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(54) BOGIE AND LOCOMOTIVE HAVING SAME

(57) The present disclosure relates to the technical field of locomotives, and provides a bogie and a locomotive having same. The bogie comprises a framework, a traction device, an axle device, a driving device and a braking device; two ends of the traction device are respectively connected to a first end beam and a vehicle body, one end of the traction device is located at the lower portion of the first end beam so that the traction device is obliquely provided, and the opening of a second recess faces the direction of the other end of the traction device; the axle device is connected to the framework; the driving device is connected to the framework and is in driving connection with the axle device; and the braking device is connected to the framework. The traction device is obliquely provided, and a part of section body of the traction device is located below the first end beam, increasing an overlapping part of the traction device and the first end beam, reducing the overall length of the bogie; and the bogie has high compactness, so as to be suitable for light locomotives.

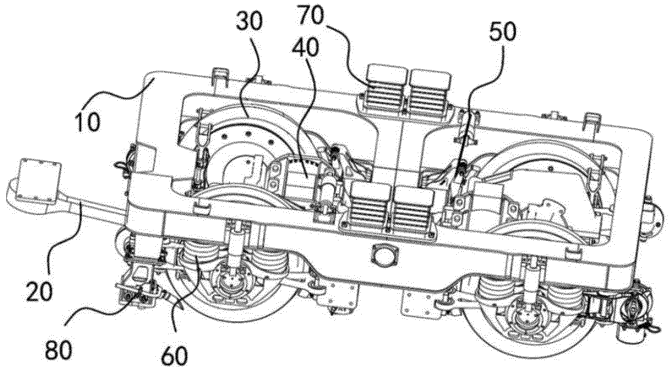

FIG. 1

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Description

CROSS REFERENCE

[0001] The present disclosure claims priority to Chinese Patent Application No. 202010943321.0 entitled "Bogie and Locomotive Having Same", filed on September 9, 2020, and the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of locomotives, and in particular, to a bogie and a locomotive having the bogie.

BACKGROUND

[0003] Currently, shunting locomotives widely used in railway maintenance sections, vehicle sections, marshalling yards and places with discontinuous electrification such as factories, mines, ports, for shunting and rescue tasks, mostly adopt internal combustion traction shunting locomotives, the power is greater than 1000 kW, the axle weight is 22t-25t, the axle type is C0-C0, and the starting traction force is greater than or equal to 350 kN. The shunting locomotive adopts internal combustion engine power, causes relatively serious air pollution, and causes more serious air pollution especially when running in some relatively closed spaces, such as subways, mountains and the like. The bogie structure is a conventional bogie structure of a diesel locomotive.

[0004] However, the bogie of the above locomotive is suitable for large locomotives, the structure is complex, and the bogie structure is relatively large in size and is not suitable for light locomotives.

SUMMARY

[0005] The present disclosure provides a bogie and a locomotive having the bogie, to be suitable for a light locomotive.

[0006] According to a first aspect of the present disclosure, there is provided a bogie, including:

a framework, the framework including two side beams, a first end beam and a second end beam, the first end beam being formed with a first recess and a second recess, the first recess being located at an upper portion of the first end beam, the first end beam protruding downward, and the second recess being located on a side portion of the first end beam;
a traction device, two ends of the traction device being respectively connected to the first end beam and a vehicle body, an end of the traction device being located at a lower portion of the first end beam so that the traction device is obliquely provided, and an opening of the second recess being towards a direction of anther end of the traction device;
an axle device, the axle device being connected to the framework;
a driving device, the driving device being connected to the framework and in driving connection with the axle device; and
a braking device, the braking device being connected to the framework.

[0007] In an embodiment of the present disclosure, the first end beam includes:

an upper cover plate, the upper cover plate being formed with the first recess;
a lower cover plate, the lower cover plate being provided opposite to the upper cover plate, and the lower cover plate being a bent plate and protruding towards a direction away from the upper cover plate;
a vertical plate, two ends of the vertical plate being respectively connected to the upper cover plate and the lower cover plate;
where, the upper cover plate, the lower cover plate and the vertical plate form the second recess, and an end of the traction device is located at a lower portion of the lower cover plate.

[0008] In an embodiment of the present disclosure, the traction device includes a traction rod, a vehicle body traction seat, a bogie traction seat, two traction rubber joints and two trays, the vehicle body traction seat and the bogie traction seat are respectively connected to two ends of the traction rod through corresponding traction rubber joints and trays, the vehicle body traction seat is connected with the vehicle body, and the first end beam further includes:

a traction seat plate, the traction seat plate being connected with the lower cover plate, the lower cover plate being inserted into the traction seat plate, and the bogie traction seat being connected with the traction seat plate; and
a reinforcing rib, the reinforcing rib connecting the lower cover plate and the vertical plate.

[0009] In an embodiment of the present disclosure, the upper cover plate includes:

a first plate section;
a second plate section, the second plate section being a bent plate, there being two second plate sections, and the two second plate sections being respectively connected to two ends of the first plate section; and
a third plate section, the third plate section being a straight plate, there being two third plate sections, and the two third plate sections being respectively connected to ends of the two second plate sections

away from the first plate section, an upper surface of the third plate section being higher than an upper surface of the first plate section, and a reserved space being provided below the third plate section;
where, the braking device is a wheel disc braking device, and the braking device is mounted in the reserved space.

[0010] In an embodiment of the present disclosure, the axle device includes an axle, two wheels and two axle boxes, the two wheels are provided on the axle at intervals, the two axle boxes are respectively provided at two ends of the axle, the bogie further includes a primary suspension device, and the primary suspension device includes:

an axle box pull rod, two ends of the axle box pull rod being respectively connected to the framework and the axle box;
a primary suspension spring, two ends of the primary suspension spring being respectively connected to the framework and the axle box; and
a primary vertical shock absorber, two ends of the primary vertical shock absorber being respectively connected to the framework and the axle box.

[0011] In an embodiment of the present disclosure, a distance between the two wheels is adjustably provided, and a mounting position of the axle box is a fixed position.

[0012] In an embodiment of the present disclosure, the framework further includes a cross beam, two ends of the cross beam are respectively connected to middle portions of the two side beams, and the driving device includes:

a gear mechanism, the gear mechanism being connected with the axle device;
a motor, the motor being in driving connection with the gear mechanism;
a motor hanger seat, the motor hanger seat being connected with the motor;
a motor hanger rod, the motor hanger rod being connected with the motor hanger seat through a motor suspension rubber sleeve, and the motor hanger rod being connected with the cross beam;
an anti-fall seat, the anti-fall seat being provided on the motor; and
an anti-fall pin, the anti-fall pin being provided on the cross beam, so that the anti-fall pin is in limit contact with the anti-fall pin when the motor hanger rod is disengaged from the cross beam.

[0013] In an embodiment of the present disclosure, the braking device is a foundation braking device, the braking device includes a wheel disc brake and a tread brake, the wheel disc brake and the tread brake are both connected to the framework, the bogie further includes a secondary suspension device, and the secondary suspension device includes: [0038] a secondary transverse shock absorber, two ends of the secondary transverse shock absorber being respectively connected to the side beam and the vehicle body, there being two secondary transverse shock absorbers, and the two secondary transverse shock absorbers being distributed diagonally and respectively connected to the two side beams;

a secondary rubber stack, the secondary rubber stack being provided on the side beam; and
a secondary transverse stop, the secondary transverse stop being provided on the side beam, and an end of the secondary transverse stop being provided opposite to the vehicle body;
where, the braking device is mounted in a middle portion of the framework and close to the secondary suspension device.

[0014] In an embodiment of the present disclosure, the bogie further includes a stone discharging and sanding device, and the stone discharging and sanding device includes:

a fixed frame, the fixed frame being connected to the framework;
a mounting seat, the mounting seat being connected with the fixed frame and positionally adjustably provided relative to the fixed frame;
a stone discharging pipe, the stone discharging pipe being connected to the mounting seat;
a connecting frame, the connecting frame being connected with the mounting seat and positionally adjustably provided relative to the fixed frame;
a sanding pipe, the sanding pipe being provided on the connecting frame; and
a sanding bracket, the sanding bracket being connected with the sanding pipe;
where, the connecting frame and the mounting seat synchronously move relative to the fixed frame, so that the stone discharging pipe and the sanding pipe move synchronously.

[0015] According to a second aspect of the present disclosure, there is provided a locomotive, including the above bogie and a vehicle body.

