of the second part 2, the crash energy is absorbed. In similar fashion, the coupling element 3 may execute a preferably linear movement from the first end region 11a of the oblong opening 11 in the direction of the second end region 11b of the oblong opening 11 of the first part 1, so that the oblong opening 11 of the first part 1 is widened and the first part 1 is deformed. The first 1 and/or second part 2 are preferably irreversibly deformed in event of a crash.

In the embodiment of a swivel joint 100 represented in Fig. 3a, the first part 1 is designed substantially as a tab, except for the fastening element, and the second part 2 as a fork. The first part 1 has a spring element 13, shown hatched, which is fashioned as a ring-shaped element and introduced into a recess 110 of the first part 1, which in this sample embodiment is formed continuous.

The hatching of the part 13 in Fig. 3a/3b is meant to portray the position and boundary of the part, not its structural makeup. For example, the spring element is a rubber ring.

The second part 2 has two legs 14, 15 arranged one above the other and extending along the x axis in Fig. 2 (which is preferably the longitudinal axis of a vehicle). Each leg 14, 15 has an oblong opening 120 and 121. The two oblong openings 120 and 121 are formed continuous. The vertical distance between the two legs 14, 15, i.e., the distance in the y direction in Fig. 2, is chosen such that a free space remains between the legs of the second part 14, 15 to accommodate the first part 1. Thus, in this sample embodiment, the first part 1 engages with the tab-shaped section in the space between the legs 14, 15 of the second part 2.

The coupling element 3 in the form of a bolt passes through the recess 110 with a middle engaging section 4c, outlined by dotted lines, and is grasped by the spring element 13. Alternatively, it may be provided that the spring element is located in a different place, and the middle engaging section 4c is introduced into a correspondingly narrower designed recess 110 for a form fitted connection. A bottom engaging section 4a of the coupling element 3 passes through the oblong opening 120c of the leg 14 of the second part 2. Moreover, a top engaging section 4b of the coupling element 3 passes through the oblong opening 121 of the other leg 15 of the second part 2. The bolt 13, in the position of the sections 4a and 4b in the end regions 120a and 121a, is rotatable within the recesses 120, 121. The end regions 120a and 121a of the openings 120, 121 are more specifically the regions in which the sections 4a and 4b of the bolt 13 are situated, which can only be shown inadequately by the reference line in this view on account of their congruence. The reference lines for 120a and 121a are placed roughly next to the sections 4a and 4b, these places of the openings 120, 121 being still assigned to the end region here. A similar representation was chosen in Fig. 2. Fig. 3c shows the oblong opening 121 of the second part 2 (alternatively it could be the opening 120, 11 or 12) without the coupling element introduced and with the position of the end regions 121a and 121b (alternatively it could be the end regions 11a/11b, 12a/12b or 120a/120b).

Fig. 3b shows the first part 1 in top view according to the embodiment of the invention represented in Fig. 3a. One can see the spring element 13. In the middle of the spring element 13 is found the engaging section 4c of the coupling element 3, which is enclosed by the spring element 13. The representation is not true to scale with Fig. 3a and 3c, nor are Fig. 3a, 3b and 3c true to scale with each other.

For example, it can be noticed that the bolt 3 in Fig. 3b has a smaller diameter than in Fig. 3a and for example would not fit exactly into the first end region 121a of Fig. 3c, as is shown in Fig. 3a and 4.

Fig. 4 shows a perspective view of the embodiment of the invention represented in Fig. 3a. One can see in this embodiment the shape of the oblong openings 120, 121, which have the same shape as the oblong openings 11, 12 in the embodiment of Fig. 1 and 2.

In event of a crash, the first 1 and second part 2 move toward each other. As explained above with the aid of Fig. 2 with a single oblong opening 12, the coupling element 3 is now displaced in both oblong openings 120, 121 of the second part 2 and moved from the first end regions 120a, 121a in the direction of the second end regions 102b, 121b of the oblong openings 120, 121, by which the oblong openings 120, 121 are widened and the tabs 14, 15 of the second part 2 are deformed. In this way, the crash energy is absorbed.

