



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
18.03.2020 Bulletin 2020/12

(21) Application number: **17935073.1**

(22) Date of filing: **28.12.2017**

(51) Int Cl.:
B61F 1/00 (2006.01) **B61F 1/10** (2006.01)
B61D 17/10 (2006.01)

(86) International application number:
PCT/CN2017/119334

(87) International publication number:
WO 2019/119500 (27.06.2019 Gazette 2019/26)

(84) Designated Contracting States:
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
Designated Extension States:
BA ME
Designated Validation States:
MA MD TN

(30) Priority: **21.12.2017 CN 201711396548**
21.12.2017 CN 201721810175 U

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(54) **RAILWAY TRAIN AND CARRIAGE FLOOR STRUCTURE THEREOF**

(57) A carriage floor structure of a railway train and a railway train having the same. The carriage floor structure comprises: a floor panel (1); side beams (2) connected to two sides of the floor panel (1) and extending in a length direction of a carriage; and two end connection frames (3) respectively arranged at two ends thereof in the length direction of the carriage and installed at a bottom surface of the floor panel (1). An inner side of each of the end connection frames (3) is provided with a buffer beam (4) extending in the length direction of the carriage. An end portion of the buffer beam (4) is connected to the inner side of the end connection frame (3). A top surface

of the buffer beam (4) is fixed to the bottom surface of the floor panel (1). A force applied to the end connection frame (3) of the carriage floor structure is sequentially transferred to a coupler beam (53), the buffer beam (4), the floor panel (1) and the side beam (2). The invention changes a force transfer manner of a conventional structure, and transfers a force applied to the end connection frame (3) to the side beam (2) by means of multiple transfers, thereby preventing breakage at a force-receiving point, and enhancing strength, stability and safety of equipment.

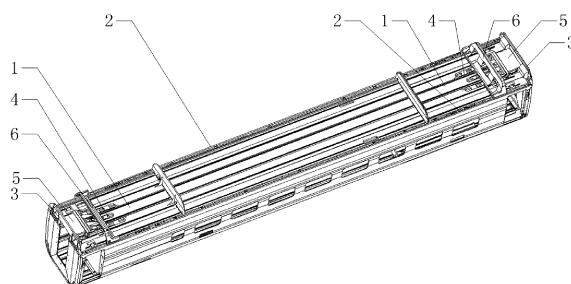


Figure 1

Description

[0001] The present application claims the priorities to Chinese Patent Application No. 201711396548.2 and Chinese Patent Application No. 201721810175.4, both titled "RAILWAY TRAIN AND CARRIAGE FLOOR STRUCTURE THEREOF" and filed with the Chinese State Intellectual Property Office on December 21, 2017, the entire disclosures of which applications are incorporated herein by reference.

FIELD

[0002] The present application relates to the technical field of rail trains, particularly to a carriage base plate structure of the rail train. Besides, the present application further relates to a rail train having the carriage base plate structure.

BACKGROUND

[0003] An electric multiple unit is a type of rail train, it is a train includes at least two locomotives or includes a carriage with power and a plurality of carriages without power. The electric multiple unit originates from double-heading locomotive, but is different from the traditional double-heading locomotive. Double heading is generally used in freight trains mainly to solve a problem of insufficient traction, which only increases the number of locomotives and does not change the trailer property of the railway carriage. The electric multiple unit is almost only used as passenger trains, and is mainly for solving a problem of insufficient acceleration and limited maximum speed, and driving devices can be placed inside multiple passenger carriages respectively, so that these carriages are powered, while a train head may become a trailer having only an operating deck and without a driving force.

[0004] Each carriage in the pure electric multiple unit has a power unit, the train head and the carriages are mostly integrated, or there is no train head and the train is completely controlled by the railway system. The electric multiple unit is mainly used in some urban rail transit trains such as maglev trains, APM (Automated People Mover) trains and ultra-high speed test trains and so on. The electric multiple unit is generally composed of two locomotives, a plurality of carriages with power and carriages without power together, and some electric multiple units omit the driving device on the train head and keep only the control device of the train.

[0005] A carriage base plate structure includes a base plate extending in a length direction of the carriage and side beams arranged at two sides of the base plate, and two ends of the carriage is provided with end connecting frames directly connected to the side beams to realize force transmission. However, this connecting manner has a poor stability, and higher strength is required by each component, otherwise fraction at force bearing points is apt to occur.

