(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 984 854 A1**

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

(43) Date of publication:
20.04.2022 Bulletin 2022/16

(21) Application number: **19932571.3**

(22) Date of filing: **12.11.2019**

(51) International Patent Classification (IPC):
B61F 5/52 *(2006.01)* ***B61F 5/26*** *(2006.01)*
B61G 9/20 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B61F 5/26; B61F 5/30; B61F 5/52; B61G 9/20

(86) International application number:
PCT/CN2019/117503

(87) International publication number:
WO 2020/248490 (17.12.2020 Gazette 2020/51)

(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:
KH MA MD TN

(30) Priority: **11.06.2019 CN 201910501304**

(71) Applicant: **CRRC TANGSHAN CO., LTD.**
Fengrun District
Tangshan
Hebei 063035 (CN)

(72) Inventors:
- **GUO, Jixiang**
  Tangshan, Hebei 063035 (CN)
- **ZHANG, Xiaojun**
  Tangshan, Hebei 063035 (CN)
- **LI, Dehua**
  Tangshan, Hebei 063035 (CN)
- **LU, Quan**
  Tangshan, Hebei 063035 (CN)
- **LI, Hui**
  Tangshan, Hebei 063035 (CN)
- **DONG, Lei**
  Tangshan, Hebei 063035 (CN)
- **FANG, Jianguo**
  Tangshan, Hebei 063035 (CN)

(74) Representative: **Patel, Binesh**
Beuro IP Limited
11 St. Paul's Square
Birmingham
B3 1RB (GB)

(54) BOGIE

(57) A bogie, comprising: a wheel set, comprising an axle (210) and two wheels (220) which are sleeved and fixed to the outer peripheral surface of the axle (210); an axle box (300), comprising an axle box body (310) the cross section of which is door frame-shaped, and the axle box (300) is located on the axle (210) by means of a bottom opening in the axle box body (310), wherein a primary suspension system installation interface (311) is provided at the top part of the axle box body (310); and a primary suspension system, which is installed at the top part of the axle box body (310) by means of the primary suspension system installation interface (311) and capable of solving the technical problem of conventional bogies being heavy in weight.

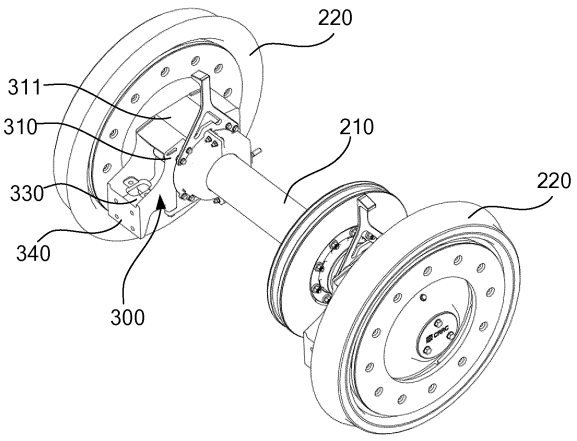

Fig.2

EP 3 984 854 A1

Description

TECHNICAL FIELD

[0001] The present application relates to the technical field of rail trains, and specifically to a bogie.

BACKGROUND ART

[0002] With the continuous development of rail trains, the bogies of rail trains need to operate under severe conditions, and the vibration frequency the bogies are subjected to is also large. A bogie is an important part of a rail train, which bears and transmits the forces from all directions. The quality of the bogie has an important influence on the rail train. The conventional bogies are heavy in weight and complex in construction.

[0003] Therefore, the weight of the bogie being too large is a technical problem that a person skilled in the art urgently needs to solve.

[0004] The above information disclosed in the background art is only for enhancing the understanding of the background of the present application, and thus may contain information that does not form the relevant art known to those of ordinary skills in the art.

SUMMARY OF THE INVENTION

[0005] The embodiments of the present application provide a bogie to solve the technical problem that a conventional bogie is heavy in weight.

[0006] Embodiments of the present application provide a bogie, comprising:

a wheel set comprising an axle and two wheels, wherein the two wheels are sleeved and fixed to the outer peripheral surface of the axle;

an axle box, comprising an axle box body a cross section of which is door frame-shaped, and the axle box being located on the axle by means of a bottom opening in the axle box body, wherein a primary suspension system installation interface is provided at a top part of the axle box body; and a primary suspension system, which is installed at the top part of the axle box body by means of the primary suspension system installation interface.

[0007] With the above technical solution, the embodiments of the present application have the following technical effects:

Firstly, the cross section of the axle box body is door frame-shaped, and the bottom of the axle box body has a bottom opening, namely, the bottom of the axle box body is not provided with a frame for closing, so as to facilitate the control of the weight of the axle box, thereby facilitating the control of the weight of the bogie, and at the same time facilitating the installation of the axle box body and the axle compared with the conventional closed-frame shaped axle box; secondly, the primary suspension system is installed on the top part of the axle box body by means of the primary suspension system installation interface which effectively utilizes the top part of the axle box body, thereby facilitating the control of the weight of the axle box, and further facilitating the control of the weight of the bogie, and which is capable of adapting to the development trend of lightweight bogies.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings are included to provide a further understanding of the present application and are incorporated in and constitute a part of the present application. The illustrative embodiments and descriptions thereof in the application are used to explain the application, and do not constitute an improper limitation of the application. In the drawings:

Fig. 1 is a schematic view of a bogie according to an embodiment of the present application;

Fig. 2 is a schematic view of the installation of a wheel set and an axle box of the bogie shown in Fig. 1;

Fig. 3 is a schematic view of a single drawbar of the bogie of Fig. 1;

Fig. 4 is a schematic view of a frame of a bogie according to an embodiment of the present application;

Fig. 5 is a schematic view of a side beam of the frame of the bogie shown in Fig. 4;

Fig. 6 is a schematic view of a cross beam of the frame of the bogie shown in Fig. 4;

Fig. 7 is a schematic view of a traction device of the bogie shown in Fig. 1;

Fig. 8 is a schematic view of an additional air chamber of a secondary air spring in the middle of the side beam shown in Fig. 5;

Fig. 9 is a schematic view of a side beam end part seat of the side beam shown in Fig. 5.

DETAILED DESCRIPTION OF THE INVENTION

[0009] In order to make the technical solutions and advantages of the embodiments of the present application clearer, the exemplary embodiments of the present application will be described in further detail below with reference to the accompanying drawings. Obviously, the described embodiments are only a part of the embodiments of the present application, not an exhaustive list of all embodiments. It should be noted that the embodiments and features of the embodiments in the present application can be combined with each other without conflict.

Embodiment 1

[0010] Fig. 1 is a schematic view of a bogie according to an embodiment of the present application; Fig. 2 is a schematic view of the installation of a wheel set and an

axle box of the bogie shown in Fig. 1. As shown in Figs. 1 and 2, according to an embodiment of the present application, a bogie includes:

a wheel set comprising an axle 210 and two wheels 220, wherein the two wheels 220 are sleeved and fixed to the outer peripheral surface of the axle 210;
an axle box 300, comprising an axle box body 310 the cross section of which is door frame-shaped, and the axle box 300 being located on the axle 210 by means of a bottom opening in the axle box body 310, wherein a primary suspension system installation interface 311 is provided at the top part of the axle box body;
and a primary suspension system, which is installed at the top part of the axle box body by means of the primary suspension system installation interface 311.