Fig. 5 shows a perspective view of another embodiment of the swivel joint 101 according to the invention. This embodiment differs in the form of the sections of the modified coupling element 30 engaging in the oblong openings 122, 123 and in the form of the oblong openings 122, 123. The sections of the coupling element 30 engaging in the oblong openings 122, 123 are fashioned as trapezoidal heads, of which only an upper engaging section 40b can be seen in Fig. 5. By comparison, refer to Fig. 3a, where the shape of the sections 4a and 4b engaging in oblong openings 121, 122 is round in cross section. In the embodiment of Fig. 5, the analogous engaging sections are trapezoidal in cross section and the ends of the oblong openings 121, 122 are polygonal, where the broader end of the oblong opening encloses the trapezoidal section on three sides with an exact fit. The engaging section 40b occupies the same position in the swivel joint 101 as the engaging section 4b in Fig. 3. The connection of the coupling element 30 to the first part 1 is identical to the connection of the coupling element 3 to the first part 1 of Fig. 3a and 3b. Likewise, there is an engaging section 4c which is rotationally symmetrical. In the embodiment of Fig. 5, the coupling element 30 can rotate inside the recess 110 in the first part 1 by the section 4c, not shown but

analogous to Fig. 3a/3b, thereby producing the swivel-joint connection of the parts 1, 2. The coupling element 30 can rotate together with the rubber ring 13 inside the recess 110, or inside the rubber ring 13. In the second part 2 or in the oblong opening 122 (and an identical opening on the back side) the coupling element 30 is not rotatable, due to the trapezoidally shaped engaging section 40b. This is different from the embodiment of Fig. 3: there, the engaging sections 4a, 4b are round and rotatable in the oblong openings 120, 121, so that the coupling element 3 is rotatable against the part 2. Furthermore, in the embodiment of Fig. 3 the engaging section 4c of the bolt 3 can be rotatable in the recess 110, for example inside the rubber ring 13 or together with the rubber ring 13, or it may not be rotatable there, because the rotatability of the bolt inside the oblong openings is sufficient for the articulated connection. In a rotatable arrangement of the section 4c in the recess 110, broadened heads 5 can be provided at each of the ends of the bolt 3, as is shown in Fig. 1, in order to prevent a slippage of the bolt 3. In similar fashion, such broadened heads may be provided in the embodiment of Fig. 5.

Fig. 6 shows a top view of the embodiment of Fig. 5. The trapezoidal engaging section 40b is arranged in the first end region 122a of the oblong opening 12. The engaging section has a first side surface 16 and an oppositely situated second side surface 17, which taper from the first end region 122a of the oblong opening 122 at a slant to each other in the direction of the second end region 122b of the oblong opening 122. The side surfaces 16, 17 of the trapezoidal engaging section 4 lie against side surfaces 25, 26 of the oblong opening 122.

In similar and mirror-image fashion, at the other side of the swivel joint 101 a trapezoidal section of the coupling element 30 which engages in the oblong opening 123 has two tapering side surfaces (not shown) tapering toward each other.

The mechanism of action and energy dissipation in event of a crash is similar to that in the embodiment of Fig. 3 and 4. The engaging section 40b of the coupling element, which is trapezoidal in cross section, is displaced from the first end region 122a in the direction of the second end region 122b, whereupon the side surfaces 16, 17 of the engaging section 40b slide along the side surfaces 25, 26 of the oblong opening 12 and the opening 122 is widened. Thanks to the widening of the oblong opening 122 of the second part 2, the crash energy is absorbed.

This embodiment differs from the embodiment previously shown in Fig. 3 and 4 by the configuration of the engaging sections 4a, 4b and 4c of the coupling element 3 and the shape of the oblong openings 12c, 12d of the second part 2.

The sections 4 a, 4b of the coupling element 3 engaging in the oblong openings 12c, d are designed as trapezoidal heads, of which only an upper engaging section 4b can be seen in Fig. 5.

Fig. 7 shows a rail vehicle 500 in a cutout view. A first car 200 is connected to another car 300 by a Jakobs bogie 400 and by a swivel joint 10 according to the invention. The swivel joint 10 (or 100 or 101) is arranged above the Jakobs bogie 400. The swivel joint 10 according to the invention is arranged, for example, on girders of a car body structure of the cars 300, 400, especially on cross girders. In particular, the cars 200 and 300 are coupled together by a Jakobs bogie and the swivel joint 10 so that no sideways displacement of the cars 200, 300 relatively to each other is possible.