[0016] The bogie of the present disclosure includes a framework, a traction device, an axle device, a driving device and a braking device. The first end beam of the framework is provided with a first recess and a second recess, that is, the first end beam adopts a downward concave and inward concave structure, so that the traction device connecting the first end beam and the vehicle body can be obliquely provided, and a part of the section body of the traction device can be located below the first end beam, that is, the overlapping portion of the traction device and the first end beam is increased, so that the overall length of the bogie is reduced, and the compactness is relatively high, so as to be suitable for a light

locomotive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Various objects, features, and advantages of the present disclosure will become more apparent from the following detailed description of the preferred embodiments of the present disclosure in conjunction with the accompanying drawings. The drawings are merely exemplary illustrations of the present disclosure and are not necessarily drawn to scale. In the drawings, the same reference numbers refer to same or similar parts throughout. Among them:

FIG. 1 is a schematic structural diagram of a bogie according to an exemplary embodiment;
FIG. 2 is a schematic structural diagram of a framework of a bogie according to an exemplary embodiment;
FIG. 3 is a schematic structural diagram of a first end beam of a bogie according to an exemplary embodiment;
FIG. 4 is a schematic structural diagram of a traction device of a bogie according to an exemplary embodiment;
FIG. 5 is a schematic structural diagram of an axle device of a bogie according to an exemplary embodiment;
FIG. 6 is a schematic structural diagram of an axle device and a driving device of a bogie according to an exemplary embodiment;
FIG. 7 is a schematic diagram of a mounting structure of a braking device of a bogie according to an exemplary embodiment;
FIG. 8 is a schematic diagram of a mounting structure of a primary suspension device of a bogie according to an exemplary embodiment;
FIG. 9 is a schematic diagram of a mounting structure of a secondary suspension device of a bogie according to an exemplary embodiment;
FIG. 10 is a schematic diagram of a mounting structure of a stone discharging and sanding device of a bogie according to an exemplary embodiment;
FIG. 11 is a schematic structural diagram of a locomotive according to an exemplary embodiment.

[0018] The reference numbers are illustrated as follows:
1. Vehicle body; 10. Framework; 11. Side beam; 12. First end beam; 121. First recess; 122. Second recess; 123. Upper cover plate; 1231. First plate section; 1232. Second plate section; 1233. Third plate section; 124. Lower cover plate; 125. Vertical plate; 126. Traction seat plate; 127. Reinforcing rib; 13. Second end beam; 14. Cross beam; 20. Traction device; 21. Traction rod; 22. Vehicle body traction seat; 23. Bogie traction seat; 24. Traction rubber joint; 25. Tray; 30. Axle device; 31. Axle; 32. Wheel; 33. Axle box; 40. Driving device; 41. Gear mechanism; 42. Motor; 43. Motor hanger seat; 44. Motor hanger rod; 45. Motor suspension rubber sleeve; 46. Anti-fall seat; 47. Anti-fall pin; 50. Braking device; 51. Wheel disc brake; 52. Tread brake; 60. Primary suspension device. 61. Axle box pull rod; 62. Primary suspension spring. 63. Primary vertical shock absorber. 70. Secondary suspension device; 71. Secondary transverse shock absorber; 72. Secondary rubber stack; 73. Secondary transverse stop; 80. Stone discharging and sanding device; 81. Fixed frame; 82. Mounting seat; 83. Stone discharging pipe; 84. Connecting frame; 85. Sanding pipe; 86. Sanding bracket; 87. First nut; 88. Second nut; 89. Strip-shaped hole; 90. Round hole.

DETAILED DESCRIPTION

[0019] Exemplary embodiments embodying features and advantages of the present disclosure will be described in detail in the following description. It should be understood that the present disclosure can have various changes in different embodiments, which do not depart from the scope of the present disclosure, and the description and drawings there are intended to be illustrative in essence and are not intended to limit the present disclosure.

[0020] In the following description of different exemplary embodiments of the present disclosure, reference is made to the accompanying drawings, which form a part of the present disclosure, and where different exemplary structures, systems, and steps that may implement aspects of the present disclosure are shown by way of example. It should be understood that other specific schemes of components, structures, exemplary devices, systems, and steps may be used and structural and functional modifications may be made without departing from the scope of the present disclosure. Moreover, although the terms "above", "between", "within", etc. may be used in this description to describe different exemplary features and elements of the present disclosure, these terms are used here for convenience only, such as according to the direction of the example in the drawings. Any content in this description should not be construed as requiring a particular three-dimensional direction of the structure to fall within the scope of the present disclosure.

[0021] An embodiment of the present disclosure provides a bogie. Referring to FIG. 1 to FIG. 11, the bogie includes: a framework 10, the framework 10 including two side beams 11, a first end beam 12 and a second end beam 13, the first end beam 12 being formed with a first recess 121 and a second recess 122, the first recess 121 being located at an upper portion of the first end beam 12, the first end beam 12 protruding downward, and the second recess 122 being located on a side portion of the first end beam 12; a traction device (20), two ends of the traction device 20 being respectively connected to the first end beam 12 and the vehicle body 1, an end of the traction device 20 being located at a lower portion of the first end beam 12 so that the traction device

20 is obliquely provided, and an opening of the second recess 122 being towards a direction of another end of the traction device 20; an axle device 30, the axle device 30 being connected to the framework 10; a driving device 40, the driving device 40 being connected to the framework 10 and in driving connection with the axle device 30; and a braking device 50, the braking device 50 being connected to the framework 10.

[0022] The bogie of an embodiment of the present disclosure includes a framework 10, a traction device 20, an axle device 30, a driving device 40, and a braking device 50. The first end beam 12 of the framework 10 is provided with a first recess 121 and a second recess 122, that is, the first end beam 12 adopts a downward concave and inward concave structure, so that the traction device 20 connecting the first end beam 12 and the vehicle body 1 can be obliquely provided, and a part of the section body of the traction device 20 can be located below the first end beam 12, that is, an overlapping portion of the traction device 20 and the first end beam 12 is increased, so that the overall length of the bogie is reduced, and the compactness is relatively high, so as to be suitable for a light locomotive.

[0023] It should be noted that the first end beam 12 protrudes downward, that is, the bottom of the first end beam 12 protrudes downward relative to a horizontal surface, so that a height difference exists between the connecting surface of the vehicle body 1 and the connecting surface of the first end beam 12 for connecting the traction device 20, so that the traction device 20 is obliquely arranged.

[0024] In an embodiment, the driving device 40 drives the axle device 30 to move, and the braking device 50 is used to control the axle device 30 to stop moving.

[0025] In an embodiment, as shown in FIG. 3, the first end beam 12 includes: an upper cover plate 123, the upper cover plate 123 being formed with a first recess 121; a lower cover plate 124, the lower cover plate 124 being provided opposite to the upper cover plate 123, and the lower cover plate 124 being a bent plate and protruding towards a direction away from the upper cover plate 123; and a vertical plate 125, two ends of the vertical plate 125 being respectively connected to the upper cover plate 123 and the lower cover plate 124; where, the upper cover plate 123, the lower cover plate 124 and the vertical plate 125 form the second recess 122, and an end of the traction device 20 is located at a lower portion of the lower cover plate 124.

[0026] Specifically, the upper cover plate 123, the lower cover plate 124 and the vertical plate 125 form an integral framework of the first end beam 12, and the bottom of the lower cover plate 124 protrudes towards a direction away from the upper cover plate 123, that is, the bottom of the lower cover plate 124 is close to the bottom surface, so that the first end beam 12 forms a downward concave structure. The upper cover plate 123, the lower cover plate 124, and the vertical plate 125 form a second recess 122, and the second recess 122 is towards a direction of another end of the traction device 20, that is, the opening of the second recess 122 is away from the second end beam 13, so that the first end beam 12 forms an inward concave structure.

[0027] In an embodiment, as shown in FIG. 3 and FIG. 4, the traction device 20 includes a traction rod 21, a vehicle body traction seat 22, a bogie traction seat 23, two traction rubber joints 24 and two trays 25, the vehicle body traction seat 22 and the bogie traction seat 23 are respectively connected to two ends of the traction rod 21 through corresponding traction rubber joints 24 and trays 25, the vehicle body traction seat 22 is connected with the vehicle body 1, and the first end beam 12 further includes: a traction seat plate 126, the traction seat plate 126 being connected with the lower cover plate 124, the lower cover plate 124 being inserted into the traction seat plate 126, and the bogie traction seat 23 being connected with the traction seat plate 126; and a reinforcing rib 127, the reinforcing rib 127 connecting the lower cover plate 124 and the vertical plate 125.

[0028] It should be noted that the traction device 20 adopts a push-pull type inclined single traction rod structure, and is composed of the vehicle body traction seat 22, the traction rod 21, the bogie traction seat 23, the traction rubber joint 24 and the tray 25. The traction rod 21 is obliquely arranged, and the height of the traction point to the rail top surface is located at the center of the bogie, which belongs to low-position traction. One end of the traction rod 21 is mounted on the first end beam 12, and the other end of the traction rod 21 is mounted on the vehicle body 1. Two ends of the traction rod 21 are mounted with the traction rubber joints 24, so that the vibration between the bogie and the vehicle body 1 can be buffered, the traction force and the braking force can be effectively transmitted, which is safe and reliable.

[0029] It should be noted that there is a plurality of reinforcing ribs 127, and the structures and arrangement manners of the plurality of reinforcing ribs 127 may be different, so as to ensure the structural stability of the first end beam 12, an arrangement manner is shown as in FIG. 3.

[0030] In an embodiment, as shown in FIG. 2, the framework 10 further includes a cross beam 14, two ends of the cross beam 14 are respectively connected to the middle portions of the two side beams 11, that is, the framework 10 is composed of two side beams 11, a first end beam 12, a second end beam 13 and a cross beam 14, the framework 10 is a framework in the shape of E3, and the strength of the framework 10 can satisfy the strength check at an axis weight of 15t -18t. In order to satisfy the overall arrangement and application of the traction device 20, the first end beam 12 adopts a downward concave and inward concave structure, and the side beam 11 can be provided with structures such as a secondary transverse shock absorber seat, a swing stop seat, a brake mounting seat and an axle box rod mounting seat, etc.