[0006] Therefore, a technical problem to be addressed by those skilled in the art is to provide a safe and stable carriage base plate structure.

SUMMARY

[0007] An object of the present application is to provide a carriage base plate structure of a rail train, to change a force transmission manner, avoid fraction of force bearing points, so as to improve the strength, stability and safety of equipment. Another object of the present application is to provide a rail train having the carriage base plate structure.

[0008] In order to address the above problems, a carriage base plate structure of a rail train is provided according to the present application includes a bottom plate and a side beam connected to two sides of the bottom plate and extending in a length direction of the carriage, and further includes two end connecting frames arranged at two ends in the length direction of the carriage respectively and mounted on a bottom surface of the bottom plate. An inner side of each of the end connecting frames is provided with a buffer beam extending in the length direction of the carriage, an end of the buffer beam is connected to the inner side of the end connecting frame, and a top surface of the buffer beam is fixedly connected to the bottom surface of the bottom plate.

[0009] Preferably, the end of the buffer beam is connected to the end connecting frame by a coupler box, and a coupler buffer device and electrical elements are arranged in the coupler box.

[0010] Preferably, the buffer beam includes a connecting plate horizontally arranged and a reinforcing plate vertically arranged at two sides of the connecting plate and protruding downward, both the connecting plate and the reinforcing plate extend in the length direction of the carriage.

[0011] Preferably, an auxiliary plate is arranged between the reinforcing plates at two sides of the connecting plate, the auxiliary plate is parallel with the connecting plate, and a gap is provided between the auxiliary plate and the connecting plate.

[0012] Preferably, a plurality of process holes are sequentially arranged on the connecting plate along an extending direction thereof.

[0013] Preferably, a first cross beam used for connecting the bottom plate is arranged above a joint between the buffer beam and the coupler box, and a second cross beam is arranged below the joint between the buffer beam and the coupler box, the first cross beam and the second cross beam are horizontally arranged and perpendicular to the buffer beam, ends of the first cross beam and the second cross beam are connected by a coupler beam, and a coupler is mounted on the coupler beam.

[0014] Preferably, the carriage base plate structure includes three buffer beams sequentially arranged in a width direction of the carriage and parallel with each other.

er, and a length of the bumper beam in the middle is smaller than lengths of the bumper beams located at both sides.

[0015] Preferably, the carriage base plate structure further includes two end partition walls arranged at two ends of the carriage respectively, two ends of the end partition wall are connected to the side beams at two sides. In a longitudinal direction, the end partition wall is located below the buffer beam, and the coupler box is located between the end partition wall and the end connecting frame.

[0016] Preferably, the reinforcing plate is specifically an arc-shaped inclined plate which can avoid the end partition wall, and a height of a side surface of the buffer beam gradually decreases from a root to an end.

[0017] A rail train is provided according to the present application, including a carriage and a carriage base plate structure arranged at a bottom of the carriage, and the carriage base plate is specifically the carriage base plate according to any one of the above descriptions.

[0018] A carriage base plate structure of a rail train is provided according to the present application, including a bottom plate and a side beam connected to two sides of the bottom plate and extending in a length direction of the carriage, and further includes two end connecting frames arranged at two ends in the length direction of the carriage respectively and mounted on a bottom surface of the bottom plate. An inner side of each of the end connecting frames is provided with a buffer beam extending in the length direction of the carriage, an end of the buffer beam is connected to the inner side of the end connecting frame, and a top surface of the buffer beam is fixedly connected to the bottom surface of the bottom plate. A force of the end connecting frame is transmitted to the buffer beam, then is transmitted from the buffer beam to the bottom plate, and finally is transmitted to the side beam. An original force transmission manner is changed, the force of the end connecting frame is transmitted to the side beam many times to avoid fracture of force bearing points, thereby improving the strength, stability and safety of the device.

[0019] A rail train including the carriage base plate structure is provided according to the present application, since the carriage base plate structure has the above technical effects, the rail train should also have the same technical effects, which are not be described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Figure 1 is a structural view showing a bottom surface of a carriage in a specific embodiment of a carriage base plate structure according to the present application;

Figure 2 is a structural view showing a bottom surface of a buffer beam in the specific embodiment of

the carriage base plate structure according to the present application;

Figure 3 is a structural view showing a top surface of a buffer beam in the specific embodiment of the carriage base plate structure according to the present application.