CLAIMS

1. A swivel joint for swivel-joint connecting of rail vehicles or rail vehicle parts, wherein the swivel joint comprises:

- a first part and a second part, wherein the first part and/or the second part has at least one oblong opening, wherein the opening has a first end region and a second end region, wherein the width of the opening decreases from the first end region in the direction of the second end region,

- a coupling element via which the first part and the second part are rotatably coupled relative to each other, wherein the coupling element engages with an engaging section in the oblong opening, and the engaging section in the normal state is arranged in the first end region of the oblong opening,

wherein the coupling element can be moved in the direction of the second end regions when the swivel joint is compressed, wherein the opening can be expanded by moving the coupling element and in this way the first part and/or the second part can be deformed.

2. The swivel joint as claimed in claim 1, wherein the first part and/or the second part has at least one spring element.

3. The swivel joint as claimed in any one of claims 1 to 2, wherein the first part is fork-shaped in cross section and the second part is tongue-shaped in cross section, with the fork-shaped first part enclosing the tongue-shaped second part.

4. The swivel joint as claimed in any one of claims 1 to 3, wherein the coupling element has a rotationally symmetrical section, so that the first part and the second part can turn relatively to each other about the axis of rotation of the rotationally symmetrical section.

5. The swivel joint as claimed in one of claims 1-4, wherein the engaging section of the coupling element is rotationally symmetrical.

6. The swivel joint as claimed in one of claims 1-4, wherein the engaging section of the coupling element has a first side surface and a second side surface, tapering from the first end region of the at least one oblong opening at a slant to each other in the direction of the second end region of the oblong opening.

7. The swivel joint as claimed in any one of claims 1 to 6, wherein the first part and the second part have at least one fastening element, with which the first and the second part can be fastened to a rail vehicle or to a rail vehicle part.

8. A rail vehicle comprising at least one swivel joint as claimed in any one of claims 1 to 7.

9. The rail vehicle as claimed in claim 8, wherein the rail vehicle comprises a Jakobs bogie.

10. A method for the swivel-joint connecting of rail vehicles or rail vehicle parts, wherein a swivel joint is used, comprising:

- a first part and/or a second part, wherein the first part and/or the second part has at least one oblong opening, wherein the opening has a first end region and a second end region, wherein the width of the opening decreases from the first end region in the direction of the second end region,

- a coupling element via which the first part and the second part are rotatably coupled with the coupling element relative to each other, wherein the coupling element engages with an engaging section in the oblong opening, and the engaging section in the normal state is arranged in the first end region of the oblong opening,

wherein the coupling element can be moved in the direction of the second end regions when the swivel joint is compressed, wherein the opening can be expanded by moving the coupling element and in this way the first part and/or the second part can be deformed.