[0011] According to the bogie of the embodiment of the present application, firstly, the cross section of the axle box body is door frame-shaped, and the bottom of the axle box body has a bottom opening, namely, the bottom of the axle box body is not provided with a frame for closing, so as to facilitate the control of the weight of the axle box, thereby facilitating the control of the weight of the bogie, and at the same time facilitating the installation of the axle box body and the axle compared with the conventional closed-frame shaped axle box; secondly, the primary suspension system is installed on the top part of the axle box body by means of the primary suspension system installation interface which effectively utilizes the top part of the axle box body, thereby facilitating the control of the weight of the axle box, and further facilitating the control of the weight of the bogie, and which is capable of adapting to the development trend of lightweight bogies.

[0012] In the implementation, with regard to the specific position where the axle box is provided on the axle, it may be the position in the specific embodiment as shown in Figs. 1 and 2. The axle box 300 is located between the two wheels 220.

[0013] The portion of the axle box provided between the two wheels of the axle, i. e. the manner in which the axle box is built-in, makes full use of the portion of the axle located between the two wheels. Compared with the external axle box in conventional technology, the built-in axle box makes the length of the axle shorter, which facilitates the control of the weight of bogies and can adapt to the development trend of lightweight bogies.

[0014] Fig. 3 is a schematic view of a single drawbar of the bogie of Fig. 1. In the implementation, as shown in the specific embodiment of Figs. 1 and 3, the bogie further comprises a single drawbar 410 and a side beam 100. Wherein an end part of the side beam is provided above the primary suspension system, and the middle portion of the side beam has a side beam single drawbar interface;

as shown in Fig. 1, the axle box further comprises a single drawbar flanging. The single drawbar flanging is provided at an end part of one side of the axle box body near the middle portion of the side beam, and the single drawbar flanging has an axle box single drawbar interface;
wherein two ends of the single drawbar are respectively fixed with the axle box single drawbar interface and the side beam single drawbar interface via an elastic connecting piece to transmit a load along the running direction of the bogie, namely, the single drawbar is used as a primary positioning drawbar to position the primary suspension system.

[0015] Therefore, the single drawbar fixes the single drawbar by means of the axle box single drawbar interface and the side beam single drawbar interface via the elastic connecting piece, realizing the elastic connection of the axle box and the side beam. The axle box is integrated with the axle box single drawbar interface, which makes full use of the structure of the axle box, is conducive to the weight control of the bogie, and can adapt to the development trend of lightweight bogie; at the same time, the single drawbar is fixed to the axle box single drawbar interface and the side beam single drawbar interface via the elastic connecting piece, and when the single drawbar transmits a tractive force and a braking force, due to the existence of the elastic connecting piece, namely, the single drawbar and the axle box, the side beams are elastically connected, the transmission process of the tractive force and the braking is gentle, and the vibration is small, and then the vibration of the bogie during acceleration and deceleration is small.

[0016] In the implementation, as shown in the specific embodiment of Fig. 1, the bogie also comprises a primary vertical oil damper 510:

as shown in Fig. 2, the axle box 300 further comprises a primary vertical oil damper flanging 330, the primary vertical oil damper flanging 330 being provided at the end part of one side of the axle box body away from the middle of the side beam, and the primary vertical oil damper flanging 330 having a primary vertical oil damper interface;
the primary vertical oil damper 510 is installed to the axle box through the primary vertical oil damper interface.

[0017] In this way, the installation of the axle box and the primary vertical oil damper is achieved. The axle box is integrated with a primary vertical oil damper interface, which makes full use of the structure of the axle box, is conducive to the weight control of the bogie, and can adapt to the development trend of the lightweight bogie.

[0018] In the implementation, as shown in the specific embodiment of Fig. 1, the bogie further comprises an obstacle-removing device 600;

the axle box further comprises an obstacle-removing device vertical plate 340, wherein the obstacle-removing device vertical plate 340 extends downward from the end part of the primary vertical oil damper flanging, and the obstacle-removing device vertical plate 340 is provided with an obstacle-removing device interface;

wherein the obstacle-removing device is installed to the axle box by means of the obstacle-removing device interface.

[0019] In this way, the obstacle-removing device is installed to the axle box by means of the obstacle-removing device interface, and the installation of the axle box and the obstacle-removing device is realized. The axle box is integrated with the obstacle-removing device interface, which makes full use of the structure of the axle box. At the same time, the installation on the axle box greatly reduces the size of the structure of the obstacle-removing device and, compared with the conventional structure form installed on the end part of the side beam, greatly reduces the weight, which is conducive to the weight control of the bogie and can adapt to the development trend of the lightweight bogie.

[0020] Specifically, as shown in Fig. 1, the body of the obstacle-removing device is formed by bending a steel pipe such that the structure is simple and compact; an installation base plate is welded to the floor, and the installation base plate is fixed to the obstacle-removing device interface of the axle box by means of four bolts.

[0021] Specifically, the axle box is a one-piece structure that is integrally cast or forged.

[0022] The axle box adopts a one-piece structure that is integrally cast or forged such that it can reduce the welding lines of the axle box and enhance the robustness of the axle box.

[0023] In the implementation, as in the specific embodiment shown in Figs. 1 and 2, each wheel set corresponds to two axle boxes, which are provided symmetrically with respect to the mid-point of the axle;

the wheel sets are two sets, and the two sets of the wheel sets are symmetrically provided with respect to the middle of the side beam.

[0024] The single wheel set is of symmetrical structure and the two wheel sets are also of symmetrical structures with respect to the middle of the side beam.

[0025] Fig. 4 is a schematic view of a frame of a bogie according to an embodiment of the present application; Fig. 5 is a schematic view of a side beam of the frame of the bogie shown in Fig. 4;

[0026] Fig. 6 is a schematic view of a cross beam of the frame of the bogie shown in Fig. 4. In the implementation, as in the specific embodiment shown in Figs 1, 4, 5, and 6, the bogie further comprises a cross beam 700 fixed to the side beam, the cross beam having a traction device installation hole 710 running up and down; wherein the side beams are two and the structures of the two side beams are symmetrical; the cross beam is fixedly connected to two side beams to form a frame;

[0027] Fig. 7 is a schematic view of a traction device of the bogie shown in Fig. 1. As shown in Figs. 1 and 7, the bogie further comprises a traction device 800, the traction device comprising traction support 810, a fixing column 820, a longitudinal fixing plate 831, and an elastic longitudinal traction stop 832, wherein the traction support 810 is for connecting with the body of a train;

the fixing column 820 is fixed below the traction support 810, the longitudinal traction stops 832 are respectively fixed on two side surfaces of the fixing column which are consistent with the direction of the gauge of the bogie, and one longitudinal fixing plate 831 is fixed on the outer side of each longitudinal traction stop 832;

wherein the longitudinal fixing plate 831 is fixed to the inner wall in the traction device installation hole which is consistent with the direction of the gauge of the bogie by means of a fastener.

[0028] When the frame transmits tractive force and braking force to the traction device via the cross beam, since the longitudinal traction stop is elastic, namely, the cross beam and the traction device are connected elastically, the transmission process of tractive force and braking is gentle and the vibration is small, and then the vibration of the bogie during acceleration and deceleration is small; further, when the train using the bogie is started and braked, the impact on the train is small and the passengers feel comfortable.

