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(54) **FRAME, BOGIE, AND RAIL VEHICLE**

(57) The present disclosure provides a frame, a bogie frame, and a railway vehicle. The frame includes two corresponding side beams and a cross beam connected to the two side beams; wherein the cross beam includes a main body portion for connecting a traction device and a connecting portion for hinging with the side beam, the connecting portion being provided at two ends of the main body portion, the width of the connecting portion being gradually reduced along a direction away from the main body portion; one end of the connecting portion away from the main body portion is movably connected with the side beam. The present disclosure provides two ends of the cross beam movably connected to two side beams, so that a certain displacement can be generated between the cross beam and the side beam, the frame has flexibility, and the frame can absorb a part of distortion energy, which improves the anti-twisting ability of the bogie frame, is beneficial for the railway vehicle to pass through the uneven rail surface or curved rail surface safely and flexibly, and improves the safety of the railway vehicle.

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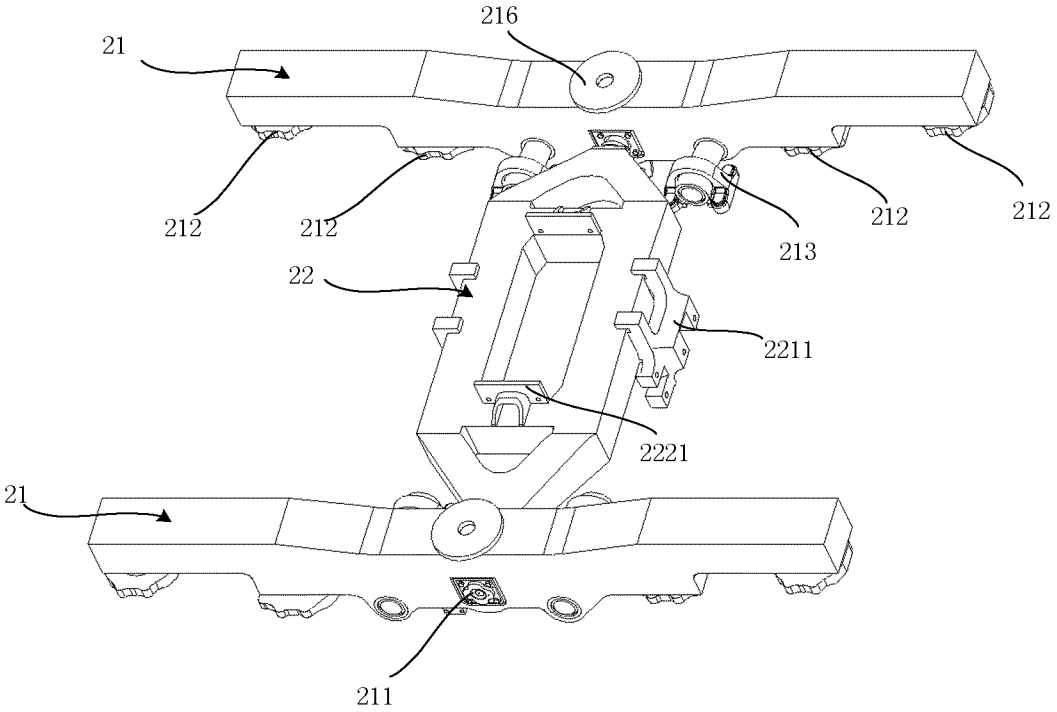

FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present disclosure relates to the technical field of railway vehicles, in particular to a frame, a bogie frame and a railway vehicle.

BACKGROUND OF THE INVENTION

[0002] The bogie frame, which is provided between the car body and the rail, is one of the most important components on the railway vehicle. The main functions of the bogie frame are: supporting the car body, bearing and transmitting various loads and forces from the car body to the wheels or from the wheel-rail to the car body, ensuring the safe operation of vehicles, so as to flexibly run along the straight rail and smoothly pass through curved rail, relieving the interaction between the car and the wheel-rail, reducing vibration and impact, and improving the operational stability and safety of vehicles. According to whether there is a power device or not, the bogie frame can be divided into the powered bogie frame and the non-powered bogie frame.

[0003] The frame is the core component of the bogie frame, which plays an important role in connecting various functional components, bearing loads, and transmitting forces in all directions. In the related technical scheme, the frame usually includes two cross beams and two side beams, the two side beams are arranged side by side, the two cross beams are lapped between the two side beams, and the joints between the cross beams and the side beams are connected by welding.

[0004] However, according to the scheme in related technologies, because the cross beams and the side beams are connected by welding (i.e. rigid connection), there is no space for the frame to move between the cross beams and the side beams, so when the vehicle runs on an uneven surface or curved surface, the anti-twisting ability is poor, which is not conducive to the safe, high-speed and flexible operation of railway vehicles, and brings potential safety hazards to the vehicle operation.

SUMMARY OF THE INVENTION

[0005] The embodiment of the present disclosure provides a frame, a bogie frame, and a railway vehicle, which are mainly to solve the problem of poor anti-twisting ability of the frame and potential safety hazard of the vehicle in the related technology.

[0006] The first aspect of the embodiment of the present disclosure provides a frame including two corresponding side beams and two cross beams connected to the two side beams, the two ends of the cross beam being respectively movably connected to the two side beams.

[0007] The cross beam includes a main body portion for connecting the traction device and a connecting portion for hinging with the side beam, the connecting portion being provided at two ends of the main body portion, the width of the connecting portion being gradually reduced along a direction away from the main body portion.

[0008] One end of the connecting portion away from the main body portion is movably connected with the side beam.

[0009] According to a second aspect of the embodiment of the present disclosure, a bogie frame is provided, including: the frame as described above, and the side beam is provided with a secondary spring mounting seat; and

a secondary spring, wherein one end of the secondary spring is connected to the secondary spring mounting seat, the other end of the secondary spring is configured to connect a car body, and the secondary spring is an air spring.

[0010] According to a third aspect of the embodiment of the present disclosure, a railway vehicle is provided, including: a car body and the bogie frame as described above, and the car body is disposed on the bogie frame.

[0011] With the frame, the bogie frame and the railway vehicle according to the embodiment of the present disclosure, the frame includes two corresponding side beams and a cross beam connected to the two side beams, the cross beam includes a main body portion for connecting the traction device and a connecting portion for hinging with the side beam, the connecting portion is provided at two ends of the main body portion, the width of the connecting portion is gradually reduced along a direction away from the main body portion, and one end of the connecting portion away from the main body portion is movably connected with the side beam. The present disclosure provides two ends of the cross beam movably connected to two side beams, so that a certain displacement can be generated between the cross beam and the side beam, the frame has flexibility, and the frame can absorb a part of distortion energy, which improves the anti-twisting ability of the bogie frame, is beneficial for the railway vehicle to pass through the uneven rail surface or curved rail surface safely and flexibly, and improves the safety of the railway vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The drawings illustrated herein serve to provide a further understanding of and constitute a part of this present disclosure, and the illustrative embodiments of this present disclosure and the description thereof are used to explain this present disclosure and are not unduly limiting. In the drawings:

FIG. 1 is a structural diagram of the frame provided by the embodiment of the present disclosure.

FIG. 2 is a structural diagram of the side beam provided by the embodiment of the present disclosure.

FIG. 3 is a structural diagram of the cross beam provided by the embodiment of the present disclosure.

FIG. 4 is a schematic diagram of the connecting structure of the side beam and the cross beam provided by the embodiment of the present disclosure.
FIG. 5 is a structural diagram of the bogie frame provided by the embodiment of the present disclosure.
FIG. 6 is a side view of FIG. 5.
FIG. 7 is a bottom view of FIG. 5.
FIG. 8 is a schematic diagram of the connecting structure of the wheelset and the driving device provided by the embodiment of the present disclosure.
FIG. 9 is a schematic diagram of the connecting structure of the motor shaft box and the end cover provided by the embodiment of the present disclosure.
FIG. 10 is a structural diagram of the end cover provided by the embodiment of the present disclosure.
FIG. 11 is a front view of the end cover provided by the embodiment of the present disclosure.
FIG. 12 is a partial cross-sectional view taken along line A-A of FIG. 11.
FIG. 13 is a structural diagram of the motor shaft box provided by the embodiment of the present disclosure from a first viewing angle.
FIG. 14 is a structural diagram of the motor shaft box provided by the embodiment of the present disclosure from a second viewing angle.
FIG. 15 is a top view of a motor shaft box provided by the embodiment of the present disclosure.
FIG. 16 is a cross-sectional view taken along line B-B of FIG. 15.
FIG. 17 is a structural diagram of the wheelset shaft box provided by the embodiment of the present disclosure.

