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(54) **BOGIE**

(57) A bogie, comprising an articulated mechanism (1), and two side beams (2) which longitudinally extend and are transversely spaced apart, wherein two cross beams (3), which are longitudinally spaced apart, are connected between the two side beams (2); each cross beam (3) comprises a middle section and edge sections located on both sides of the middle section; longitudinal beams (4) are connected between ends, which are lo-

cated on the same transverse side, of the two middle sections; the articulated mechanism (1) is installed on the two longitudinal beams (4); and at least part of the edge sections are gradually inclined inwards in a transverse direction away from the middle sections. A reduction in a wheelbase of the bogie, and the enhancement of the small-curve passing capacity are facilitated.

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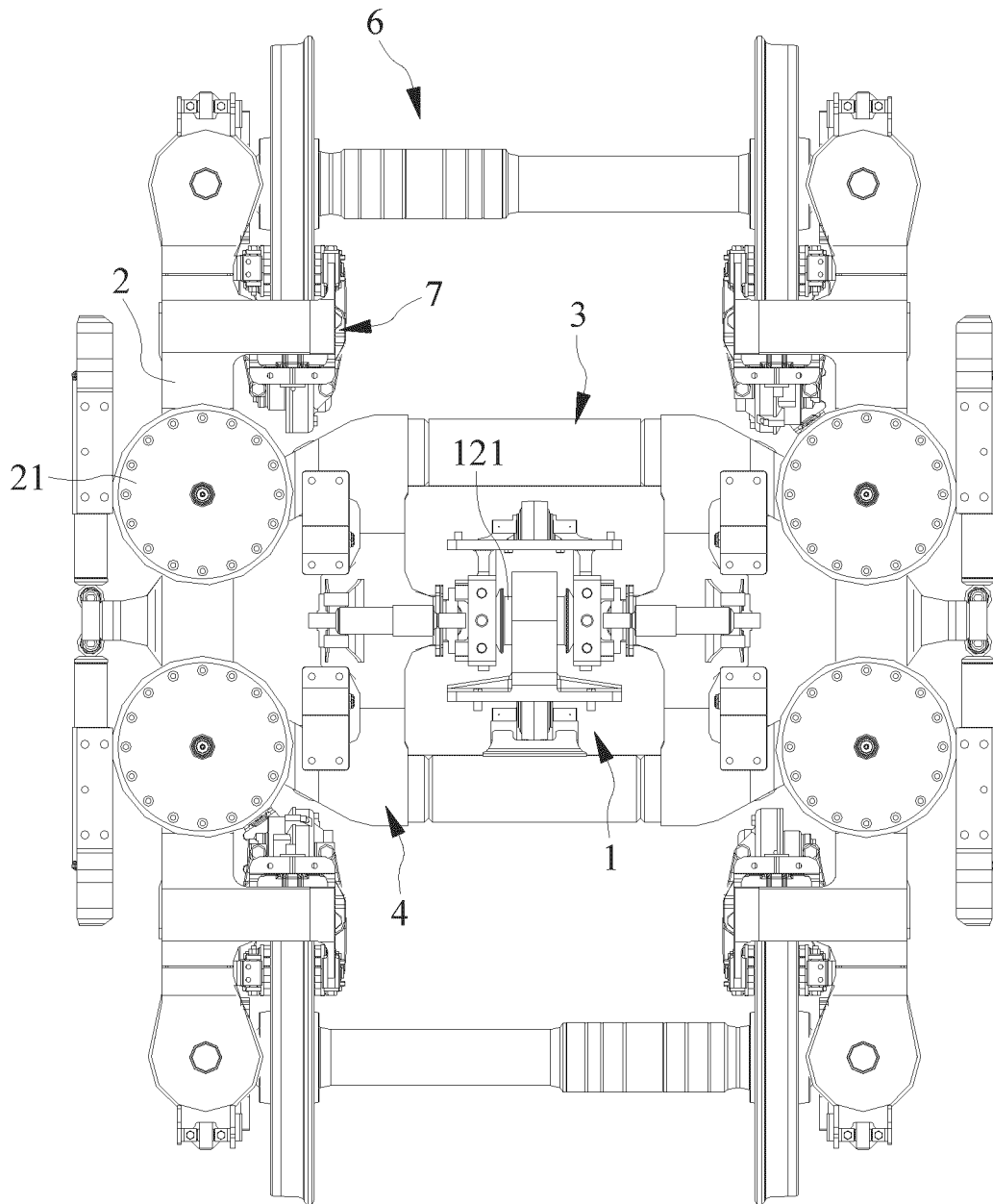


Figure 2

Description

[0001] The present application claims priority to Chinese Patent Application No. 202110753132.1, titled "BOGIE", filed on July 2, 2021 with the China National Intellectual Property Administration, which is incorporated herein by reference in its entirety.

FIELD

[0002] The present application relates to the technical field of rail vehicles, and in particular to a bogie.

BACKGROUND

[0003] In general, an articulated bogie carries two car bodies, resulting in a relatively large wheelbase which may reach a maximum of 2.9 meters. Thus, the bogie has a poor ability to pass through a small-radius curve, fast wheel flange wear, and large direct and indirect losses caused by factors such as vehicle outages due to reprofile and replacement of wheels.

SUMMARY

[0004] The present application is to provide a bogie with a relatively small wheelbase, which can improve the ability to pass through a small-radius curve, thereby reducing the wheel flange wear, prolonging the reprofile period, and saving costs.

[0005] A bogie is provided according to the present application. The bogie includes an articulation mechanism and two side beams which extend along a longitudinal direction and are spaced apart in a transverse direction, two transverse beams spaced apart in the longitudinal direction are connected between the two side beams; each transverse beam includes a middle section and edge sections arranged on both sides of the middle section, and a longitudinal beam is connected between ends of two middle sections located on a same side in the transverse direction, the articulation mechanism is installed on the longitudinal beam, and at least part of the edge section gradually tilts inward along a direction transversely away from the middle section.

[0006] A longitudinal distance between the two middle sections is relatively large with the above structure, which can provide a space for installing the articulation mechanism. At least part of each of the two edge sections can gradually tilt inward along the direction transversely away from the middle section, which can provide a space for a brake mechanism, and is beneficial for reducing the wheelbase of the bogie and further improving the ability to pass through a small-radius curve, thereby reducing the wheel flange wear, prolonging the reprofile period and saving costs.