DETAIL DESCRIPTION

[0021] A core of the present application is to provide a carriage base plate structure of a rail train, which changes a force transmission manner, to avoid fraction of force bearing points, and improve the strength, stability and safety of device. Another core of the present application is to provide a rail train having the carriage base plate structure.

[0022] For those skilled in the art to better understand the technical solutions of the present application, the present application will be further described in detail hereinafter in conjoint with the accompany drawings and the specific embodiments.

[0023] Referring to Figures 1 to 3, Figure 1 is a structural view showing a bottom surface of a carriage in a specific embodiment of a carriage base plate structure according to the present application; Figure 2 is a structural view showing a bottom surface of a buffer beam in a specific embodiment of the carriage base plate structure according to the present application; and Figure 3 is a structural view showing a top surface of a buffer beam in a specific embodiment of the carriage base plate structure according to the present application.

[0024] A carriage base plate structure of a rail train according to the specific embodiment of the present application includes a bottom plate 1 and side beams 2 connected to two sides of the bottom plate 1 and extending in a length direction of the carriage, and further includes two end connecting frames 3 arranged at two ends in the length direction of the carriage respectively and mounted on a bottom surface of the bottom plate 1, that is, an overall structure of the bottom plate 1 extends in the length direction of the carriage, and the end connecting frames 3 are arranged at two ends of the carriage in the length direction of the bottom plate 1, the side beams 2 are arranged between the two end connecting frames 3 that are opposite to each other, extending directions of the two side beams 2 are both parallel with the length direction of the carriage, and the two side beams 2 are located at two sides of the bottom plate 1 respectively.

[0025] Inner sides of the end connecting frames 3, that is, opposite sides of the two end connecting frames, are both provided with a buffer beam 4 extending in the length direction of the carriage. One end of the buffer beam 4 is connected to the inner side of the end connecting frame 3 and a top surface of the buffer beam 4 is fixedly connected to the bottom surface of the bottom plate 1.

[0026] A top surface and a bottom surface of each component are defined according to an up-down locality

when the rail train runs normally. To facilitate illustration, the length direction of the carriage can be defined as a front-rear direction, a direction in which the rail train travels normally is "front", and a direction opposite to "front" is "rear"; a direction vertical to a rail surface is defined as an up-down direction, a direction vertically pointing to the rail surface is "down" and a direction deviating from the rail surface is "up"; a plane parallel with the rail surface is defined as a horizontal plane, there are a front-rear direction and a left-right direction perpendicular to the front-rear direction in the horizontal plane. The left-right direction is a transverse direction or a width direction of the carriage described in the present application, the front-rear direction is a longitudinal direction or the length direction of the carriage described in the present application, and the up-down direction is a height direction in the present application.

[0027] As shown in Figure 1, two end connecting frames 3 mounted on the bottom surface of the bottom plate 1 refers to that, a front end and a rear end of the bottom surface of the bottom plate 1 are both provided with one end connecting frame 3, each end connecting frame 3 extends from up to bottom approximately, and the end connecting frame 3 has an upper end connected to the front end or the rear end of the bottom plate 1, and extends downward from the bottom surface of the bottom plate 1.

[0028] In the carriage base plate structure provided according to the embodiment of the present application, a coupler box 5 is further required. An end of the buffer beam 4 is connected to the end connecting frame 3 through the coupler box 5, a cavity in the coupler box 5 configured to mount a coupler is further provided with a coupler buffer device and electric elements. The end connecting frame 3 is not directly connected to the side beam 2, a force of the end connecting frame 3 is transmitted to the buffer beam 4 through the coupler box 5, then is transmitted from the buffer beam 4 to the bottom plate 1, and finally is transmitted to the side beam 2. An original force transmission manner is changed, the force of the end connecting frame 3 is transmitted to the side beam 2 through many-times transmission to avoid fracture of force bearing points, thereby improving the strength, stability and safety of the device.