[0029] Specifically, the longitudinal traction stop is a longitudinal traction stop of rubber material.

[0030] In the implementation, as shown in the specific embodiment of Fig. 6, the traction device further comprises a wear plate 841 and an elastic transverse stop 842;

the wear plates 841 are respectively fixed on two side surfaces of the fixing column perpendicular to the direction of the gauge of the bogie, and the transverse stop 842 is fixed on an inner wall surface of the traction device installation hole perpendicular to the direction of the gauge of the bogie, and can be replaced separately after the wear plates are damaged.

[0031] When the frame transmits the force for changing the direction of the bogie to the traction device via the cross beam, since the transverse stop is elastic, namely, the cross beam and the traction device are elastically connected, the transmission process of the force for changing the direction of the bogie is gentle in the direction of the gauge of the bogie, and the vibration is small, and thus the vibration of the bogie during the steering is small.

[0032] Specifically, the transverse stop is a transverse stop of rubber material.

Embodiment 2

[0033] The bogie according to embodiment 2 of the present application further comprises the following features based on embodiment 1.

[0034] Fig. 8 is a schematic view of an additional air chamber of a secondary air spring in the middle of the side beam shown in Fig. 5. As shown in Figs. 4, 5, and 8, an additional air chamber of the secondary air spring of the bogie is formed in the middle of the side beam;

the additional air chamber of the secondary air spring comprises a main air chamber 111 and an auxiliary air chamber 112, wherein the main air chamber 111 and the auxiliary air chamber 112 are arranged side by side in the width direction of the side beam and are in communication with each other, and the main air chamber 111 is a part located between two main air chamber partition plates 131 after the inner cavity of the side beam body is separated by the two main air chamber partition plates 131;

wherein the side beam body comprises a side beam upper cover plate 121 and a side beam lower cover plate 122 provided opposite to each other, and two side beam vertical plates 123 fixed between the side beam upper cover plate and the lower cover plate.

[0035] In the bogie of the embodiment of the present application, firstly, the additional air chamber of the secondary air spring of the bogie is provided in the middle of the side beam, and the function of the additional air chamber of the secondary air spring is to provide an additional air chamber for the air spring; in this way, the additional air chamber of the secondary air spring provided in the middle of the side beam makes the bogie structure of the embodiment of the present application simple, as compared to the complexity of separately providing the additional air chamber air cylinder component for the secondary air spring. Secondly, the main air chamber of the additional air chamber of the secondary air spring is provided in the inner cavity of the side beam body, and then the auxiliary air chamber arranged side by side with the main air chamber in the width direction of the side beam is provided outside the inner cavity of the side beam body, namely, the main air chamber is provided in the inner cavity of the side beam body, and the auxiliary air chamber is provided outside the inner cavity of the side beam body. The main air chamber in the additional air chamber of the secondary air spring in the embodiment of the present application is provided in the side beam of the frame, compared with the conventional additional air chamber of the secondary air spring being provided in the inner cavity of the cross beam of the frame. Since the structure of the side beam is relatively large, the position where the main air chamber is provided can be selected in the middle of the side beam which is closer to the secondary air spring. In addition, under the requirement of not exceeding the limit of the side beam in the width direction, it is also possible to add a simple structure only for providing the auxiliary air chamber, thereby increasing the space of the additional air chamber of the secondary air spring, and at the same time, exerting small influence on the structure of the side beam.

[0036] Specifically, as shown in Figs. 5 and 8, the inner cavity of the side beam body is a space enclosed by a side beam upper cover plate 121, a side beam lower cover plate 122, and two side beam vertical plates 123; wherein the plate surface of the side beam vertical plate is along the length direction of the side beam. Therefore, the inner cavity of the side beam body is a space along the length direction of the side beam. The two main air chamber partition plates 131 divide the inner cavity of the side beam body, and the portion of the inner cavity of the side beam body between the two main air chamber partition plates forms the main air chamber 111. Therefore, the structure of the main air chamber is very simple and it is easy to process and manufacture.

[0037] In the implementation, with regard to the structure of the auxiliary air chamber, as shown in Fig. 8, the vertical portion of the auxiliary air chamber is enclosed by the auxiliary air chamber enclosing plate 132 and the outer plate surface of the communicating side beam vertical plate 123-1;

the side beam upper cover plate 121 is further sealed above the vertical portion of the auxiliary air chamber as the top part of the auxiliary air chamber, and the side beam lower cover plate 122 is further sealed below the vertical portion of the auxiliary air chamber as the bottom of the auxiliary air chamber;

wherein the communicating side beam vertical plate 123-1 is a side beam vertical plate having a communication air hole, and the communication air hole 123-2 is used for communicating the main air chamber 111 with the auxiliary air chamber 112.

[0038] The communicating side beam vertical plate 123-1 is not only a side beam vertical plate of the side beam, providing sufficient support for the side beam, but also a component portion of the main air chamber and the auxiliary air chamber, effectively utilizing the necessary structure of the side beam, and facilitating the weight reduction of the bogie; the top part of the main air chamber and the top part of the auxiliary air chamber are both borne by the side beam upper cover plate, and the bottom of the main air chamber and the bottom of the auxiliary air chamber are both borne by the side beam lower cover plate. The structure is simple and the welding is less, which is conducive to processing and manufacturing. The structure of the main air chamber and the structure of the auxiliary air chamber are both very simple structures that are easy to process and manufacture.

[0039] In the implementation, to realize the function of the main air chamber and the auxiliary air chamber as additional air chambers of the secondary air spring, a

corresponding structure is also required. As shown in Fig. 8, as an alternative, the side beam further comprises a hollow column 140;

the hollow column 140 penetrates the side beam upper cover plate from the inner bottom of the auxiliary air chamber upwards to form a secondary air spring installation interface 121-1; wherein the side wall of the hollow column has a vent hole 141 communicating the inside and outside of the hollow column, and the top part outer surfaces of the main air chamber and the auxiliary air chamber serve as a secondary air spring mount;
alternatively, the hollow column penetrates the side beam upper cover plate from the inner bottom of the main air chamber upwards to form a secondary air spring installation interface.

[0040] With regard to the hollow column in the above-mentioned two positions, the lower end of the hollow column is fixed at the inner bottom of the side beam lower cover plate, the upper end of the hollow column penetrates through the side beam upper cover plate, and the hollow column also plays the role of supporting and reinforcing between the side beam lower cover plate and the side beam upper cover plate; in addition, the structure of the air chamber and the structure of the auxiliary air chamber are both very simple and easy to process and manufacture. The position of the secondary air spring installation interface needs to comprehensively consider the arrangement of other components of the bogie, and after the position of the secondary air spring installation interface is determined, the position of the hollow column is determined according to the position of the secondary air spring installation interface. The secondary air spring mount provides installation and positioning for the secondary air spring installation.

[0041] In the implementation, the relative positions of the main air chamber and the auxiliary air chamber may be as shown in Figs. 5 and 8 where the main air chamber 111 and the auxiliary air chamber 112 are arranged side by side from the inside to the outside in the direction of the gauge of the bogie;
it is also possible that the main air chamber and the auxiliary air chamber are arranged side by side from the outside to the inside in the direction of the gauge of the bogie.