REFERENCES IN THE DRAWINGS:

[0013]

10-wheelset; 11-shaft; 12-wheel; 13-wheelset shaft box; 131-primary spring supporting seat;
20-frame; 21-side beam; 211-first hinge portion; 2111-hinge pin seat; 2112-pressing sleeve; 2113-positioning ring; 2114-hinge end cover; 212-primary spring mounting seat; 213-brake caliper hanging seat; 214-transverse damper seat; 215-anti-roll torsion bar mounting seat; 216-secondary spring mounting seat; 22-cross beam; 221-sub-cross beam; 2211-traction rod mounting seat; 22111-traction rod joint mounting seat; 22112-triangle plate rubber joint mounting seat; 222-supporting beam; 2221-transverse buffer mounting seat; 223-connecting beam; 2231-connecting beam main body; 2232-first connecting portion; 2233-second connecting portion; 2234-second hinge portion; 22341-hinge pin; 22342-center bolt;
31-directdrive motor; 311-housing; 3111 -stator; 3112-end cover; 31121-end cover body; 31122-first projection; 31123-second projection; 31124-first connecting plate; 32-motor shaft box; 321-motor shaft box body; 322-second connecting plate; 323-positioning platform; 324-base; 325-positioning annulus platform; 326-second stiffener; 327-first stiffener;
40-primary spring;
50-secondary spring;
60-traction device.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0014] In order to clarify the technical solutions and advantages of the embodiments of the present disclosure, the following further detailed description of the exemplary embodiments of the present disclosure is given in conjunction with the accompanying drawings, and it is apparent that the described embodiments are only a part of the embodiments of the present disclosure, and are not exhaustive of all embodiments. It should be noted that the embodiments in the present disclosure and the features in the embodiments can be combined with each other without conflict.

[0015] FIG. 1 is a structural diagram of the frame provided by the embodiment of the present disclosure. FIG. 2 is a structural diagram of the side beam provided by the embodiment of the present disclosure. FIG. 3 is a structural diagram of the cross beam provided by the embodiment of the present disclosure. Please refer to FIGs. 1 to 3.

[0016] The present embodiment provides a frame 20 including two corresponding side beams 21 and a cross beam 22 connected to the two side beams 21, two ends of the cross beam 22 being movably connected to the two side beams 21 respectively.

[0017] Specifically, the cross beam 22 includes a main body portion for connecting the traction device and a connecting portion for hinging with the side beam 21, the connecting portion is provided at two ends of the main body portion, and the width of the connecting portion is gradually reduced along a direction away from the main body portion, and one end of the connecting portion away from the main body is movably connected to the side beam 21.

[0018] With the above arrangement, the side beam 21 is articulated with the cross beam 22, and the rotational freedom is completely released, so that the side beam 21 has a good follow-up to the wheelset. The embodiment realizes the flexibility of the frame 20, and the frame 20 can bear a part of the rail distortion, thus reducing the deflection change caused by the rail distortion, so that the bogie frame has good adaptability on both straight rail and curved rail, and is conducive to improving the comfort of passengers. The width of the connecting portion is gradually reduced so that a gap can be formed between the connecting portion and the side beam 21, which can ensure that the cross beam 22 can have a greater amount of rotation relative to the side beam 21 and avoid collision between the cross beam 22 and the

side beam 21. In addition, the space in the partial gap can be fully utilized to arrange other components on the bogie frame (such as brake caliper hanging seat, etc.).

[0019] Specifically, in the embodiment, two ends of the cross beam 22 are movably connected with the two side beams 21 respectively, that is, certain displacement can be generated between the cross beam 22 and the side beams 21 in any direction, so that the frame 20 becomes a flexible frame, and the frame 20 also bears a part of the distortion, thus reducing the variation of the deflection of the primary spring 40 caused by the rail distortion. That is to say the present embodiment can make the vehicle body more adaptable to the curved rail by changing the angle of the cross beam 22 and the side beam 21 in the horizontal direction. Through the change of the cross beam 22 and the side beam 21 in the vertical direction, the car body is more adaptable for the uneven rail surface, to ensure the flexibility of the bogie frame, ease the influence of rail distortion, which is conducive to maintaining the stability of the car body and improving the safety of railway vehicles. The embodiment improves the ability of the bogie frame to adapt to the rail distortion, improves the safety of the vehicle passing curved rail, and solves the contradiction between the anti-rolling stiffness and the anti-torsion stiffness of the frame connected by welding in the related technology, as well as the anti-bending stiffness and the anti-twisting stiffness.

[0020] Alternatively, in the present embodiment, a first hinge portion 211 is provided at the middle of the side beam 21, a second hinge portion 2234 is provided at two ends of the cross beam 22, and the side beam 21 and the cross beam 22 are hinged and connected through the first hinge portion 211 and the second hinge portion 2234.

[0021] Specifically, FIG. 4 is a schematic diagram of the connecting structure of the side beam and the cross beam provided by the embodiment of the present disclosure. Please refer to FIG. 4. In the embodiment, the first hinge portion 211 includes a hinge pin seat 2111 disposed in the side beam 21, a cavity is formed in the hinge pin seat 2111, and a pressing sleeve 2112, a positioning ring 2113 and a hinge end cover 2114 are disposed in the cavity. The positioning ring 2113 is located at one side away from the cross beam 22, and one end of the pressing sleeve 2112 close to the cross beam 22 is abutted against the inner wall of the cavity. The positioning ring 2113 is pressed on one end of the pressing sleeve 2112 away from the cross beam 22 through a fastener, and the positioning ring 2113 is sleeved outside the hinge end cover 2114. The pressing sleeve 2112 can be selected from a rubber sleeve for better adapt to deformation.

[0022] The second hinge portion 2234 includes a hinge pin 22341 penetrated into the pressing sleeve 2112 and abutted against the hinge end cover 2114, and a center bolt 22342 penetrated through the hinge end cover 2114 and fixed in the hinge pin 22341, so that the first hinge portion 211 and the second hinge portion 2234 are hinged.

[0023] With the above arrangement, the side beam 21 is articulated with the cross beam 22, and the rotational freedom is completely released, so that the side beam 21 has a good follow-up to the wheelset. The embodiment realizes the flexibility of the frame 20, and the frame 20 can bear a part of the rail distortion, thus reducing the deflection change caused by the rail distortion, so that the bogie frame has good adaptability on both straight rail and curved rail, and is conducive to improving the comfort of passengers.

[0024] In the present embodiment the main body portion includes two sub-cross beams 221 provided corresponding to each other and two supporting beams 222 provided between the two sub-cross beams 221 and the connecting portion includes two connecting beams 223 connected to two ends of the two sub-cross beams 221 respectively.

[0025] The connecting beam 223 includes a connecting beam body 2231, and one end of the connecting beam body 2231 facing the sub-cross beam is provided with a first connecting portion 2232 and a second connecting portion 2233 for connecting the two sub-cross beams. The first connecting portion 2232 and the second connecting portion 2233 are intersected each other, and gaps are formed between the first connecting portion 2232 and the side beam 21, and between the second connecting portion 2233 and the side beam 21. The end of the connecting beam body 2231 away from the sub-cross beam is provided with a second hinge portion 2234. In the embodiment, the connecting beam main body 2231, the first connecting portion 2232, and the second connecting portion 2233 form a substantially isosceles triangular structure, and the gaps between the first connecting portion 2232 and the side beam 21, and between the second connecting portion 2233 and the side beam 21 can ensure that the cross beam 22 can have a larger rotation amount relative to the side beam 21 and avoid collision between the cross beam 22 and the side beam 21. In addition, the space in the partial gap can be fully utilized to dispose other components on the bogie frame (such as brake caliper hanging seat, etc.).

[0026] In the embodiment, two ends of the cross beam 22 are hinged with the side beam 21, so that the cross beam 22 can have a larger displacement relative to the side beam 21 to improve the flexibility of the frame 20. The cross beam frame formed by two sub-cross beams 221 and two supporting beams 222 ensures the strength of the beam 22.

[0027] Further, two supporting beams 222 are provided with transverse buffer mounting seats 2221, the transverse buffer mounting seat 2221 is provided on a side of the supporting beam 222 facing the other supporting beam 222, two transverse buffer mounting seats 2221 are arranged corresponding to each other, and two ends of the transverse buffer are respectively connected to the two transverse buffer mounting seats 2221. By arranging the transverse buffer on the transverse buffer mounting

seat 2221, the cross movement limitation of the bogie frame can be realized, and the buffering and vibration damping effects on the cross swing of rubber can be realized to ensure installation and operation of the vehicle.

[0028] Alternatively, two sub-cross beams 221 are provided with traction rod mounting seats 2211. The traction rod mounting seat 2211 includes a traction rod joint mounting seat 22111 and a triangle plate rubber joint mounting seat 22112 for connecting a direct drive motor. The traction rod joint mounting seat 22111 and the triangle plate rubber joint mounting seat 22112 are integrally formed, which not only realizes the connection between the direct drive motor and the frame 20, but also realizes the connection between the traction rod and the frame 20, ensuring the transmission of traction and driving force, and realizing the provision and transmission of vehicle running power. One end of the traction rod is connected to the traction rod joint mounting seat 22111, and the other end of the traction rod is connected to the traction device on the frame 20. One end of the connecting rod is connected to the triangle plate rubber joint mounting seat 22112, and the other end of the connecting rod is connected to the housing of the direct drive motor.

[0029] The side beam 21 also includes two brake caliper hangers 213 positioned on two sides of the first hinge portion 211, and the brake caliper hangers 213 are provided on the side of the side beam 21 facing the cross beam 22. The brake caliper hanging seat 213 is configured to mount the brake caliper of the tread brake, and the brake caliper hanging seat 213 is provided on the inner side between the two wheelsets, so that the space is fully utilized for mounting, and the utilization of the mounting space of the frame 20 is improved.

[0030] The side beam 21 also includes a transverse damper seat 214 disposed below the first hinge portion 211, and the transverse damper seat 214 is located on the same side of the side beam 21 as the primary spring mounting seat 212. The transverse damper seat 214 is configured to mount the transverse damper on the traction device. One end of the transverse damper is connected with the transverse damper seat 214, and the other end of the transverse damper is connected with the traction device on the frame 20 to alleviate the transverse vibration caused by uneven rail or curved motion during the operation of the vehicle.