[0029] In order to improve the strength, the buffer beam 4 includes a connecting plate arranged horizontally and a reinforcing plate 41 vertically arranged at two sides of the connecting plate and protruding downward, both the connecting plate and the reinforcing plate 41 extend in the length direction of the carriage. A top surface of the connecting plate is fixedly connected to the bottom plate 1, to form a main force transmission structure, and the grooved buffer beam 4 is formed by the reinforcing plate 41 arranged at the two sides of the connecting plate, thus improving the strength of the device. An auxiliary plate 42 may also be arranged between the reinforcing plates 41 at the two sides of the connecting plate, the auxiliary plate 42 is parallel with the connecting plate, and a gap

is set between the auxiliary plate 42 and the connecting plate to further improve the strength. Multiple process holes may also be sequentially arranged on the connecting plate along an extending direction thereof. A position and the structure of each component can be adjusted according to different situations, which are all within the scope of protection of the present application.

[0030] "Multiple" in the present application means "at least two". Multiple process holes sequentially arranged on the connecting plate along the extending direction thereof refer to that, the multiple process holes are arranged at intervals in the extending direction of the connecting plate, the multiple process holes may not located in a same straight line, as long as the multiple process holes are roughly sequentially distributed in the extending direction of the connecting plate.

[0031] In the carriage base plate structure provided according to the embodiment of the present application, a first cross beam 51 configured to connect the bottom plate 1 is arranged above a joint between the buffer beam 4 and the coupler box 5, and a second cross beam 52 is arranged below the joint between the buffer beam 4 and the coupler box 5. The first cross beam 51 and the second cross beam 52 are horizontally arranged and perpendicular to the buffer beam 4, ends of the first cross beam 51 and the second cross beam 52 are connected by a coupler beam 53, and a coupler is mounted on the coupler beam 53, the strength of the device and the stable connection are ensured by above structure. A tractive force and a braking force between the carriages are transmitted to the coupler beam 53 through the coupler, the coupler beam 53 transmits the forces to the buffer beam 4, the first cross beam 51 and the second cross beam 52, the buffer beam 4 transmits the forces to the bottom plate 1, and the bottom plate 1 transmits the forces to the side beams 2. At the same time, the first cross beam 51 and the second cross beam 52 also transmit the forces to the bottom plate 1 and then to the side beams 2.

[0032] A number of the buffer beam can be adjusted according to different situations, for example, three buffer beams 4 are sequentially arranged in a width direction of the carriage, the three buffer beams 4 are parallel with each other, and a length of the bumper beam 4 in the middle is smaller than lengths of the bumper beams located at both sides.

[0033] Based on the carriage base plate structure provided according to the above specific embodiments, the carriage base plate structure further includes two end partition walls 6 arranged at two ends of the carriage respectively, two ends of the end partition wall 6 are connected to the side beams 2 at two sides; in an up-down direction, the end partition wall 6 is located below the buffer beam 4, and in a longitudinal direction, the coupler box 5 is located between the end partition wall 6 and the end connecting frame 3, thus realizes the air diversion, and a relative closed space is formed to place other devices.

[0034] Specifically, the reinforcing plate 41 is an arc-

shaped inclined plate which can avoid the end partition wall 6, and a height of a side surface of the buffer beam 4 gradually decreases from a root to a tail end thereof, so as to avoid the end partition wall 6 and to compact the structure.

[0035] The arc-shaped inclined plate refers to that the reinforcing plate 41 is inclined downward from the inner side to the outer side, and the inclined surface is an arc-shaped surface, that is, an arc-shaped curve line is inclined downward from the inner side to the outer side, so as to form an avoidance space at the inner side of the reinforcing plate 41 for avoiding the end partition wall 6, thus ensuring that the end partition wall 6 can be located below the reinforcing plate 41 and mounted at the inner side of the reinforcing plate 41.

[0036] The root of the buffer beam 4 refers to a portion connected to the end connecting frame 3, that is, an end portion of the buffer beam 4, and the tail end refers to another end opposite to the end portion.

[0037] In addition to the carriage base plate structure, a rail train having the above carriage base plate structure is further provided according to the specific embodiment of the present application, and structures of other parts of the rail train can be referred to the conventional technology, which will not be described herein.

