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(54) **Device protecting rail cars against climbing in case of a railway collision**

(57) A device comprises a toothed element (1) having at least three distant plate segments (3) ended with teeth (6) in which rods (8) are embedded. The width of notches (9) formed in the plate segments (3) is greater than the thickness of the rods (8), and the distance (10) between the opposite planes is greater than the thickness of these plate segments (3).

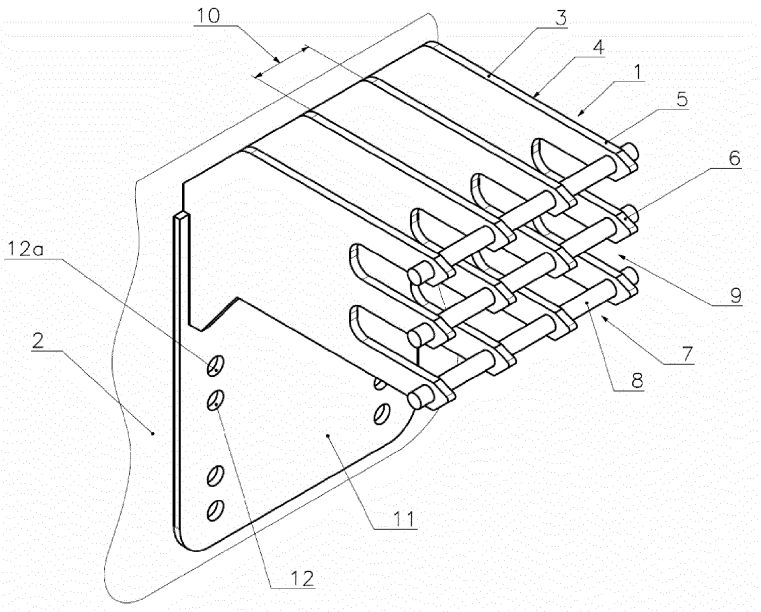

Fig.1

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Description

[0001] This invention relates to a device protecting rail cars against climbing, especially during the final collision phase when shock absorbers are plastically deformed.

[0002] From German patent application DE102006050028 a device is known for protecting rail cars against climbing during a railway collision, said device comprising vertical and horizontal blocking elements projecting from the front walls of these rail cars. These vertical and horizontal blocking elements are firmly connected together and they form a grate-like structure made of flat ribbons forming cells opened in a direction in which a rail car is moving. These open cells are made in such a way that they can be deformed in their longitudinal direction to ensure in this way their mutual penetration and meshing between the blocking elements of neighbouring rail cars.

[0003] From EP2193970 a buffer is also known protecting rail cars against climbing during a railway collision, said buffer comprising a coupling element having teeth shaped on its outer surface. This coupling element is shaped as a flat plate connected with the front of a rail car and it has toothed projections arranged on its concave surface.

[0004] From patent specification US7694633 the element protecting rail cars against climbing during a railway collision is also known. This element is fastened to the front of the rail car at a determined height so as to enable its cooperation with a suitable element of the neighbouring rail car in case of a collision. In a middle part of this element, there is made a central cut-out limited by an upper plate, a lower plate and two side centring surfaces.

[0005] From patent specification EP 2163454 a railway engine is also known comprising a device protecting rail cars against climbing during a railway collision. Said device has a supporting element fastened slidably on a chassis of a railway engine over its bumpers. An end part of that device is purpose-built to be engaged with the front surface of a nearby railway car during a collision.

[0006] It is an aim of this invention to create a device protecting rail cars against climbing during a railway collision. This device ensures a great rigidity in a transverse direction, as well as easy mashing with a protecting device fastened in the front part of the neighbouring rail car even during a substantial linear and angular displacement of these meshing devices. An additional aim of the solution according to the invention is to enable easier modernisation of the existing railway cars.

