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(54) **BOLSTER-LESS FRAMED BOGIE SUITABLE FOR HIGH-SPEED FREIGHT WAGON**

(57) A bolster-less framed bogie suitable for a high-speed railway freight wagon, the bogie comprising comprising a frame assembly (200), four tumbler axle box positioning devices (400), and two wheelset assemblies (500); the frame assembly (200) includes a pair of box-shaped side beams (210), two round steel crossbeams (220), two longitudinal connection beams (230), and a guide pin assembly (240); two ends of each of the round steel crossbeams (220) are respectively fixed on one of the box-shaped side beams (210) to form an H-shaped structure; the longitudinal connection beams (230) and the guide pin assembly (240) are disposed within a space enclosed by means of the pair of box-shaped side beams (210) and the two round steel crossbeams (220); a middle portion of each of the box-shaped side beams (210) is U-shaped to form a U-shaped middle section (214), a mounting platform for rubber pile spring of secondary suspension (214a) is provided at a concave part of the U-shaped middle section (214), and a rubber pile spring of secondary suspension (300) is disposed on the mounting platform for rubber pile spring of secondary suspension (214a); a top of the rubber pile spring of secondary suspension (300) is provided with a positioning seat boss (304) matched with a

positioning hole on a wagon body; the guide pin assembly (240) is located between the pair of box-shaped side beams (210), and two sides of the guide pin assembly (240) are respectively provided with first transverse damper mounting seats (241); the two longitudinal connection beams (230) are respectively located on a side of the guide pin assembly (240) and are respectively provided with a second transverse damper mounting seat (234); the first transverse damper mounting seats (241) are respectively connected to one second transverse damper mounting seat (234) by means of a transverse hydraulic damper (130); a first traction rod seat (242) is provided at a lower portion of the guide pin assembly (240), and a second traction rod seat (223) is provided at a lower portion of one of the round steel crossbeams (220), and a traction rod assembly (120) is provided between the first traction rod seat (242) and the second traction rod seat (223); an anti-hunting damper (110) is provided at an outer side of the frame assembly (200); end portions of the pair of box-shaped side beams (210) are connected to the two wheelset assemblies (500) by means of the four tumbler axle box positioning devices (400); a plurality of disc-shaped brake devices (600) is provided between each of the round steel crossbeams

(220) and an axle (501) of each of the wheelset assemblies (500). The bogie may meet the requirements of a railway freight wagon with a running speed of 200 km/h.

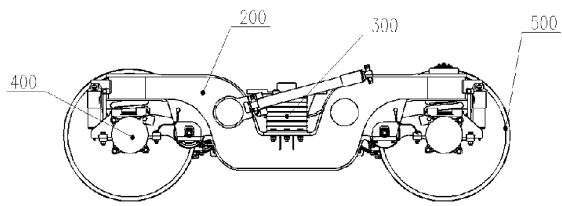


FIG.1

## Description

### TECHNICAL FIELD

[0001] The disclosure relates to a bogie for a freight wagon, in particular to a bolster-less framed bogie suitable for a high-speed railway freight wagon.

### BACKGROUND OF THE DISCLOSURE

[0002] At present, there has been much progress in the research of a bogie of an express freight wagon, and most researches focus on the bogie that meets the running speed of 160km/h. In order to meet the demand of domestic railway freight, it is necessary to further develop a bogie that meets a requirement of a high-speed freight wagon with a maximum running speed of 200km/h on the basis of 160km/h bogie.

[0003] The existing bogies for the express freight wagon are all welding framed bogies, and there are three main categories: Linoer damper positioning framed bogie with a swing table structure, rubber pile guide pillar positioning framed bogie with no swing table and with top-mounted bolster, and rubber spring positioning framed bogie with no swing table and with top-mounted bolster.

[0004] A Chinese patent application No. CN200620034959.8 (publication No. CN200945865 Y) discloses an express railway freight wagon bogie, which belongs to a framed bogie with a top-mounted bolster and with no swing table, wherein a primary suspension device is positioned by an axle box and a metal-liquid rubber composite spring, and a secondary suspension device between the bolster and the frame adopts a rubber pile spring, an elastic side bearing of constant contact double-acting rollers, and two sets of disc-shaped brakes.

[0005] A Chinese patent No. CN01275171.5 (publication No. CN2517641 Y) discloses a high-speed freight wagon bogie, which also belongs to a framed bogie with a top-mounted bolster and with no swing table, wherein a primary suspension device thereof adopts a guide-pillar style rubber spring for positioning, and two crossbeams are used to connect two side beams to form an H-shaped frame, which also uses disc-shaped brakes.

[0006] The above two kinds of bogies for express both adopt a tray-style axle box positioning structure and an axle box spring is a metal-liquid rubber composite spring. Defects thereof are as follows, such as being difficult to match three-directional rigidity, and poor ability to restrain the hunting movement of the wheelset, poor stability in high-speed running, and poor reliability for long-term high-speed running and poor maintenance economy due to using wear parts, etc., and the maximum running speed thereof is 160km/h.

[0007] A Chinese patent application No. CN201110440779.5 (publication No. CN102490755 A) discloses a "high-speed railway freight wagon bogie", which uses a bolster-less tumbler framed bogie and may

meet the requirements of a running speed of 200km/h and axle weight of 16.5t. The two side beams of the bogie are connected through a large central crossbeam and two small crossbeams. Although the bolster is removed, the large central crossbeam is provided, which increases the weight of the bogie and manufacturing difficulty.

[0008] Chinese patent application No. CN201310681744.X (Publication No. CN103661463 A) discloses "a high-speed railway freight wagon bogie", which also uses a bolster-less tumbler framed bogie and may meet the requirements of a running speed of 200km/h. The bogie resembles a passenger car bogie, and the second suspension spring adopts an air spring structure, which is complicated in structure and inconvenient for installation and maintenance, resulting in increased costs in manufacturing, maintenance, and repairing of the bogie.

### SUMMARY OF THE DISCLOSURE

[0009] The disclosure provides a bolster-less framed bogie suitable for a high-speed railway freight wagon, which is lightweight and can meet the requirements of a running speed of 200 km/h.

[0010] In order to achieve the above objects, the bolster-less framed bogie suitable for a high-speed railway freight wagon according to the disclosure, comprising a frame assembly, four tumbler axle box positioning devices and two wheelset assemblies; wherein the frame assembly includes a pair of box-shaped side beams, two round steel crossbeams, two longitudinal connection beams and a guide pin assembly; two ends of each of the round steel crossbeams are respectively fixed on one of the box-shaped side beams to form an H-shaped structure; the longitudinal connection beams and the guide pin assembly are disposed within a space enclosed by means of the pair of box-shaped side beams and the two round steel crossbeams; a middle portion of each of the box-shaped side beams is U-shaped to form a U-shaped middle section, a mounting platform for rubber pile spring of secondary suspension is provided at a concave part of the U-shaped middle section, and a rubber pile spring of secondary suspension is disposed on the mounting platform for rubber pile spring of secondary suspension ; a top of the rubber pile spring of secondary suspension is provided with a positioning seat boss matched with a positioning hole on a wagon body; the guide pin assembly is located between the pair of box-shaped side beams, and two sides of the guide pin assembly are respectively provided with first transverse damper mounting seats; the two longitudinal connection beams are respectively located on a side of the guide pin assembly and are respectively provided with a second transverse damper mounting seat; and the first transverse damper mounting seats are respectively connected to one second transverse damper mounting seat by means of a transverse hydraulic damper; a first traction rod seat is provided at a lower portion of the guide pin assembly, and a second

traction rod seat is provided at a lower portion of one of the round steel crossbeams, and a traction rod assembly is provided between the first traction rod seat and the second traction rod seat; an anti-hunting damper is provided at an outer side of the frame assembly, and the anti-hunting damper is connected to the wagon body for playing a role of restraining a hunting vibration and improving a critical speed of the bogie; end portions of the pair of box-shaped side beams are connected to the two wheelset assemblies by means of the four tumbler axle box positioning devices; a plurality of disc-shaped brake devices are provided between each of the round steel crossbeams and an axle of each of the wheelset assemblies to ensure a brake force of the bogie.