[0007] Optionally, a vertical dimension of a joint between the middle section and the edge section is smaller than a vertical dimension of a joint between the side beam

and the edge section, and a vertical dimension of at least part of the edge section gradually decreases along a direction transversely away from the middle section.

[0008] Optionally, the edge section is a box beam structure, and the middle section is a circular tube beam structure.

[0009] Optionally, each of the two side beams is provided with two air spring assemblies spaced apart along the longitudinal direction, each of the two air spring assemblies includes at least one air spring, and the air springs are arranged in series.

[0010] Optionally, each air spring is provided with a damping hole, and the bogie is not provided with a vertical shock absorber.

[0011] Optionally, the articulation mechanism includes a first articulation seat and a second articulation seat; the first articulation seat includes two support bodies spaced apart in the transverse direction, the support body is provided with a support groove that opens upward, and a longitudinal dimension of at least part of the support groove gradually decreases from top to bottom; the second articulation seat is configured to install a core shaft, two axial ends of the core shaft form support parts, and a longitudinal dimension of at least part of the support part gradually decreases from top to bottom; and in an assembly state, at least part of a longitudinal wall surface of the at least part of the support part, the longitudinal dimension of which gradually decreases, is configured to contact at least part of a groove side wall of the at least part of the support groove, the longitudinal dimension of which gradually decreases.

[0012] Optionally, a longitudinal dimension of at least an lower end of the support part gradually decreases from top to bottom, the support part includes two wedge-shaped surfaces arranged oppositely, the two wedge-shaped surfaces are connected by a bottom surface, and an edge is formed between the wedge-shaped surface and the bottom surface; and the groove side wall of the support groove include a first side wall surface and a second side wall surface with a slope consistent with the wedge-shaped surface, the first side wall surface is arranged below the second side wall surface, the first side wall surface and the second side wall surface are transitioned through an arc surface, and the wedge-shaped surface contacts the second side wall surface and protrudes downwards from the second side wall surface to suspend the edge.

[0013] Optionally, a groove bottom wall of the support groove and the first side wall surface are transitioned through an arc surface.

[0014] Optionally, a mounting plate is provided on a side, in the longitudinal direction, of the first articulation seat for connecting a car, a reinforcement block is provided on a side, longitudinally away from the mounting plate, of the support body, and at least part of the reinforcement block is arranged above the groove bottom wall of the support groove.

[0015] Optionally, the bogie further includes a press

block, and the press block is connected to the support body for pressing the core shaft.

[0016] Optionally, the first articulation seat is further connected to a single traction rod.

[0017] Optionally, the bogie further includes an anti-roll torsion bar device including a torsion bar, a torsion arm and a connecting rod, two ends of the torsion bar are provided with bearing seats, the bearing seat is installed on a bottom of the edge section, and the connecting rod is arranged on an inner side of the side beam in the transverse direction.

[0018] Optionally, the bearing seat is in a parallelogram shape, and at least part of the connecting rod is bent to avoid the edge section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Figure 1 is a structural schematic diagram of a bogie provided according to an embodiment of the present application;

Figure 2 is a top view of Figure 1;

Figure 3 shows a schematic diagram of a connection structure of a side beam, a transverse beam and a longitudinal beam;

Figure 4 is a structural schematic diagram of an articulation mechanism;

Figure 5 is a partial enlarged view of a butt joint between a support part and a support groove;

Figure 6 is a structural schematic diagram of a first articulation seat;

Figure 7 is a front view of Figure 6; and

Figure 8 is a schematic diagram of a partial structure of a bogie provided according to the present application in a bottom view.

[0020] The reference signs in Figures 1 to 8 are described as follows:

1 articulation mechanism, 11 first articulation seat, 111 support body, 111a support groove, 111a-1 first side wall surface, 111a-2 second side wall surface, 111a-3 groove bottom wall, 112 mounting plate, 113 reinforcement block, 114 single traction rod, 12 second articulation seat, 121 core shaft, 121a support part, 121a-1 wedge-shaped surface, 121a-2 bottom surface, 121a-3 edge, and 122 press block;
2 side beam, and 21 air spring;
3 transverse beam, 31 middle section, and 32 edge section;

4 longitudinal beam;

5 anti-roll torsion bar device, 51 torsion bar, 511 bearing seat, 52 torsion arm, and 53 connecting rod;

6 wheel set; and

7 brake mechanism.

DETAILED DESCRIPTION OF EMBODIMENTS

[0021] In order to enable those skilled in the art to better understand the technical solutions of the present application, the present application is further described in detail below in conjunction with the accompanying drawings and the embodiments.

[0022] Words such as "first" and "second" herein are only for the convenience of describing two or more structures or components with a same or similar structure and/or function, and do not represent any special limitation on order and/or importance.

[0023] In the description, a travelling direction of a rail train is referred to as a longitudinal direction, the direction perpendicular to the longitudinal direction in the travelling plane of the track train is referred to as a transverse direction, and the direction perpendicular to the travelling plane of the rail train is referred to as a vertical direction.

The vertical direction is also referred to as an up-down direction, a direction relatively close to the travelling plane is referred to as a down direction, and a direction relatively far away from the travelling plane is referred to as an up direction.

[0024] Referring to Figures 1 to 3, Figure 1 is a structural schematic diagram of a bogie provided according to an embodiment of the present application, Figure 2 is a top view of the bogie in Figure 1, and Figure 3 is a schematic diagram of a connection structure of a side beam, a transverse beam and a longitudinal beam.

[0025] As shown in Figures 1 to 3, a bogie is provided according to the present application for connecting a wheel set 6 and a car body. The bogie includes an articulation mechanism 1 and two side beams 2 which extend along a longitudinal direction and are spaced apart in a transverse direction. Two transverse beams 3 spaced apart in the longitudinal direction are connected between the two side beams 2, and each transverse beam 3 includes a middle section 31 and edge sections 32 arranged on both sides of the middle section 31. A longitudinal beam 4 is connected between ends of two middle sections 31 located on a same side in the transverse direction, and the articulation mechanism 1 is installed on two longitudinal beams 4. At least part of the edge section 32 gradually tilts inward along a direction transversely away from the middle section 31.