[0031] The side beam 21 also includes an anti-roll torsion bar mounting seat 215 that is located on the same side of the side beam 21 as the primary spring mounting seat 212 and is disposed close to the transverse damper seat 214. The anti-roll torsion bar mounting seat 215 is configured to mount the anti-roll torsion bar, and two ends of the anti-roll torsion bar are respectively connected to the anti-roll torsion bar mounting seats 215 on the two side beams 21, so as to prevent head shaking between the vehicle and the bogie frame and ensure the safety of the operation of the vehicle.

[0032] The side beam 21 also includes a secondary spring mounting seat 216 disposed above the first hinge portion 211, and the secondary spring mounting seat 216 is disposed on the other side of the side beam 21 corresponding to the primary spring mounting seat 212. The secondary spring is mounted on the secondary spring mounting seat 216 and is connected to the car body. The secondary spring can further relieve the vibration of the wheelset 10, and the vibration of the car body is reduced by two-stage alleviation, thus ensuring the comfort of passengers. The secondary spring can be an air spring.

Embodiment 2

[0033] FIG. 5 is a structural diagram of the bogie frame provided by the embodiment of the present disclosure. FIG. 6 is a side view of FIG. 5. FIG. 7 is a bottom view of FIG. 5. Refer to FIGs. 5 to 7.

[0034] The embodiment provides a bogie frame including at least two wheelsets 10, a frame 20, a primary spring 40, a secondary spring 50 and a traction device 60.

[0035] The wheelset 10 is disposed below the frame 20 for contacting the rail. The number of wheelsets 10 may be decided as required for example two, three or the like. Each wheelset 10 includes a shaft 11 and two wheels 12 fixed to the outer circumferential surface of the shaft 11. The wheels 12 are the direct components of the bogie frame in contact with the rail. The shaft 11 is configured to transmit the power of the driving device to the wheels 12 to drive the wheels 12 to move along the rail. The shaft 11 is projected beyond the two wheels 12, and a wheelset shaft box 13 is connected to two ends of the shaft 11. The wheelset shaft box 13 includes a wheelset shaft box bearing and a wheelset shaft box body, the inner ring of the wheelset shaft box bearing is fixed to the outer peripheral surface of the shaft, and the outer ring of the wheelset shaft box bearing is fixed to the wheelset shaft box body. In the embodiment, the shaft 11 is selected from a hollow shaft to reduce the weight of the bogie frame on the premise of satisfying the strength.

[0036] The frame 20 is the main load-bearing structure of the bogie frame for mounting other components on the bogie frame. The frame 20 includes two corresponding side beams 21 perpendicular to the shaft 11 and connected to the wheelset shaft box 13 located at the same end of the shaft 11, and a cross beam 22 connected to the two side beams 21.

[0037] The driving device is configured to provide power for the bogie frame. In the embodiment, the driving device can be selected as a direct drive motor 31, which is disposed on the shaft 11 and between the two wheels 12. The direct drive motor 31 is configured to directly drive the shaft 11 to rotate, thereby eliminating the intermediate transmission structure.

[0038] The driving device also includes motor shaft boxes 32 disposed on two sides of the direct drive motor 31, the motor shaft boxes 32 being located between the direct drive motor 31 and the corresponding wheels 12, and the motor shaft boxes 32 is configured to provide

support for the direct drive motor so that the direct drive motor 31 can be fixed to the shaft 11. The motor shaft box 32 includes a motor bearing and a motor shaft box body 321. An inner ring of the motor bearing is fixed to the outer circumferential surface of the shaft 11 and an outer ring of the motor bearing is fixed to the motor shaft box body 321. The rotor of the direct drive motor 31 is fixedly connected to the inner ring of the motor bearing to drive the shaft 11, and the stator of the direct drive motor 31 is fixedly connected to the outer ring of the motor bearing.

[0039] The primary spring 40 is mounted between the wheelset shaft box 13 and the side beam 21 of the frame 20. The secondary spring 50 is mounted between the side beam 21 of the frame 20 and the car body. The traction device 60 is mounted on the cross beam 22 for connecting the car body to transmit load.

[0040] FIG. 17 is a structural diagram of the wheelset shaft box provided by the embodiment of the present disclosure. Refer to FIGs. 5 and 17. Further, two primary spring mounting seats 212 are provided at two ends of the side beam 21 of the present embodiment, and the two primary spring mounting seats 212 are disposed at intervals. Two ends of the wheelset shaft box 13 are connected to the primary spring mounting seats 212 through the primary spring 40. Two primary spring supporting seats 131 are respectively disposed on two sides of the wheelset shaft box 13. A lower end of the primary spring 40 is mounted on the primary spring supporting seat 131, and an upper end of the primary spring 40 is connected to the primary spring mounting seat 212. The primary spring 40 realizes connection and positioning between the frame 20 and the wheelset 10, allowing the frame 20 to mitigate vertical vibration caused by uneven rails. In the embodiment, the primary spring 40 may be primary rigid spring, rubber stack spring or a combination of a steel spring and a rubber spring.

[0041] As the frame 20 described in the first embodiment is adopted in the embodiment, the architecture bears a part of the distortion, The deflection change of the primary spring 40 caused by rail distortion is reduced, the ability of the bogie frame to adapt to the rail distortion is improved, the safety of the vehicle passing curved rail is improved, and the contradiction between the anti-rolling stiffness and the anti-twisting stiffness, as well as the anti-bending stiffness and the anti-twisting stiffness of the frame connected by welding in related technologies is solved. With the frame 20 including the flexible frame, it is also beneficial to change the driving structure of the bogie frame into a direct drive motor drive, and the direct drive motor 31 disposed on the shaft 11 is adapted to directly drive the shaft 11 to rotate, thus omitting the gear transmission mechanism between the motor and the shaft in the related technology, reducing the noise when the bogie frame is used, and being beneficial to improving the experience of passengers. Since intermediate transmission alleviation is omitted by using the direct drive motor 31 for driving, the loss of motor power can be reduced and the transmission efficiency can be improved. Compared with the gear transmission structure, using the direct drive motor 31 can also reduce the maintenance frequency and reduce maintenance cost. In addition, providing the wheelset shaft box 13 on the outside of the wheel 12 facilitates saving space on the inside of the frame 20 so as to facilitate the mounting of other components.

[0042] FIG. 8 is a schematic diagram of the connecting structure of the wheelset and the driving device provided by the embodiment of the present disclosure. Please continue to refer to FIG. 8. In the embodiment, the outer shape of the housing 311 may be designed as required, for example may be cylindrical or prismatic. The housing 311 is sleeved on the shaft 11, and a rotor (not shown in the drawings) and the stator 3111 disposed corresponding to each other are provided in the housing 311. The stator 3111 is provided on the housing 311, and the rotor is provided on the shaft 11. As the direct drive motor 31 is powered, a magnetic force action is generated between the stator 3111 and the rotor to drive the rotor to rotate, so that the shaft 11 rotates together with the rotor, thereby driving the wheel 12.

[0043] FIG. 9 is a schematic diagram of the connecting structure of the motor shaft box and the end cover provided by the embodiment of the present disclosure. Please continue to refer to FIG. 9. In the embodiment, two ends of the housing 311 are provided with end covers 3112, and the end covers 3112 are provided with end cover shaft holes through the end covers for the shaft 11 to pass through. Two end covers 3112 are fixed at two ends of the housing 311, the shaft 11 passes through the two end cover shaft holes and the hollow portion of the housing 311, and the end of the end cover 3112 away from the housing 311 is fixed to the motor shaft box body, so that the stator 3111 is fixedly connected with the outer ring of the motor bearing. That is, the motor shaft box 32 is provided on the shaft 11 by a motor bearing, and one end of the motor shaft box 32 is also connected with an end cover 3112 on the housing 311, and the housing 311 is supported by the motor shaft boxes 32 provided on two sides of the housing 311, so that the stator 3111 and the rotor in the housing 311 can be separated from each other by a certain gap, and the shaft 11 can rotate within the gap to transmit power.

[0044] FIG. 10 is a structural diagram of the end cover provided by the embodiment of the present disclosure. FIG. 11 is a front view of the end cover provided by the embodiment of the present disclosure. FIG. 12 is a partial cross-sectional view taken along line A-A of FIG. 11. FIG. 13 is a structural diagram of the motor shaft box provided by the embodiment of the present disclosure from a first viewing angle. FIG. 14 is a structural diagram of the motor shaft box provided by the embodiment of the present disclosure from a second viewing angle. FIG. 15 is a top view of a motor shaft box provided by the embodiment of the present disclosure. FIG. 16 is a partial cross-sectional view taken along line B-B of FIG. 15. Please con-

tinue to refer to FIGs. 10 to16.

[0045] Alternatively, the end cover 3112 of the embodiment includes an end cover body 31121, one end of the end cover body 31121 facing the housing 311 is provided with a first projection 31122 for connecting the housing 311, two end surfaces of the housing 311 are respectively provided with grooves, and two end covers 3112 and the housing 311 are engaged and fitted through the first projection 31122 and the grooves.

[0046] The end cover body 31121 has an end cover body threaded hole, the housing 311 has a housing threaded hole matched with the end cover body threaded hole, and bolts pass through the end cover body threaded hole and the housing threaded hole in turn to realize the fixed connection between the end cover 3112 and the housing 311.

[0047] The end of the end cover body 31121 away from the housing 311 is provided with a second projection 31123, and a first connecting plate 31124 for connecting the motor shaft box 32 is provided on the outer peripheral side of the second projection 31123.