[0007] The device protecting against climbing of the invention comprises a toothed element fastened to the front wall of a rail car in which vertical abutment elements are connected with horizontal abutment elements. The device is **characterized in that** the toothed element comprises at least three distant vertical abutment elements made as plate segments ended with teeth, and in the teeth of said plate segments there are fastened horizontal abutment elements made as rods. Notches formed in the plate segments have their width greater than a thickness of rods forming the horizontal abutment elements, and the distance between the opposite flat surfaces of the plate segments is greater than the thickness of those plate segments. Advantageously, the horizontal abutment elements have a form of rods of circular cross section.

[0008] Advantageously, the toothed segment is jointed with the vertical plate.

[0009] Advantageously, the plate segments of the toothed element are placed perpendicularly to the vertical plate.

[0010] Advantageously, the toothed element's vertical plate is fastened to the front wall of the rail car through the bumper body. More advantageously, the toothed element's vertical plate is fastened to the front wall of the rail car and compressed to it by fixing bolts of the bumper body.

[0011] Advantageously, rods forming the horizontal abutment elements are embedded at the horizontal, coaxial openings made in toothed plate segments.

[0012] Advantageously, the vertical plate of the toothed element comprises two sets of openings enabling fastening it in different positions under the bumper body.

[0013] Advantageously, the plate segments being the vertical abutment elements are placed asymmetrically in relation to side edges of the vertical plate.

[0014] Thanks to placing toothed elements having many distant vertical abutment elements made as plate segments ended with teeth having horizontal rod abutment elements on the opposite front walls of the connected railway cars they can be easy interengaged even by greater axial and angular displacements. Moreover, when the devices according to the invention are engaged, the rail cars being connected are protected against climbing, as well as against running aside from the railway tracks line.

[0015] By connecting the toothed element with the vertical plate and fastening of this vertical plate to the front wall of the rail car by means of the bumper body, the existing rolling stock comprising hitherto no device protecting against climbing may be easily modernized.

[0016] Thanks to the rods embedding in the openings of the teeth of the plate segments, these segments are connected one with another, which allows to evenly distribute a force between them when the device according to this invention is in action, especially for such collisions in which a force acting between neighbouring rail cars is not parallel to an axis of railway tracks.

[0017] The present invention is illustrated in its embodiments in a drawing, in which Fig. 1 presents in a perspective view a device protecting rail cars against climbing, Fig. 2 presents this device in a side view, Fig. 3 presents this device in a top view with plate segments partially cut-out, Fig. 4 presents the devices protecting rail cars against climbing before engaging, and Fig. 5 presents the devices protecting rail cars against climbing

with bumpers of neighbouring rail cars in their position after engaging.

[0018] As it is shown in the embodiment in Fig. 1, a device protecting rail cars against climbing according to this invention comprises a toothed element 1 fastened to the front wall 2 of a rail car. This toothed element 1 has four plate segments 3 working as vertical abutment elements 4. Each of these plate segments 3 has projected units, each comprising three-finger projections 5 having angle teeth 6 on their ends.

[0019] Three circular rods 8 embedded in the angle teeth 6 of each of the four plate segments 3 work as horizontal abutment elements 7. In order to ensure the cooperation between the toothed element 1 and a similar toothed element fastened to the front wall of another rail car, notches 9 are wider than the diameter of the rods 8, and also the distance 10 between the opposite flat surfaces of the plate segments 3 is greater than their thickness. The width of the notches 9 in the shown embodiment is twice greater than the diameter of the rods 8, and the distance 10 between the opposite planes of the plate segments 3 is three times greater than their thickness. This great difference between these dimensions being compared ensures the better cooperation and engagement between cooperating toothed elements fastened on the front walls 2 of the connected rail cars.

[0020] The toothed element 1 is fastened on the front wall 2 of a rail car by means of a vertical plate 11 having openings 12, 12a. The vertical plate 11 is an integral part of the toothed element 1. In the upper part of the plate 11 above the openings 12, 12a, the plate segments 3 are shaped perpendicularly to this vertical plate 11.

[0021] As it is shown in the side view in Fig. 2, the notches 9 shaped between the finger projections 5 of the plate segments 3, have arc ends 13 forming an abutment surface designed to cooperate with the rods 8 of the toothed element 1 in the adjacent rail car.