[0031] In an embodiment, as shown in FIG. 3, the upper

cover plate 123 includes: a first plate section 1231; a second plate section 1232, the second plate section 1232 being a bent plate, there being two second plate sections 1232, and the two second plate sections 1232 being respectively connected to two ends of the first plate section 1231; and a third plate section 1233, the third plate section 1233 being a straight plate, there being two third plate sections 1233, the two third plate sections 1233 being respectively connected to ends of the two second plate sections 1232 away from the first plate section 1231, an upper surface of the third plate section 1233 being higher than an upper surface of the first plate section 1231, and a reserved space being provided below the third plate section 1233; where, the braking device 50 is a wheel disc braking device, and the braking device 50 is mounted in the reserved space.

[0032] Specifically, as shown in FIG. 3, the first end beam 12 is composed of an upper cover plate 123, a vertical plate 125, a lower cover plate 124 and a plurality of reinforcing ribs 127, and the first end beam 12 is of a downward concave framework structure. In the framework structure enclosed by the upper cover plate 123, the lower cover plate 124 and the vertical plate 125, the reinforcing ribs 127 are added according to needs, and a manner of slow change cross section is adopted at the transition to ensure that the first end beam 12 has sufficient strength and stiffness while the stress is less than the allowable limit value.

[0033] It should be noted that, considering that the types of the braking devices 50 are different, and the selections of the braking devices 50 for the bogies with different standards are also different. For example, when the wheel disc braking device is selected, the wheel disc braking device needs to be mounted on the first end beam 12, thus a reserved space is provided below the third plate section 1233, so that the wheel disc braking device can be mounted when the wheel disc braking device is selected, and the adaptability is good.

[0034] In an embodiment, as shown in FIG. 5 and FIG. 8, the axle device 30 includes an axle 31, two wheels 32 and two axle boxes 33, the two wheels 32 are provided on the axle 31 at intervals, the two axle boxes 33 are respectively provided at two ends of the axle 31, the bogie further includes a primary suspension device 60, and the primary suspension device 60 includes: an axle box pull rod 61, two ends of the axle box pull rod 61 being respectively connected to the framework 10 and the axle box 33; a primary suspension spring 62, two ends of the primary suspension spring 62 being respectively connected to the framework 10 and the axle box 33; and a primary vertical shock absorber 63, two ends of the primary vertical shock absorber 63 being respectively connected to the framework 10 and the axle box 33.

[0035] Specifically, the axle box 33 is provided on the framework 10 through a primary suspension device 60, that is, the axle device 30 is connected to the framework 10. The axle box pull rod 61, the primary suspension spring 62, and the primary vertical shock absorber 63 realize the connection in the horizontal direction and the vertical direction to ensure the stability of the connection.

[0036] In an embodiment, the axle device 30 adopts a traditional wheel pair structure, and is composed of an axle box 33, wheels 32, and an axle 31. In order to satisfy the requirements for the traction force of the axle 31, wheels with a wheel diameter of 1100 mm may be used.

[0037] In an embodiment, the primary suspension device 60 adopts a triangular axle box pull rod 61 with stiffness in all directions being adjustable, a primary suspension spring 62 with large deflection and a primary vertical shock absorber 63. The axle device 30 is connected with the framework 10 through the primary suspension device 60 to realize elastic positioning.

[0038] In an embodiment, the distance between the two wheels 32 is adjustably provided, and the mounting position of the axle box 33 is a fixed position. That is, the distance between the two wheels 32 can vary, which can adapt to different requirements in China and Europe at the same time. Specifically, according to different track gauge requirements, different wheels 32 are replaced, and the wheels 32 are mounted at different positions, but the mounting position of the axle box 33 is a fixed position, thus sufficient space needs to be reserved between the axle box 33 and the wheels 32, ensuring to adapt to use at different track gauge.

[0039] In an embodiment, as shown in FIG. 1 and FIG. 6, the framework 10 further includes a cross beam 14, two ends of the cross beam 14 are respectively connected to middle portions of the two side beams 11, and the driving device 40 includes: a gear mechanism 41, the gear mechanism 41 being connected with the axle device 30; a motor 42, the motor 42 being in driving connection with the gear mechanism 41; a motor hanger seat 43, the motor hanger seat 43 being connected with the motor 42; a motor hanger rod 44, the motor hanger rod 44 being connected with the motor hanger seat 43 through a motor suspension rubber sleeve 45, and the motor hanger rod 44 being connected with the cross beam 14; an anti-fall seat 46, the anti-fall seat 46 being provided on the motor 42; and an anti-fall pin 47, the anti-fall pin 47 being provided on the cross beam 14, so that the anti-fall pin 47 is in a limit contact with the anti-fall seat 46 when the motor hanger rod 44 is disengaged from the cross beam 14.

[0040] Specifically, the motor 42 of the driving device 40 drives the axle device 30 to rotate through the gear mechanism 41, and the motor 42 is connected to the framework 10 through the motor hanger rod 44 provided on the motor hanger seat 43, and the arrangement of the anti-fall seat 46 and the anti-fall pin 47 may not cause the motor 42 to fall off when the motor hanger rod 44 is disengaged from the framework 10.

[0041] In an embodiment, the driving device 40 is composed of a gear mechanism 41, a motor 42, an anti-fall seat 46, a motor hanger seat 43, a motor hanger rod 44, an anti-fall pin 47, and a motor suspension rubber sleeve 45. The gear mechanism 41 is arranged on the inner

sides of the two wheels 32, one side of the gear mechanism 41 holds the shaft and is suspended on the axle 31 through the gearbox bearing, and the other side of the gear mechanism 41 is connected with the motor 42. The motor 42 is arranged between the two wheels 32, and the gear mechanism 41 can adopt a parallel gear transmission structure. A motor suspension rubber sleeve 45 is mounted on the motor hanger rod 44 to reduce the vibration and shock of the motor 42. In order to prevent the motor 42 from falling off, the anti-fall pin 47 is provided to ensure the safety of the driving device 40.

[0042] In an embodiment, as shown in FIG. 7 and FIG. 9, the braking device 50 is a foundation braking device, the braking device 50 includes a wheel disc brake 51 and a tread brake 52, the wheel disc brake 51 and the tread brake 52 are both connected to the framework 10, the bogie further includes a secondary suspension device 70, and the secondary suspension device 70 includes: a secondary transverse shock absorber 71, two ends of the secondary transverse shock absorber 71 being respectively connected to the side beam 11 and the vehicle body 1, there being two secondary transverse shock absorbers 71, and the two secondary transverse shock absorbers 71 being distributed diagonally and respectively connected to the two side beams 11; a secondary rubber stack 72, the secondary rubber stack 72 being provided on the side beam 11; and a secondary transverse stop 73, the secondary transverse stop 73 being provided on the side beam 11, an end of the secondary transverse stop 73 being provided opposite to the vehicle body 1; where the braking device 50 is mounted in a middle portion of the framework 10 and is close to the secondary suspension device 70

[0043] In an embodiment, the foundation braking device adopts a single-side tread braking unit, the braking unit is arranged in a middle portion of the bogie, each bogie is provided with four sets of tread braking units, and two sets of the tread braking units have parking brake functions. The foundation braking device is mainly composed of a common brake unit (i.e., the wheel disc brake 51), a parking brake unit (i.e., the tread brake 52), a brake shoe and the like. Among them, the first end beam 12 reserves the mounting space of the wheel disc braking device.

[0044] In an embodiment, the secondary suspension device 70 adopts a secondary rubber stack 72, the vertical stiffness of the secondary rubber stack 72 is 4.85 kN/mm, and the static deflection is 12 mm. Each side of the framework 10 is provided with two sets of secondary rubber stacks 72, which are longitudinally arranged on the center line of the side beam 11. Each side of the framework 10 is respectively provided with a secondary transverse shock absorber 71, which is obliquely symmetrically arranged. The outer side of the side beam 11 is respectively provided with a secondary transverse stop 73.

[0045] In an embodiment, as shown in FIG. 1 and FIG. 10, the bogie further includes a stone discharging and sanding device 80, and the stone discharging and sanding device 80 includes: a fixed frame 81, the fixed frame 81 being connected to the framework 10; a mounting seat 82, the mounting seat 82 being connected with the fixed frame 81, and being positionally adjustably provided relative to the fixed frame 81; a stone discharging pipe 83, the stone discharging pipe 83 being connected to the mounting seat 82; a connecting frame 84, the connecting frame 84 being connected with the mounting seat 82, and being positionally adjustably provided relative to the fixed frame 81; a sanding pipe 85, the sanding pipe 85 being provided on the connecting frame 84; and a sanding bracket 86, the sanding bracket 86 being connected with the sanding pipe 85; where, the connecting frame 84 and the mounting seat 82 synchronously move relative to the fixed frame 81, so that the stone discharging pipe 83 and the sanding pipe 85 move synchronously.