[0026] Here, "inward" refers to being relatively close to a position of a longitudinal centerline of the bogie, and the longitudinal centerline refers to a line that passes through a longitudinal center and extends along the transverse direction.

[0027] A longitudinal distance between the two middle sections 31 is relatively large with the above structure,

which can provide a space for the installation of the articulation mechanism 1. At least part of each of the two edge sections 32 can gradually tilt inward along the direction transversely away from the middle section 31, which can also provide space for a brake mechanism 7, and is beneficial for reducing the wheelbase of the bogie to improve the ability to pass through a small-radius curve, thereby reducing the wheel flange wear, prolonging the reprofile period and saving costs.

[0028] It should be noted that the embodiment of the present application does not limit the transverse dimension of the edge section 32, the transverse dimension of an inclined part of the edge section 32, and the angle between the inclined part of the edge section 32 and the transverse direction. Those skilled in the art can make selections according to actual needs during specific implementation, as long as the requirements for use can be met.

[0029] Generally speaking, the side beam 2 is provided with an air spring assembly (i.e. airspring assembly) to support the car. In order to ensure sufficient support performance, the vertical dimensions of the side beams 2 are relatively large, while the vertical dimensions of the transverse beams 3 may be relatively small to reduce the weight of the bogie.

[0030] In this way, the vertical dimension of the edge section 32 used to connect the middle section 31 and the side beam 2 may vary to adapt to the different vertical dimensions of the middle section 31 and the side beam 2. In detail, the vertical dimension at a joint between the middle section 31 and the edge section 32 may be smaller than the vertical dimension at a joint between the side beam 2 and the edge section 32, and the vertical dimension of at least part of the edge section 32 may gradually decrease along a direction transversely away from the middle section 31.

[0031] Based on the size requirement, the edge section 32 may adopt a box beam structure to facilitate processing. At this time, a top plate and a bottom plate of the inclined part of the edge section 32 may be roughly in a parallelogram shape. The middle section 31 may be a circular tube beam structure. The middle section 31 may be isodiametric, which is conveniently realized by using a circular tube beam.

[0032] It can be understood that the solution selection that the edge section 32 adopts the box beam structure and the middle section 31a adopts the circular tube beam structure is only an exemplary description of the embodiment of the present application. In a specific implementation, other beam structures may also be adopted for the edge section 32 and the middle section 31, as long as the functional implementation is not affected.

[0033] As mentioned above, the side beam 2 is usually provided with the air spring assembly for connecting the car body. For the bogie required to connect two adjacent car bodies in the longitudinal direction, each side beam 2 may be provided with two air spring assemblies spaced apart along the longitudinal direction, and each air spring

assembly is used to connect one car body. Each air spring assembly may include at least one air spring 21, and if multiple air springs are provided, the multiple air springs 21 may be arranged in series in use.

[0034] In this way, the gas in the air springs 21 may flow to each other, and internal pressures of the air springs 21 may be kept consistent. In practice, only using one height valve can control inflating and exhausting of the air springs 21, which can realize a synchronous lifting of the car bodies on both sides, so as to simplify the control operation. At the same time, the vertical additional load inside the articulation mechanism 1 caused by different numbers of people, i.e. different loads, in the cars on both sides, can also be reduced, which is beneficial for improving the load state of the articulation mechanism 1.

[0035] Each of the air springs 21 may be provided with a damping hole (not shown in the figure) to function as a vertical shock absorber. Therefore, the bogie provided according to the present application may not be provided with a vertical shock absorber, so as to save the space of the bogie and thereby reduce manufacturing costs.

[0036] It should be noted that the air springs 21 are isolated from each other, and it is also feasible that each of the air springs 21 is individually provided with a height valve to control the inflating and exhausting. Similarly, it is also feasible that each air spring 21 is not provided with a damping hole and is provided with a vertical shock absorber.

[0037] Referring to Figures 4 to 7, Figure 4 is a structural schematic diagram of an articulation mechanism, Figure 5 is a partial enlarged view of a butt joint between a support part and a support groove, Figure 6 is a structural schematic diagram of a first articulation seat, and Figure 7 is a front view of Figure 6.

[0038] Further, as shown in Figure 4, the articulation mechanism 1 may include a first articulation seat 11 and a second articulation seat 12. The first articulation seat 11 may include two support bodies 111 spaced apart in the transverse direction. The support body 111 may be provided with a support groove 111a that opens upward, and a longitudinal dimension of at least part of the support groove 111a may gradually decrease from top to bottom. The second articulation seat 12 is configured to install a core shaft 121, two axial ends of the core shaft 121 form support parts 121a, and a longitudinal dimension of at least part of the support part 121a may gradually decrease from top to bottom. In an assembly state, at least part of a longitudinal wall surface of the part of the support part 121a, the longitudinal dimension of which gradually decreases, can contact at least part of a groove side wall of the support groove 111a, the longitudinal dimension of which gradually decreases.

[0039] Different from a conventional solution that an U-shaped groove matches a core shaft with a circular cross section, the solution that, the support part 121a, at least part of which gradually decreases from top to bottom, matches the support groove 111a, adopted in the

embodiment of the present application, is more conducive to ensuring the reliability of the vertical positioning of the core shaft 121. Moreover, the support part 121a and the groove side wall of the support groove 111a is in a surface-to-surface contact, the force area is relatively large, which can reduce stress concentration and improve the service life of the articulation mechanism 1.

[0040] Furthermore, as shown in Figure 5, a longitudinal dimension of at least a lower end of the support part 121a may gradually decrease from top to bottom, and the support part 121a may include two wedge-shaped surfaces 121a-1 arranged oppositely. The two wedge-shaped surfaces 121a-1 may be connected by a bottom surface 121a-2, and an edges 121a-3 may be formed between the wedge-shaped surface 121a-1 and the bottom surface 121a-2. The groove side wall of the support groove 111a may include a first side wall surface 111a-1 and a second side wall surface 111a-2 with a slope consistent with the wedge-shaped surface 121a-1. The first side wall surface 111a-1 may be arranged below the second side wall surface 111a-2, and the first side wall surface 111a-1 and the second side wall surface 111a-2 may be transitioned through an arc surface. The wedge-shaped surface 121a-1 may contact the second side wall surface 111a-2 and extend downwards from the second side wall surface 111a-2 to suspend the edge 121a-3. In this way, line contact between the support part 121a and the groove side wall of the support groove 111a can be avoided, so as to better avoid stress concentration.

