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(54) **BOGIE FRAMEWORK AND BOGIE HAVING SAME**

(57) A bogie framework comprises two side beams (2) and a cross-beam (1) fixedly disposed between the two side beams (2), wherein the cross-beam (1) and the side beams (2) are all box beams. The cross-beam (1) is in an H shape, and connecting portions at two ends thereof respectively converge obliquely toward the lateral center line thereof. Each side beam (2) is provided with a socket (21) at an inner side thereof formed of an upper cover plate and a lower cover plate thereof. The upper cover plate of each connecting portion of the cross-beam (1) engages with a portion of the upper cover plate of the corresponding side beam (2) forming the socket (21). The lower cover plate of each connecting portion of the cross-beam (1) engages with a portion of the lower cover

plate of the corresponding side beam (2) forming the socket (21). An external side vertical plate of each connecting portion of the cross-beam (1) exceeds the end portions of the upper cover plate and the lower cover plate of the cross-beam and is inserted into the side beam (2) from the corresponding socket (21) to connect to the side beam (2). The bogie framework is easy to weld during assembly, the welded connections have high reliability and stability, and a sufficient installation space is provided for other components at inner sides of side beams (2). Also disclosed is a bogie comprising the bogie framework.

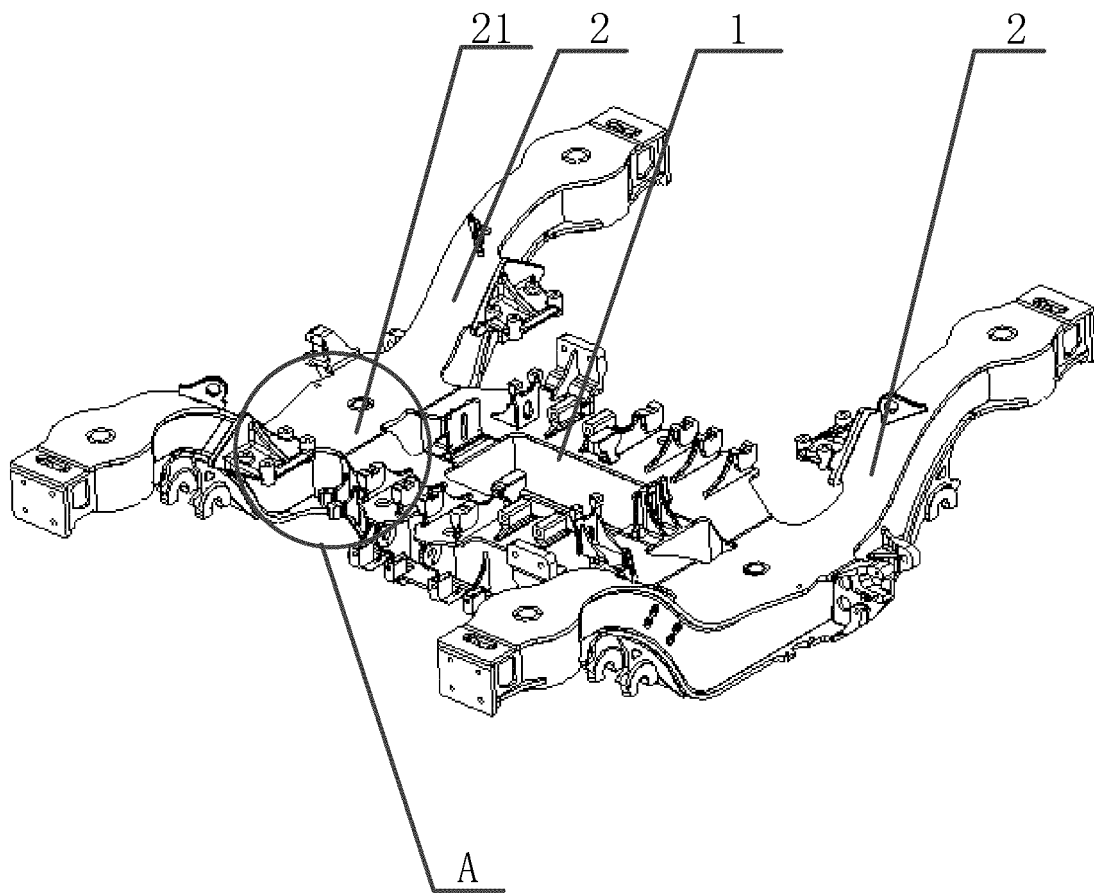


Figure 1

Description

[0001] This application claims priorities to Chinese Patent Applications No. 201710852362.7, titled "BOGIE FRAME AND BOGIE HAVING SAME", and No. 201721202610.5, titled "BOGIE FRAME AND BOGIE HAVING SAME", filed on September 19, 2017 with the Chinese State Intellectual Property Office, the entire disclosures of which are incorporated herein by reference.