[0042] The relative positions of the main air chamber and the auxiliary air chamber may comprehensively consider the arrangement of other components of the bogie.

[0043] In the implementation, as shown in Fig. 8, to reinforce the structure of the main air chamber, the main air chamber reinforcing rib plate 111-1 may be provided in the main air chamber, and the main air chamber reinforcing rib plate 111-1 has an air hole;
wherein the main air chamber reinforcing rib plate is used for reinforcing the structure of the main air chamber.

[0044] The main air chamber reinforcing rib plate is provided to reinforce the main air chamber and the side beam.

[0045] In the implementation, Fig. 9 is a schematic view of a side beam end part seat of the side beam shown in Fig. 5, and as shown in Fig. 9, the side beam further includes two side beam end part seats 160;

the side beam end part seat comprises a side beam end part bottom plate 161, a fixing structure 162, and a stone sweeper mount 163 respectively formed at two ends of the side beam end part bottom plate;
wherein the fixing structure is fixed to one end of the side beam body.

[0046] The side beam end part seat of the above-mentioned structure is an open special-shaped structure, which does not form a box-type structure at the end part of the side beam in the conventional technology. On the one hand, it is advantageous to reduce the weight and control the weight of the side beam and the bogie, and at the same time, other structures can be provided, such as a fixing structure and a stone sweeper mount, and the structure is compact.

[0047] In the implementation, as shown in Fig. 9, the stone sweeper mount 163 may be bent upwards with respect to the side beam end part bottom plate 161; it is also possible that the stone sweeper mount is bent downwards with respect to the side beam end part bottom plate.

[0048] The bending direction of the stone sweeper mount with respect to the side beam end part bottom plate can be selected according to actual needs by comprehensively considering other components of the bogie.

[0049] In the implementation, as shown in Fig. 9, in order to reinforce the side beam end part seat, the side beam end part seat further comprises an end part seat reinforcing rib plate 164;
the end part seat reinforcing rib plate 164 is formed above the side beam end part bottom plate to fixedly connect the fixing structure 162 and the stone sweeper mount 163, and the end part seat reinforcing rib plate 164 has a bogie lifting hole 164-1.

[0050] In this way, the end part seat reinforcing rib plate can not only reinforce the side beam end part seat, but also provide a bogie lifting hole, facilitating weight reduction of the bogie.

[0051] In the implementation, the side beam end part seat may be formed with a multi-functional mount. As shown in Fig. 9, the side beam end part seat may also include a primary suspension system mount 165;
the primary suspension system mount 165 is formed above the side beam end part bottom plate 161 and is fixedly connected to the fixing structure 162 and the end part seat reinforcing rib plate 164.

[0052] The primary suspension system mount is directly provided on the side beam end part seat, the side beam end part seat can well bear the vibration transmitted by the primary suspension system, and the primary suspension system mount is fixedly connected to the fixing struc-

ture and the end part seat reinforcing rib plate to reinforce the side beam end part seat.

[0053] As shown in Fig. 9, the primary suspension system mounts 165 are two and symmetrically provided with respect to the end part seat reinforcing rib plate 164, and the primary suspension system mounts 165 press against the primary suspension system.

[0054] The symmetrical arrangement of the primary suspension system mount facilitates the force transmission of the primary suspension system.

[0055] As shown in Fig. 9, the side beam end part seat further includes a primary vertical oil damper mount 166; the primary vertical oil damper mount 166 is formed above the side beam end part bottom plate 161 and is fixedly connected to the stone sweeper mount 163 and the end part seat reinforcing rib plate 164.

[0056] The side beam end part seat may be reinforced by fixedly connecting the primary vertical oil damper mount with the stone sweeper mount and the end part seat reinforcing rib plate.

[0057] As shown in Fig. 9, the primary vertical oil damper mounts 166 are two and symmetrically provided with respect to the end part seat reinforcing rib plate.

[0058] The primary vertical oil damper mounts are provided symmetrically, and the corresponding primary vertical oil damper facilitates vibration attenuation.

[0059] In the implementation, as shown in Fig. 9, the side beam end part seat 160 is a one-piece side beam end part seat integrally cast or forged.

[0060] The side beam end part seat of a one-piece structure can reduce the welding lines of the side beam, which not only can enhance the robustness of the side beam and reduce the difficulty of manufacturing the bogie, but also can effectively absorb shocks, and avoid various welding defects and stress concentration problems caused by complex welding structure.

[0061] In the implementation, as shown in Fig. 4, the bogie frame further comprises four tread sweeping device mounts 910, two anti-snake movement oil damper mounts 920, two anti-side-rolling torsion bar mounts 930, and four primary drawbar seats which are welded. The two side beams are formed by welding a steel plate and a cast component. The cross beams are formed by tailor welding steel plates and are respectively connected in the middle of the inner side of the side beams, and form the frame with the side beams and with other components by tailor welding.

[0062] In the implementation, the bogie further comprises a secondary suspension system which comprises a secondary air spring, a secondary vertical oil damper, a secondary transverse oil damper, and a secondary transverse buffer. The lower part of the secondary air spring is located on the air spring seat by means of a secondary air spring installation interface in the middle of the side beam, and the upper end of the secondary air spring is connected to the vehicle body; one end of the secondary vertical oil damper is coupled to a secondary vertical reduction seat on the frame, and the other end is coupled to the vertical reduction seat of the vehicle body; one end of the secondary transverse oil damper is coupled to a secondary transverse oil damper mount of the frame, and the other end is coupled to a mount on a traction beam of a traction device.

[0063] Specifically, the secondary air spring adopts a coil air spring.

[0064] In the implementation, the bogie further comprises an anti-side-rolling torsion bar device installed on the anti-side-rolling mount of the frame, which can effectively improve the anti-side-rolling rigidity and safety of the train. The main torsion arm beam of the anti-side-rolling torsion bar adopts an arc-shaped structure, which can effectively improve the space layout and effective utilization of the bogie and make its structure more compact.

[0065] In the implementation, the bogie also comprises an anti-snake movement absorber.

[0066] In the description of the present application and embodiments thereof, it is to be understood that the orientation or positional relationships indicated by the terms "top", "bottom", "height", etc. are based on the orientation or positional relationship shown in the drawings, and are only for the convenience of describing the application and simplifying the description, rather than indicating or implying that the referred device or element must have a specific orientation, or be constructed and operated in a specific orientation, and therefore cannot be construed as a limitation of the present application.

[0067] In the present application and embodiments thereof, unless otherwise clearly specified and limited, the terms "provide", "install", "connected", "connect", "fix" and other terms should be understood in a broad sense. For example, it can be a fixed connection or a detachable connection, or integrated; it can be a mechanical connection, an electrical connection, or communication; it can be directly connected or indirectly connected through an intermediate medium, and it can be the internal communication of two elements or the interaction relationship between two elements. For a person of ordinary skills in the art, the specific meaning of the above-mentioned terms in the present application can be understood according to specific situations.