**[0011]** In some embodiments, each of the longitudinal connection beams includes an upper arc-shaped cover plate, a lower arc-shaped cover plate, and an intermediate partition connected between the upper arc-shaped cover plate and the lower arc-shaped cover plate; the second transverse damper mounting seat is provided at an outer side of a middle portion of the upper arc-shaped cover plate.

**[0012]** In some embodiments, two ends of the longitudinal connection beam are welded to the two round steel crossbeams, and the outer side of the longitudinal connection beam is welded to the box-shaped side beam through a rib plate.

**[0013]** In some embodiments, a transverse stopper seat is provided at a side of a middle portion, close to the guide pin assembly, of the longitudinal connection beam, and a longitudinal stopper seat is arranged at a middle portion of a side, close to the guide pin assembly, of the round steel crossbeam which is not mounted the second traction rod seat. The transverse stopper seat and the longitudinal stopper seat are used to install flexible stoppers to restrict transverse and longitudinal movements of the wagon body relative to the bogie.

**[0014]** In some embodiments, the round steel crossbeams of the frame assembly adopt an arrangement that one is longer than the other; two ends of the longer round steel crossbeam penetrate through the two box-shaped side beams and extend a certain length outwards, and an extended portion of the longer round steel crossbeam is provided with an anti-hunting damper mounting seat; an end of the anti-hunting damper is connected to the anti-hunting damper mounting seat on the round steel crossbeam through an elastic spherical hinge, and another end of the anti-hunting damper is connected to an anti-hunting damper connection seat on a chassis of the wagon body to form a diagonal bracing anti-hunting damper connection structure.

**[0015]** In some embodiments, two ends of the box-shaped side beam are each provided with an axle box spring installation sleeve, a vertical damper mounting seat, and a tumbler seat; each of the tumbler axle box positioning devices includes an axle box body, an elastic suspension system, and a vertical hydraulic damper; the axle box body includes a positioning tumbler, a clamping

hoop, an axle box end cover, an axle box spring bearing platform, a vertical damper support, and an anti-skid device adapter; the elastic suspension system is installed between the axle box spring installation sleeve and the axle box spring bearing platform, and the positioning tumbler is installed on the tumbler seat through an elastic positioning node assembly, and the vertical hydraulic damper is installed between the vertical damper mounting seat and the vertical damper support.

**[0016]** In some embodiments, ends of the two round steel crossbeams are respectively fixed on two sides of the U-shaped middle sections of the pair of box-shaped side beams.

**[0017]** In some embodiments, the traction rod assembly is composed of a traction rod body and a traction rod node, and the traction rod node is a composite member of metal and rubber to release vertical and transverse movements.

**[0018]** In some embodiments, the disc-shaped brake device adopts a shaft disc brake, which includes a brake hanger provided on the round steel crossbeam, a brake caliper mounted on the brake hanger, and a brake disc provided on the axle of each of the wheelset assemblies. In addition, the disc-shaped brake device further includes a unit brake cylinder, an electronic anti-skid device, a load-type empty-load wagon adjustment valve, etc., which adopt conventional structures in the field and do not belong to the improvement content of the disclosure, so they are omitted.

**[0019]** In some embodiments, the rubber pile spring of secondary suspension adopts a rubber-steel plate laminated spring and is installed on the mounting platform for rubber pile spring of secondary suspension through bolts. The rubber-steel plate laminated spring has a "sandwich" structure formed by alternate layers of steel plate and rubber, which provides a relatively high vertical load-bearing capacity and a relatively low transverse rigidity for the bogie.

**[0020]** Compared with the existing structures, the disclosure has the following beneficial effects:

1) The disclosure adopts a bolster-less framed bogie. The frame is composed of two box-shaped side beams and two round steel crossbeams to form an H-shaped structure, which reduces the weight of the bogie, and has stable structural performance, simple structure, and is easy to manufacture and maintenance.

2) The second system spring adopts the rubber pile spring of secondary suspension structure. The rubber pile is a layered "sandwich" structure combining steel plates and rubbers. It adopts a large vertical rigidity and a small transverse rigidity and uses a multi-layer rubber combination to have a high vertical bearing capacity, and a large horizontal shear displacement capacity is provided; a relatively small transverse rigidity is achieved, so that the transverse dynamic performance of the freight wagon is im-

proved, and the structure is simple, and maintenance is convenient, and the cost is low.

3) The second system of the bogie is equipped with an anti-hunting damper, which can effectively restrain the bogie's hunting movement and increase the critical speed of the bogie.

4) Multiple sets of disc-shaped brake devices are adopted, so that sufficient braking force for the bogie is provided, thereby a safe braking distance of the freight wagon is ensured.

5) The bogie axle box adopts a tumbler positioning structure. The tumbler positioning device adjusts the rigidity of the elastic rubber node to make the wheelset have proper longitudinal and transversal positioning rigidity. The structure is reliable and can effectively control the hunting movement of the wheelset and the bogie, so that the dynamic performance of the freight wagon during high-speed running is met.

6) Based on the above reasons, the bolster-less framed bogie meets the requirements of running speed of 200km/h and more.

## BRIEF DESCRIPTION OF THE DRAWINGS

### [0021]

Fig. 1 is a schematic diagram of the front view structure of the bolster-less framed bogie according to the disclosure.

Fig. 2 is a schematic diagram of the top view structure of a bolster-less framed bogie in Fig. 1.

Fig. 3 is a schematic diagram of the structure of a frame assembly in Fig. 1.

Fig. 4 is a cross-sectional view of a rubber pile spring of secondary suspension in Fig. 3.

Fig. 5 is a schematic diagram of the connection structure of an anti-hunting damper in Fig. 1.

Fig. 6 is a schematic diagram of the structure of a round steel crossbeam in Fig. 3.

Fig. 7 is a schematic diagram of the structure of a wheelset assembly in Fig. 1.

Fig. 8 is a schematic diagram of the structure of a longitudinal connection beam in Fig. 3.

FIG. 9 is a schematic diagram of the structure of a guide pin assembly in Fig. 3.

Fig. 10 is a schematic diagram of the structure of a box-shaped side beam in Fig. 3.