[0048] The motor shaft box 32 includes a motor shaft box body 321, a second connecting plate 322 for connecting the end cover 3112 is provided at one end of the motor shaft box body 321 facing the end cover 3112, and the motor shaft box 32 and the end cover 3112 are fixed by connecting the first connecting plate 31124 with the second connecting plate 322.

[0049] In an alternative embodiment, the first connecting plate 31124 is provided with a plurality of first fixing holes, the second connecting plate 322 is provided with a plurality of second fixing holes, the plurality of first fixing holes corresponds to the plurality of second fixing holes one by one, and fasteners pass through the first fixing holes and the second fixing holes in turn to fixedly connect the first connecting plate 31124 and the second connecting plate 322.

[0050] The side of the motor shaft box body 321 facing the direct drive motor 31 is provided with an annular groove and a portion of the second projection 31123 protruded from the first connecting plate 31124 is a protrusion. The protrusion and the groove are butted to achieve alignment of the end cover 3112 and the motor shaft box body 321.

[0051] Referring to FIGs. 10 to16, further, the motor shaft box 32 of the present embodiment further includes a positioning platform 323 and a base 324 both provided on the outer circumferential side of the motor shaft box body 321. The positioning platform 323 and the base 324 are corresponding to each other. The positioning platform 323 is configured to mount and position the motor shaft box 32, and the base 324 is for providing support when the motor shaft box 32 is placed.

[0052] The base 324 includes an annular protrusion provided on the outer circumferential side of the motor shaft box body 321, which can play a good supporting role and can reduce the weight of the motor shaft box body 321 due to the hollow inside.

[0053] The motor shaft box 32 also includes stiffeners disposed on the outer circumferential side of the motor shaft box body 321 and between the positioning platform 323 and the base 324, and the stiffeners can make the motor shaft box body 321 have a thinner wall thickness, thereby reducing the weight of the motor shaft box body 321. By providing the stiffeners, the motor shaft box body 321 can be ensured to have good strength, which is beneficial to the lightweight of the motor shaft box 32.

[0054] The stiffeners include a plurality of first stiffeners 327 located in the middle of the motor shaft box body 321, and the plurality of first stiffeners 327 are spaced from each other. The first stiffener 327 may be distributed on the motor shaft box body 321 in a convex shape.

[0055] The stiffeners also include a second stiffener 326 located on the side of the motor shaft box body 321 away from the direct drive motor 31, and the length of the second stiffener 326 in the direction of the shaft 11 is smaller than the length of the first stiffener 327 in the direction of the shaft 11. The second stiffener 326 mainly serves to reinforce the end strength to avoid the local strength being too low.

[0056] The motor shaft box body 321 is provided with a positioning annulus platform 325 for fixing motor bearings. The positioning annulus platform 325 has an inner diameter smaller than the outer diameter of the motor bearing, the end of the motor bearing away from the direct drive motor 31 is abutted against the positioning annulus platform 325, and the side of the motor bearing facing the direct drive motor 31 is abutted against the end cover 3112, and the positioning annulus platform 325 can limit the displacement of the motor bearing so as to keep stable.

[0057] The outer ring of the motor bearing is threaded with the motor shaft box body 321, and the inner ring of the motor bearing is interference connected with the shaft 11. The shaft 11 can drive the inner ring of the motor bearing to rotate relative to the outer ring of the motor bearing through balls disposed between the outer ring and the inner ring of the motor bearing.

Embodiment 3

[0058] According to a third aspect of the embodiment of the present disclosure, a railway vehicle is provided, including: a car body and the bogie frame as described above, and the car body is disposed on the bogie frame.

[0059] The railway vehicle of the embodiment includes the bogie frame described in the second embodiment, so that the railway vehicle has a strong ability to pass through the uneven rail surface or curved rail surface, good safety, and low noise of the vehicle, which is beneficial to improving the experience of passengers.

[0060] In the description of the present disclosure, It should be understood that the terms "front", "rear", "head", "tail" and the like denote an orientation or positional relationship based on those shown in the drawings and are intended for ease of description and simplifica-

tion of the description only, and are not intended to indicate or imply that the device or element in question must have a particular orientation, be constructed and operate in a particular orientation and therefore cannot be construed as limiting to the present disclosure.

[0061] Furthermore, the terms "first" and "second" are used for descriptive purposes only and cannot be understood as indicating or implying relative importance or implying the number of technical features indicated. Thus, an element defined as "first", or "second" may explicitly or implicitly include one or more of such elements. In the description of this application, "a plurality of" means at least two, e.g. two, three, etc. unless expressly specified otherwise.

[0062] In the present disclosure, the terms "arranged", "connected", etc. are to be understood in a broad sense. For example, the connection can be directly connected or indirectly connected by intermediate media, and it can be the internal communication of two elements or the interaction between two elements. The specific meanings of the above terms in the present disclosure may be understood on a case-by-case basis to those of ordinary skill in the art.

[0063] Although some alternative embodiments of the present disclosure have been described additional changes and modifications may be made to these embodiments once the basic inventive concepts are known to those skilled in the art. Accordingly, the appended claims are intended to be interpreted to encompass some alternative embodiments as well as all changes and modifications falling within the scope of the present disclosure.

[0064] Apparently those skilled in the art may make various changes and modifications to the present disclosure without departing from the spirit and scope of the present disclosure. Thus the present disclosure is intended to include such modifications and variations provided that they fall within the scope of the claims and their equivalents.

Claims

1. A frame comprising: two corresponding side beams and a cross beam connected to the two side beams;

   wherein the cross beam includes a main body portion for connecting a traction device and a connecting portion for hinging with the side beam, the connecting portion being provided at two ends of the main body portion, the width of the connecting portion being gradually reduced along a direction away from the main body portion;

   one end of the connecting portion away from the main body portion is movably connected with the side beam.

2. The frame according to claim 1, wherein a first hinge portion is provided on a middle of the side beam, a second hinge portion is provided on two ends of the cross beam, and the side beam and the cross beam are hinged and connected through the first hinge portion and the second hinge portion.

3. The frame according to claim 2, wherein the first hinge portion includes a hinge pin seat arranged in the side beam, a cavity is formed in the hinge pin seat, the cavity is provided with a pressure sleeve, a positioning ring and a hinge end cover, the positioning ring is located at one side away from the cross beam, one end of the pressure sleeve close to the cross beam is abutted on an inner wall of the cavity, the positioning ring is pressed on one end of the pressure sleeve away from the cross beam through a fastener, and the positioning ring is sleeved at an outer side of the hinge end cover;

   wherein the second hinge portion includes a hinge pin and a central bolt, the hinge pin is arranged in the pressure sleeve and is in contact with the hinge end cover, and the central bolt is fixed in the hinge pin after passing through the hinge end cover.

4. The frame according to claim 2, wherein the main body portion includes two corresponding sub-cross beams and two supporting beams disposed between the two sub-cross beams, and the connecting portion includes two connecting beams connecting two ends of the two sub-cross beams;

   the connecting beam includes a connecting beam body, and one end of the connecting beam body facing the sub-cross beam is provided with a first connecting portion and a second connecting portion for connecting the two sub-cross beams, the first connecting portion and the second connecting portion are intersected each other, and gaps are formed between the first connecting portion and the side beam, and between the second connecting portion and the side beam, one end of the connecting beam body away from the sub-cross beam is provided with a second hinge portion.

5. The frame according to claim 4, wherein the two supporting beams are provided with transverse buffer mounting seats, the transverse buffer mounting seats are arranged on side of the supporting beam facing other supporting beam, and the two transverse buffer mounting seats are arranged corresponded to each other.

6. The frame according to claim 5, wherein the two sub-cross beams are provided with traction rod mounting seats, the traction rod mounting seats includes traction rod joint mounting seats and triangular rubber joint mounting seats, and the traction rod joint mounting seats and the triangular rubber joint mounting

seats are integrally formed.

7. The frame according to claim 2, wherein two primary spring mounting seats are disposed at two ends of the side beam, and the two primary spring mounting seats are disposed at intervals.

8. The frame according to claim 7, wherein the side beam further includes two brake caliper hangers on two sides of the first hinge portion, and the brake caliper hangers are disposed on side of the side beam facing the cross beam.

9. The frame according to claim 8, wherein the side beam further includes a transverse damper seat disposed below the first hinge portion, the transverse damper seat and the primary spring mounting seat being located on same side of the side beam.

10. The frame according to claim 9, wherein the side beam further includes an anti-roll torsion bar mounting seat, the anti-roll torsion bar mounting seat and the primary spring mounting seat being located on same side of the side beam and adjacent to the cross damper mounting seat.

11. The frame according to claim 10, wherein the side beam further includes a secondary spring mounting seat disposed above the first hinge portion, the secondary spring mounting seat disposed on other side of the side beam corresponded to the primary spring mounting seat.

12. A bogie frame comprising: a frame as claimed in any one of claims 1-11, the side beams being provided with secondary spring mounting seats;
a secondary spring, wherein one end of the secondary spring is connected to the secondary spring mounting seat, other end of the secondary spring is configured to connect a car body, and the secondary spring is an air spring.