[0068] In the present application and embodiments thereof, unless otherwise clearly specified and limited, the first feature being "above" or "below" the second feature may include the direct contact between the first feature and second feature, or may include the situation that the first feature and the second feature are not in direct contact but are connected through another feature therebetween. Further, the first feature being "above", "on" and "beyond" the second feature includes that the first feature is directly above and obliquely above the second feature, or merely indicates that the first feature is at a higher level than the second feature. The first feature being "below", "under" and "beneath" the second feature includes that the first feature is directly above and obliquely above the second feature, or simply indicates that

the first feature is at a lower level than the second feature.

[0069] The above disclosure provides many different implementation modes or examples for realizing different structures of the present application. To simplify the disclosure of the present application, components and arrangements of specific examples have been described above. They are, of course, merely examples and are not intended to limit the present application. Further, this application may repeat reference numerals and/or reference letters in different examples. Such repetition is for the purpose of simplification and clarity, and does not indicate the relationship between the various implementation modes and/or arrangements discussed. In addition, this application provides examples of various specific processes and materials, but those of ordinary skill in the art may be aware of the application of other processes and/or the use of other materials. Although a few alternative embodiments of this application have been described, those skilled in the art, once armed with the basic inventive concept, can make additional alterations and modifications to these embodiments. It is therefore intended that the appended claims be interpreted as including some alternative embodiments and all alterations and modifications falling within the scope of the present application.

[0070] Obviously, those skilled in the art can make various changes and variations to the application without departing from the spirit and scope of the present application. In this way, if these modifications and variations of the present application fall within the scope of the claims of the present application and their equivalent technologies, the present application is also intended to include these changes and variations.

Claims

1. A bogie, **characterized by** comprising:

a wheel set comprising an axle and two wheels, wherein the two wheels are sleeved and fixed to the outer peripheral surface of the axle;
an axle box, comprising an axle box body a cross section of which is door frame-shaped, and the axle box being located on the axle by means of a bottom opening in the axle box body, wherein a primary suspension system installation interface is provided at a top part of the axle box body; and a primary suspension system, which is installed at the top part of the axle box body by means of the primary suspension system installation interface.

2. The bogie according to claim 1, **characterized in that** the axle box is located between the two wheels.

3. The bogie according to claim 2, **characterized by** further comprising a single drawbar and a side beam, wherein an end part of the side beam is provided above the primary suspension system, and the middle portion of the side beam has a side beam single drawbar interface;

the axle box further comprises a single drawbar flanging, the single drawbar flanging is provided at the end part of one side of the axle box body near the middle portion of the side beam, and the single drawbar flanging has an axle box single drawbar interface;
wherein two ends of the single drawbar are respectively fixed with the axle box single drawbar interface and the side beam single drawbar interface via an elastic connecting piece to transmit a load along the bogie.

4. The bogie according to claim 3, **characterized by** further comprising a primary vertical oil damper:

the axle box further comprises a primary vertical oil damper flanging, the primary vertical oil damper flanging being provided at the end part of one side of the axle box body away from the middle portion of the side beam, and the primary vertical oil damper flanging having a primary vertical oil damper interface;
wherein, the primary vertical oil damper is installed to the axle box through the primary vertical oil damper interface.

5. The bogie according to claim 4, **characterized by** further comprising an obstacle-removing device;

the axle box further comprises an obstacle-removing device vertical plate, the obstacle-removing device vertical plate extending downward from the end part of the primary vertical oil damper flanging, and the obstacle-removing device vertical plate being provided with an obstacle-removing device interface;
wherein, the obstacle-removing device is installed to the axle box by means of the obstacle-removing device interface.

6. The bogie according to claim 5, **characterized in that** each of the wheel sets corresponds to two axle boxes, which are provided symmetrically with respect to a mid-point of the axle;
the wheel sets are two sets, and the two sets of the wheel sets are symmetrically provided with respect to the middle of the side beam.

7. The bogie according to claim 3, **characterized by** further comprising a cross beam fixed to the side beam, the cross beam having a traction device installation hole penetrating up and down;

the bogie further comprises a traction device, the traction device comprising traction support, a fixing column, a longitudinal fixing plate, and an elastic longitudinal traction stop, wherein the traction support is for connecting with a body of a train;
the fixing column is fixed below the traction support, the longitudinal traction stops are respectively fixed on two side surfaces of the fixing column which are consistent with a direction of a gauge of the bogie, and one longitudinal fixing plate is fixed on an outer side of each of the longitudinal traction stops;
wherein, the longitudinal fixing plate is fixed to an inner wall in the traction device installation hole which is consistent with the direction of the gauge of the bogie by means of a fastener.

8. The bogie according to claim 7, **characterized in that** the traction device further comprises a wear plate and an elastic transverse stop;

the transverse stops are respectively fixed on two side surfaces of the fixing column which are perpendicular to the direction of the gauge of the bogie, and one wear plate is fixed at the outer side of each of the transverse stops;
wherein, the wear plate is fixed to the inner wall in the traction device installation hole which is perpendicular to the direction of the gauge of the bogie by means of a fastener.

9. The bogie according to claim 3, **characterized in that** an additional air chamber of a secondary air spring of the bogie is formed in the middle portion of the side beam;

the additional air chamber of the secondary air spring comprises a main air chamber and an auxiliary air chamber, wherein the main air chamber and the auxiliary air chamber are arranged side by side in a width direction of the side beam and are in communication with each other, and the main air chamber is a part located between two main air chamber partition plates after an inner cavity of the side beam body is separated by the two main air chamber partition plates;
wherein the side beam body comprises a side beam upper cover plate and a side beam lower cover plate provided opposite to each other, and two side beam vertical plates fixed between the side beam upper cover plate and the lower cover plate.

10. The bogie according to claim 9, **characterized in that** a vertical portion of the auxiliary air chamber is enclosed by an auxiliary air chamber enclosing plate and an outer plate surface of a communicating side beam vertical plate;

the side beam upper cover plate is further sealed above the vertical portion of the auxiliary air chamber as the top part of the auxiliary air chamber, and the side beam lower cover plate is further sealed below the vertical portion of the auxiliary air chamber as the bottom of the auxiliary air chamber;
wherein the communicating side beam vertical plate is a side beam vertical plate having a communication air hole, and the communication air hole is used for communicating the main air chamber with the auxiliary air chamber.

11. The bogie according to claim 10, **characterized in that** the side beam further comprises a hollow column;

the hollow column penetrates the side beam upper cover plate from the inner bottom of the auxiliary air chamber upwards to form a secondary air spring installation interface; or the hollow column penetrates the side beam upper cover plate from the inner bottom of the main air chamber upwards to form the secondary air spring installation interface;
wherein the side wall of the hollow column has a vent hole communicating an inside and outside of the hollow column, and top part outer surfaces of the main air chamber and the auxiliary air chamber serve as a secondary air spring mount;

12. The bogie according to claim 11, **characterized in that** the main air chamber and the auxiliary air chamber are arranged side by side from inside to outside in the direction of the gauge of the bogie;
or the main air chamber and the auxiliary air chamber are arranged side by side from the outside to the inside in the direction of the gauge of the bogie.

13. The bogie according to claim 11, **characterized in that** a main air chamber reinforcing rib plate is provided in the main air chamber, and the main air chamber reinforcing rib plate has an air hole; wherein the main air chamber reinforcing rib plate is used for reinforcing a structure of the main air chamber.