[0038] The rail train and the carriage base plate structure thereof provided according to the present application are described in detail hereinbefore. The principle and the embodiments of the present application are illustrated herein by specific examples. The above description of examples is only intended to help the understanding of the method and the spirit of the present application. It should be noted that, for the person skilled in the art, a few of modifications and improvements may be made to the present application without departing from the principle of the present application, and these modifications and improvements are also deemed to fall into the scope of the present application defined by the claims.

Claims

1. A carriage base plate structure of a rail train, comprising:

a bottom plate (1), and
side beams (2) connected to two sides of the bottom plate (1) and extending in a length direction of the carriage, and
further comprising two end connecting frames (3) respectively arranged at two ends in the length direction of the carriage and mounted on a bottom surface of the bottom plate (1), wherein:

an inner side of each of the end connecting frames (3) is provided with a buffer beam (4) extending in the length direction of the carriage, an end of the buffer beam (4) is connected to

the inner side of the end connecting frame (3), and a top surface of the buffer beam (4) is fixedly connected to the bottom surface of the bottom plate (1).

2. The carriage base plate structure according to claim 1, wherein the end of the buffer beam (4) is connected to the end connecting frame (3) by a coupler box (5), and a coupler buffer device and electrical elements are arranged in the coupler box (5).

3. The carriage base plate structure according to claim 2, wherein the buffer beam (4) comprises a connecting plate horizontally arranged and a reinforcing plate (41) vertically arranged at two sides of the connecting plate and protruding downward, and both the connecting plate and the reinforcing plate (41) extend in the length direction of the carriage.

4. The carriage base plate structure according to claim 3, wherein an auxiliary plate (42) is arranged between the reinforcing plates (41) at the two sides, the auxiliary plate (42) is parallel with the connecting plate, and a gap is arranged between the auxiliary plate (42) and the connecting plate.

5. The carriage base plate structure according to claim 4, wherein a plurality of process holes are sequentially arranged on the connecting plate along an extending direction thereof.

6. The carriage base plate structure according to claim 3, wherein a first cross beam (51) used for connecting the bottom plate (1) is arranged above a joint between the buffer beam (4) and the coupler box (5), and a second cross beam (52) is arranged below the joint between the buffer beam (4) and the coupler box (5), the first cross beam (51) and the second cross beam (52) are horizontally arranged and perpendicular to the buffer beam (4), ends of the first cross beam (51) and the second cross beam (52) are connected by a coupler beam (53), and a coupler is mounted on the coupler beam (53).

7. The carriage base plate structure according to claim 3, comprising three buffer beams (4) sequentially arranged in a width direction of the carriage and parallel with each other, wherein a length of the bumper beam (4) in the middle is smaller than lengths of the bumper beams (4) located at both sides.

8. The carriage base plate structure according to any one of claims 3 to 7, further comprising two end partition walls (6) arranged at two ends of the carriage respectively, wherein two ends of the end partition wall (6) are connected to the side beams (2) at two sides; and in an up-down direction, the end partition wall (6) is located below the buffer beam (4), and in

a longitudinal direction, the coupler box (5) is located between the end partition wall (6) and the end connecting frame (3).

9. The carriage base plate structure according to claim 8, wherein the reinforcing plate (41) is specifically an arc-shaped inclined plate which can avoid the end partition wall (6), and a height of a side surface of the buffer beam (4) gradually decreases from a root to an end of the buffer beam (4). 5 10
10. A rail train, comprising a carriage and a carriage base plate structure arranged at a bottom of the carriage, wherein the carriage base plate structure is specifically the carriage base plate structure according to any one of claims 1 to 9. 15