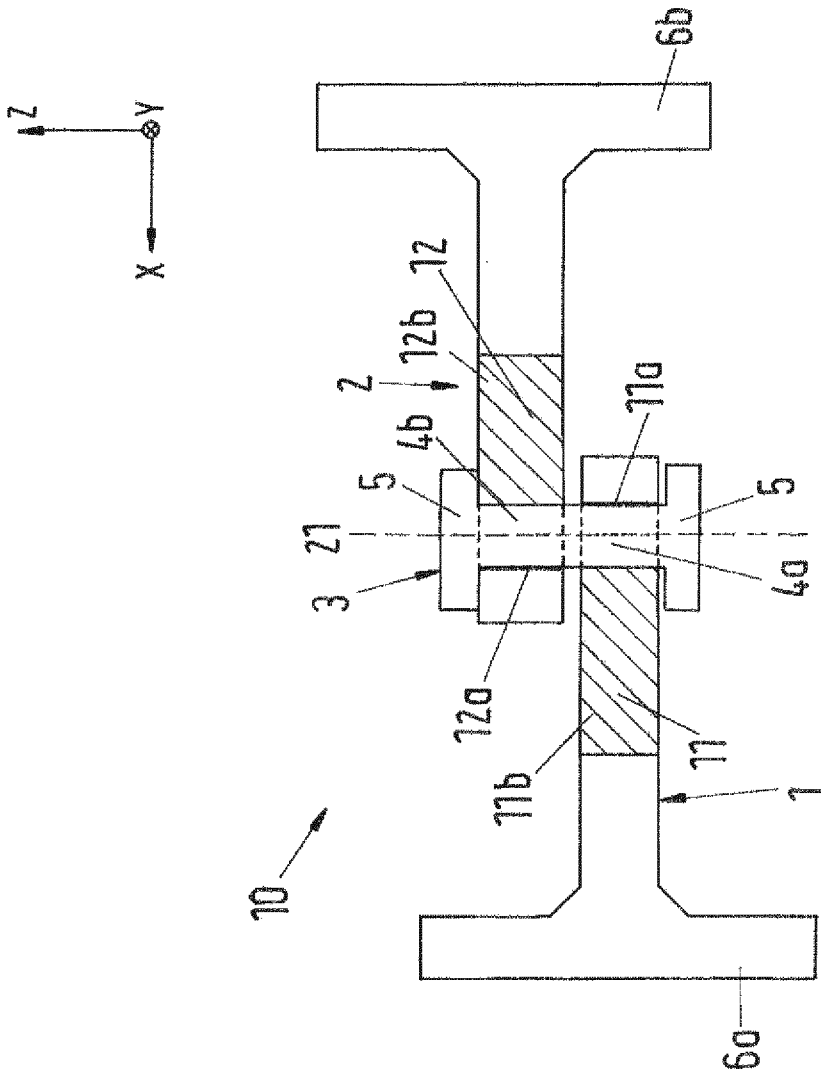


Fig.1

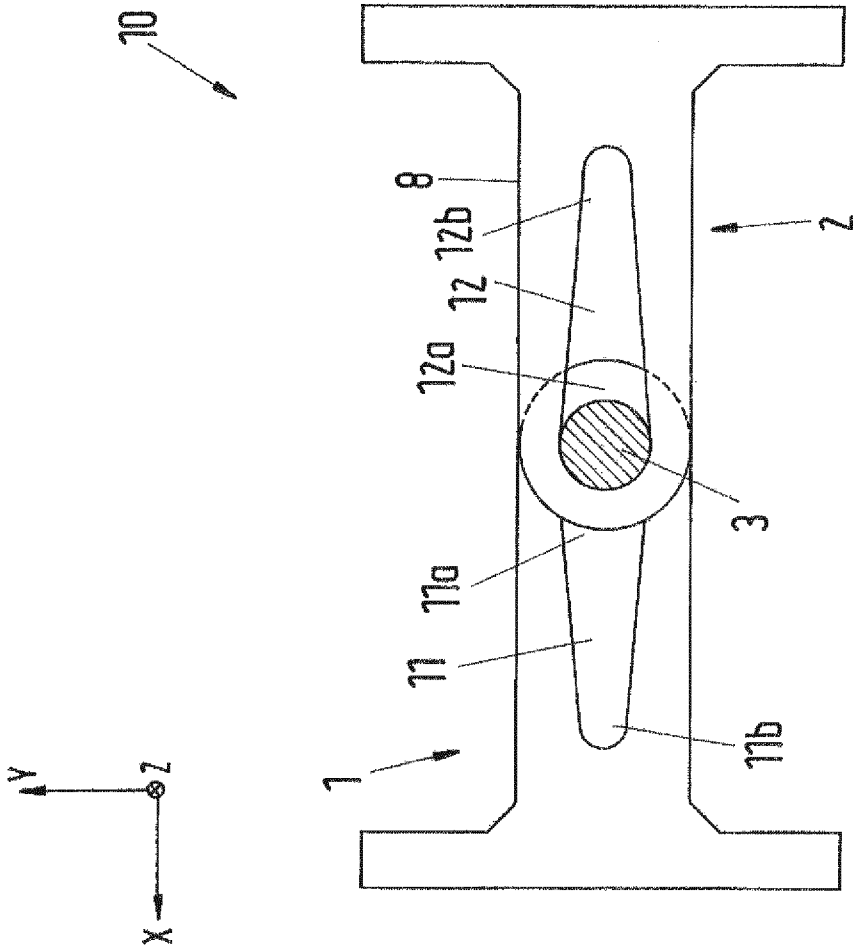


FIG.2

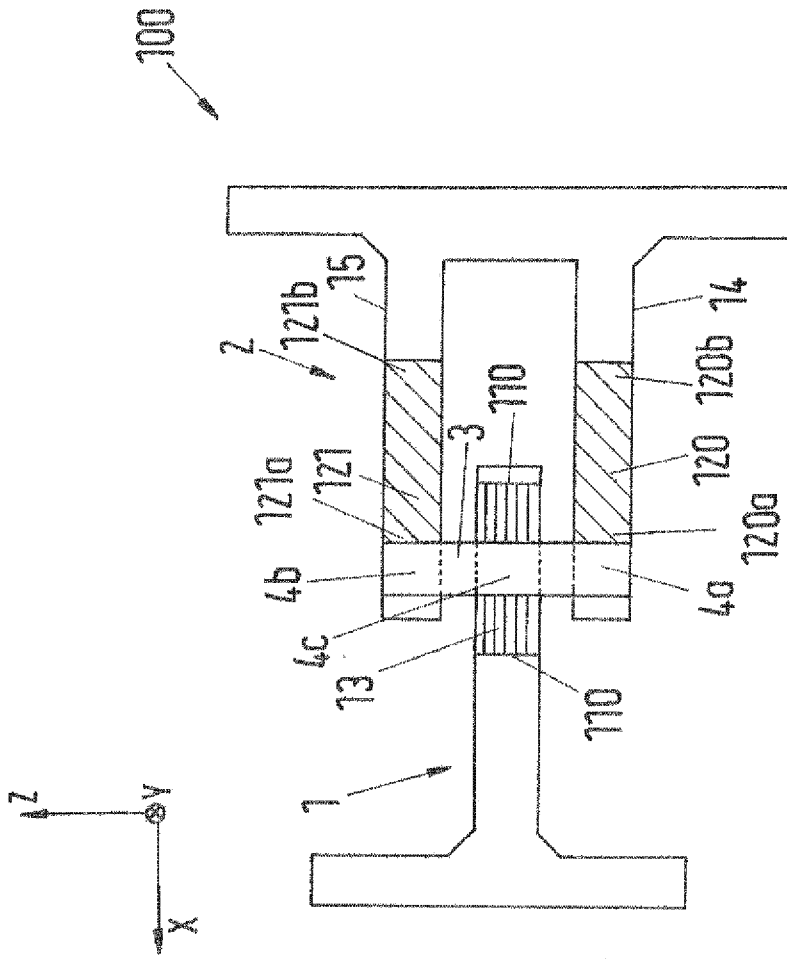