FIELD

[0002] The present application relates to the technical field of bogies, and in particular to a bogie frame and a bogie provided with the bogie frame.

BACKGROUND

[0003] In rail vehicles, a bogie is an important component. The bogie is a direct receiver of a traction force, a braking force, a load of a vehicle, and an external force, and the bogie plays a crucial role in the running quality of the vehicle and the safety of passenger transportation.

[0004] A cross sill and side sills of a bogie frame are main load-bearing components. The cross sill is rigidly integrated by welding transversely between the left side sill and the right side sill. The cross sill may be a round tubular cross sill or a box cross sill. The box cross sill is formed by welding of sheets. Usually, two round tubular cross sills are used in parallel in the bogie frame, or one box- cross sill is used in the bogie frame. The structural strength of the cross sill and the structural strength of the side sills as well as the connection strength between the cross sill and the side sills is important for the overall strength of the bogie frame.

[0005] At present, two ends of the box cross sill are typically connected to the side sills respectively by transitional connection members. This connection has a poor welding quality, a poor the connection reliability, susceptibility of damage, a difficult manufacturability, a large space occupation, a large manufacturing workload, and a difficult installation.

[0006] In addition, a secondary vertical damper in the conventional bogie is generally mounted between the side sill and a body bolster, moreover, the secondary vertical damper is located at an outer side of the side sill and far away from the centerline of a vehicle body. In operation, an up and down stroke, generated due to vibration of the vehicle body, of the secondary vertical damper is large, which may adversely affect the service life of the secondary vertical damper and may even cause damage.

[0007] Therefore, a technical issue to be currently addressed by the person skilled in the art is to overcome the defects of the conventional bogie.

SUMMARY

[0008] In view of this, a bogie frame is provided according to the present application, which not only facilitates performing the welded connection during assembly and achieves a highly reliable and highly stable welded connection, but also can provide, at an inner side region of each of side sills, a sufficient mounting space for other components, thereby improving the flexibility of design of the bogie frame. A bogie including the bogie frame described above is further provided according to the present application, the bogie frame of which not only facilitates performing the welded connection during assembly and achieves a highly reliable and highly stable welded connection, but also can provide, at the inner side region of each of the side sills, a sufficient mounting space for other components, thereby improving the flexibility of design of the bogie frame.

[0009] Technical solutions are provided according to the present application as follows.

[0010] A bogie frame is provided according to the present application, which includes two side sills and one cross sill fixedly arranged between the two side sills. Each of the cross sill and the two side sills is a box beam. The cross sill is in an H-shape. Each of connection portions of the cross sill at two ends thereof obliquely converges towards a transverse centerline of the cross sill. An inner side of each of the two side sills is provided with a socket formed by an upper cover plate and a lower cover plate of the respective side sill. An upper cover plate of each of the connection portions of the cross sill is butt joined to a portion, forming part of the socket, of the upper cover plate of the respective side sill. A lower cover plate of each of the connection portions of the cross sill is butt joined to a portion, forming part of the socket, of the lower cover plate of the respective side sill. An outer side vertical plate of each of the connection portions of the cross sill goes beyond an end portion of the upper cover plate and an end portion of the lower cover plate of the cross sill, and is inserted via the respective socket into the respective side sill to be connected to the respective side sill.

[0011] Preferably, the upper cover plate of the side sill extends inwards at a joint where the upper cover plate of the side sill is correspondingly connected to the cross sill, and the lower cover plate of the side sill extends inwards at a joint where the lower cover plate of the side sill is correspondingly connected to the cross sill, to form the respective socket

corresponding to the respective connection portion of the cross sill.

[0012] Preferably, an end surface, at a position where the socket is formed, of the upper cover plate of the side sill is adapted to an end surface of the upper cover plate of the respective connection portion of the cross sill. An end surface, at a position where the socket is formed, of the lower cover plate of the side sill is adapted to an end surface of the lower cover plate of the respective connection portion of the cross sill.

[0013] Preferably, the outer side vertical plate of each of the connection portions is an inwardly concaved arc-shaped plate.

[0014] Preferably, the outer side vertical plate of each of the connection portions is formed by a first straight plate segment, a second straight plate segment and a transitional arc-shaped plate segment, the first straight plate segment is inserted into the respective socket, the second straight plate segment extends from a middle portion of the cross sill and obliquely converges towards the transverse centerline of the cross sill, and the transitional arc-shaped plate segment is arranged between the first straight plate segment and the second straight plate segment.

[0015] Preferably, the outer side vertical plate of each of the connection portions of the cross sill is inserted into the respective side sill via the respective socket, and then connected by welding to the upper cover plate, the lower cover plate and a vertical plate of the respective side sill.