Fig. 11 is a schematic diagram of the connection structure of a traction rod assembly of a bolster-less framed bogie in Fig. 1.

Figs. 12 and 13 are schematic diagrams of the structures of an axle box positioning device in Fig. 1 (different perspectives).

[0022] In the above figures, reference numerals corresponding to components and parts are as follows:

Anti-hunting damper 110, traction rod assembly 120, transverse hydraulic damper 130;

frame assembly 200 including: box-shaped side beam 210, outer web plate 211, inner web plate 211a, upper cover plate 212, lower cover plate 213, U-shaped middle section 214, mounting platform for rubber pile spring of secondary suspension 214a, axle box spring installation sleeve 215, vertical damper mounting seat 216, tumbler seat 217, positioning baffle 218, round steel crossbeam 220, brake hanger 221, air path mounting seat 222, second traction rod seat 223, anti-hunting damper mounting seat 224, longitudinal stopper seat 225, longitudinal connection beam 230, upper arc-shaped cover plate 231, lower arc-shaped cover plate 232, intermediate partition 233, second transverse damper mounting seat 234, transverse stopper seat 235, guide pin assembly 240, first transverse damper mounting seat 241, first traction rod seat 242;

rubber pile spring of secondary suspension 300, including: base 301, partition 302, rubber 303, and positioning seat boss 304;

tumbler axle box positioning device 400, including: axle box body 410, axle box end cover 411, positioning tumbler 420, axle box spring bearing platform 421, elastic suspension system 450, inner steel spring 452, outer steel spring 453, first system rubber spring 454, clamping hoop 460, vertical hydraulic damper 470, anti-skid device adapter 480, vertical damper support 490;

wheelset assembly 500, including: axle 501, wheel 502, brake disc 503; disc-shaped brake device 600.

## DETAILED DESCRIPTION OF THE DISCLOSURE

[0023] The disclosure will be further described in detail below in conjunction with the drawings and specific embodiments.

[0024] As shown in Figs. 1-13, it is provided an express freight wagon bogie with a maximum running speed of 200km/h or more, which adopts a bolster-less framed structure, including one frame assembly 200, two rubber pile springs of secondary suspension 300, four tumbler axle box positioning devices 400, two wheelset assemblies 500, six disc-shaped brake devices 600, and two anti-hunting dampers 110.

[0025] As shown in Fig. 3, the frame assembly adopts a traditional H-shaped structure, including two box-shaped side beams 210, two round steel crossbeams 220, a pair of longitudinal connection beams 230, and a guide pin assembly 240.

[0026] As shown in Figs. 3 and 4, a rubber pile spring of secondary suspension 300 includes a base 301, a partition 302, a rubber 303, and a positioning seat boss 304 located on top. The base 301 of the rubber pile spring of secondary suspension is fastened to a mounting platform for rubber pile spring of secondary suspension 214a of

the box-shaped side beam 210 by means of bolts. The partition 302 and the rubber 303 of the rubber pile spring of secondary suspension are arranged in a stacked manner, resembling a "sandwich" structure, which ensures that the rubber pile spring of secondary suspension 300 has a relatively large vertical rigidity and a relatively small transverse rigidity. The positioning scat boss 304 cooperates with a positioning hole on the wagon body, so that a positioning effect is achieved.

**[0027]** As shown in Figs. 3 and 5, the anti-hunting damper 110 is arranged at an end of the round steel crossbeam 220 of the frame assembly. A spherical hinge on an end of the anti-hunting damper 110 is clamped into an anti-hunting damper mounting seat 224 of the round steel crossbeam and is fastened by means of two bolts, and a spherical hinge on the other end of the anti-hunting damper 110 is connected to an anti-hunting damper connection seat of the wagon body.

**[0028]** As shown in Figs. 3 and 6, the two round steel crossbeams 220 of the frame assembly sequentially pass through inner and outer double web plates (including the outer web plate 211 and the inner web plate 211a) of the two box-shaped side beams 210, and the round steel crossbeam 220 and the inner and outer double web plates are connected by means of annular welds. Meanwhile, each of the round steel crossbeams 220 is provided with three brake hangers 221; the brake hangers 221 and the round steel crossbeams 220 adopt lap welds, and the lap welds must be polished into arc transitions; the brake hanger is a four-point positioning structure and is connected with a brake caliper through four bolts. The two round steel crossbeams 220, one of which is longer than the other, and two ends of the longer round steel crossbeam 220 are each welded with an anti-hunting damper mounting seat 224. In addition, a center of the round steel crossbeam 220 is provided with a longitudinal stopper seat 225 being connected by means of lap welds. An air path mounting seat 222 is provided on an inner side of the round steel crossbeam 220, and the air path mounting seat 222 is connected by means of lap welds. A second traction rod seat 223 is provided beneath one of the round steel crossbeams 220, and the second traction rod seat 223 is connected by means of lap welds.

**[0029]** As shown in Fig. 7, the wheelset assembly 500 includes two RC22-type axles 501 and four HCS-type wheels 502. The diameter of a wheel is 915mm, with LM-type tread conforming to TB/T449; a wheel material is CL60 steel, and an axle material is LZ45CrV steel, and a brake disc material is vermicular graphite cast iron or forged steel. Three brake discs 503 are installed on the axle 501 and form a disc-shaped brake device 600 together with the brake caliper and the like on the brake hangers 221.

**[0030]** As shown in Figs. 3 and 8, each of the longitudinal connection beams 230 is arranged between the two round steel crossbeams 220 and is a plate welding structure, and lap welds are used between an upper arc-shaped cover plate 231, a lower arc-shaped cover plate

232, an intermediate partition 233 and the round steel crossbeams 220, and the lap welds must be polished with an arc transition to form a dovetail shape; a second transverse damper mounting seat 234 is welded to an outer side of a middle position of the arc-shaped cover plates 231 of the pair of longitudinal connection beams; a transverse stopper seat 235 is welded on an inner side of the intermediate partition of the longitudinal connection beam.

**[0031]** As shown in Figs. 3 and 9, a guide pin assembly 240 is provided at a center of the frame assembly 200. The guide pin assembly 240 is a plate welding structure. Two sides of the guide pin assembly 240 are provided with first transverse damper mounting seats 241. The first transverse damper mounting seats 241, together with the second transverse damper mounting seat 234 of the longitudinal connection beam 230, are fastened with two transverse hydraulic dampers 130 by means of bolts. As shown in Fig. 11, a first traction rod seat 242 on a lower portion of the guide pin assembly 240 is connected to a second traction rod seat 223 of a round steel crossbeam 220 through a traction rod assembly 120. The traction rod assembly 120 is composed of a traction rod body and a traction rod node, and the traction rod node is a composite member of metal and rubber.