[0046] Specifically, the stone discharging pipe 83 and the sand scattering pipe 85 belong to synchronous position adjustment, that is, according to the distances to the rail surface. The mounting seat 82 is connected with the connecting frame 84, thus achieving the synchronous movement of the mounting seat 82 and the connecting frame 84 relative to the fixed frame 81, so as to achieve the synchronous movement of the stone discharging pipe 83 and the sand scattering pipe 85.

[0047] In an embodiment, as shown in FIG. 10, a strip-shaped hole 89 can be provided on the fixed frame 81 and the connecting frame 84. A bolt is threaded into the strip-shaped hole 89, and is fixed by a second nut 88. Thus, when the position is adjusted, the second nut 88 is loosened, so that the connecting frame 84 moves relative to the fixed frame 81, and the stone discharging pipe 83 and the sand scattering pipe 85 move synchronously.

[0048] In an embodiment, as shown in FIG. 10, a plurality of round holes 90 can be provided on the fixed frame 81. A bolt passes through the mounting seat 82, then is threaded into a certain round hole 90 and fixed through a first nut 87. When the position is adjusted, the first nut 87 is loosened, so that the mounting seat 82 moves relative to the fixed frame 81, and the stone discharging pipe 83 and the sand scattering pipe 85 move synchronously. The bolt is threaded into another round hole 90 and fixed through the first nut 87.

[0049] An embodiment of the present disclosure further provides a locomotive, referring to FIG. 11, including the bogie described above and a vehicle body 1.

[0050] In an embodiment, the lower part of the chassis of the vehicle body 1 is provided with two bogies, a main converter cabinet, a fuel tank, a battery, etc.

[0051] In an embodiment, the bogie is a power bogie suitable for a light shunting locomotive, and the bogie is suitable for a lightweight shunting locomotive having a locomotive length≤15000 mm, a shaft weight of 15t-18t, a shaft type of B0-B0, a maximum speed of 80 km/h, a single-axis traction forced 62.5kN, a traction motor power≤200kW, a minimum curve radius of R100m, and a

bogie longitudinal size≤4200mm (without a traction device), which satisfy the requirements of European dynamic gauge and domestic railway gauge.

[0052] The lower part of the vehicle body of the locomotive is provided with a main converter cabinet, a fuel tank and other components along the longitudinal direction. The lower part of the vehicle body occupies a relatively large space, and the longitudinal size of the bogie is limited in a relatively small space. The bogie needs to be designed with a reasonable structural layout, a proper wheelbase, a proper traction mode and framework structure on the premise that the strength requirement of each bearing part is ensured, the functions of all the moving parts are normally exerted, and the dynamic performance is good. The upper part of the vehicle body chassis of the locomotive needs a larger space for arrangement requirements of locomotive pipelines, circuits and the like, and the bogie suspension system needs to adopt a suspension parameter of primary soft and secondary hard, resulting in that the primary suspension system cannot provide enough wheel pair lateral positioning stiffness by adopting a spring plus a single-pull rod structure. The positioning structure is relatively complex and occupies a certain longitudinal space size if a spring plus double pull rod wheel is used. Therefore, a primary spring with large deflection and a triangular axle box pull rod structure are adopted for cooperation, so as to achieve the primary being soft and an appropriate wheel pair lateral positioning stiffness. The bogie structure can satisfy the mounting of two braking modes of the foundation braking device, that is the tread braking and wheel disc braking. The bogie rim lubricating device adopts an oil and gas rim lubrication technology, and the lubricating grease is a degradable material, reducing the influence on the environment. The paint components of the bogie all employ aqueous coatings, reducing pollution to the environment.

[0053] Other embodiments of the present disclosure will be apparent to those skilled in the art from consideration of the description and practice of the invention disclosed here. The present disclosure is intended to cover any variations, uses, or adaptations of the invention following the general principles of the present disclosure and including common general knowledge or conventional technical means in the art not disclosed in this disclosure. The description and example embodiments are considered as exemplary only, with a true scope and spirit of the disclosure being indicated by the preceding claims.

[0054] It should be understood that the present disclosure is not limited to the exact construction that has been described above and illustrated in the accompanying drawings, and that various modifications and changes may be made without departing from the scope of them. The scope of the present disclosure is limited only by the appended claims.

Claims

1. A bogie, comprising:

a framework (10), the framework (10) comprising two side beams (11), a first end beam (12) and a second end beam (13), the first end beam (12) being formed with a first recess (121) and a second recess (122), the first recess (121) being located at an upper portion of the first end beam (12), the first end beam (12) protruding downward, and the second recess (122) being located on a side portion of the first end beam (12);

a traction device (20), two ends of the traction device (20) being respectively connected to the first end beam (12) and a vehicle body (1), an end of the traction device (20) being located at a lower portion of the first end beam (12) so that the traction device (20) is obliquely provided, and an opening of the second recess (122) being towards a direction of anther end of the traction device (20);

an axle device (30), the axle device (30) being connected to the framework (10);

a driving device (40), the driving device (40) being connected to the framework (10) and in driving connection with the axle device (30); and

a braking device (50), the braking device (50) being connected to the framework (10).

2. The bogie according to claim 1, wherein the first end beam (12) comprises:

an upper cover plate (123), the upper cover plate (123) being formed with the first recess (121);

a lower cover plate (124), the lower cover plate (124) being provided opposite to the upper cover plate (123), and the lower cover plate (124) being a bent plate and protruding towards a direction away from the upper cover plate (123);

a vertical plate (125), two ends of the vertical plate (125) being respectively connected to the upper cover plate (123) and the lower cover plate (124);

wherein, the upper cover plate (123), the lower cover plate (124) and the vertical plate (125) form the second recess (122), and an end of the traction device (20) is located at a lower portion of the lower cover plate (124).

3. The bogie according to claim 2, wherein the traction device (20) comprises a traction rod (21), a vehicle body traction seat (22), a bogie traction seat (23), two traction rubber joints (24) and two trays (25), the vehicle body traction seat (22) and the bogie traction seat (23) are respectively connected to two ends of the traction rod (21) through corresponding traction

rubber joints (24) and trays (25), the vehicle body traction seat (22) is connected with the vehicle body (1), and the first end beam (12) further comprises:

a traction seat plate (126), the traction seat plate (126) being connected with the lower cover plate (124), the lower cover plate (124) being inserted into the traction seat plate (126), and the bogie traction seat (23) being connected with the traction seat plate (126); and
a reinforcing rib (127), the reinforcing rib (127) connecting the lower cover plate (124) and the vertical plate (125).

4. The bogie according to claim 2, wherein the upper cover plate (123) comprises:

a first plate section (1231);
a second plate section (1232), the second plate section (1232) being a bent plate, there being two second plate sections (1232), and the two second plate sections (1232) being respectively connected to two ends of the first plate section (1231); and
a third plate section (1233), the third plate section (1233) being a straight plate, there being two third plate sections (1233), and the two third plate sections (1233) being respectively connected to ends of the two second plate sections (1232) away from the first plate section (1231), an upper surface of the third plate section (1233) being higher than an upper surface of the first plate section (1231), and a reserved space being provided below the third plate section (1233);
wherein, the braking device (50) is a wheel disc braking device, and the braking device (50) is mounted in the reserved space.

5. The bogie according to claim 1, wherein the axle device (30) comprises an axle (31), two wheels (32) and two axle boxes (33), the two wheels (32) are provided on the axle (31) at intervals, the two axle boxes (33) are respectively provided at two ends of the axle (31), the bogie further comprises a primary suspension device (60), and the primary suspension device (60) comprises:

an axle box pull rod (61), two ends of the axle box pull rod (61) being respectively connected to the framework (10) and the axle box (33);
a primary suspension spring (62), two ends of the primary suspension spring (62) being respectively connected to the framework (10) and the axle box (33); and
a primary vertical shock absorber (63), two ends of the primary vertical shock absorber (63) being respectively connected to the framework (10) and the axle box (33).

6. The bogie according to claim 5, wherein a distance between the two wheels (32) is adjustably provided, and a mounting position of the axle box (33) is a fixed position.

7. The bogie according to claim 1, wherein the framework (10) further comprises a cross beam (14), two ends of the cross beam (14) are respectively connected to middle portions of the two side beams (11), and the driving device (40) comprises:

a gear mechanism (41), the gear mechanism (41) being connected with the axle device (30);
a motor (42), the motor (42) being in driving connection with the gear mechanism (41);
a motor hanger seat (43), the motor hanger seat (43) being connected with the motor (42);
a motor hanger rod (44), the motor hanger rod (44) being connected with the motor hanger seat (43) through a motor suspension rubber sleeve (45), and the motor hanger rod (44) being connected with the cross beam (14);
an anti-fall seat (46), the anti-fall seat (46) being provided on the motor (42); and
an anti-fall pin (47), the anti-fall pin (47) being provided on the cross beam (14) so that the anti-fall pin (47) is in limit contact with the anti-fall pin (47) when the motor hanger rod (44) is disengaged from the cross beam (14).