[0022] As illustrated in Fig. 3, the rods 8 are embedded in coaxial openings 14 made in the teeth 6 of said plate segments 3.

[0023] A shrinkage connection is used between the openings 14 and the rods 8 in order to protect the rods 8 against sliding out during a railway collision.

[0024] In Fig. 4 there is shown a set of railway bumpers 15 having devices protecting rail cars against climbing. In this embodiment, the bumpers 15 are shown in the position of a resilient collision, in which toothed elements 1 are not yet in their geared position. The toothed elements 1 are designed to be fastened to the front walls 2 of rail cars so that the vertical plate 11 being an integral part of the toothed element 1 is pressed to the front wall 2 of the rail car by means of bolts fastening a body 16 of the bumper 15. The plate segments 3 of each toothed element 1 project above buffer plates 17 in such a manner that when the bumpers 15 are further deformed, both toothed elements 1 can be connected by mutually introducing the rods 8 into the notches 9.

[0025] In Fig. 5 there is shown a group of railway bumpers 15 having devices protecting rail cars against climbing in the situation of plastic deformation when toothed elements 1 are mutually interlocked. In this situation, the toothed elements 1 of the neighbouring rail cars are deeply and tightly engaged together, sustained even with significant axial and angular displacements. In order to increase the reliability of the coupling between toothed elements 1 of the neighbouring rail cars, the toothed elements 1 fastened by the bodies 16 of the bumpers 15 being in the mutual contact have the plate segments 3 shifted one in relation to another in the transverse direction by a half of a pitch so that the plate segments 3 located above the first bumper 15 get between plate segments situated above the second bumper 15. This displacement has been achieved by an asymmetric arrangement of the plate segments 3 in relation to the side edges 18, 19 of the vertical plate 11.

[0026] By increasing the distance of the plate 3 from one side edge 19, a possibility has been obtained to use the same construction of the toothed element 1 at both sides of the set of bumpers 15 together with the proper off-set of the mutually co-operating plate segments 3.

[0027] Similarly, in order to obtain the more reliable coupling between the toothed elements 1 of the neighbouring rail cars, the toothed elements 1 fastened by the bodies 16 of the brought into contact bumpers 15 have their plate segments 3 shifted one in relation to another in the vertical direction by a half of a pitch between the teeth 6 in such a way that the teeth 6 shaped on the plate segments 3 above one bumper 15 get between the teeth 6 formed on the plate segments above the second bumper 15. This displacement has been achieved by providing two pairs of openings 12, 12a in the vertical plate 11. This construction makes it also possible to use the same construction of a toothed element 1 on both sides of the set of bumpers 15 with providing a proper displacement of the cooperating plate segments 3. In order to achieve such a displacement, the toothed element 1 is mounted under one body 16 of the bumper 15 making use of the downward-shifted set of four openings 12, and the same toothed element 1 is mounted under the body 16 of the bumper of the neighbouring rail car using the set of four openings 12a shifted upwards.

Claims

1. A device protecting rail cars against climbing during a railway collision, comprising a toothed element (1) fastened to the front wall of the rail car, in which vertical abutment elements (4) are connected with horizontal abutment elements (7), **characterized in that** the toothed element (1) comprises at least three distant vertical abutment elements (4) shaped as plate segments (3) ended with teeth (6), and in the teeth (6) of the mentioned plate segments (3) there are embedded the horizontal abutment elements (7) shaped as rods (8), whereas the width of notches

(9) formed in the plate segments (3) is greater than the thickness of the rods (8) forming the horizontal abutment elements (7), and the distance (10) between the opposite planes of the plate segments (3) is greater than the thickness of these plate segments (3).

2. A device according to Claim 1 wherein the horizontal abutment elements (7) are made as the rods (8) having a circular section.

3. A device according to Claim 1 or 2 wherein a toothed element (1) is joined with a vertical plate (11).

4. A device according to Claim 3 wherein the plate segments (3) of the toothed element (1) are perpendicular to the vertical plate (11).

5. A device according to Claim 3 or 4 wherein the vertical plate (11) of the toothed element (1) is fastened to the front wall (2) of the rail car by a body (16) of a bumper (15).