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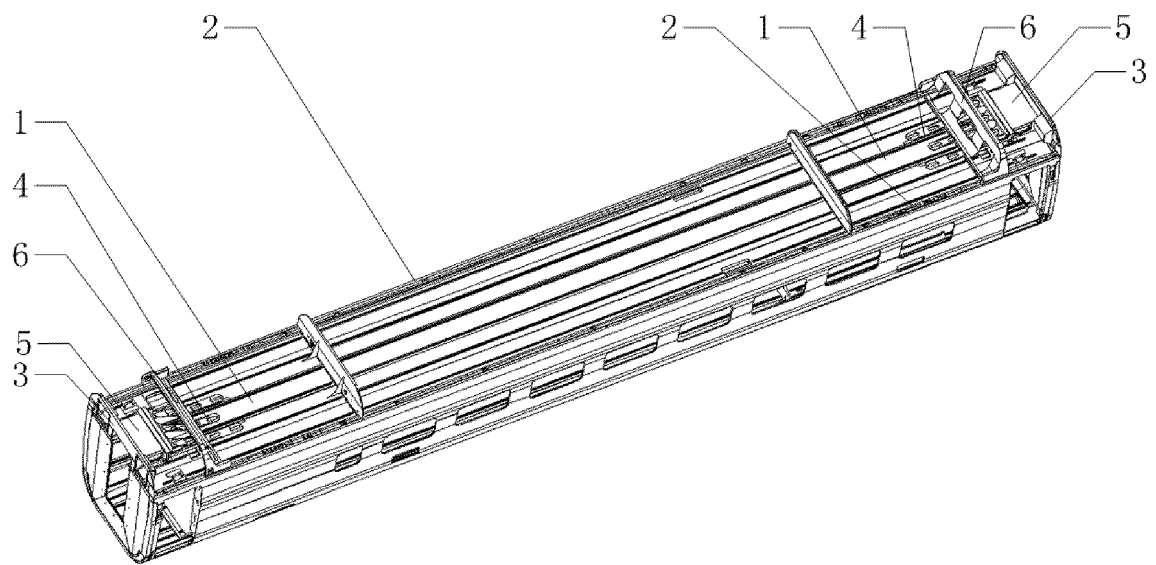