[0041] A groove bottom wall 111a-3 of the support groove 111a and the first side wall 111a-1 may also be transitioned through an arc surface, so as to ensure a smooth transition between the groove bottom wall 111a-3 and the groove side wall, thereby avoiding the occurrence of a stress weak point.

[0042] Continuing to refer to Figure 4, mounting plates 112 may be respectively provided on sides, in the longitudinal direction, of the first articulation seat 11 and the second articulation seat 12. The mounting plates 112 of the first articulation seat 11 and the second articulation seat 12 may be arranged oppositely in the longitudinal direction, and are respectively used to connect the two car bodies.

[0043] Referring to Figures 6 and 7, for the first articulation seat 11, a reinforcement block 113 may also be provided on a side of the support body 111 longitudinally away from the mounting plate 112, and at least part of the reinforcement block 113 may be arranged above the groove bottom wall of the support groove 111a. In this way, a cross-sectional area of the first articulation seat 11 at the root of the support groove 111a can be increased, thereby increasing the bending and shear cross section moduli. The support body 111 can have sufficient bearing capacity when transmitting longitudinal traction force and impact load.

[0044] The bogie provided according to the present application may further include a press block 122, and the press block 122 may be connected to the support body

111 for pressing the core shaft 121. With reference to Figure 4, the press block 122 may be provided with three through holes, two through holes on both sides in the longitudinal direction are used for assembling the connectors to connect the support body 111. The through hole in the middle is a process hole (the corresponding position of the core shaft 121 is also provided with a vertical hole), and is used to match a disassembly tooling to separate the structure of the core shaft 121 and the support body 111, which can solve the problem of difficult disassembly caused by metal damascene, deformation due to interference fit, metal corrosion, etc..

[0045] Two longitudinal ends of the press block 122 are also provided with hooks extending downwards, and the hooks can be engaged with the two side walls of the support groove 111a to improve the overall rigidity and load-bearing performance.

[0046] The first articulation seat 11 may also be connected to a single traction rod 114 for transmitting a longitudinal traction force. Compared with a double traction rod structure, the single traction rod 114 has a simple structure, and is lightweight and easy to maintain, and has a relatively low cost. Of course, it is also feasible to use a double traction rod structure in actual implementation.

[0047] Referring to Figure 8, Figure 8 is a schematic diagram of a partial structure of a bogie provided according to the present application in a bottom view.

[0048] The bogie provided according to the present application may further include an anti-roll torsion bar device 5, which may include a torsion bar 51, a torsion arm 52 and a connecting rod 53. Two ends of the torsion bar 51 may be provided with bearing seats 511, and a connection structure of the torsion bar 51, the torsion arm 52, the connecting rod 53 and the bearing seat 511 is not limited here. Those skilled in the art may refer to the conventional technology to arrange during specific implementation.

[0049] In the embodiment of the present application, as shown in Figure 8, the bearing seat 511 may be installed on a bottom of the edge section 32 to facilitate disassembly and maintenance. The connecting rod 53 may be arranged on an inner side of the side beam 2 in the transverse direction to reduce the transverse size of the connecting rod 53 and effectively save space of the bogie, thereby reducing the inter-spring mass of the bogie.

[0050] Since the edge section 32 has the inclined part, the bearing seat 511 may be in a parallelogram shape to match the bottom plate of the edge section 32. At least part of the connecting rod 53 may be bent to avoid the inclined part of the edge section 32.

[0051] The above are only the preferred embodiments of the present application. It should be pointed out that, some improvements and modifications may be made without departing from the principles of the present application for those skilled in the art, and the improvements and modifications should also be regarded as the pro-

tection scope of the present application.

Claims

1. A bogie, comprising an articulation mechanism (1) and two side beams (2) which extend along a longitudinal direction and are spaced apart in a transverse direction, wherein two transverse beams (3) spaced apart in the longitudinal direction are connected between the two side beams (2), the transverse beam (3) comprises a middle section (31) and edge sections (32) arranged on both sides of the middle section (31), and a longitudinal beam (4) is connected between ends of two middle sections (31) located on a same side in the transverse direction, the articulation mechanism (1) is installed on two longitudinal beams (4), and at least part of the edge section (32) gradually tilts inward along a direction transversely away from the middle section (31).
 2. The bogie according to claim 1, wherein a vertical dimension of a joint between the middle section (31) and the edge section (32) is smaller than a vertical dimension of a joint between the side beam (2) and the edge section (32), and a vertical dimension of at least part of the edge section (32) gradually decreases along a direction transversely away from the middle section (31).
 3. The bogie according to claim 2, wherein the edge section (32) is a box beam structure, and the middle section (31) is a circular tube beam structure.
 4. The bogie according to claim 1, wherein each of the two side beams (2) is provided with two air spring assemblies spaced apart along the longitudinal direction, each of the two air spring assemblies comprises at least one air spring (21), and the air springs are arranged in series.
 5. The bogie according to claim 4, wherein each of the air springs (21) is provided with a damping hole, and the bogie is not provided with a vertical shock absorber.
 6. The bogie according to any one of claims 1 to 5, wherein
 - the articulation mechanism (1) comprises a first articulation seat (11) and a second articulation seat (12),
 - the first articulation seat (11) comprises two support bodies (111) spaced apart in the transverse direction, the support body (111) is provided with a support groove (111a) that opens upward, and a longitudinal dimension of at least part of the support groove (111a) gradually decreases from top to bottom,
 - the second articulation seat (12) is configured to install a core shaft (121), two axial ends of the core shaft (121) form support parts (121a), and a longitudinal dimension of at least part of the support part (121a) gradually decreases from top to bottom, and
 - in an assembly state, at least part of a longitudinal wall surface of the at least part of the support part (121a), the longitudinal dimension of which gradually decreases, is configured to contact at least part of a groove side wall of the at least part of the support groove (111a), the longitudinal dimension of which gradually decreases.
 7. The bogie according to claim 6, wherein
 - a longitudinal dimension of at least a lower end of the support part (121a) gradually decreases from top to bottom, the support part (121a) comprises two wedge-shaped surfaces (121a-1) arranged oppositely, the two wedge-shaped surfaces (121a-1) are connected by a bottom surface (121a-2), and an edge (121a-3) is formed between the wedge-shaped surface (121a-1) and the bottom surface (121a-2); and
 - the groove side wall of the support groove (111a) comprise a first side wall surface (111a-1) and a second side wall surface (111a-2) with a slope consistent with the wedge-shaped surface (121a-1), the first side wall surface (111a-1) is arranged below the second side wall surface (111a-2), the first side wall surface (111a-1) and the second side wall surface (111a-2) are transitioned through an arc surface, and the wedge-shaped surface (121a-1) contacts the second side wall surface (111a-2) and protrudes downwards from the second side wall surface (111a-2) to suspend the edge (121a-3).
 8. The bogie according to claim 7, wherein a groove bottom wall (111a-3) of the support groove (111a) and the first side wall surface (111a-1) are transitioned through an arc surface.
 9. The bogie according to claim 6, wherein a mounting plate (112) is provided on a side, in the longitudinal direction, of the first articulation seat (11) for connecting a car body, a reinforcement block (113) is provided on a side, longitudinally away from the mounting plate (112) of the support body (111), at least part of the reinforcement block (113) is arranged above the groove bottom wall (111a-3) of the support groove (111a).
 10. The bogie according to claim 6, further comprising a press block (122), wherein the press block (122)