**[0032]** As shown in Fig. 3 and Fig. 10, each of the box-shaped side beams includes an outer web plate 211 and an inner web plate 211a, an upper cover plate 212 and a lower cover plate 213. Arc-shaped upper and lower cover plates of the box-shaped side beam are welded to form a whole by means of butt welds and then welded with the outer web plate 211 and the inner web plate 211a to form a box-shaped structure. In the embodiment, a middle portion of the box-shaped side beam 210 is recessed into a U-shape, forming a U-shaped middle section 214. A mounting platform for rubber pile spring of secondary suspension 214a is welded to a bottom face of the U-shaped middle section 214 which is welded to the upper cover plate 212 of the box-shaped side beam by means of butt welds, so as to facilitate the installation of the rubber pile spring of secondary suspension 300. Two ends, between the arc-shaped upper and lower cover plates, of the box-shaped side beam 210 are each provided with an axle box spring installation sleeve 215; the lower cover plate 213 of the box-shaped side beam is provided with a hole with a same inner diameter as the axle box spring installation sleeve 215 at a position corresponding to a position of the axle box spring installation sleeve 215, and a first system axle box spring (elastic suspension system 450) is installed in the cylindrical cavity formed by the hole; any one of the four axle box spring installation sleeves 215 may be chosen to be provided thereon with a weighing valve mounting seat 215a to mount a weighing valve; meanwhile, a vertical damper mounting seat 216 is provided on an outer end face of each axle box spring installation sleeve 215. In the embodiment, to ensure the strength of the vertical damper mounting seat 216, an integral forging piece is adopted,

and the seat is opened to be connected with the axle box spring installation sleeve 215 by means of lap welds.

**[0033]** As shown in Figs. 12 and 13, the tumbler axle box positioning device 400 includes an axle box body 410, an elastic suspension system 450, and a vertical hydraulic damper 470. The axle box body 410 is formed after a positioning tumbler 420 and a clamping hoop 460 are enclosed and fastened by means of bolts. A wheelset bearing is disposed in a cavity of the axle box body 410, and an axle box end cover 411 is installed at an outer end of the cavity of the axle box body 410, and an anti-skid device adapter 480 for installing an anti-skid device is provided on a side of the axle box body 410.

**[0034]** A top face of a pivoting end of the positioning tumbler 420 is provided with an axle box spring bearing platform 421. The elastic suspension system 450 is installed between the axle box spring bearing platform 421 and the axle box spring installation sleeve 215 at an end of the box-shaped side beam 210. The vertical hydraulic damper 470 is installed between the vertical damper support 490 provided at a rear end of the axle box body 410 and the vertical damper mounting seat 216 at an end of the box-shaped side beam 210; a fixed end of the positioning tumbler 420 is connected to a tumbler seat 217 beneath the U-shaped middle section 214 of the box-shaped side beam 210 through an elastic positioning node assembly 430.

**[0035]** The elastic suspension system 450 includes an annular rubber cushion, an inner steel spring 452, and an outer steel spring 453 which abut against the annular rubber cushion in parallel, and a first system rubber spring 454 lining in the inner steel spring 452. In addition, a top of the first system rubber spring 454 is located on upper end surfaces of the inner steel spring 452 and the outer steel spring 453. A bottom of the first system rubber spring 454 passes through the inner steel spring 452 and is located between a circular hole in a center of the annular rubber cushion and the bottom surface of the axle box spring bearing platform, and a cross-section is in a T-shape.

**[0036]** The positioning tumbler 420 and the tumbler seat 217 of the box-shaped side beam 210 are connected by a snap-in structure. Two ends of the elastic positioning node of the positioning tumbler 420 are respectively snapped into the grooves on two sides of the tumbler seat 217 and are closed by a positioning baffle 218. The positioning baffle 218 is fastened to the tumbler seat 217 by means of two bolts. The elastic rubber node and the tumbler seat 217 of the box-shaped side beam 210 adopt a snap-in structure, which is simple and reliable in structure and greatly improves the requirements of the assembly process. An end face of the positioning tumbler 420 is provided with a lifting shoulder, and the vertical damper mounting seat 216 of the box-shaped side beam 210 is provided with a wheelset lifter that matches with the lifting shoulder.

**[0037]** A center part of the clamping hoop 460 is hollowed out into an infrared axle temperature detection

hole, which is convenient for ground equipment, such as 5T to perform axle temperature detection, thus solving the problem that an infrared temperature detection technology cannot be adopted during an online running of the first system axle box of the framed bogie of the existing freight wagon. In addition, a rubber dust cover is lined between an infrared axle temperature detection hole and a wheelset bearing, thereby effectively preventing dust and dirt from permeating the center part of the clamping hoop 460; the positioning tumbler 420 and the clamping hoop 460 are respectively sealed with a bearing rear baffle with a labyrinth seal structure, which effectively improves the dust-proof and oil-proof ability of the axle box body 410.

## Claims

1. A bolster-less framed bogie suitable for a high-speed railway freight wagon, comprising a frame assembly (200), four tumbler axle box positioning devices (400), and two wheelset assemblies (500); wherein

the frame assembly (200) includes a pair of box-shaped side beams (210), two round steel crossbeams (220), two longitudinal connection beams (230), and a guide pin assembly (240); two ends of each of the round steel crossbeams (220) are respectively fixed on one of the box-shaped side beams (210) to form an H-shaped structure; the longitudinal connection beams (230) and the guide pin assembly (240) are disposed within a space enclosed by means of the pair of box-shaped side beams (210) and the two round steel crossbeams (220);

a middle portion of each of the box-shaped side beams (210) is U-shaped to form a U-shaped middle section (214), a mounting platform for rubber pile spring of secondary suspension (214a) is provided at a concave part of the U-shaped middle section (214), and a rubber pile spring of secondary suspension (300) is disposed on the mounting platform for rubber pile spring of secondary suspension (214a); a top of the rubber pile spring of secondary suspension (300) is provided with a positioning seat boss (304) matched with a positioning hole on a wagon body;

the guide pin assembly (240) is located between the pair of box-shaped side beams (210), and two sides of the guide pin assembly (240) are respectively provided with first transverse damper mounting seats (241); the two longitudinal connection beams (230) are respectively located on a side of the guide pin assembly (240) and are respectively provided with a second transverse damper mounting seat (234); the first transverse damper mounting seats (241) are re-