13. The bogie frame according to claim 12, further including:

a wheelset, including a shaft and two wheels fixed on the outer peripheral surface of the shaft;
a wheelset shaft box, arranged at two ends of the shaft, wherein the side beam is connected with the wheelset shaft box;
the direct drive motor located between the two wheels;
the motor shaft box located between the direct drive motor and the wheel, wherein the motor shaft box includes a motor bearing and a motor shaft box body, the inner ring of the motor bearing is fixed on the outer peripheral surface of the shaft, and the outer ring of the motor bearing is fixed with the motor shaft box body;
wherein a rotor of the direct drive motor and an inner ring of the motor bearing are fixed by a connector to drive the shaft, and a stator of the direct drive motor and an outer ring of the motor bearing are fixed by the connector.

14. The bogie frame according to claim 13, wherein the direct drive motor further includes:

a housing, wherein the rotor and the stator are arranged in the housing, and the housing is fixed with the stator;
two end covers, wherein the end cover is provided with penetrating end cover shaft holes, two end covers are fixed at two ends of the housing, the shaft passes through the two end cover shaft holes and a hollow portion of the housing, and one end of the end cover deviating from the housing is fixed with the motor shaft box body to realize fixed connection between the stator and the outer ring of the motor bearing.

15. The bogie frame according to claim 14, wherein the end cover includes:

an end cover body facing one end of the housing is provided with a first projection for connecting the housing;
wherein the two end surfaces of the housing are respectively provided with clamping grooves, and the two end covers and the housing are clamped and fitted with the clamping grooves through the first projection and the clamping grooves;
wherein the end cover body has an end cover body threaded hole, the housing has a housing threaded hole matched with the end cover body threaded hole, and bolts pass through the end cover body threaded hole and the housing threaded hole in turn to realize the fixed connection between the end cover and the housing.

16. The bogie frame according to claim 15, wherein one end of the end cover body away from the housing is provided with a second projection, and the outer peripheral side of the second projection is provided with a first connecting plate for connecting the motor shaft box;
one end of the motor shaft box body facing the end cover is provided with a second connecting plate for connecting the end cover, and the motor shaft box and the end cover are fixed by connecting the first connecting plate with the second connecting plate.

17. The bogie frame according to claim 16, wherein the first connecting plate is provided with a plurality of first fixing holes, the second connecting plate is pro-

vided with a plurality of second fixing holes, the first fixing holes are one-to-one corresponding to the second fixing holes, and fasteners is passed through the first fixing holes and the second fixing holes in turn to make the first connecting plate and the second connecting plate fixedly connected.

18. The bogie frame according to claim 17, wherein the side of the motor shaft box body facing the direct drive motor is provided with an annular groove;

the part of the first connecting plate is protruded from the second projection is defined as an protrusion;
the protrusion and the groove are butted to realize the alignment between the end cover and the motor shaft box body.

19. The bogie frame according to claim 12, wherein the outer peripheral side of the motor shaft box is provided with a positioning platform and a base, and the positioning platform and the base are corresponded, the positioning platform is configured to mount other components, and the base is configured to provide support when the motor shaft box is placed.

20. The bogie frame according to claim 19, wherein the base includes an annular protrusion disposed on the outer peripheral side of the motor shaft box.

21. The bogie frame according to claim 19, wherein the outer peripheral side of the motor shaft box is further provided with stiffeners, and the stiffeners are located between the positioning platform and the base.

22. The bogie frame according to claim 21, wherein the stiffeners include a plurality of first stiffeners located in the middle of the motor shaft box body, and the plurality of first stiffeners are spaced apart from each other.

23. The bogie frame according to claim 22, wherein the stiffeners further includes a second stiffener located on the side of the motor shaft box body away from the direct drive motor, the length of the second stiffener in the shaft direction being less than the length of the first stiffener in the shaft direction.

24. The bogie frame according to claim 17, wherein the motor shaft box body is provided with a positioning annulus platform for fixing the motor bearing, the inner diameter of the positioning annulus platform is smaller than the outer diameter of the motor bearing, and an end of the motor bearing away from the direct drive motor is abutted against the positioning annulus platform.

25. The bogie frame according to claim 24, wherein the outer ring of the motor bearing is threaded to the motor shaft box body, and the inner ring of the motor bearing is interference connected to the shaft.

26. A railway vehicle comprising: a car body and a bogie frame according to any one of claims 12 to 25, the car body being disposed on the bogie frame.

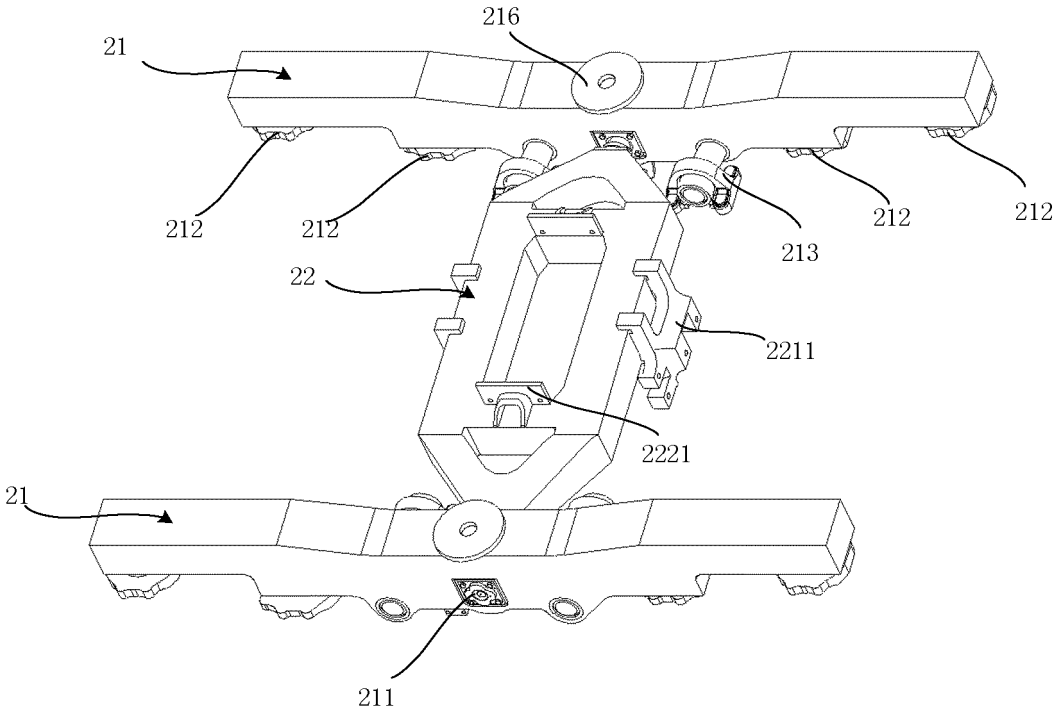
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FIG. 1

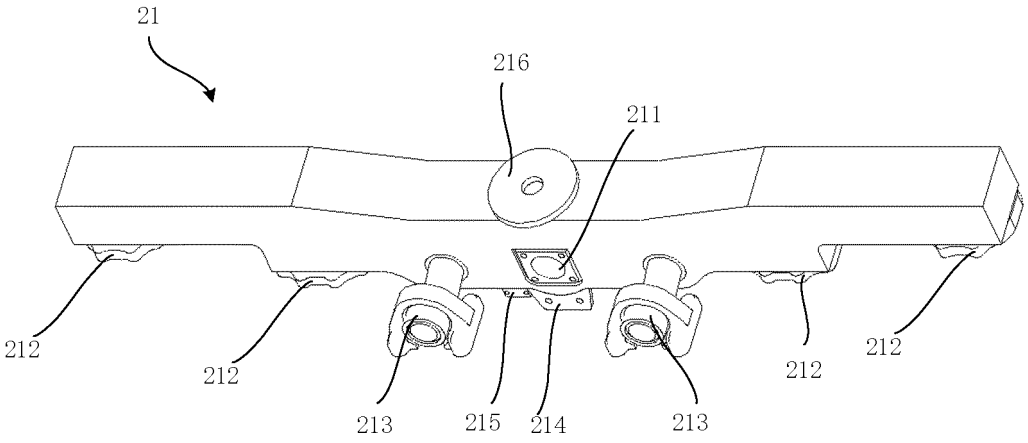
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FIG. 2

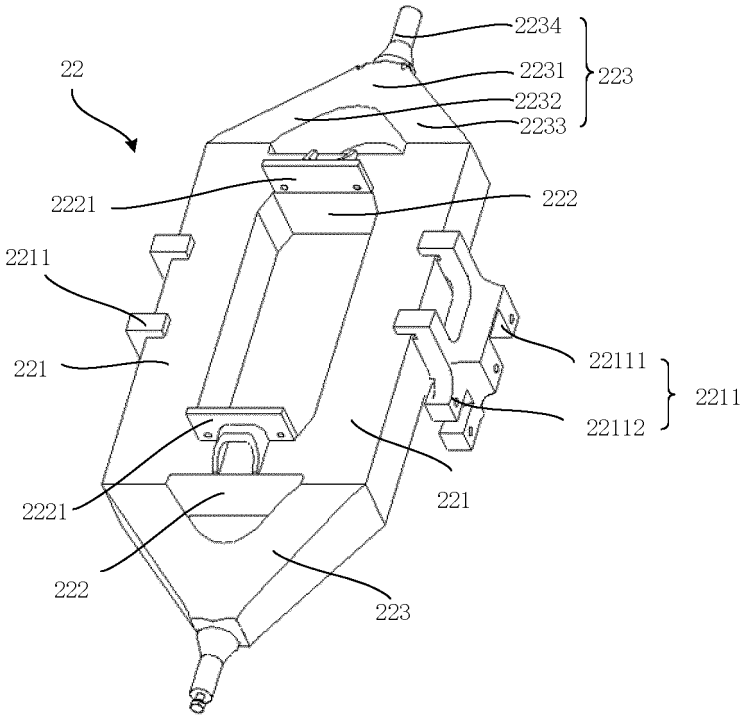
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FIG. 3