is connected to the support body (111) for pressing the core shaft (121).

11. The bogie according to claim 6, wherein the first articulation seat (11) is further connected to a single traction rod (114). 5
12. The bogie according to any one of claims 1-5, further comprising an anti-roll torsion bar device (5) comprising a torsion bar (51), a torsion arm (52), and a connecting rod (53), wherein two ends of the torsion bar (51) are provided with bearing seats (511), the bearing seat (511) is installed on a bottom of the edge section (32), and the connecting rod (53) is arranged on an inner side of the side beam (2) in the transverse direction. 10 15
13. The bogie according to claim 12, wherein the bearing seat (511) is in a parallelogram shape, and at least part of the connecting rod (53) is bent to avoid the edge section (32). 20

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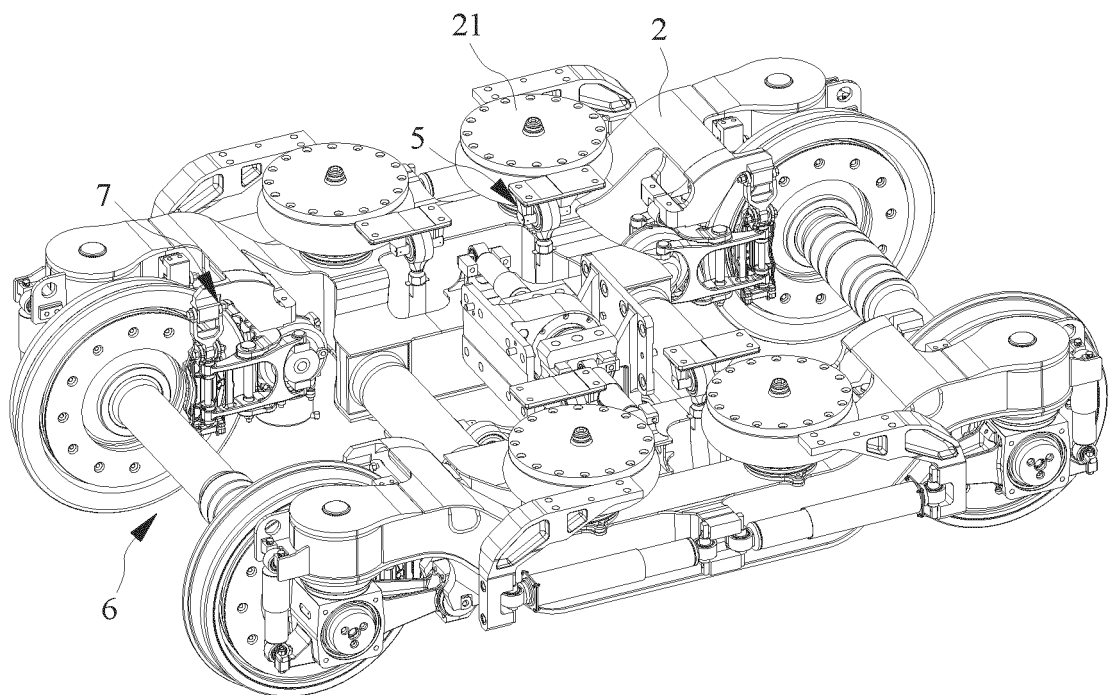