14. The bogie according to claim 3, **characterized in that** the side beam further comprises two side beam end part seats;

the side beam end part seats comprise a side beam end part bottom plate, and a fixing structure and an obstacle-removing device mount respectively formed at two ends of the side beam end part bottom plate;

wherein the fixing structure is fixed to one end of the side beam body.

15. The bogie according to claim 14, **characterized in that** the obstacle-removing device mount is bent upwards with respect to the side beam end part bottom plate.

16. The bogie according to claim 15, **characterized in that** the side beam end part seat further comprises an end part seat reinforcing rib plate;
the end part seat reinforcing rib plate is formed above the side beam end part bottom plate to fixedly connect the fixing structure and the obstacle-removing device mount, and the end part seat reinforcing rib plate has a bogie lifting hole.

17. The bogie according to claim 16, **characterized in that** the side beam end part seat further comprises a primary suspension system mount;

the primary suspension system mount is formed above the side beam end part bottom plate and is fixedly connected to the fixing structure and the end part seat reinforcing rib plate;
the primary suspension system mounts are two and symmetrically provided with respect to the end part seat reinforcing rib plate, and the primary suspension system mounts press against the primary suspension system.

18. The bogie according to claim 16, **characterized in that** the side beam end part seat further comprises a primary vertical oil damper mount;

the primary vertical oil damper mount is formed above the side beam end part bottom plate and is fixedly connected to the obstacle-removing device mount and the end part seat reinforcing rib plate;
the primary vertical oil damper mounts are two and symmetrically provided with respect to the end part seat reinforcing rib plate.

19. The bogie according to any one of claims 14 to 18, **characterized in that** the side beam end part seat is a one-piece side beam end part seat integrally cast or forged.