Figure 1

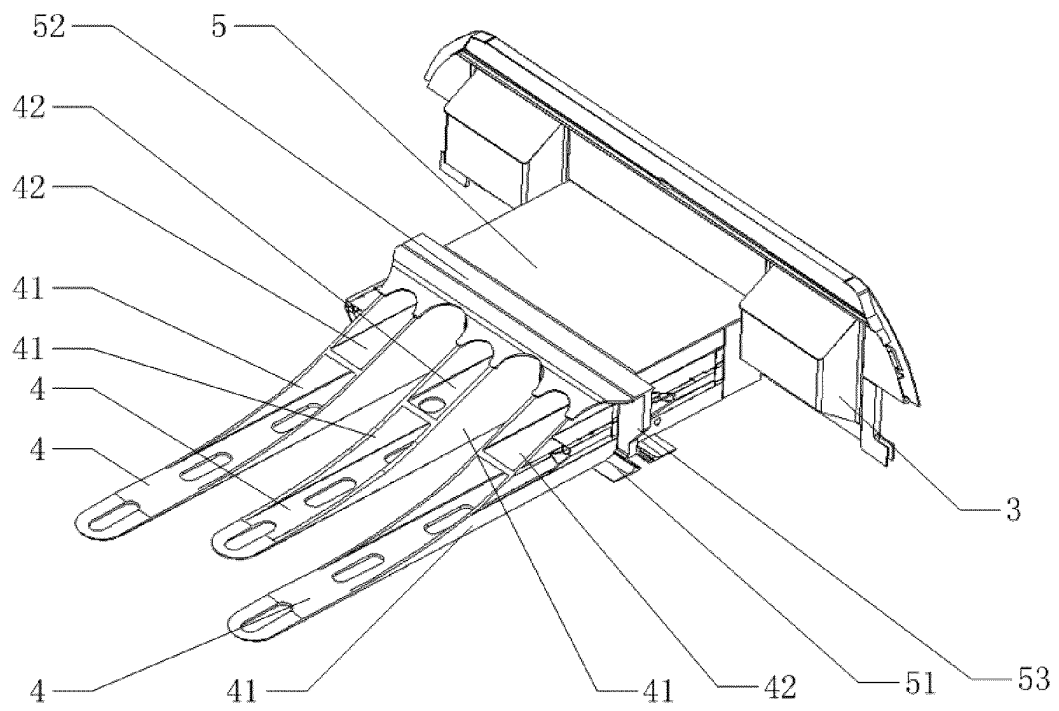


Figure 2

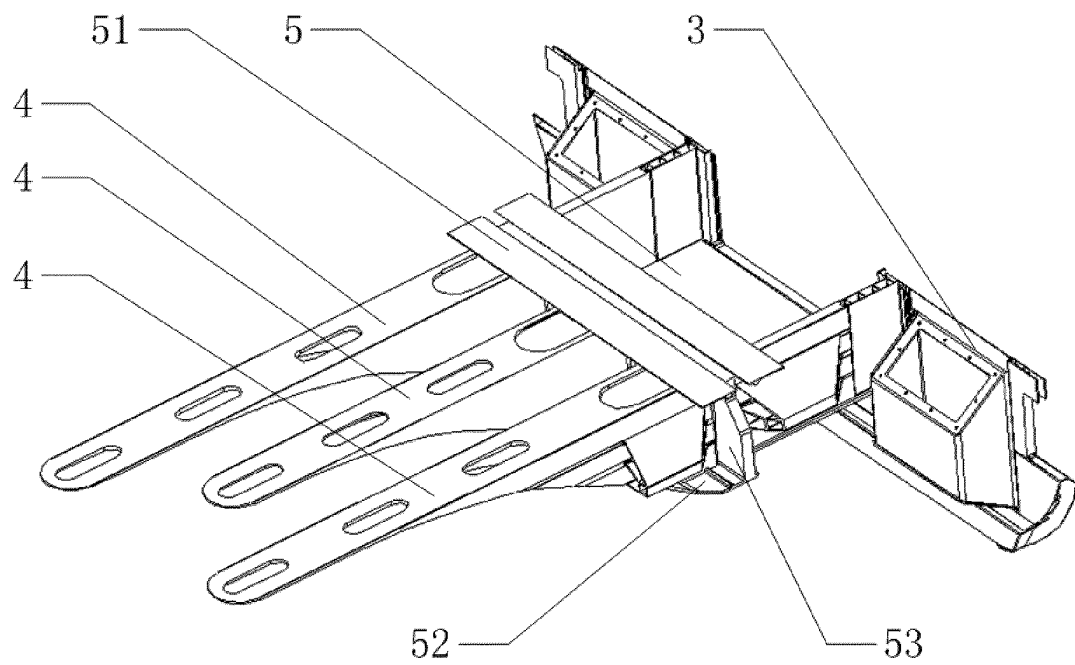


Figure 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/119334

A. CLASSIFICATION OF SUBJECT MATTER B61F 1/00(2006.01)i; B61F 1/10(2006.01)i; B61D 17/10(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																					
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B61F; B61D; B61G Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNPAT, CNKI, WPI, EPODOC: 轨道, 列车, 车厢, 底板, 地板, 缓冲, 车钩, 边梁, 横梁; railway, train, carbody, floor, back w plate, buffer, coupling, side w beam, cross w beam.																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>CN 106364511 A (CRRC NANJING PUZHEN CO., LTD.) 01 February 2017 (2017-02-01) description, paragraphs 4-23, and figures 1-2</td> <td>1-3, 7, 10</td> </tr> <tr> <td>A</td> <td>CN 204172921 U (CSR ZHUZHOU ELECTRIC LOCOMOTIVE CO., LTD.) 25 February 2015 (2015-02-25) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 206679011 U (BYD COMPANY LIMITED) 28 November 2017 (2017-11-28) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>JP 2006001501 A (HITACHI LTD.) 05 January 2006 (2006-01-05) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>EP 1052154 A1 (ALSTOM) 15 November 2000 (2000-11-15) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>EP 1125816 A1 (TALGO TRANSTECH OY.) 22 August 2001 (2001-08-22) entire document</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	CN 106364511 A (CRRC NANJING PUZHEN CO., LTD.) 01 February 2017 (2017-02-01) description, paragraphs 4-23, and figures 1-2	1-3, 7, 10	A	CN 204172921 U (CSR ZHUZHOU ELECTRIC LOCOMOTIVE CO., LTD.) 25 February 2015 (2015-02-25) entire document	1-10	A	CN 206679011 U (BYD COMPANY LIMITED) 28 November 2017 (2017-11-28) entire document	1-10	A	JP 2006001501 A (HITACHI LTD.) 05 January 2006 (2006-01-05) entire document	1-10	A	EP 1052154 A1 (ALSTOM) 15 November 2000 (2000-11-15) entire document	1-10	A	EP 1125816 A1 (TALGO TRANSTECH OY.) 22 August 2001 (2001-08-22) entire document	1-10
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Date of the actual completion of the international search 28 August 2018	Date of mailing of the international search report 14 September 2018																				
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2017/119334

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
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