6. A device according to Claim 5 wherein the vertical plate (11) of the toothed element (1) is fastened to the front wall (2) of the rail car and is pressed to the front wall (2) by means of bolts fastening the body (16) of the bumper (15).

7. A device according to Claims 1 - 6 wherein the rods (8) being the horizontal abutment elements (7) are embedded in coaxial horizontal openings (14) made in the teeth (6) of the plate segments (3).

8. A device according to Claims 5 - 6 wherein the vertical plate (11) of the toothed element (1) has two sets of openings (12, 12a) to be fastened below the body (16) of the bumper (15) in different positions.

9. A device according to Claim 1 or 8 wherein the plate segments (3) are asymmetrically situated in relation to side edges (18, 19) of the vertical plate (11).

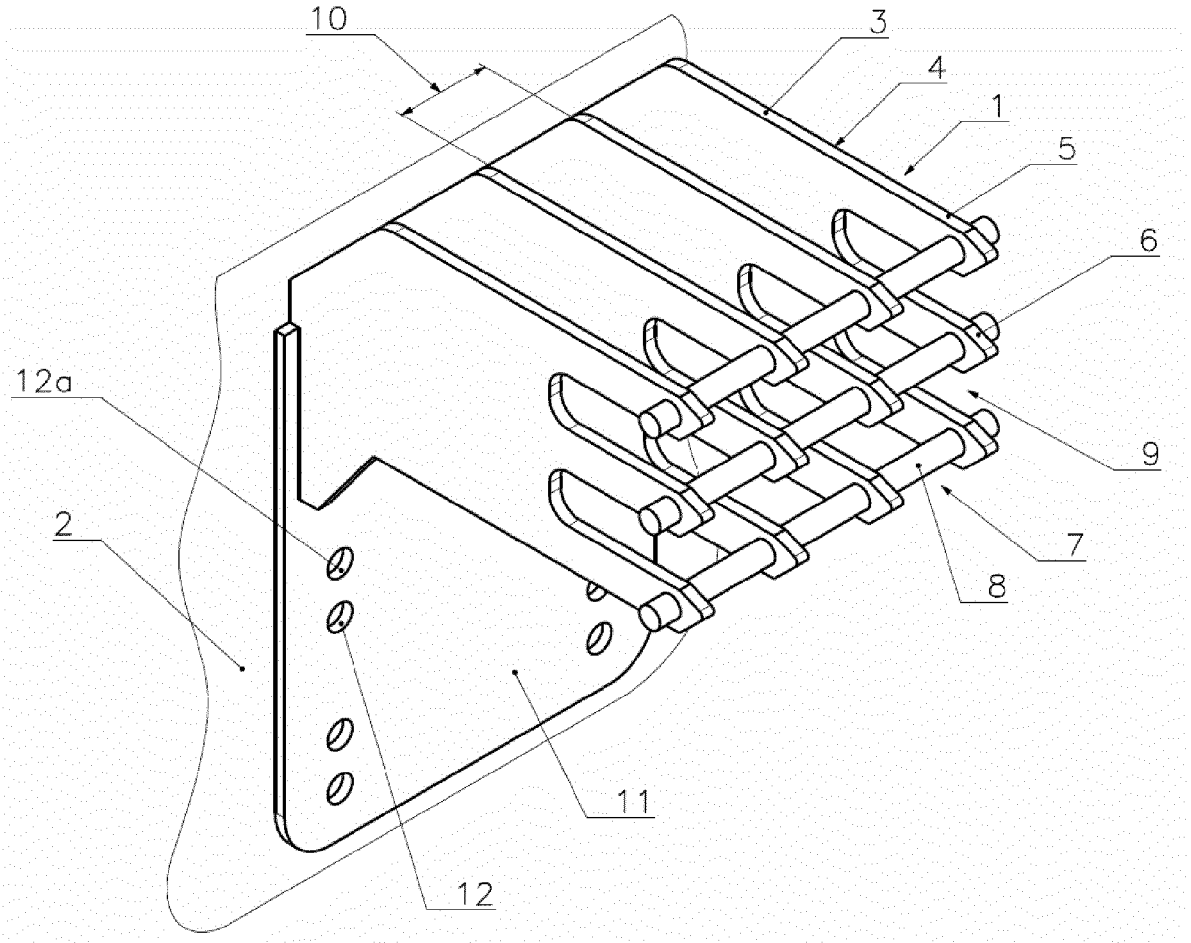

Fig.1

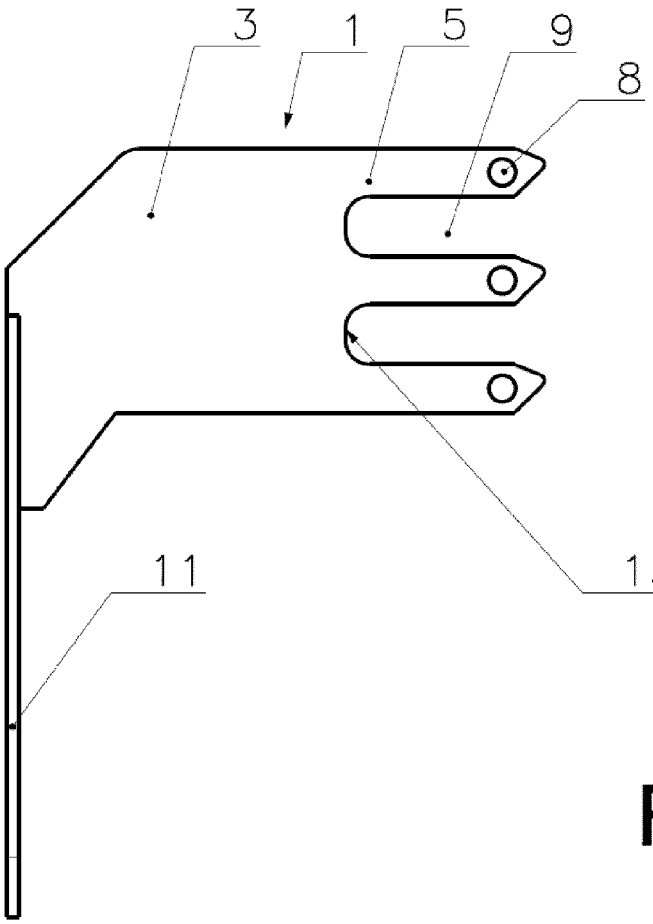

Fig.2

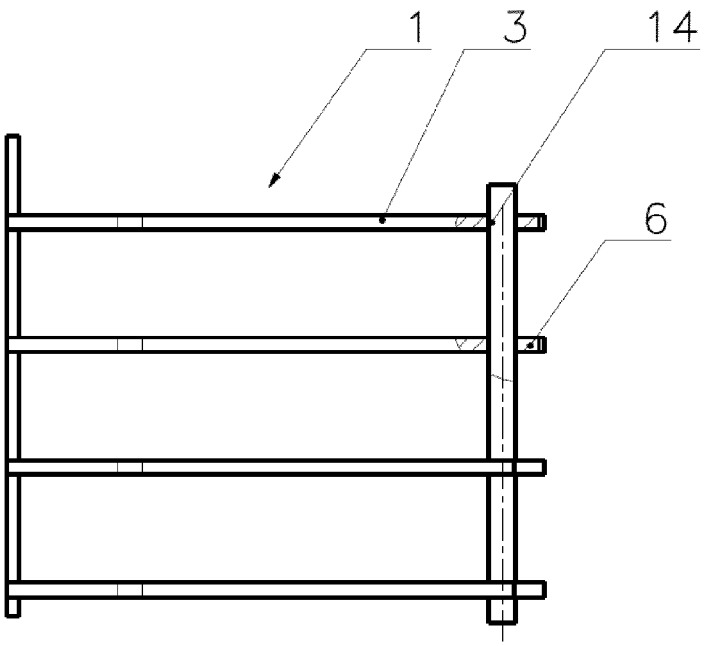

Fig.3

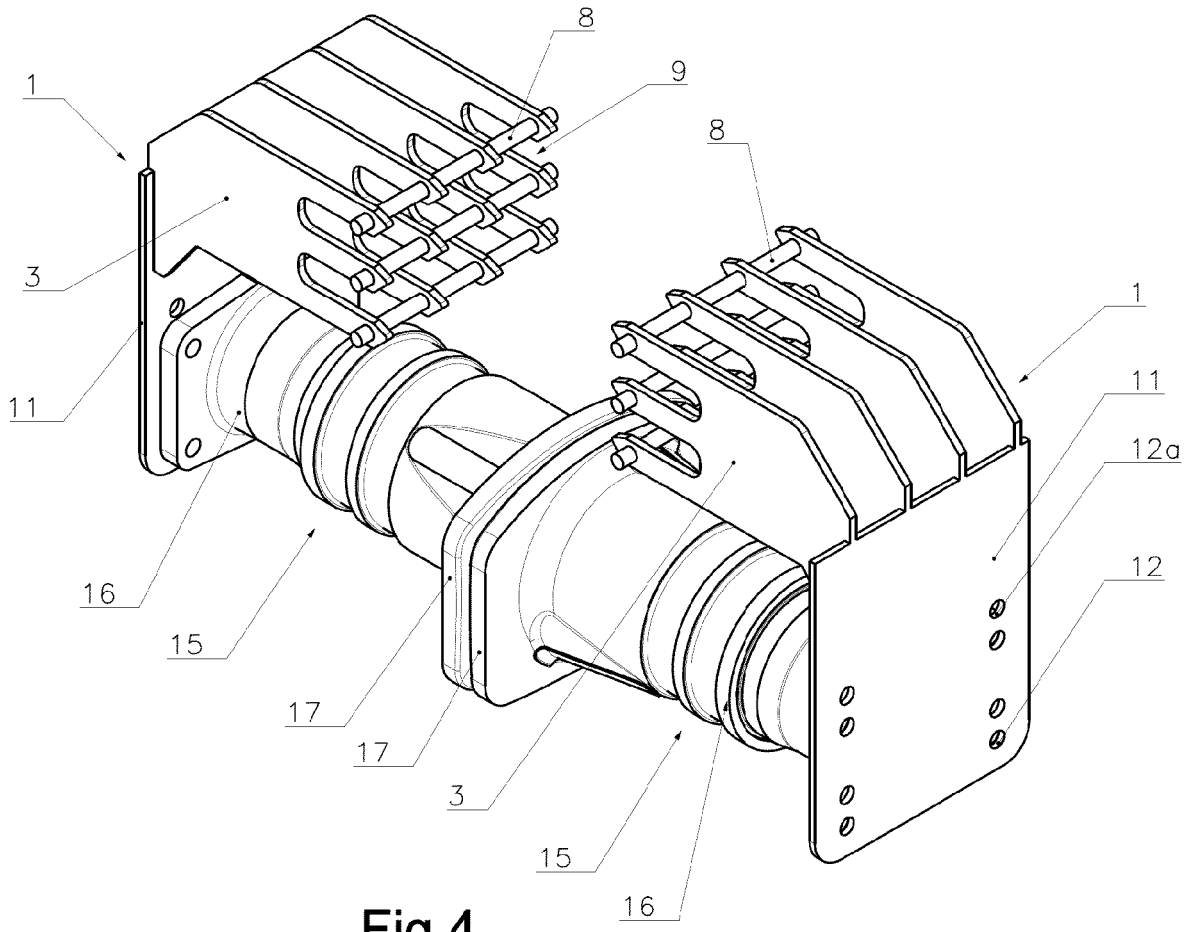

Fig.4

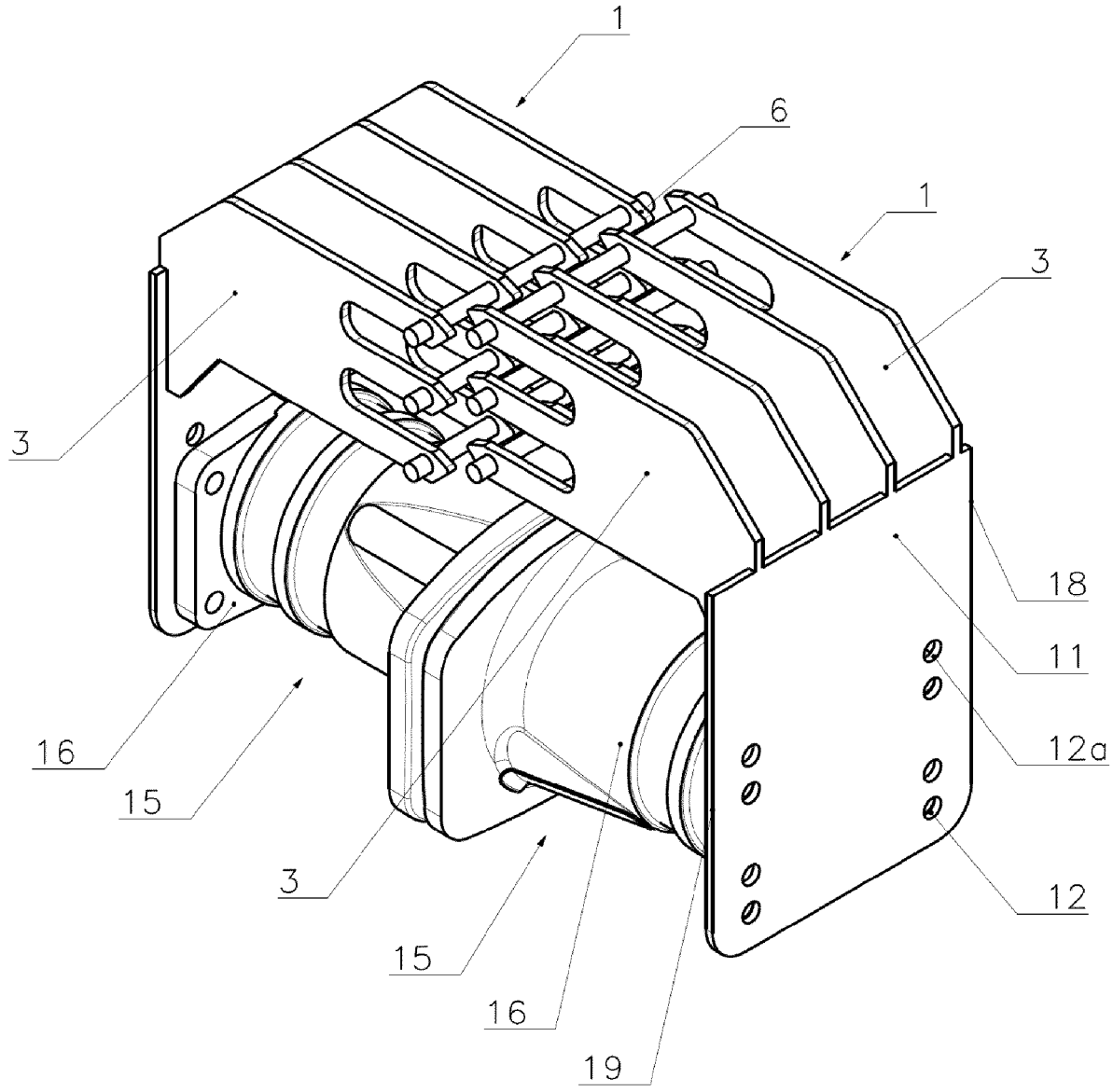

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 13 46 1556

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	DE 10 2008 048244 B3 (VOSSLOH LOCOMOTIVES GMBH [DE]) 10 September 2009 (2009-09-10) * paragraph [0014] - paragraph [0018]; figures 1-7 *	1	INV. B61D15/06 B61G11/18
A	FR 2 531 393 A1 (SCHARFENBERGKUPPLUNG GMBH [DE]) 10 February 1984 (1984-02-10) * page 2, line 24 - page 4, line 9; figures 1-5 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

B61D
B61G
B61F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 January 2014	Chlosta, Peter

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