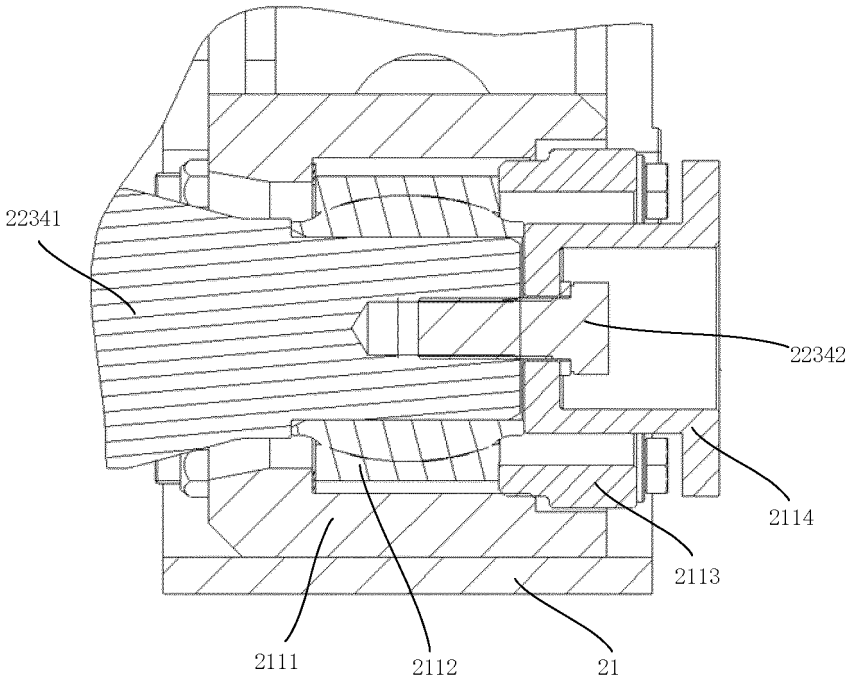
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FIG. 4