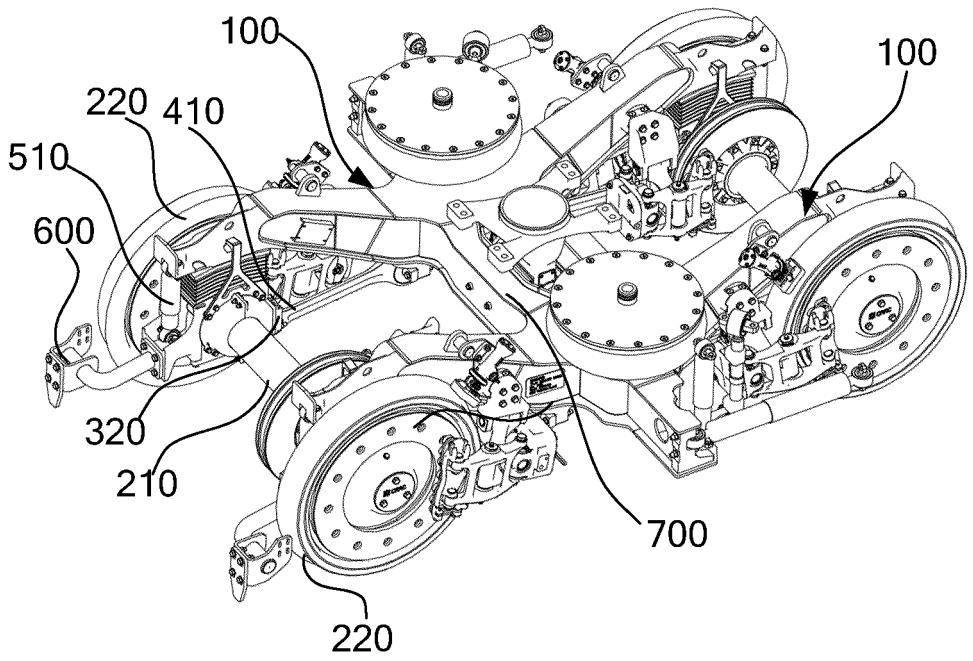
100
100
220
410
510
600
320
210
700
220

Fig.1

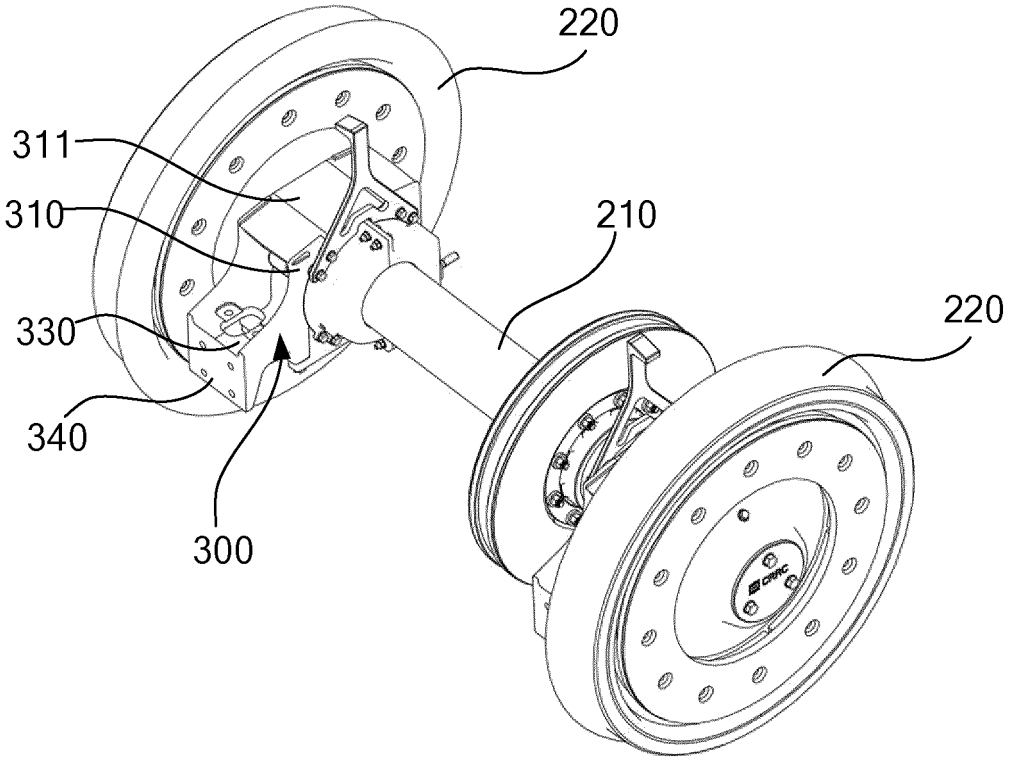
220
311
310
210
220
330
340
300

Fig.2

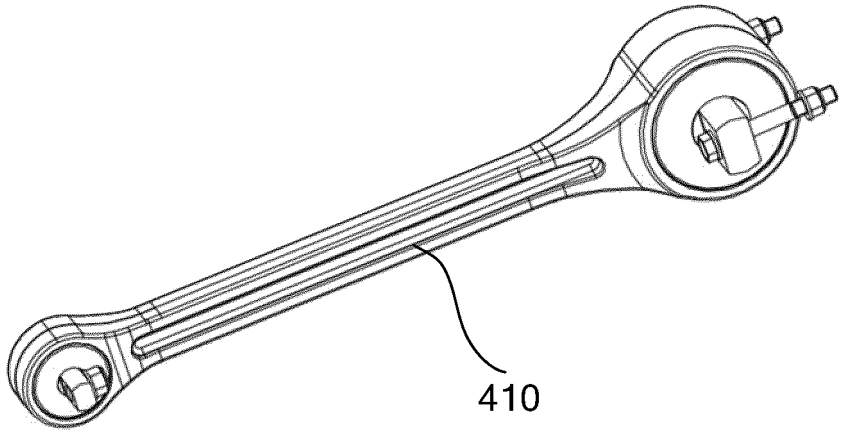

Fig.3

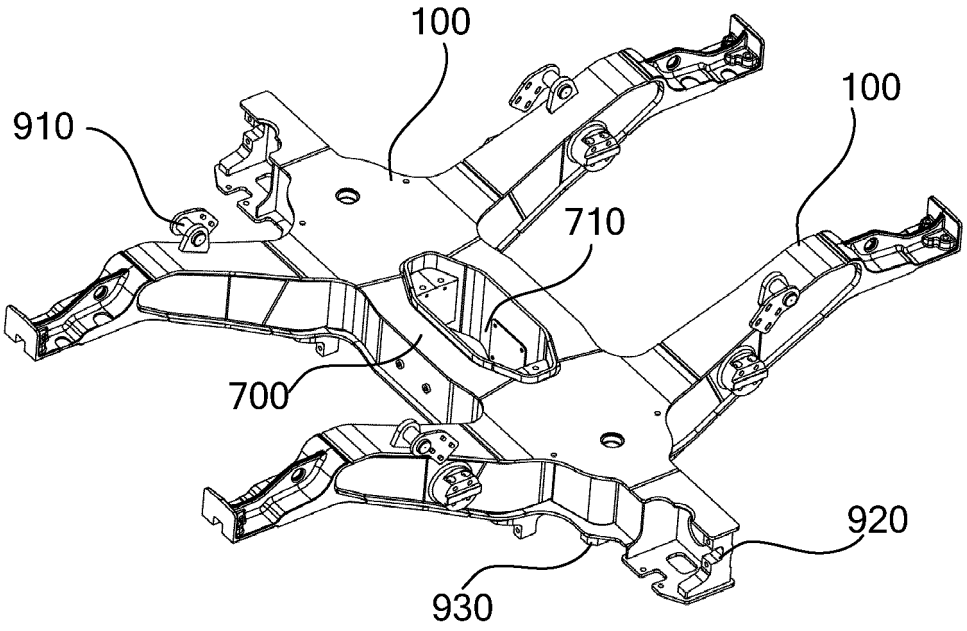

Fig.4

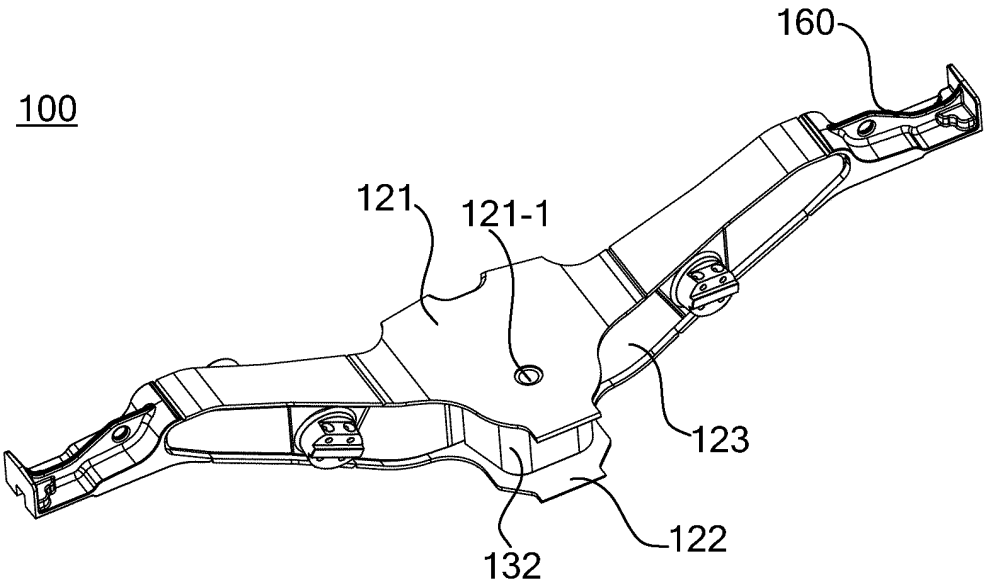

Fig.5

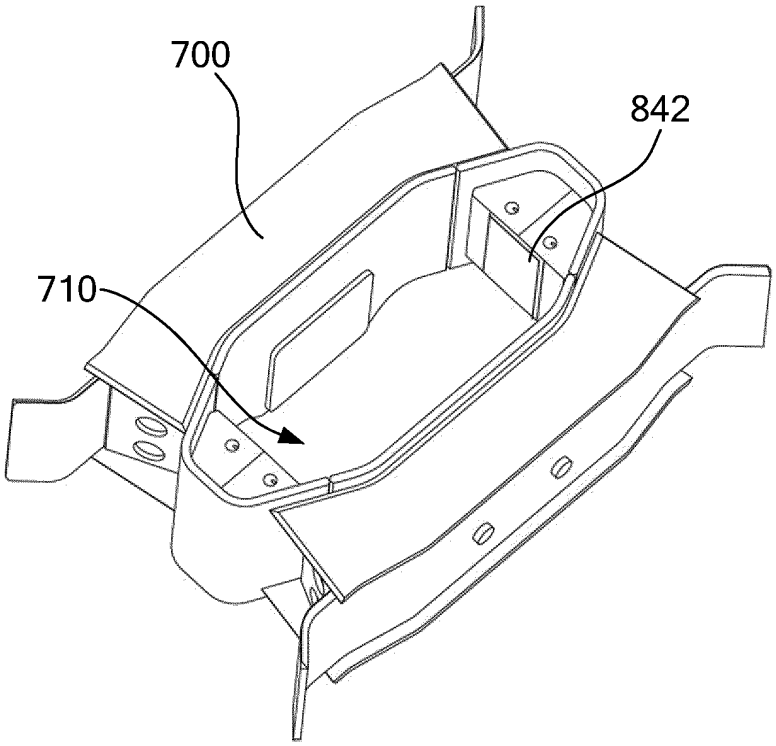

Fig.6

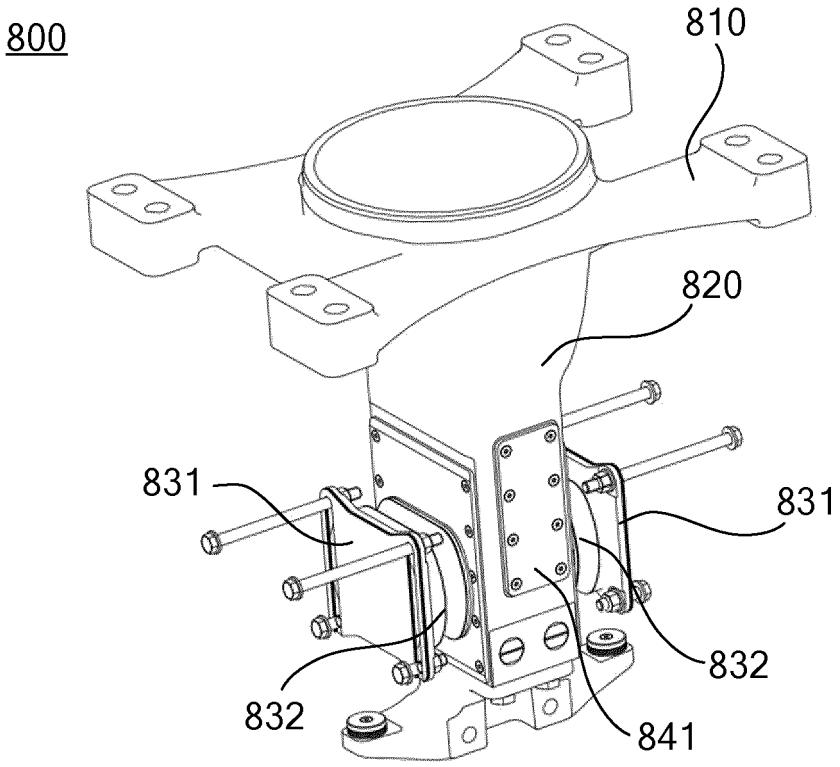

Fig.7

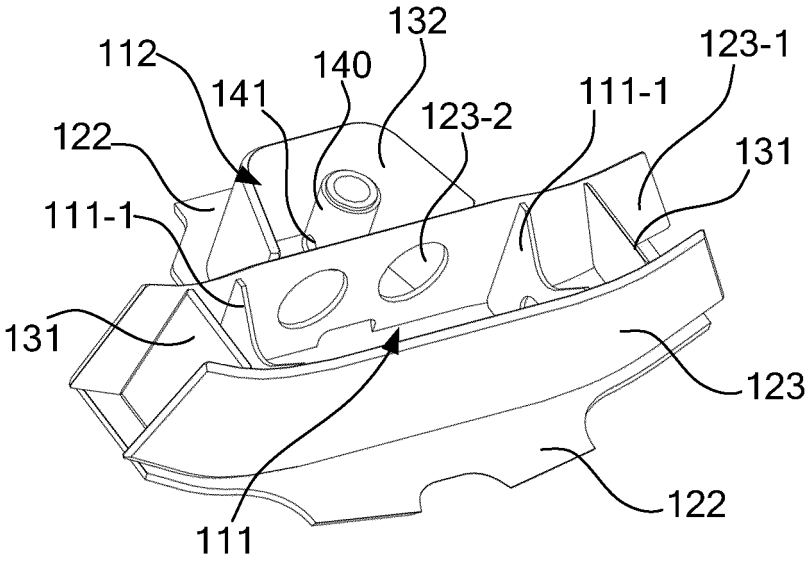
112
141
140
132
123-1
111-1
123-2
122
131
111-1
131
123
122
111

Fig.8

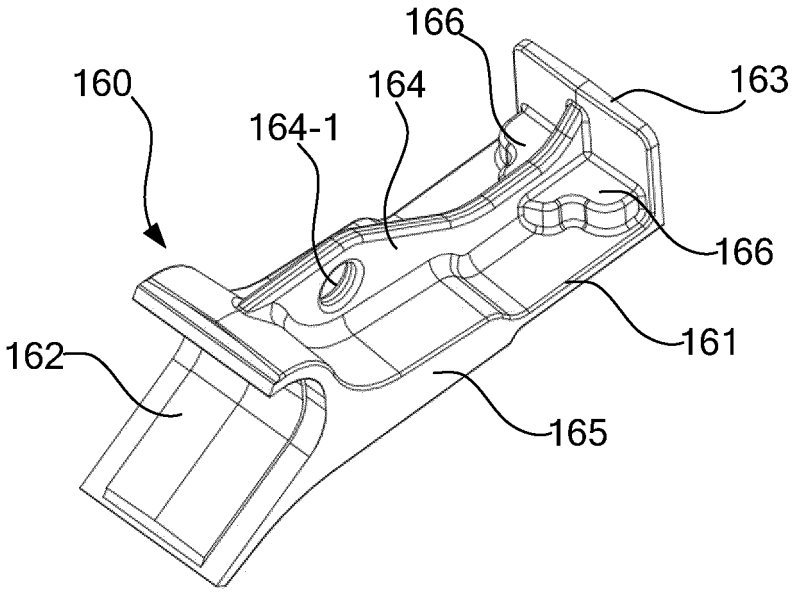
166
160
164
163
164-1
166
161
162
165

Fig.9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/117503

A. CLASSIFICATION OF SUBJECT MATTER

B61F 5/52(2006.01)i; B61F 5/26(2006.01)i; B61G 9/20(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; 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)

WPI; EPODOC; CNPAT; CNKI: 中车唐山机车车辆有限公司, 转向架, 轴箱, 内置, 牵引, 排障, 气室, 空气, 减震, 减振, 缓冲, 减重, 轻量化, bogie, axle, built win, inside, traction, obstacle, air, gas, vibration, damping, weight

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 109436005 A (CRRC CHANGCHUN RAILWAY VEHICLES CO., LTD.) 08 March 2019 (2019-03-08) description, paragraphs 22-26, and figures 1-5	1-4, 7, 8
Y	CN 109436005 A (CRRC CHANGCHUN RAILWAY VEHICLES CO., LTD.) 08 March 2019 (2019-03-08) description, paragraphs 22-26, and figures 1-5	5, 6, 9, 10, 14, 15, 19
Y	CN 108639089 A (CRRC QINGDAO SIFANG CO., LTD.) 12 October 2018 (2018-10-12) description, paragraphs 35, 36, 50, and 51, and figures 1-5	5, 6, 14, 15, 19