[0016] Preferably, the side sill is a U-shaped structural beam with a downwardly concaved middle portion, and the socket is arranged at the downwardly concaved position of the side sill.

[0017] Preferably, a secondary vertical damper seat is provided at an outer side of the outer side vertical plate of each of the connection portions of the cross sill. A connection portion, for connection to a top portion of a secondary vertical damper, of a body bolster is provided at a position, right above the secondary vertical damper seat and corresponding to the secondary vertical damper seat, of the body bolster.

[0018] Preferably, the upper cover plate of each of the connection portions of the cross sill and a portion, forming part of the socket, of the upper cover plate of the respective side sill are located in a same plane and butt joined to each other. The lower cover plate of each of the connection portions of the cross sill and a portion, forming part of the socket, of the lower cover plate of the respective side sill are located in a same plane and butt joined to each other.

[0019] A bogie is further provided according to the present application, which includes a bogie frame. The bogie frame is the bogie frame according to any one of the above aspects.

[0020] In the bogie according to the present application, the cross sill is directly connected to the side sills, without requiring to provide the transitional connection members in the conventional technology, thus, the bogie frame facilitates performing the welded connection during assembly, and a highly reliable and highly stable welded connection can be achieved. Since each of the connection portions of the cross sill at the two ends thereof obliquely converges towards the transverse centerline of the cross sill, a sufficient mounting space may be provided, at the inner side region of each of the side sills, for other components, thereby improving the flexibility of design of the bogie frame. Each of the cross sill and the side sills is provided as a box beam, which facilitates reduction of the overall weight of the frame and saves the material.

[0021] The bogie frame of the bogie including the bogie frame according to the present application not only facilitates performing the welded connection during assembly, and achieves a highly reliable and highly stable welded connection, but also can provide, at the inner side region of each of the side sills, a sufficient mounting space for other components, thereby improving the flexibility of design of the bogie frame.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] For more clearly illustrating embodiments of the present application or the technical solutions in the conventional technology, drawings referred to describe the embodiments or the conventional technology will be briefly described hereinafter. The drawings in the following description are only examples of the present application, and for the person skilled in the art, other drawings may be obtained based on the provided drawings without any creative efforts.

Figure 1 is a schematic front view showing the structure of a bogie frame of a motor unit according to an embodiment of the present application;

Figure 2 is an enlarged view of part A in Figure 1;

Figure 3 is a schematic rear view showing the structure of the bogie frame of the motor unit according to the embodiment of the present application;

Figure 4 is a top view of the bogie frame of the motor unit according to the embodiment of the present application;

Figure 5 is a front view of the bogie frame of the motor unit according to the embodiment of the present application;

Figure 6 is a side view of the bogie frame of the motor unit according to the embodiment of the present application;

Figure 7 is a schematic view showing the structure of a bogie of the motor unit according to an embodiment of the present application;

Figure 8 is a schematic front view showing the structure of a bogie frame of a trailer according to an embodiment of the present application; and

Figure 9 is a schematic view showing the structure of a bogie of the trailer according to an embodiment of the present application.

Reference Numerals in Figures 1 to 9:

- | | |
|-----------------|-----------------------------------|
| 1 cross sill; | 2 side sill; |
| 21 socket; | 3 secondary vertical damper seat; |
| 4 body bolster; | 5 secondary vertical damper. |

DETAILED DESCRIPTION OF EMBODIMENTS

[0023] The technical solutions in the embodiments of the present application will be described clearly and completely hereinafter in conjunction with the drawings in the embodiments of the present application. The described embodiments are only a part of the embodiments of the present application, rather than all embodiments. Based on the embodiments in the present application, all of other embodiments, made by the person skilled in the art without any creative efforts, fall into the protection scope of the present application.

[0024] A bogie frame is provided according to an embodiment of the present application, which not only facilitates fit-up and welding with a high reliability and a good stability, but also can provide, at an inner side region of each of side sills, a sufficient mounting space for other components, thereby improving the flexibility of design of the bogie frame. A bogie including the bogie frame described above is further provided according to another embodiment of the present application, which not only facilitates fit-up and welding with a high reliability and a good stability, but also can provide, at an inner side of each of side sills, a sufficient mounting space for other components, thereby improving the flexibility of design of the bogie frame.

[0025] Reference is made to Figures 1 to 9. Figure 1 is a schematic front view showing the structure of a bogie frame of a motor unit according to the present application. Figure 2 is an enlarged view of part A in Figure 1. Figures 3 to 6 are respectively a schematic rear view showing the structure of the bogie frame of the motor unit according to the embodiment of the present application, as well as a top view, a front view and a side view of the bogie frame of the multiple-unit train according to the embodiment of the present application. Figure 7 is a schematic view showing the structure of a bogie of the motor unit according to an embodiment of the present application. Figure 8 is a schematic front view showing the structure of a bogie frame of a trailer according to an embodiment of the present application. Figure 9 is a schematic view showing the structure of a bogie of the trailer according to an embodiment of the present application.