- spectively connected to one second transverse damper mounting seat (234) by means of a transverse hydraulic damper (130);  
 a first traction rod seat (242) is provided at a lower portion of the guide pin assembly (240),  
 and a second traction rod seat (223) is provided at a lower portion of one of the round steel crossbeams (220), and a traction rod assembly (120) is provided between the first traction rod seat (242) and the second traction rod seat (223);  
 an anti-hunting damper (110) is provided at an outer side of the frame assembly (200);  
 end portions of the pair of box-shaped side beams (210) are connected to the two wheelset assemblies (500) by means of the four tumbler axle box positioning devices (400);  
 a plurality of disc-shaped brake devices (600) is provided between each of the round steel crossbeams (220) and an axle (501) of each of the wheelset assemblies (500).
2. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in claim 1, wherein each of the longitudinal connection beams (230) includes an upper arc-shaped cover plate (231), a lower arc-shaped cover plate (232), and an intermediate partition (233) connected between the upper arc-shaped cover plate (231) and the lower arc-shaped cover plate (232); the second transverse damper mounting seat (234) is provided at an outer side of a middle portion of the upper arc-shaped cover plate (231).
  3. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in claim 2, wherein two ends of the longitudinal connection beam (230) are welded to the two round steel crossbeams (220), and the outer side of the longitudinal connection beam (230) is welded to the box-shaped side beam (210) through a rib plate.
  4. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in claim 2, wherein a transverse stopper seat (235) is provided at a side of a middle portion, close to the guide pin assembly (240), of the longitudinal connection beam (230), and a longitudinal stopper seat (225) is arranged at a middle portion of a side, close to the guide pin assembly (240), of the round steel crossbeam (220) which is not mounted the second traction rod seat (223).
  5. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in any one of claims 1-4, wherein the round steel crossbeams (220) of the frame assembly (200) adopt an arrangement that one is longer than the other; two ends of the longer round steel crossbeam (220) penetrate through the two box-shaped side beams (210) and extend a certain length outwards, and an extended portion of the longer round steel crossbeam is provided with an anti-hunting damper mounting seat (224); an end of the anti-hunting damper (110) is connected to the anti-hunting damper mounting seat (224) on the round steel crossbeam (220) through an elastic spherical hinge, and another end of the anti-hunting damper (110) is connected to an anti-hunting damper connection seat on a chassis of the wagon body to form a diagonal bracing anti-hunting damper connection structure.
  6. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in any one of claims 1-4, wherein two ends of the box-shaped side beam (210) are each provided with an axle box spring installation sleeve (215), a vertical damper mounting seat (216) and a tumbler seat (217); each of the tumbler axle box positioning devices (400) includes an axle box body (410), an elastic suspension system (450) and a vertical hydraulic damper (470); the axle box body (410) includes a positioning tumbler (420), a clamping hoop (460), an axle box end cover (411), an axle box spring bearing platform (421), a vertical damper support (490) and an anti-skid device adapter (480); the elastic suspension system (450) is installed between the axle box spring installation sleeve (215) and the axle box spring bearing platform (421), and the positioning tumbler (420) is installed on the tumbler seat (217) through an elastic positioning node assembly (430), and the vertical hydraulic damper (470) is installed between the vertical damper mounting seat (216) and the vertical damper support (490).
  7. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in any one of claims 1-4, wherein ends of the two round steel crossbeams (220) are respectively fixed on two sides of the U-shaped middle sections (214) of the pair of box-shaped side beams (210).
  8. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in any one of claims 1-4, wherein the traction rod assembly (210) is composed of a traction rod body and a traction rod node, and the traction rod node is a composite member of metal and rubber.
  9. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in any one of claims 1-4, wherein the disc-shaped brake device (600) adopts a shaft disc brake, which includes a brake hanger (221) provided on the round steel crossbeam (220), a brake caliper mounted on the brake hanger (221), and a brake disc (503) provided on the axle (501) of each of the wheelset assemblies



(500).

10. The bolster-less framed bogie suitable for a high-speed railway freight wagon as claimed in any one of claims 1-4, wherein the rubber pile spring of secondary suspension (300) adopts a rubber-steel plate laminated spring and is installed on the mounting platform for rubber pile spring of secondary suspension (214a) through bolts.

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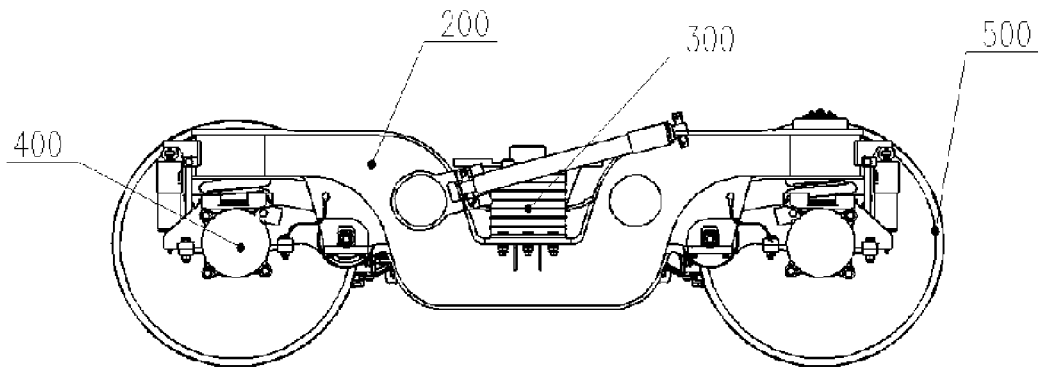