Y	CN 103738347 A (CSR QINGDAO SIFANG CO., LTD.) 23 April 2014 (2014-04-23) description, paragraphs 31-39, and figures 1-3	9, 10
A	CN 107697091 A (CRRC CHANGCHUN RAILWAY VEHICLES CO., LTD.) 16 February 2018 (2018-02-16) entire document	1-19
A	CN 103770804 A (CSR QINGDAO SIFANG LOCOMOTIVE & ROLLING STOCK CO., LTD.) 07 May 2014 (2014-05-07) entire document	1-19

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 March 2020	**11 March 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/117503

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1637425 A2 (JOSEF MEYER WAGGON AG.) 22 March 2006 (2006-03-22) entire document	1-19
A	WO 2013097963 A1 (DURMAZLAR MAKINA SANAYI VE TICARET ANONIM SIRKETI) 04 July 2013 (2013-07-04) entire document	1-19

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/117503

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	109436005	A	08 March 2019	CN	209290406	U	23 August 2019
CN	108639089	A	12 October 2018	CN	208376773	U	15 January 2019
CN	103738347	A	23 April 2014	CN	103738347	B	23 June 2017
CN	107697091	A	16 February 2018	CN	107697091	B	27 December 2019
CN	103770804	A	07 May 2014	CN	103770804	B	29 June 2016
EP	1637425	A2	22 March 2006	DE	502005004995	D1	25 September 2008
				EP	1637425	B1	13 August 2008
WO	2013097963	A1	04 July 2013	EP	2797800	A1	05 November 2014
				US	2014360400	A1	11 December 2014
				EP	2797800	B1	02 May 2018
				ES	2682278	T3	19 September 2018

Form PCT/ISA/210 (patent family annex) (January 2015)