8. The bogie according to claim 1, wherein the braking device (50) is a foundation braking device, the braking device (50) comprises a wheel disc brake (51) and a tread brake (52), the wheel disc brake (51) and the tread brake (52) are both connected to the framework (10), the bogie further comprises a secondary suspension device (70), and the secondary suspension device (70) comprises:

a secondary transverse shock absorber (71), two ends of the secondary transverse shock absorber (71) being respectively connected to the side beam (11) and the vehicle body (1), there being two secondary transverse shock absorbers (71), and the two secondary transverse shock absorbers (71) being distributed diagonally and respectively connected to the two side beams (11);
a secondary rubber stack (72), the secondary rubber stack (72) being provided on the side beam (11); and
a secondary transverse stop (73), the secondary transverse stop (73) being provided on the side beam (11), and an end of the secondary transverse stop (73) being provided opposite to the vehicle body (1);
wherein, the braking device (50) is mounted in a middle portion of the framework (10) and close

to the secondary suspension device (70).

9. The bogie according to claim 1, wherein the bogie further comprises a stone discharging and sanding device (80), and the stone discharging and sanding device (80) comprises:

a fixed frame (81), the fixed frame (81) being connected to the framework (10);
a mounting seat (82), the mounting seat (82) being connected with the fixed frame (81) and positionally adjustably provided relative to the fixed frame (81);
a stone discharging pipe (83), the stone discharging pipe (83) being connected to the mounting seat (82);
a connecting frame (84), the connecting frame (84) being connected with the mounting seat (82) and positionally adjustably provided relative to the fixed frame (81);
a sanding pipe (85), the sanding pipe (85) being provided on the connecting frame (84); and
a sanding bracket (86), the sanding bracket (86) being connected with the sanding pipe (86);
wherein, the connecting frame (84) and the mounting seat (82) synchronously move relative to the fixed frame (81), so that the stone discharging pipe (83) and the sanding pipe (85) move synchronously.

10. A locomotive, comprising the bogie according to any one of claims 1 to 9 and a vehicle body (1).

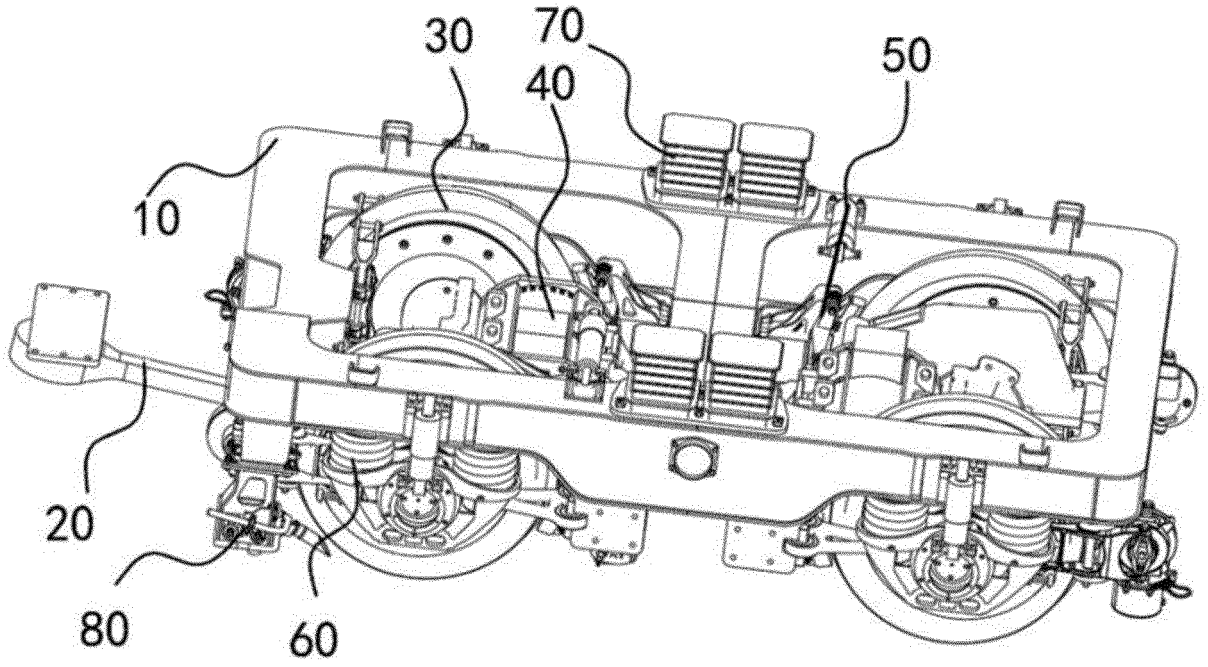


FIG. 1

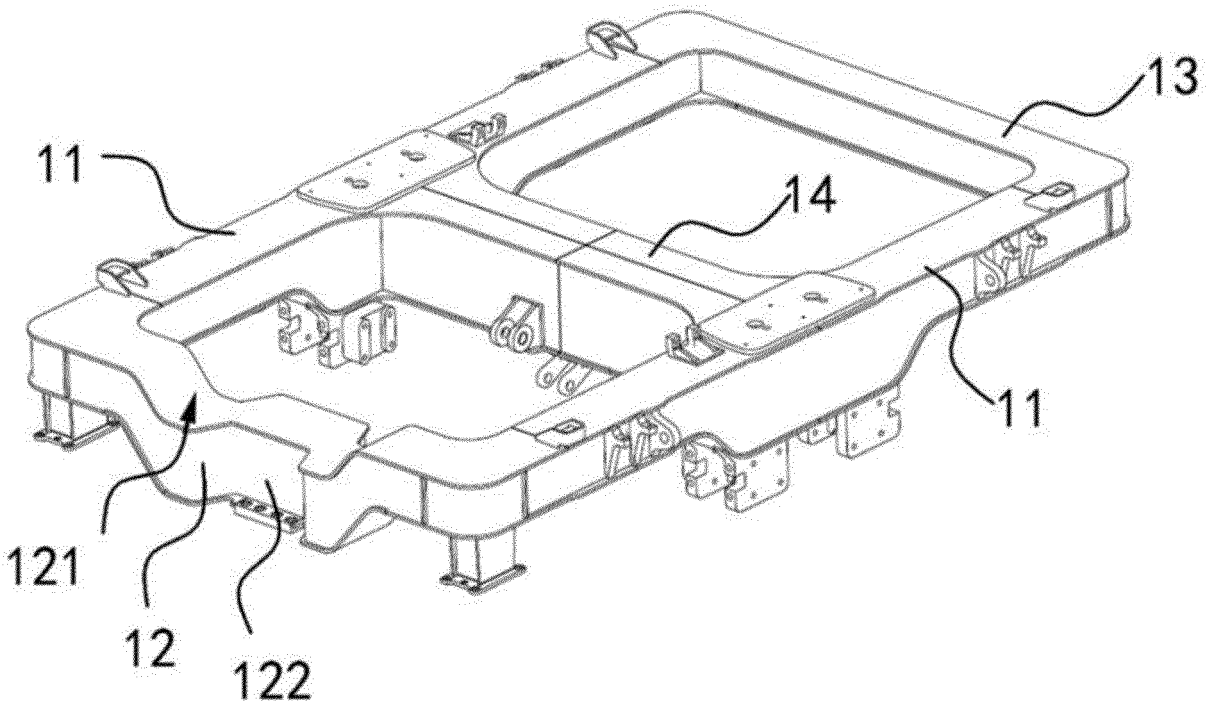
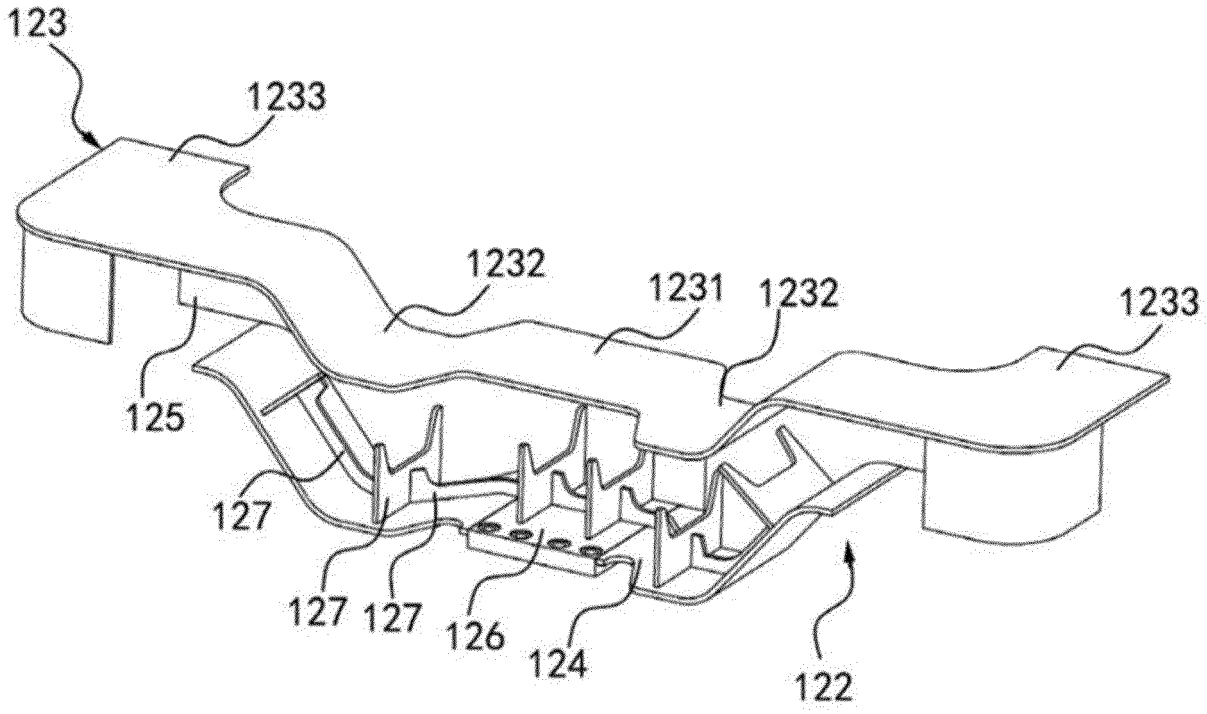