FIG.1

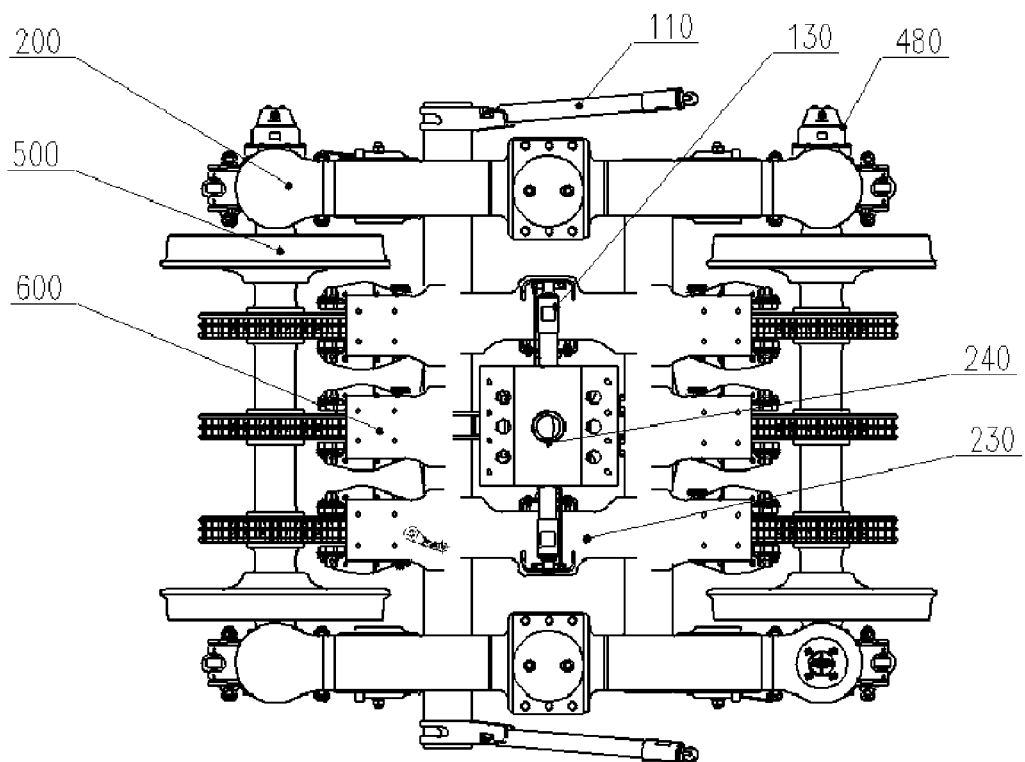


FIG.2

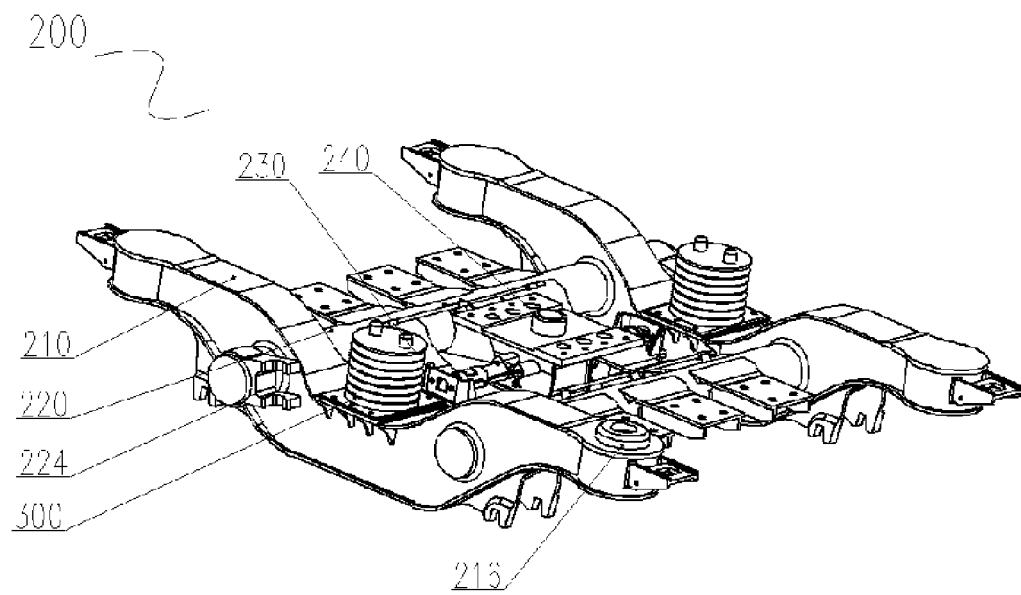


FIG.3

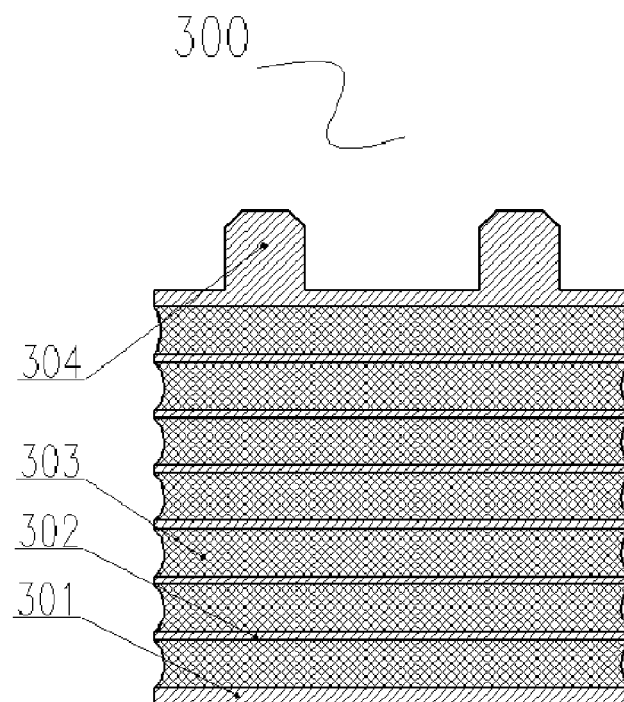


FIG.4

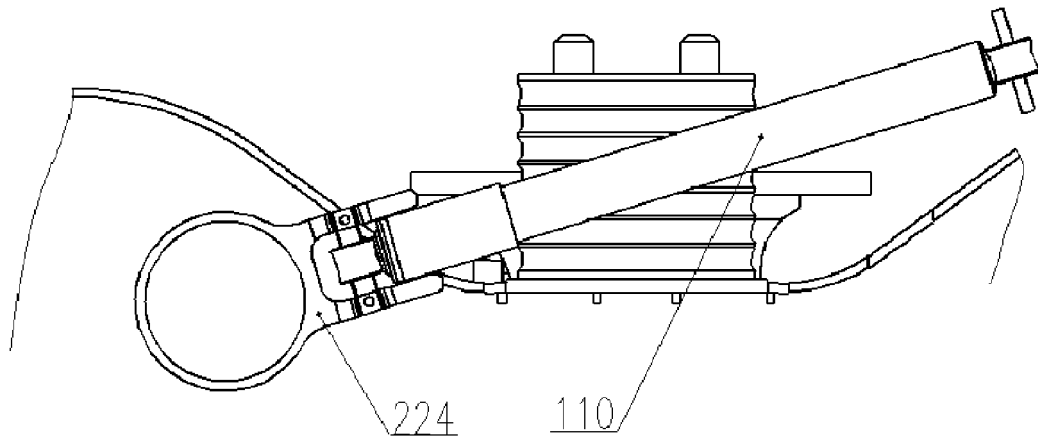


FIG.5

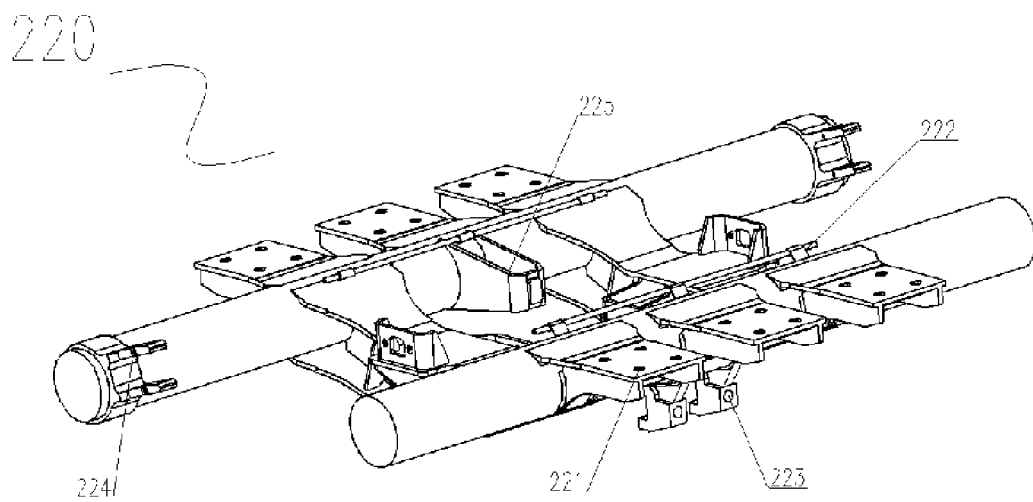


FIG.6

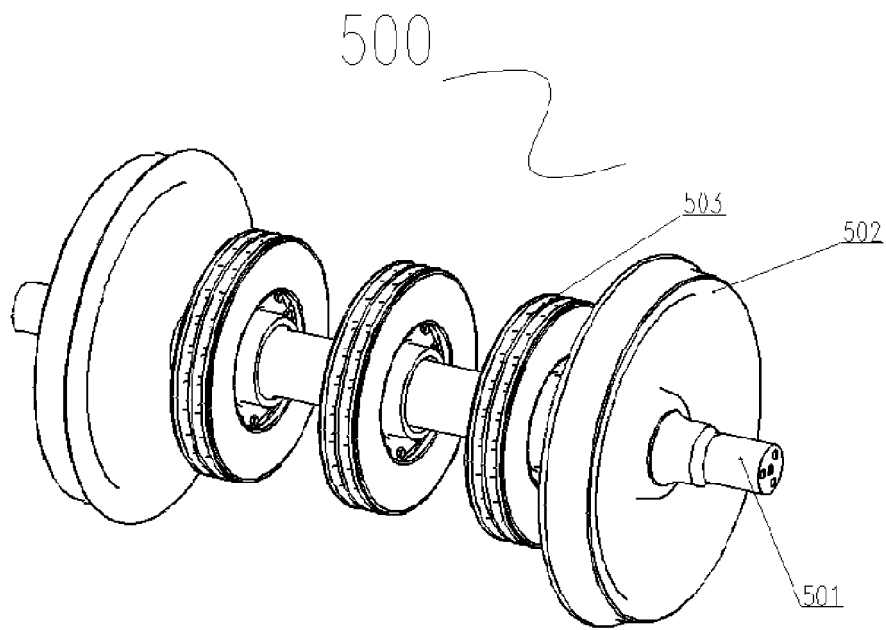


FIG. 7

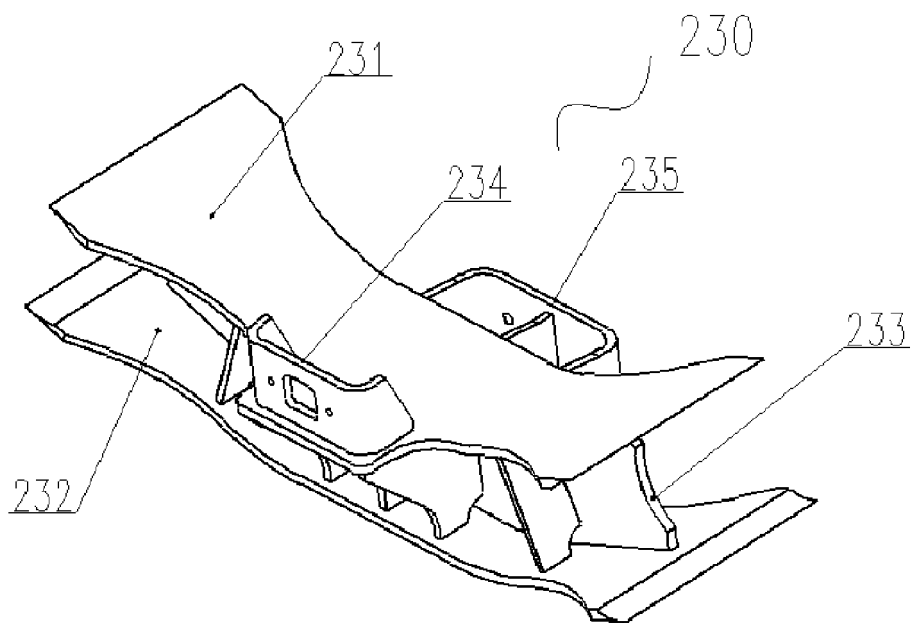


FIG. 8

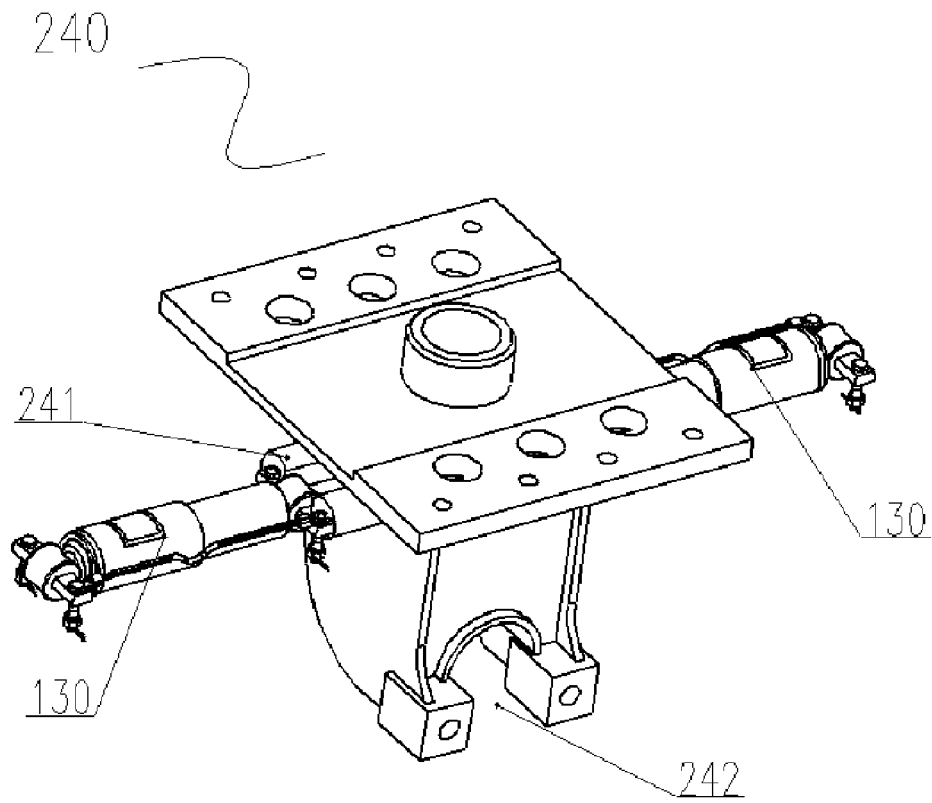


FIG. 9

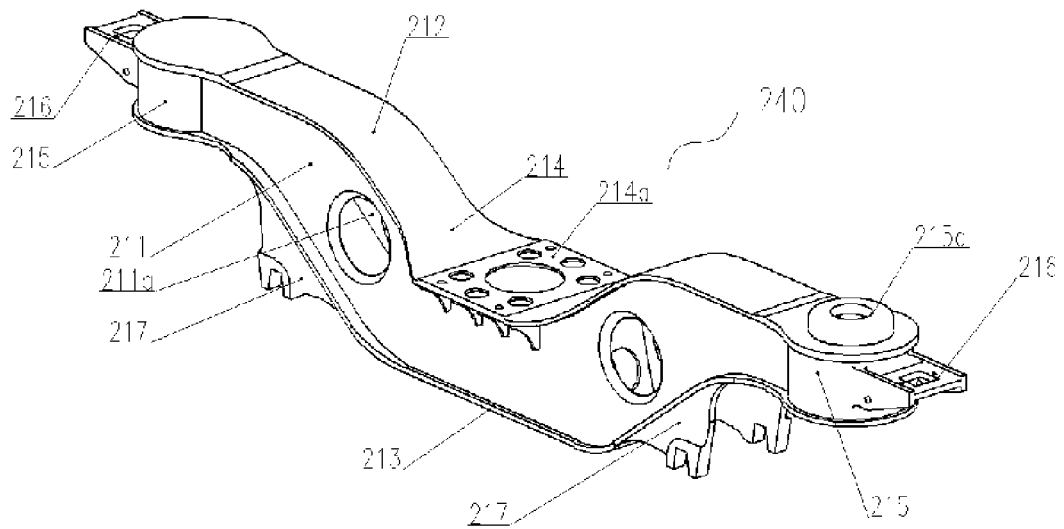


FIG. 10

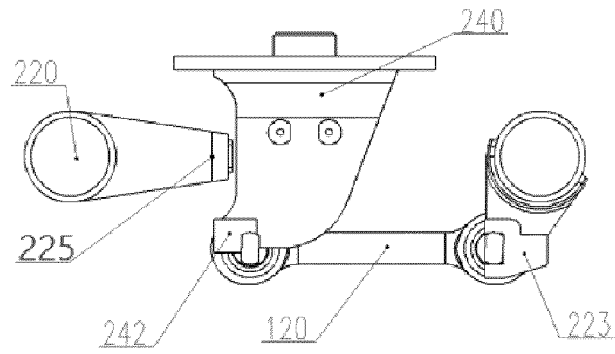


FIG. 11

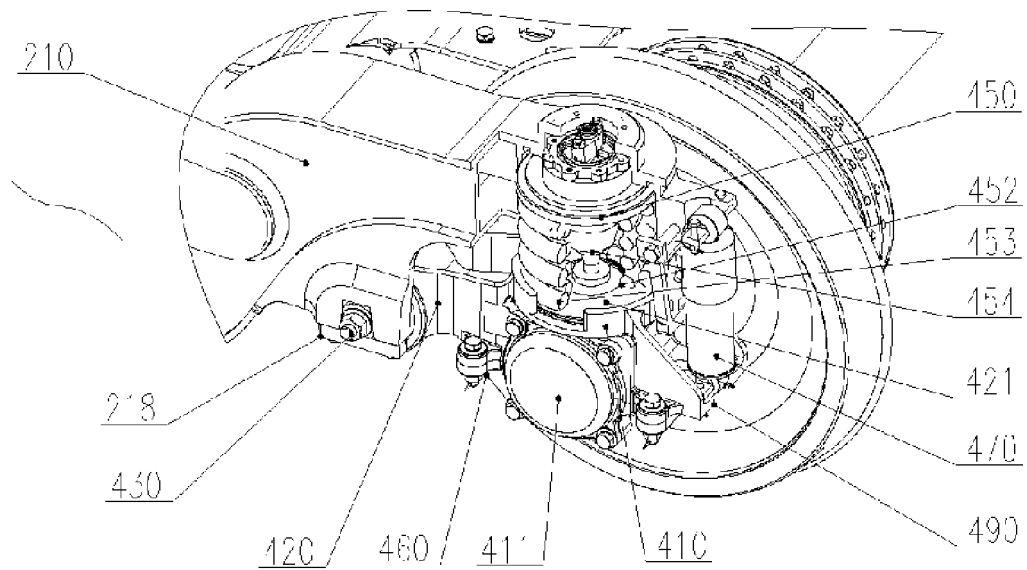


FIG. 12

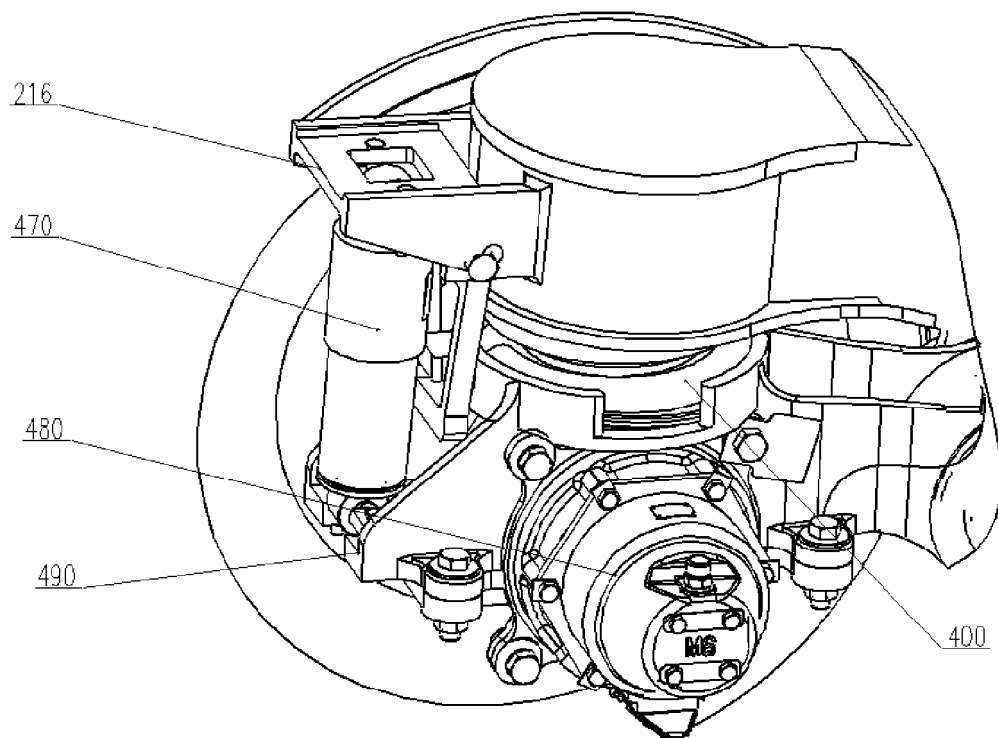


FIG.13



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/105308

## A. CLASSIFICATION OF SUBJECT MATTER

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)

CNKI, VEN, CNABS; 构架式转向架, 摇枕, 高速, 货车; freight, car, wagon, bogie, bolsterless, high, speed, railway

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                     | Relevant to claim No. |
|-----------|--|-----------------------|