Fig.3a

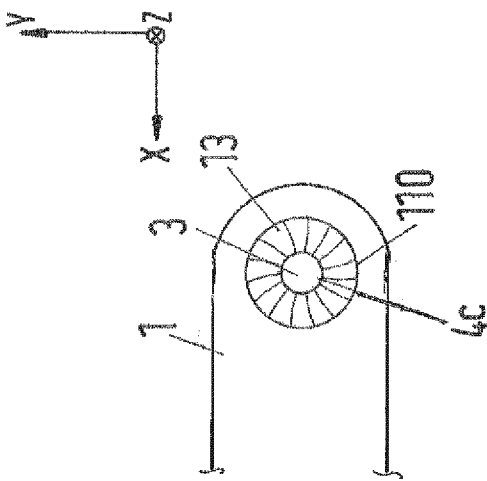


Fig.3b

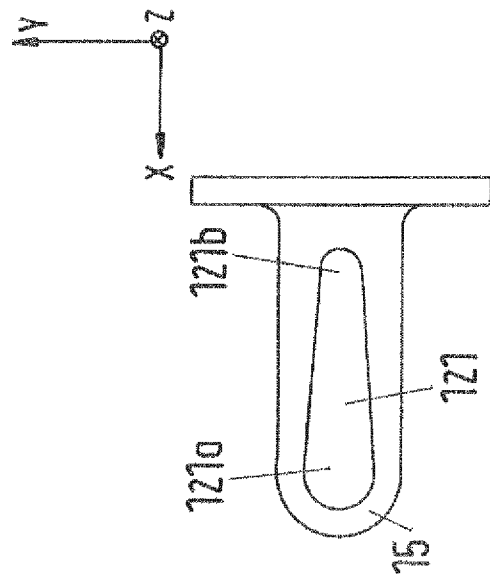


Fig.3c