FIG. 2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1233
1232
1231
1232
1233
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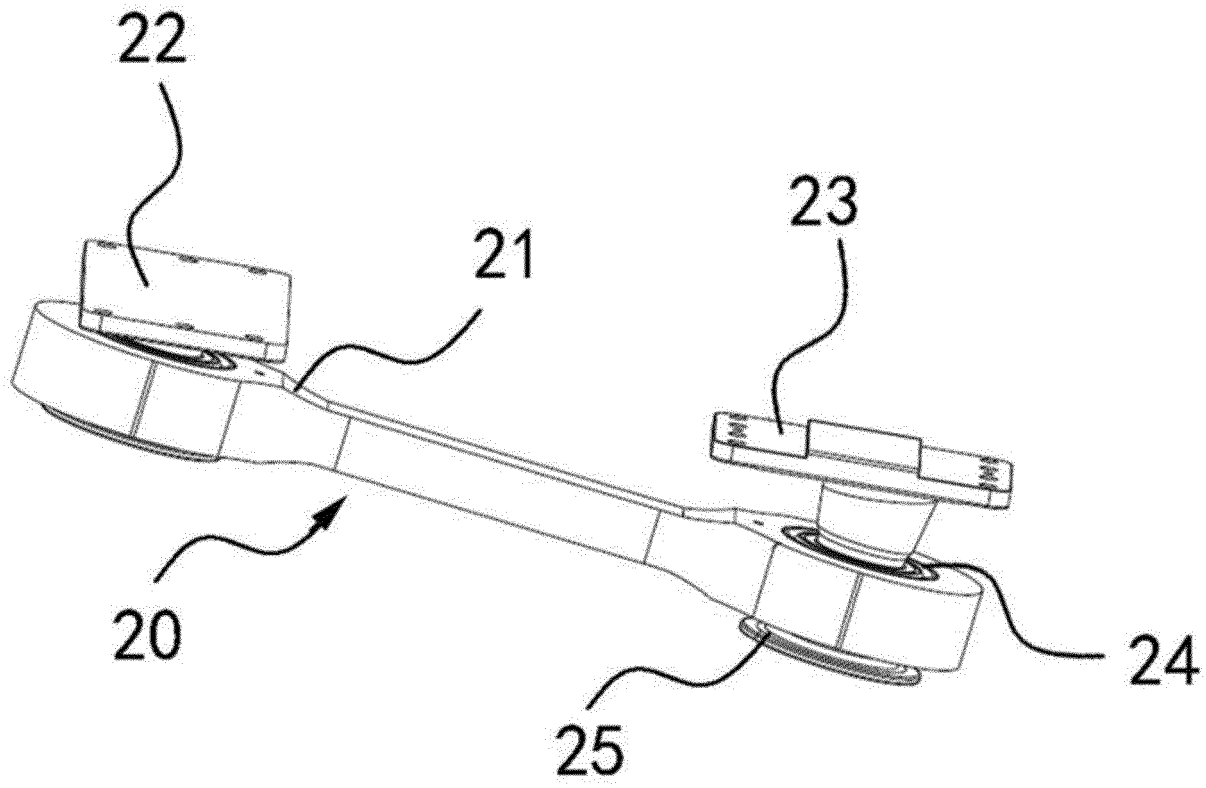
127
126
124
122

FIG. 3


22
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23
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24
25