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| A         | CN 201457403 U (CHANGCHUN RAILWAY VEHICLES CO., LTD.) 12 May 2010<br>(2010-05-12)<br>description, page 1, and figure 1 | 1-10                  |
| A         | DK 0512089 T3 (AEG SCHIENENFAHRZEUGE) 22 May 1995 (1995-05-22)<br>entire document                                      | 1-10                  |
| A         | CN 102490755 A (JINAN RAILWAY VEHICLES EQUIPMENT CO., LTD.) 13 June 2012<br>(2012-06-13)<br>entire document            | 1-10                  |
| A         | CN 103661463 A (QIJIHAR RAILWAY ROLLING STOCK CO., LTD.) 26 March 2014<br>(2014-03-26)<br>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

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Date of the actual completion of the international search

13 August 2020

Date of mailing of the international search report

18 September 2020

Name and mailing address of the ISA/CN

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Telephone No.

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**INTERNATIONAL SEARCH REPORT**  
**Information on patent family members**

International application No.

**PCT/CN2020/105308**

| Patent document<br>cited in search report |           |    | Publication date<br>(day/month/year) | Patent family member(s) |           |    | Publication date<br>(day/month/year) |
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| CN  | 201457403 | U  | 12 May 2010                          | None                    |           |    |                                      |
| DK  | 0512089   | T3 | 22 May 1995                          | EP                      | 0512089   | A1 | 11 November 1992                     |
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| CN  | 103661463 | A  | 26 March 2014                        | CN                      | 103661463 | B  | 31 August 2016                       |

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

**REFERENCES CITED IN THE DESCRIPTION**

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