Figure 1

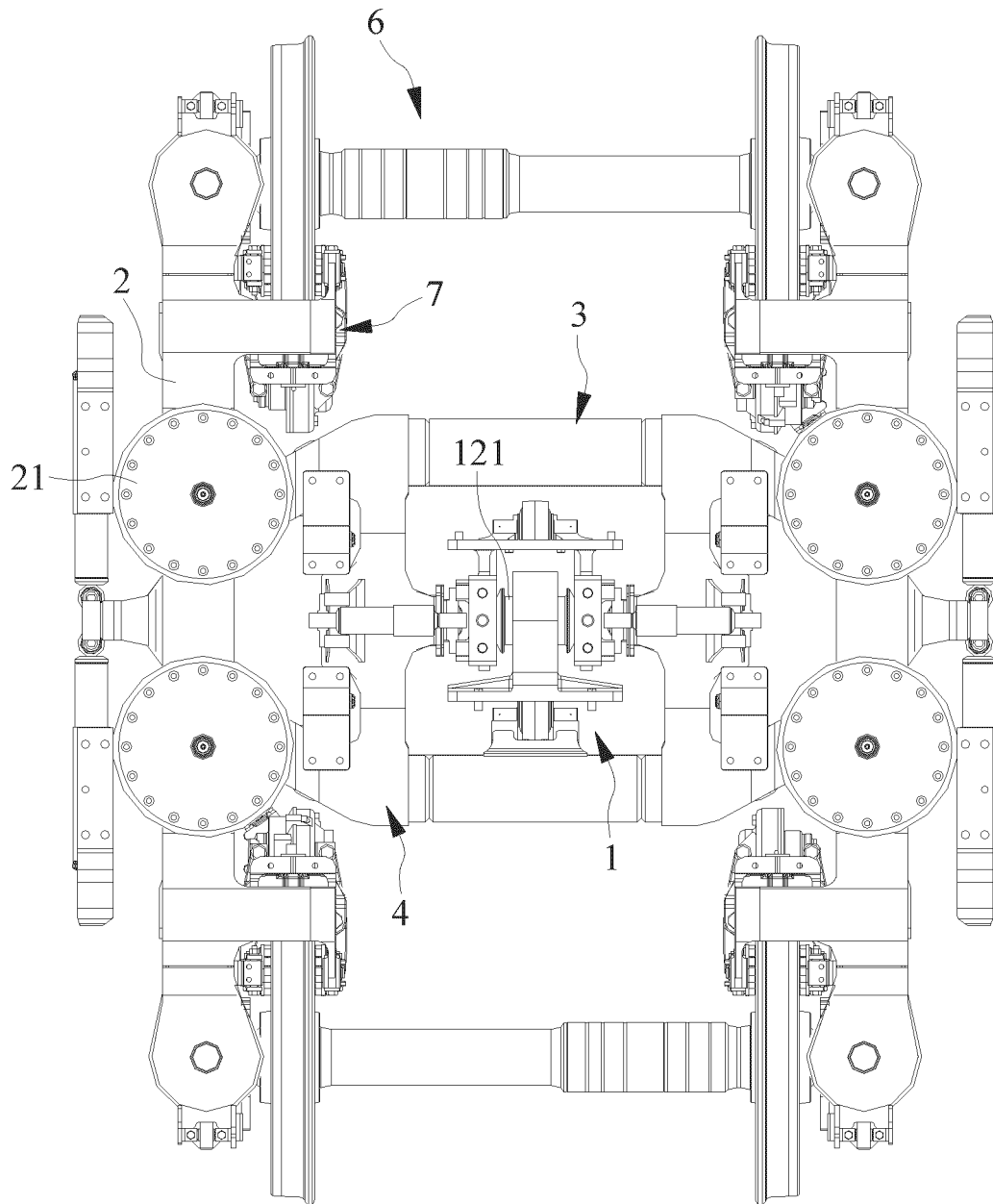


Figure 2

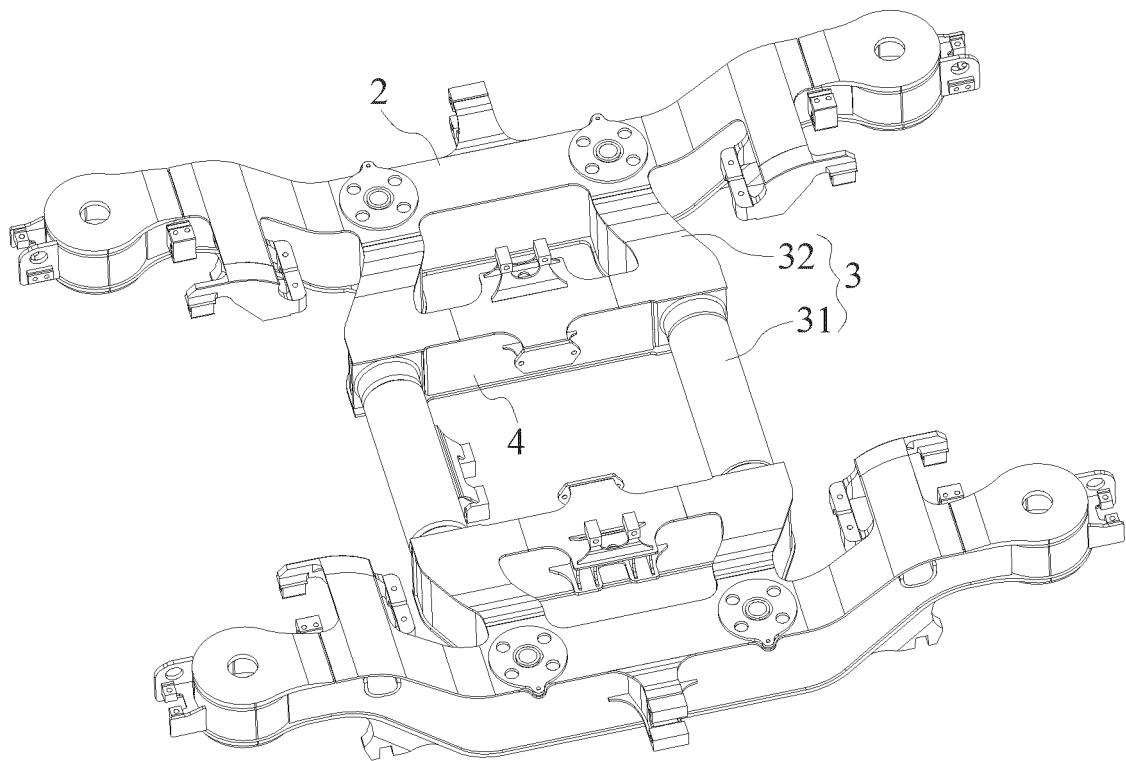


Figure 3

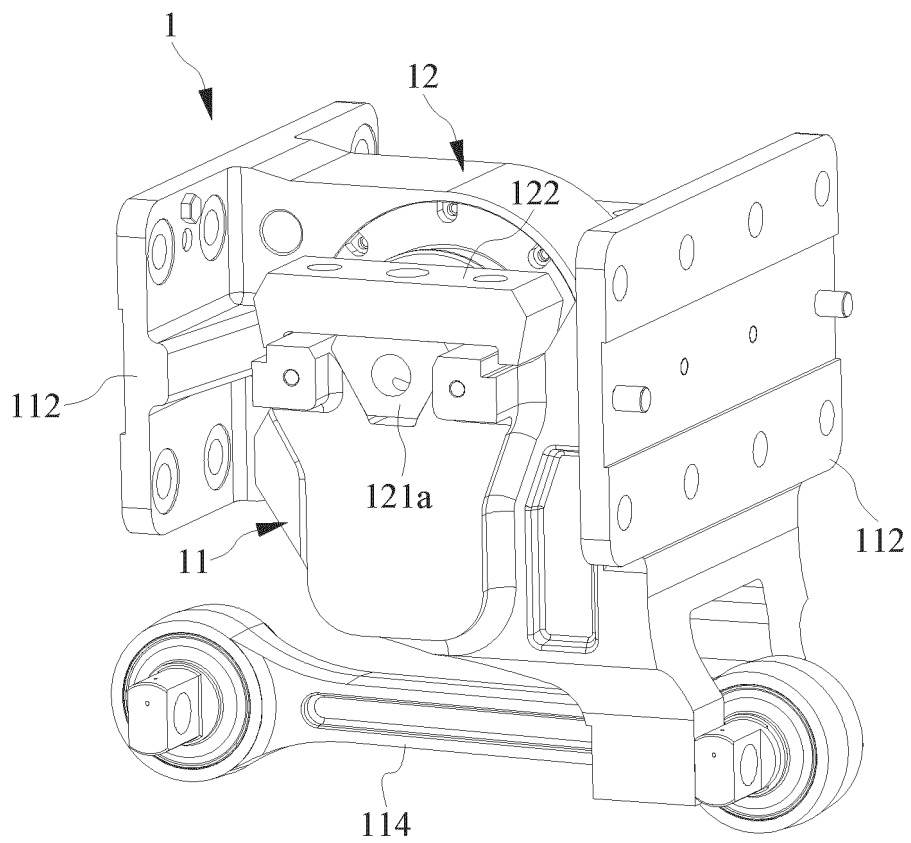


Figure 4

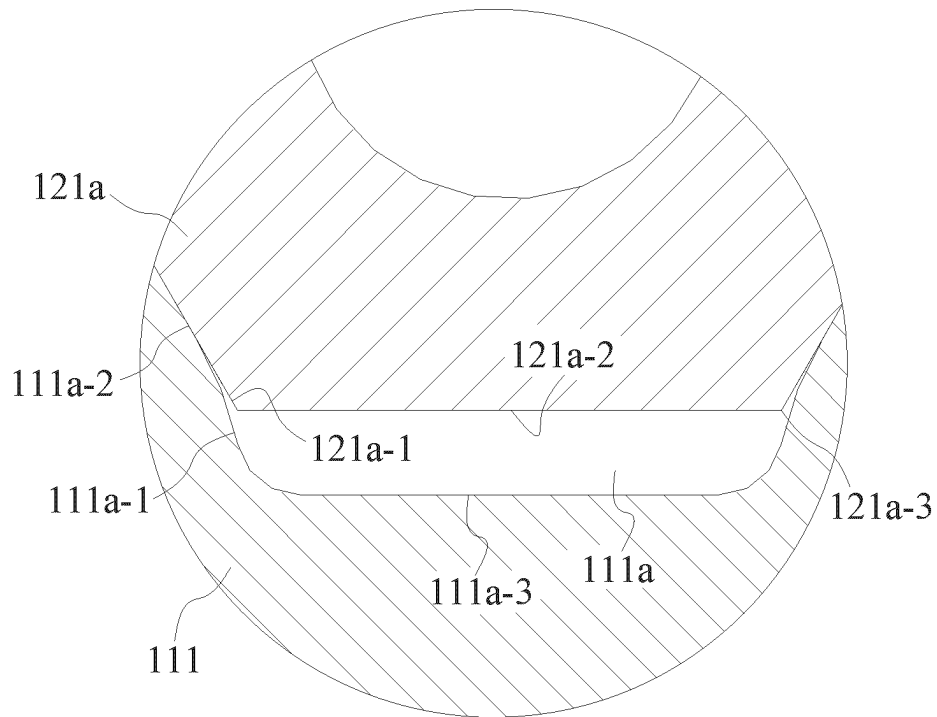


Figure 5

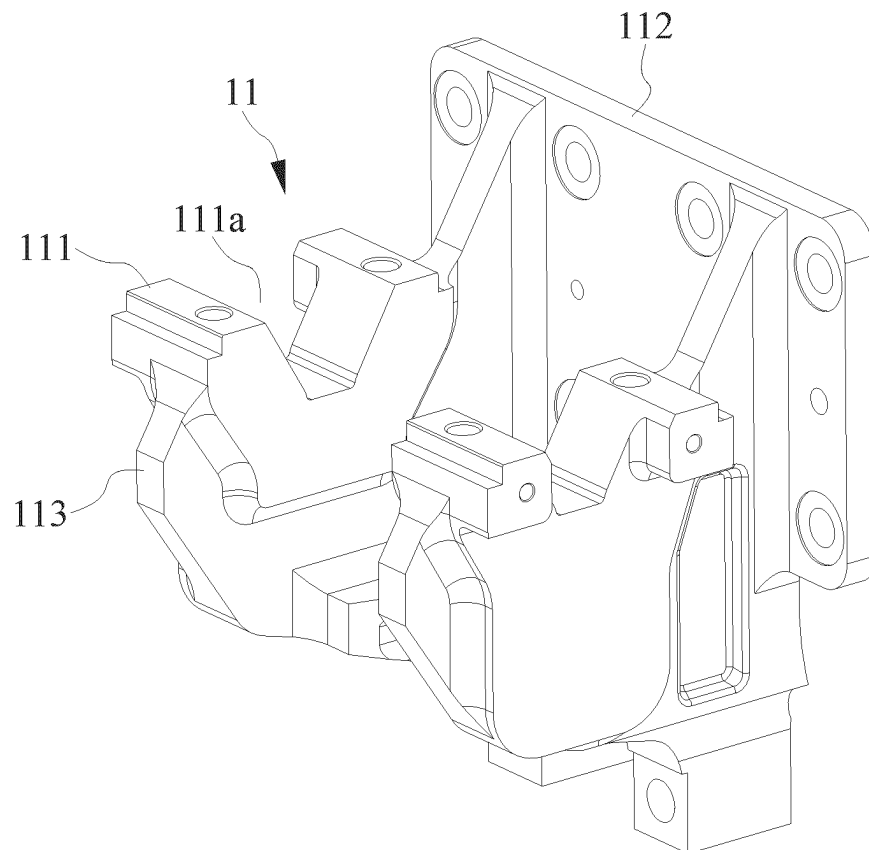


Figure 6

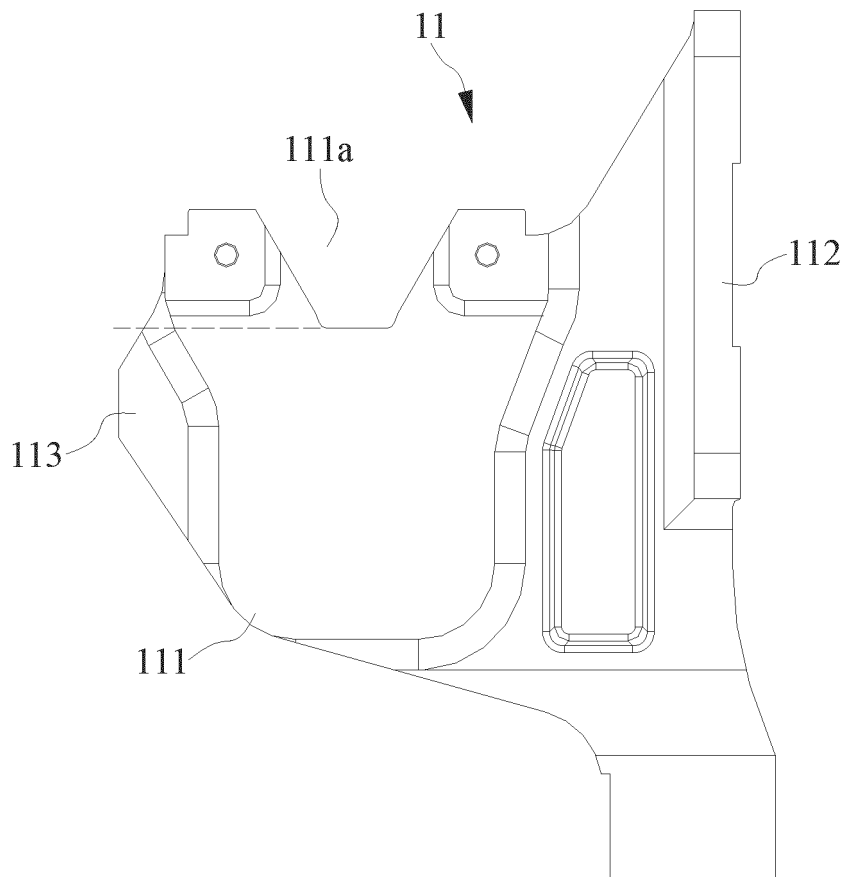


Figure 7