FIG. 4

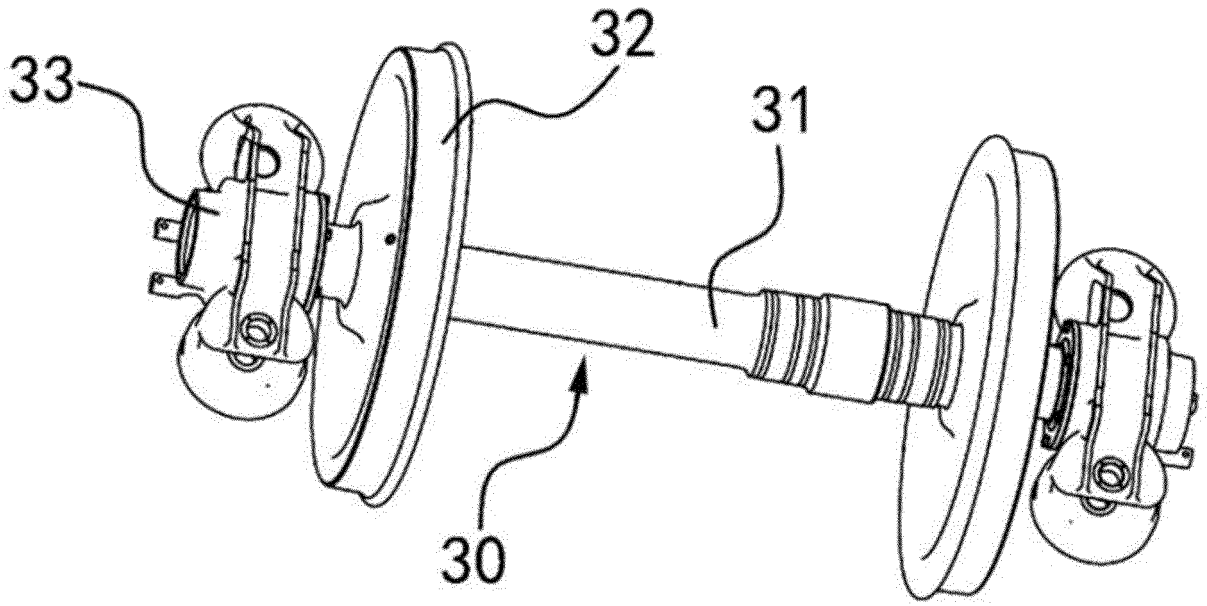

FIG. 5

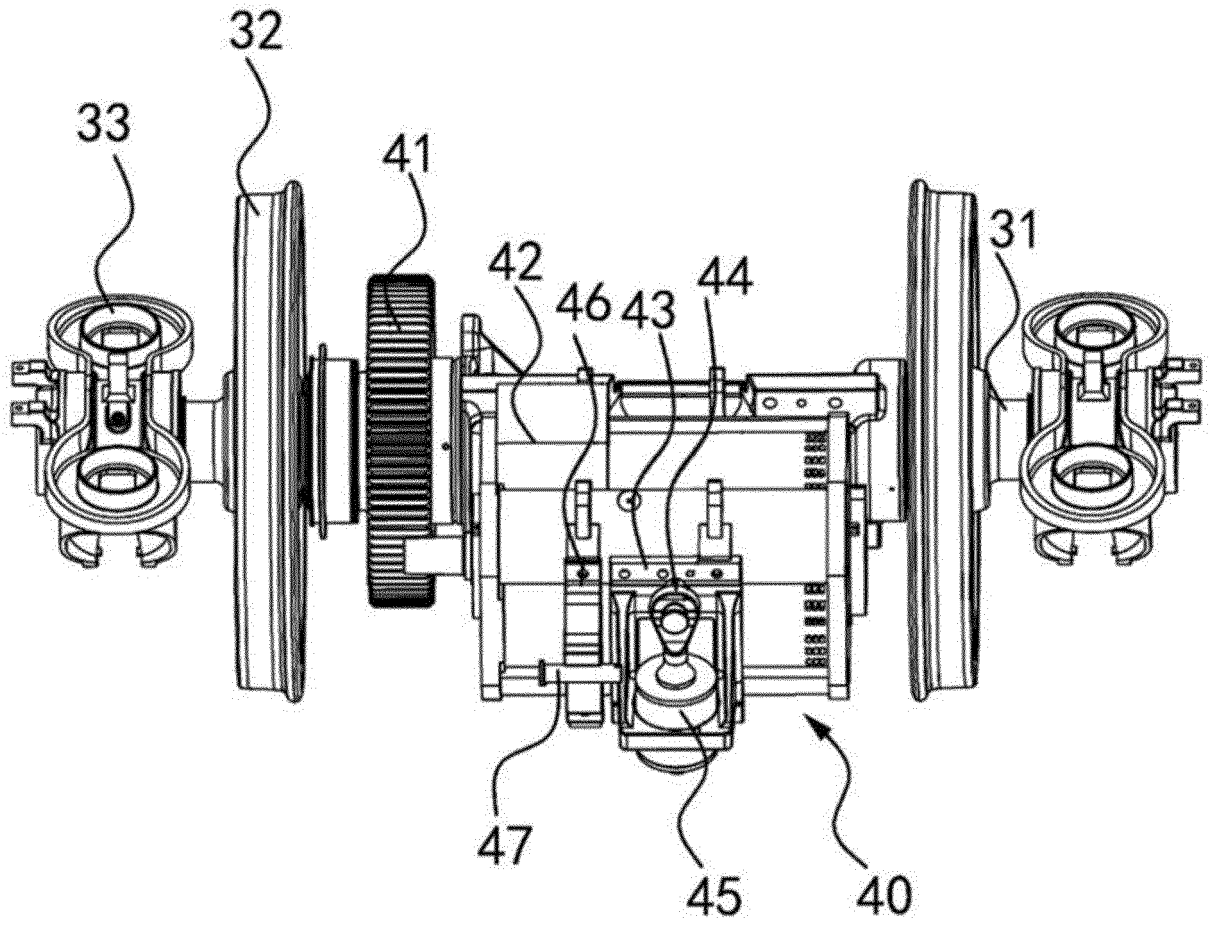

FIG. 6

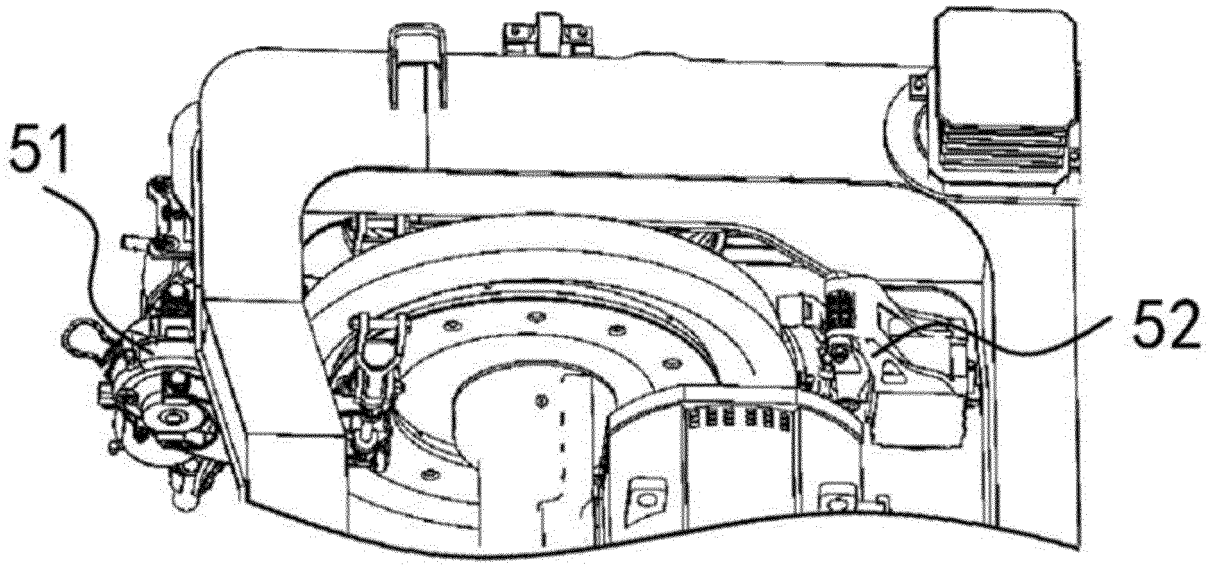

FIG. 7

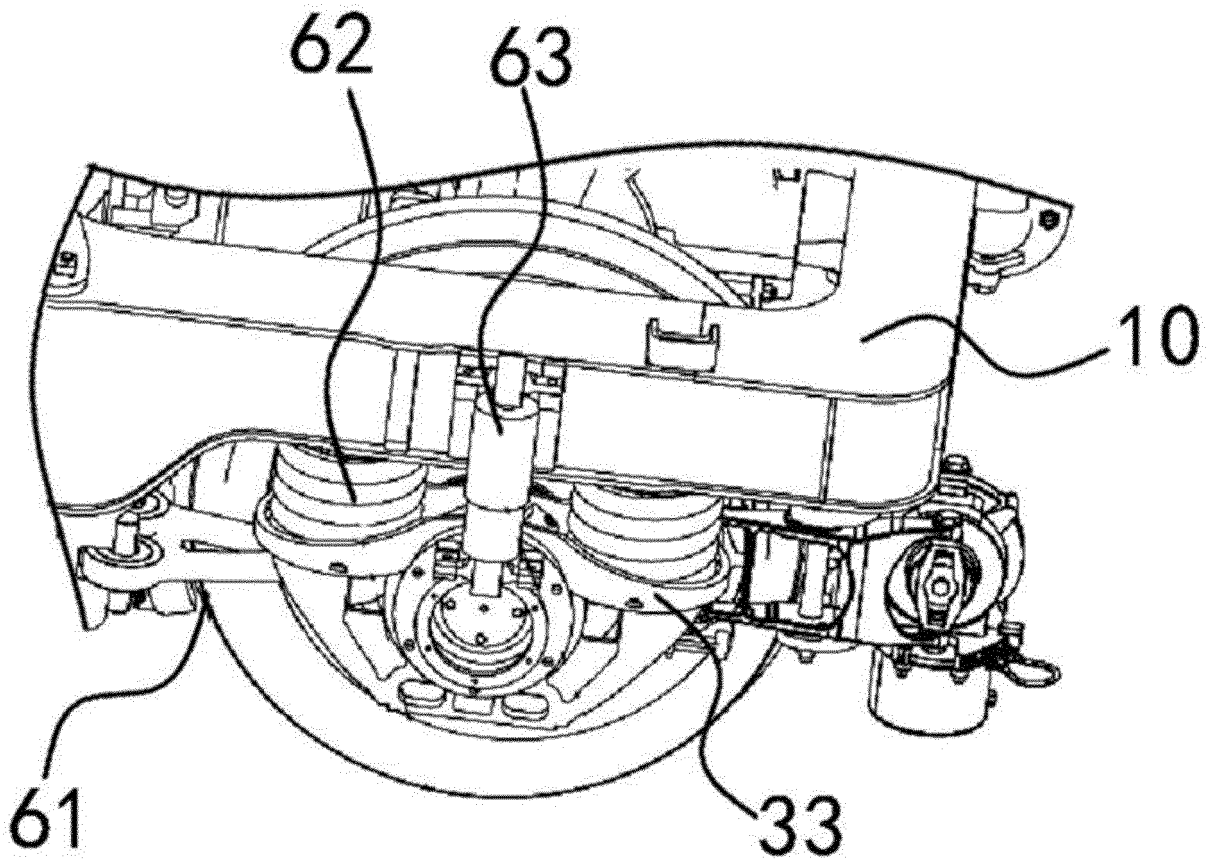

FIG. 8

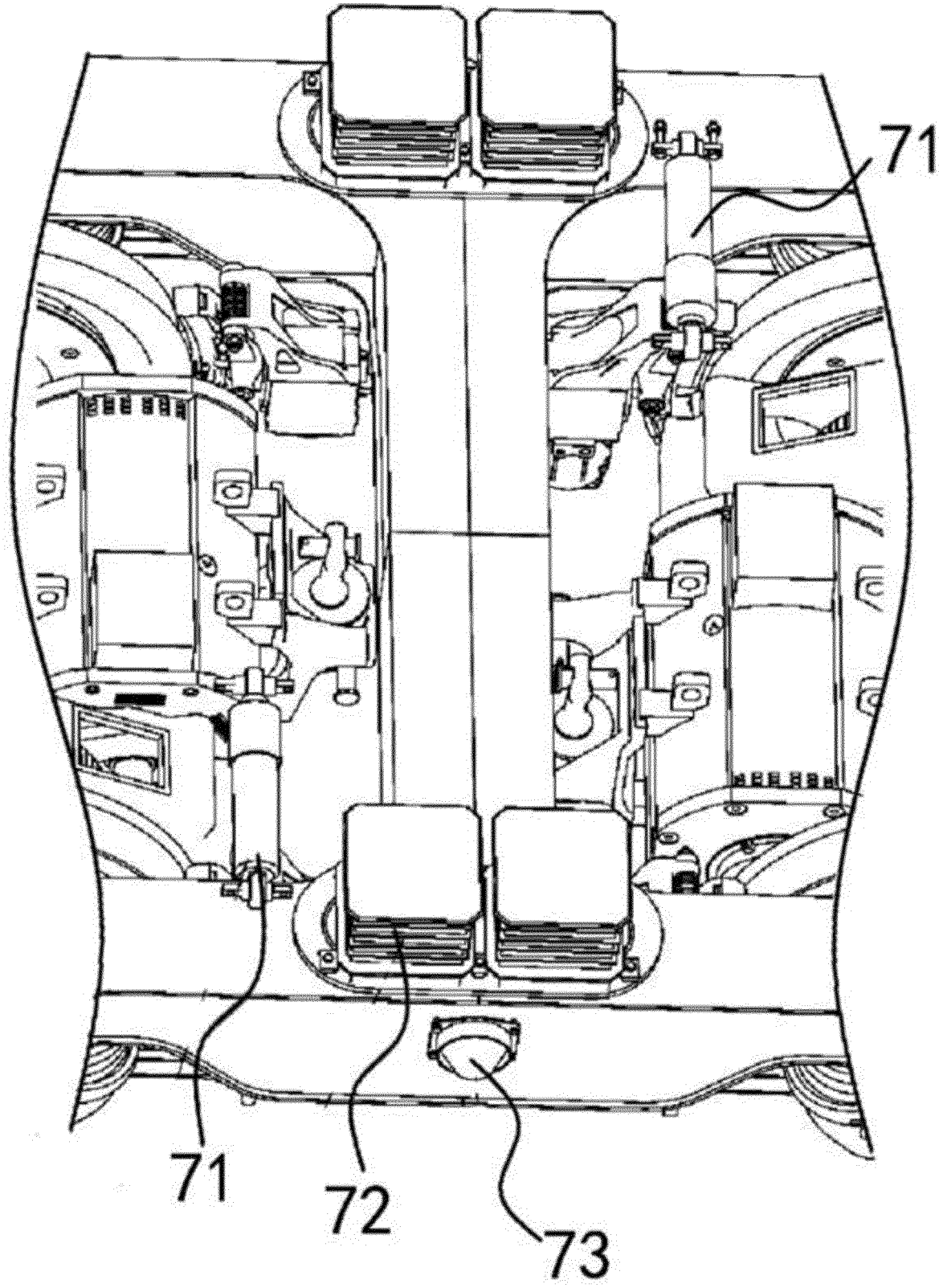

FIG. 9

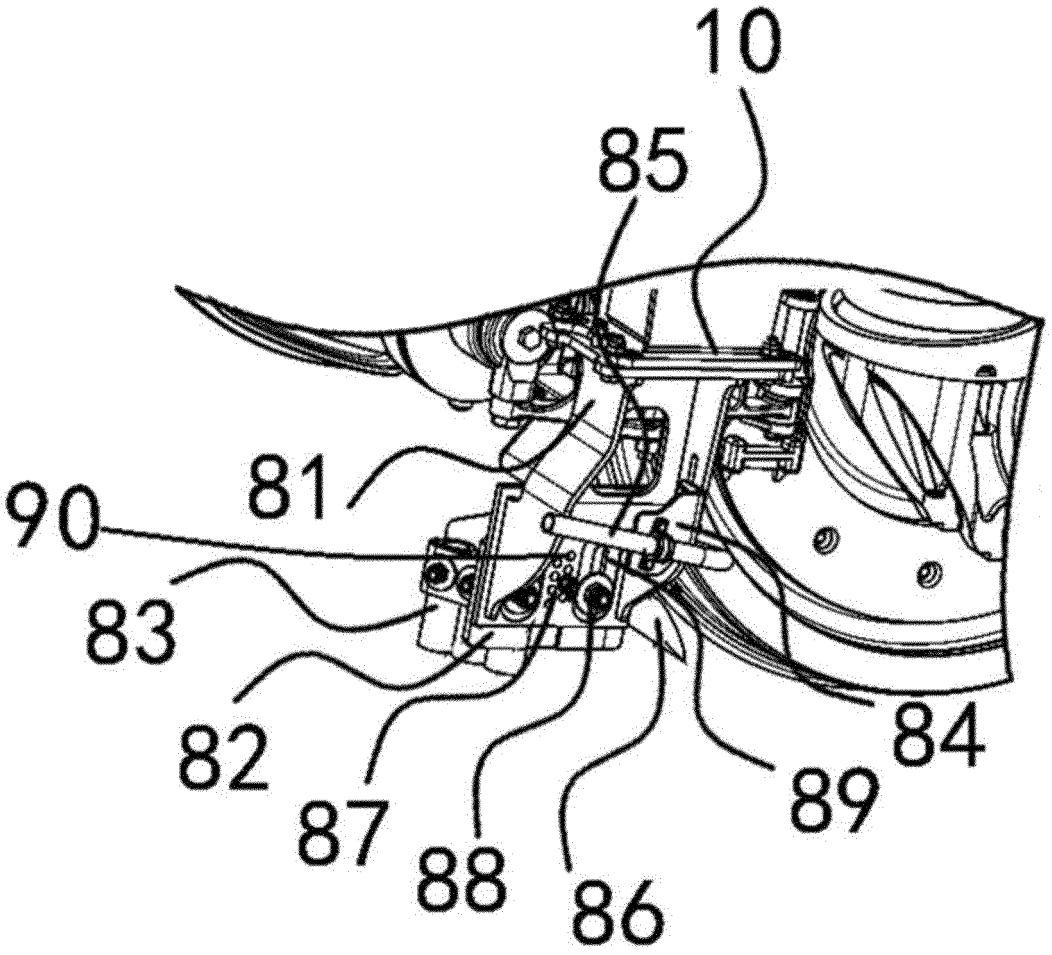

FIG. 10

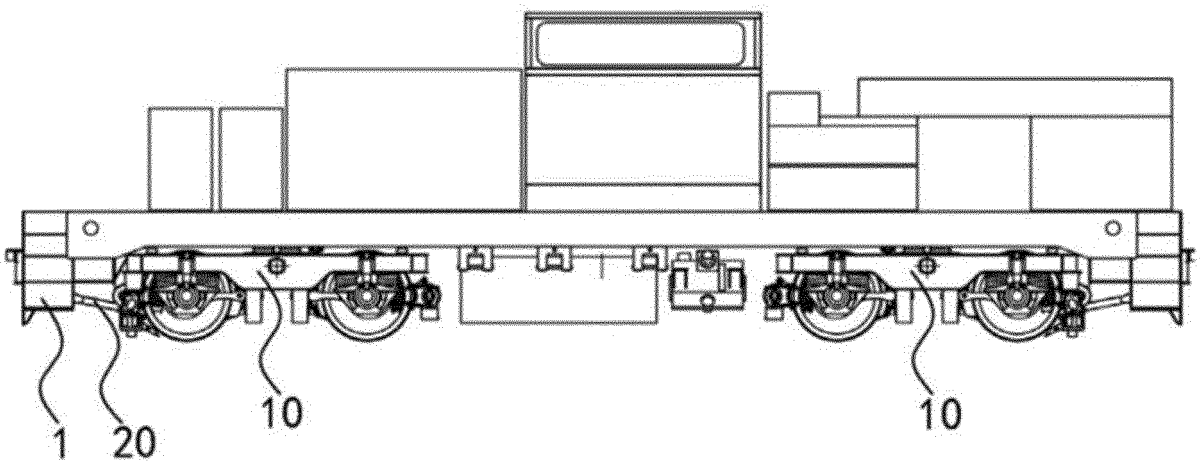

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/108244

A. CLASSIFICATION OF SUBJECT MATTER

B61F 5/50(2006.01)i; B61F 5/52(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; 大同电力机车; 转向架, 构架, 端梁, 边梁, 牵引梁, 推挽, 斜, 牵引, 杆 , 牵引拉杆, 避让槽, 凹槽, 凹口, 缺口, 凹陷, 容置槽, 容纳槽, 凹, 凸, 弯, 避让, 避开, 躲避, 让位; bogie, truck, frame, end, boundary, beam, grider, push+, pull+, tract+, draw+, oblique, diagonal, notch+, concav+, open+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 112026828 A (CRRC DATONG CO., LTD.) 04 December 2020 (2020-12-04) entire document	1-10
A	CN 110962873 A (CRRC DATONG CO., LTD.) 07 April 2020 (2020-04-07) description, paragraphs [0010]-[0050], and figures 1-9	1-10
A	CN 104477193 A (BEIJING FEB.7TH RAILWAY TRANSPORTATION EQUIPMENT CO., LTD.) 01 April 2015 (2015-04-01) entire document	1-10
A	CN 107738660 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 27 February 2018 (2018-02-27) entire document	1-10
A	CN 105216824 A (CSR ZHUZHOU ELECTRIC LOCOMOTIVE CO., LTD.) 06 January 2016 (2016-01-06) entire document	1-10
A	RU 2320508 C1 (FEDERAL NOE GUP VSEROSSIJSKIJ) 27 March 2008 (2008-03-27) entire document	1-10

☑ 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
28 September 2021	**22 October 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** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/108244

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 202294848 U (BAOJI CSR TIMES ENGINEERING MACHINERY CO., LTD.) 04 July 2012 (2012-07-04) entire document	1-10
A	CN 201506365 U (DALIAN LOCOMOTIVE & ROLLING STOCK CO., LTD. CNR GROUP) 16 June 2010 (2010-06-16) entire document	1-10

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/108244

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 112026828 A	04 December 2020	None	
CN 110962873 A	07 April 2020	CN 110962873 B	02 February 2021
CN 104477193 A	01 April 2015	CN 104477193 B	29 March 2017
CN 107738660 A	27 February 2018	None	
CN 105216824 A	06 January 2016	None	
RU 2320508 C1	27 March 2008	None	
CN 202294848 U	04 July 2012	None	
CN 201506365 U	16 June 2010	None	

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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