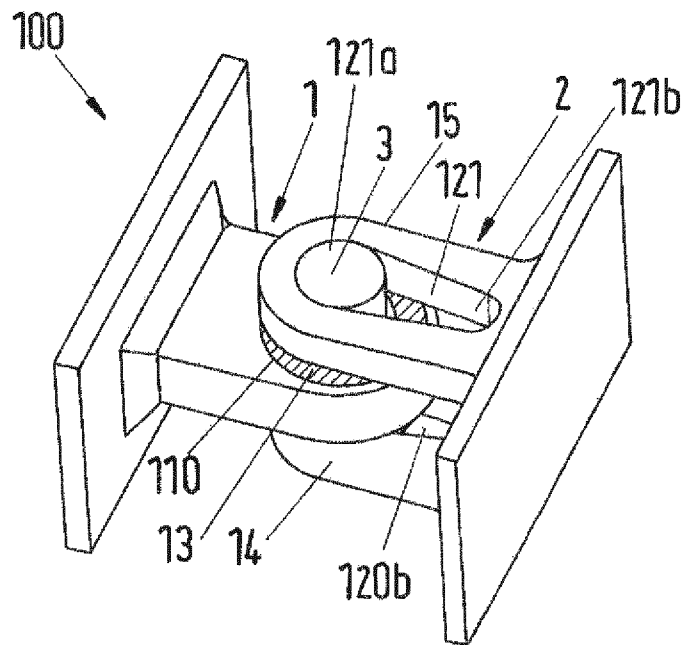


Fig.4

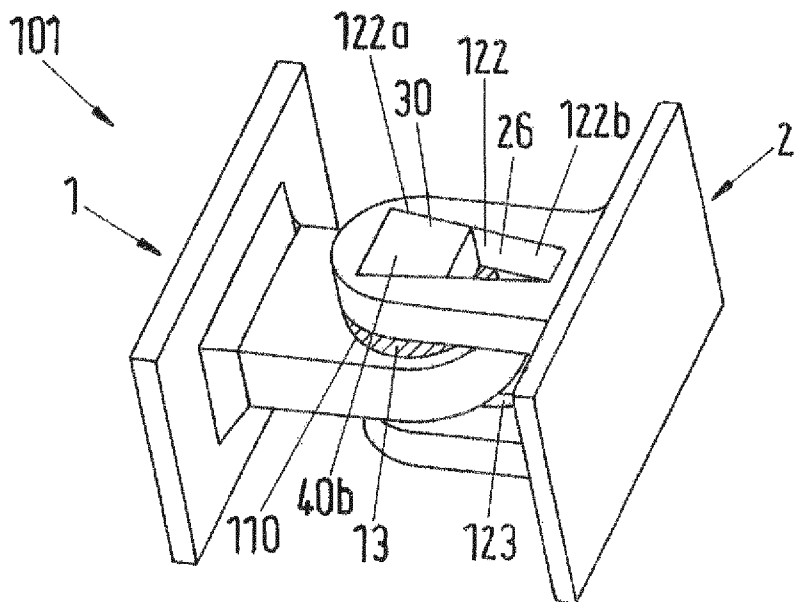


Fig.5

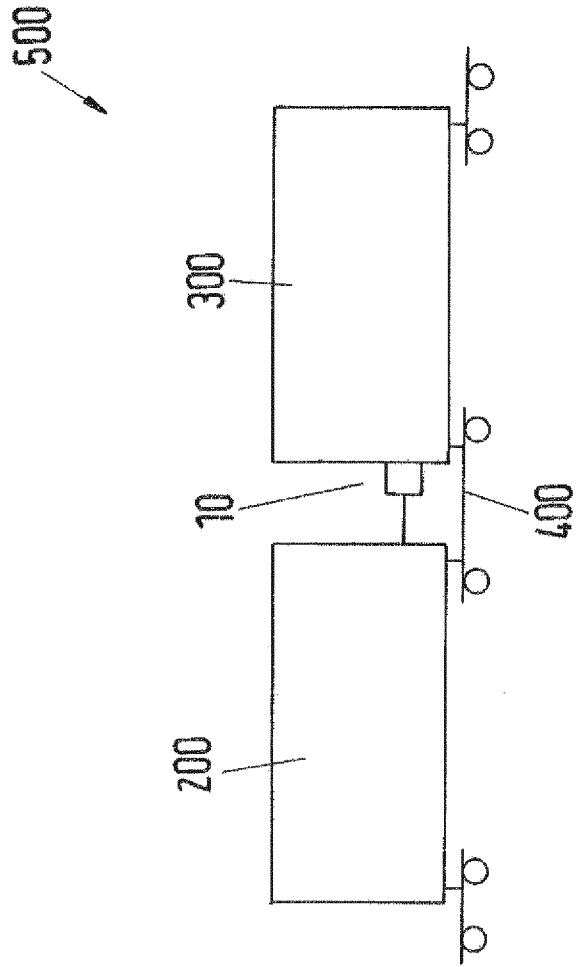


Fig.7