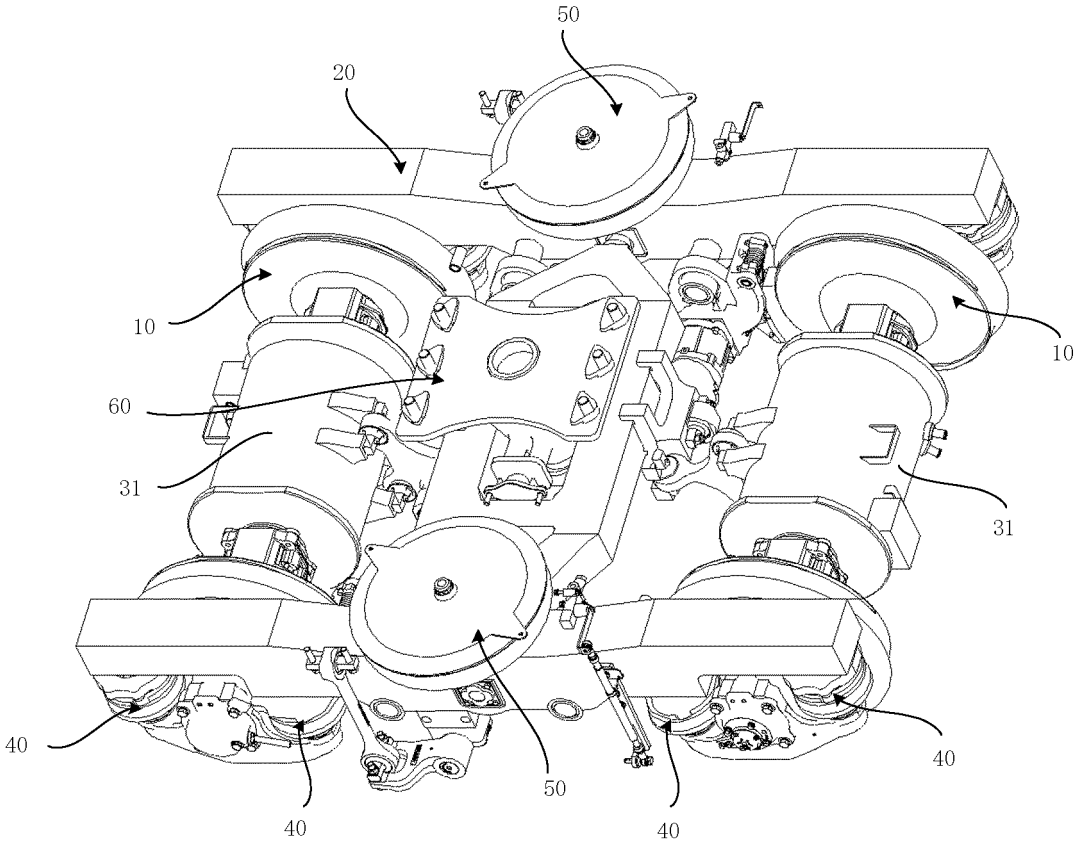

FIG. 5

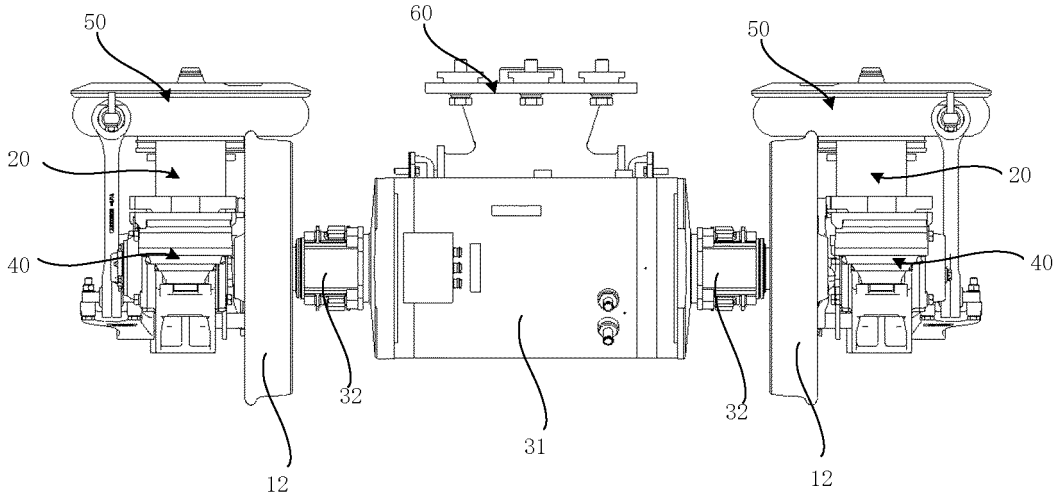

FIG. 6

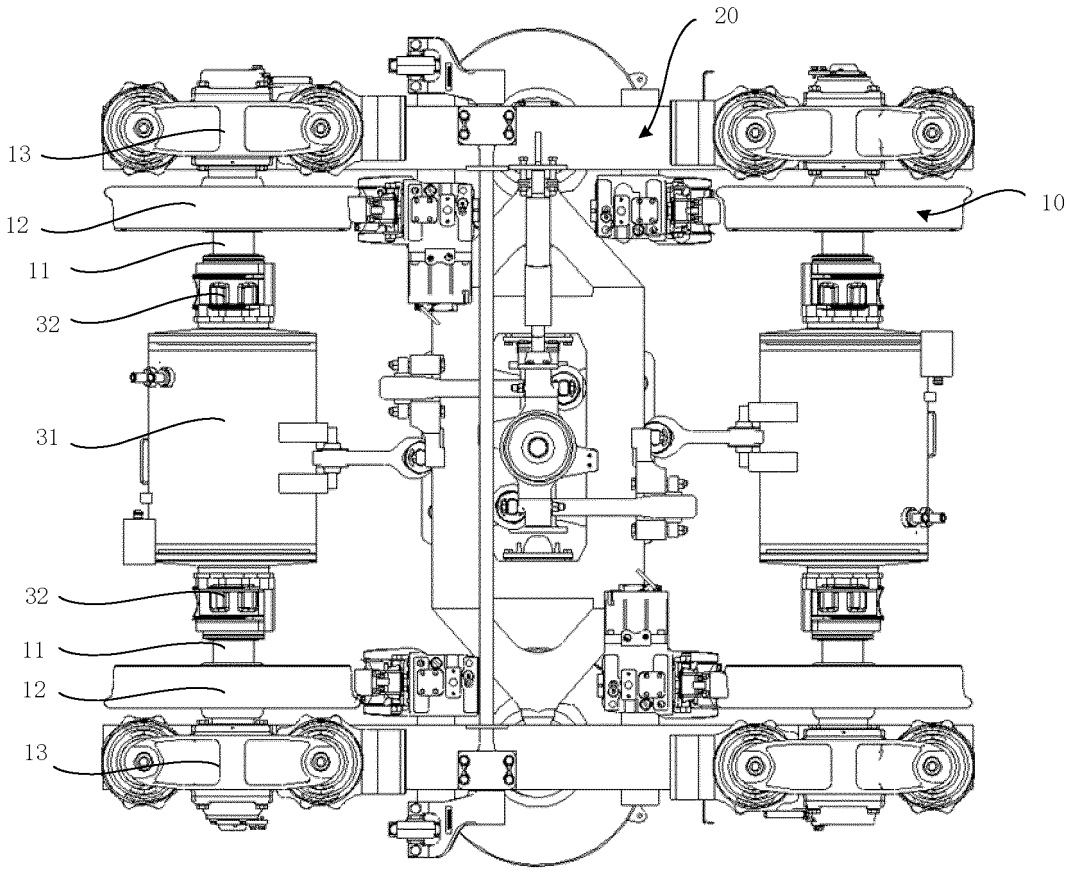

FIG. 7

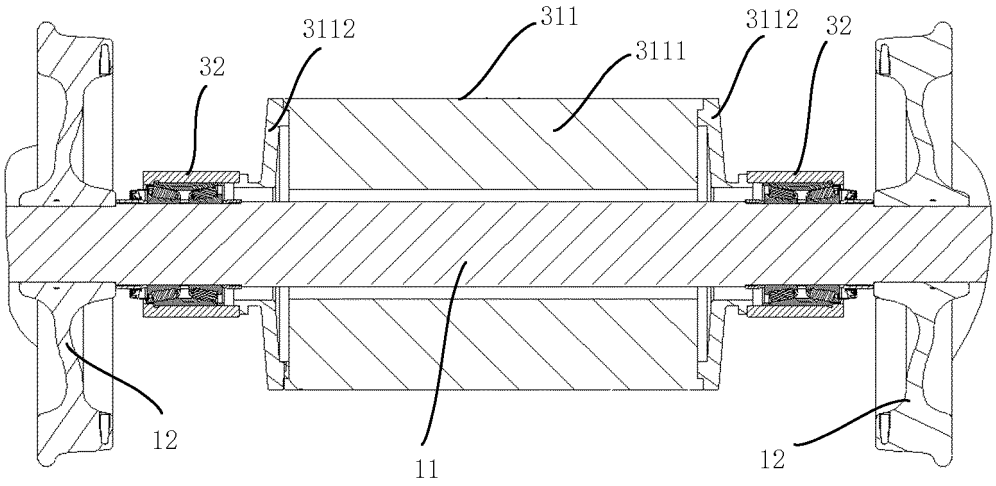

FIG. 8

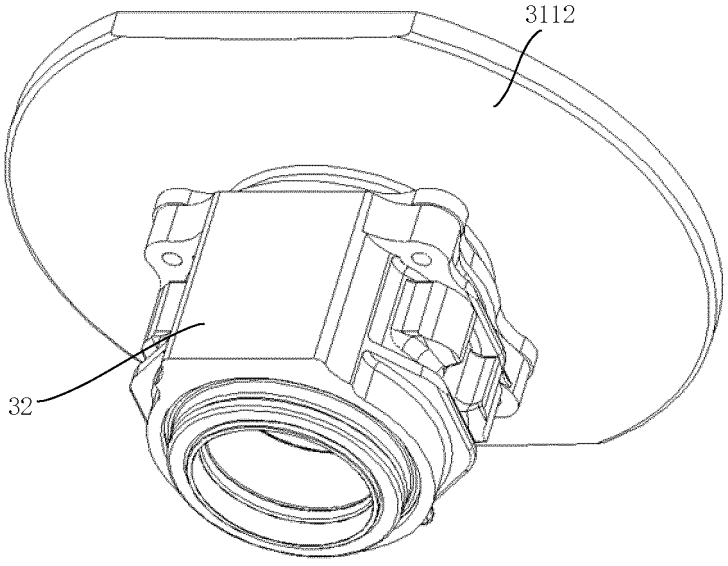

FIG. 9

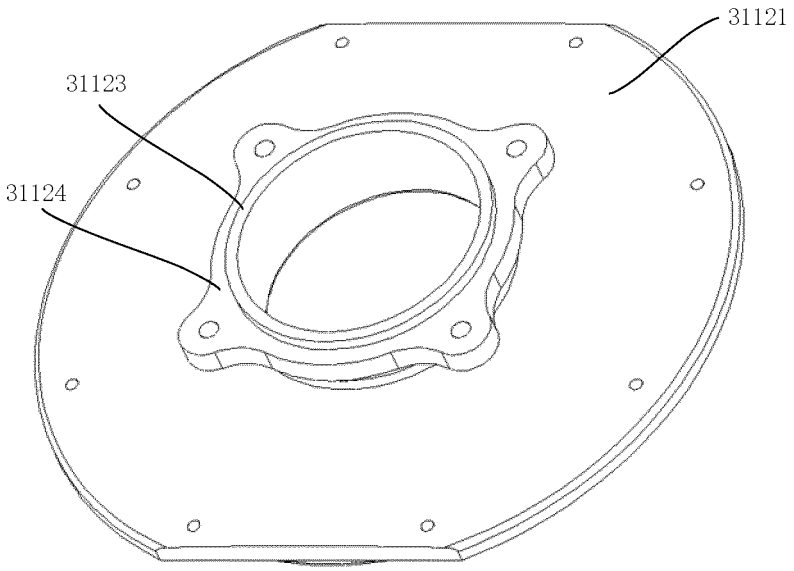

FIG. 10

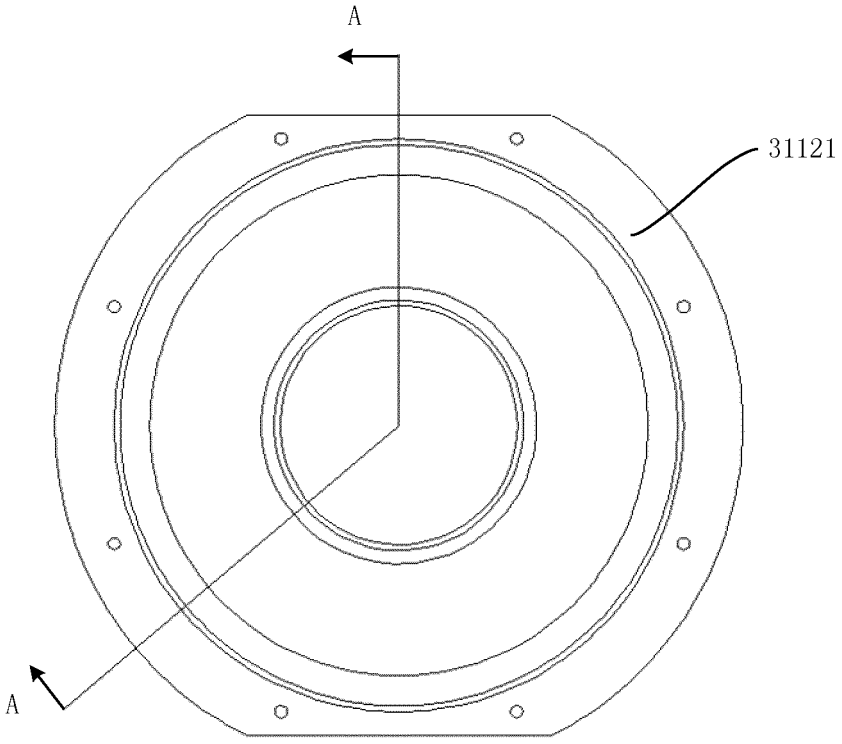

FIG. 11

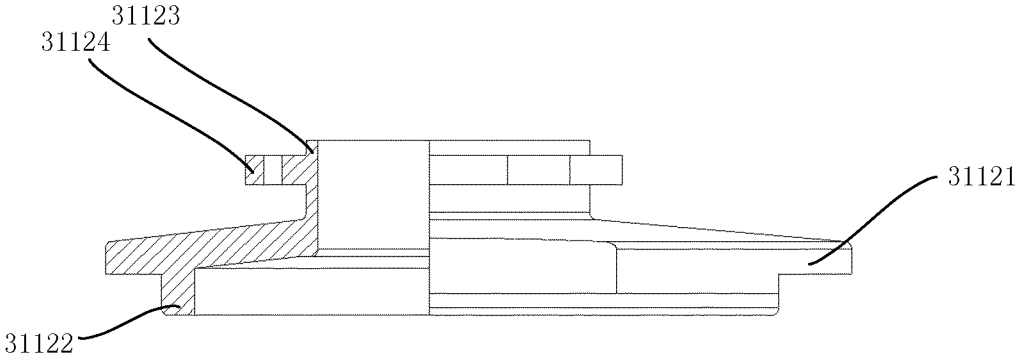

FIG. 12

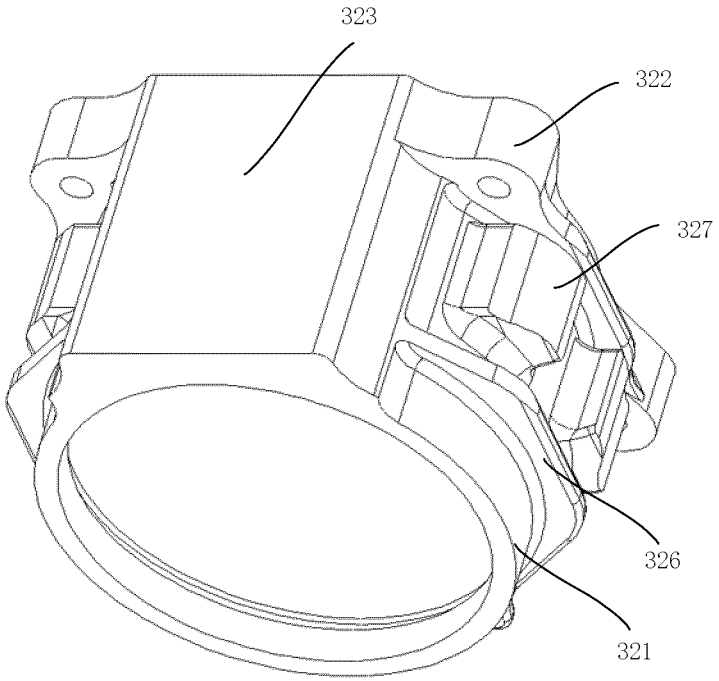

FIG. 13

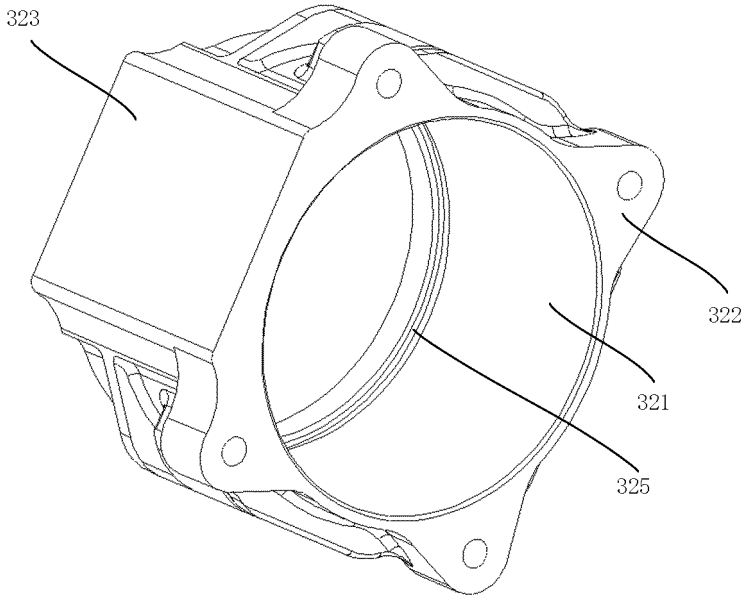

FIG. 14

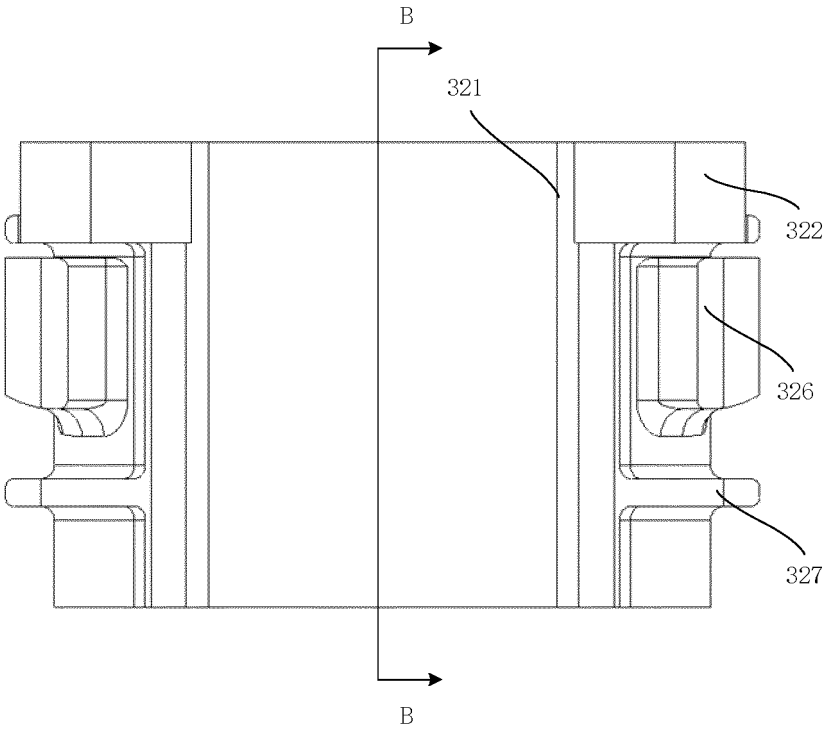

FIG. 15

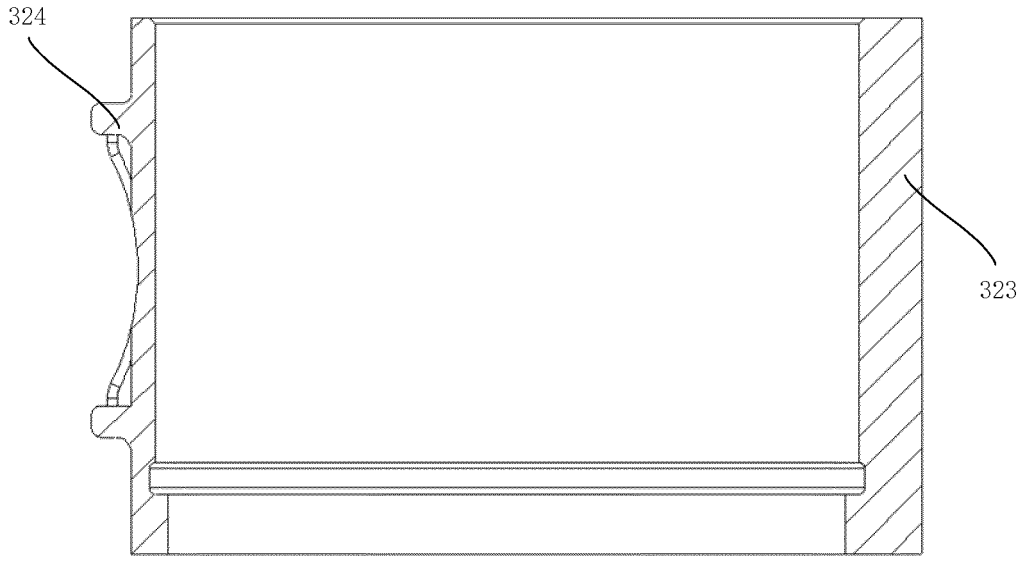

FIG. 16

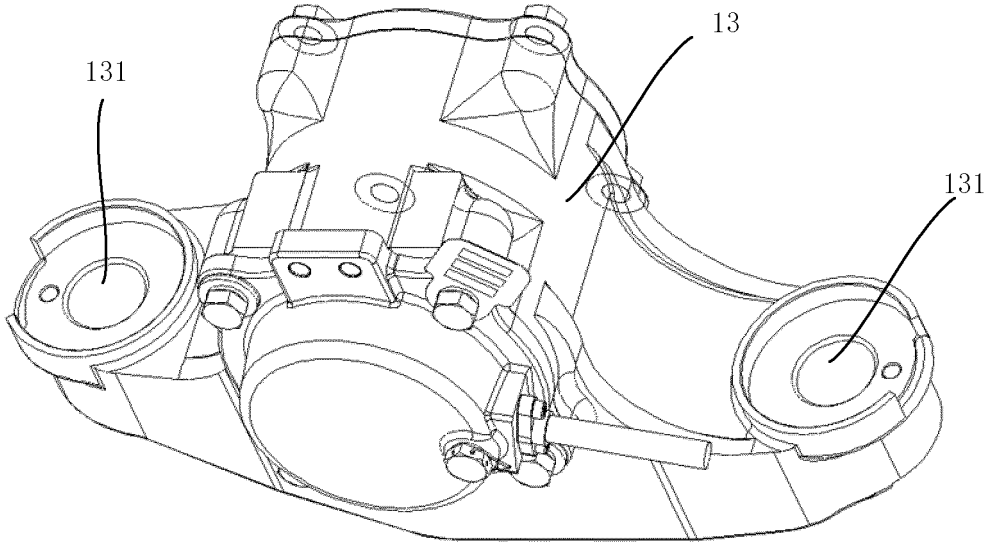

FIG. 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/116402

A. CLASSIFICATION OF SUBJECT MATTER

B61F 5/52(2006.01)i; B61F 5/10(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

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: 中车唐山机车车辆有限公司, 轨道车辆, 列车, 火车, 转向架, 构架, 横梁, 侧梁, 铰接, 活动连接, 宽度, 轮对, 电机, 壳体, 端盖, rail, vehicle, bogie, framework, side, beam, cross, hinge, width, wheel, motor, shell, cover

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 111469878 A (SOUTHWEST JIAOTONG UNIVERSITY) 31 July 2020 (2020-07-31) description, paragraphs 23-28, figures 1-8	1, 2, 7-11
Y	CN 111469878 A (SOUTHWEST JIAOTONG UNIVERSITY) 31 July 2020 (2020-07-31) description, paragraphs 23-28, figures 1-8	12-14, 26
Y	CN 104527661 A (CSR QINGDAO SIFANG CO., LTD.) 22 April 2015 (2015-04-22) description, paragraphs 27-53, figures 1-6	12-14, 26
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A	CN 102753418 A (NIPPON SHARYO, LTD. et al.) 24 October 2012 (2012-10-24) entire document	1-26
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A	CN 105882674 A (TONGJI UNIVERSITY) 24 August 2016 (2016-08-24) entire document	1-26

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

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"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
22 April 2021	**12 May 2021**
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.

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INTERNATIONAL SEARCH REPORT

International application No.
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A	EP 1095838 A2 (FREDIANI, Aldo) 02 May 2001 (2001-05-02) entire document	1-26
A	GB 1029192 A (HENRICOT USINES EMILE S.A.) 11 May 1966 (1966-05-11) entire document	1-26

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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