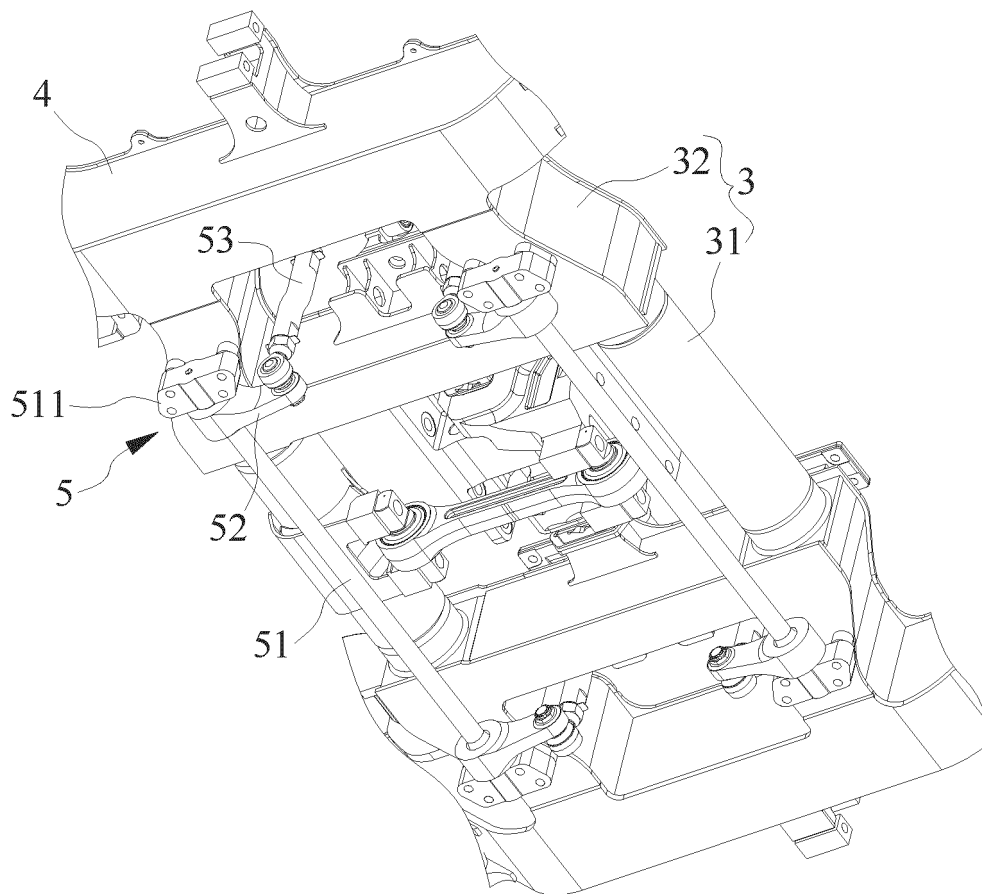


Figure 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/070216

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,B61G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

VEN, CNKI: beam, bogie, steering, curve; 转向架, 铰接, 横梁, 分段, 弯曲

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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PX	CN 113247038 A (CRRC QINGDAO SIFANG CO., LTD.) 13 August 2021 (2021-08-13) claims 1-13	1-13
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
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REFERENCES CITED IN THE DESCRIPTION

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