[0026] The bogie frame according to an embodiment of the present application includes two side sills 2 and one cross sill 1 fixedly arranged between the two side sills 2. The cross sill 1 and the side sills 2 may form an H-shaped structure. Each of the cross sill 1 and the side sills 2 is a box beam. Each of a peripheral wall of the cross sill 1 and a peripheral wall of the side sill 2 is formed by an upper cover plate, a lower cover plate and vertical plates.

[0027] The cross sill 1 is in an H-shape. Each of connection portions of the cross sill 1 at two ends thereof obliquely converges towards a transverse centerline of the cross sill 1, that is, in a direction of width of the train, each of the two ends of the cross sill 1 respectively forms two branches for connecting to the respective side sill 2. Due to the H shape of the cross sill 1, the vertical plates of each of the two branches of the respective connection portion of the cross sill 1 may include an inner side vertical plate and an outer side vertical plate, the inner side vertical plate is arranged close to the transverse centerline of the cross sill 1, and the outer side vertical plate is arranged away from the transverse centerline of the cross sill 1. The arrangement of the inner side vertical plate can improve the overall strength of the bogie frame. Moreover, each of the connection portions of the cross sill 1 and a middle portion of the respective side sill 2 form an opening. A sufficient space may be provided at the opening so as to weld the inner side vertical plate to the upper cover plate and the lower cover plate of each of the cross sill 1 and the side sill 2.

[0028] An inner side of the side sill 2 is provided with a socket 21. The socket 21 is formed by the upper cover plate and the lower cover plate of the side sill 2. The upper cover plate of each of the connection portions of the cross sill 1 is butt joined to a portion, forming part of the socket 21, of the upper cover plate of the respective side sill 2. The lower

cover plate of each of the connection portions of the cross sill 1 is butt joined to a portion, forming part of the socket 21, of the lower cover plate of the respective side sill 2.

[0029] The outer side vertical plate of each of the connection portions of the cross sill 1 goes beyond an end portion of the upper cover plate and an end portion of the lower cover plate of the cross sill 1, i.e., the outer side vertical plate of the cross sill 1 extends beyond the upper cover plate and the lower cover plate of the cross sill 1 in the width direction of the train. An end portion of the outer side vertical plate of each of the connection portions of the cross sill 1 is inserted via the respective socket 21 into the respective side sill 2 to be connected to the respective side sill 2.

[0030] The cross sill 1 may be fixedly connected to the side sills 2 by welding. The cross sill 1 and the side sills 2 of the bogie frame of the multiple-unit train may be arranged in the above way, and the cross sill 1 and the side sills 2 of the bogie frame of the trailer may also be arranged in the above way.

[0031] In this bogie frame, the cross sill 1 is directly connected to the side sills 2, without requiring to provide transitional connection members in the conventional technology, thus, the bogie frame facilitates fit-up and welding with a high reliability and a good stability. Since each of the connection portions of the cross sill 1 at the two ends thereof obliquely converges towards the transverse centerline of the cross sill 1, a sufficient mounting space may be provided, at an inner side region of each of the side sills 2, for other components, thereby improving the flexibility of design of the bogie frame. Each of the cross sill 1 and the side sills 2 is provided as a box beam, which facilitates reduction of the overall weight of the frame and saves the material.

[0032] In the above embodiments, the upper cover plate and the lower cover plate of the side sill 2 extend inwards at a corresponding connection to the cross sill 1, to form the socket 21 corresponding to the respective connection portions of the cross sill 1. That is, the upper cover plate and the lower cover plate of one side sill 2 forming the socket 21 extend towards the other side sill 2, thereby facilitating the fit-up between the cross sill 1 and the side sills 2. Moreover, the extension structure of the upper cover plate of the side sills 2 for connecting to the cross sill 1 may prevent the cross sill 1 from occupying a space, used for connection to other components, of the side sill 2, and thus may prevent other parts of the side sill 2 from interfering in the fit-up process.

[0033] In the above embodiments, an end surface, at a position where the socket 21 is formed, of the upper cover plate of each of the side sills 2 is adaptive to an end surface of the upper cover plate of the corresponding connection portion of the cross sill 1, and an end surface, at a position where the socket 21 is formed, of the lower cover plate of each of the side sills 2 is adaptive to an end surface of the lower cover plate of the corresponding connection portion of the cross sill 1. "Adaptive" means that the end surfaces have corresponding shapes and may be completely and seamlessly jointed to each other. By taking the end surfaces of the upper cover plate and the lower cover plate of each of the connection portions of the cross sill 1 being flat surfaces as an example, the end faces at the portions, where the socket 21 is formed, of the upper cover plate and the lower cover plate of each of the side sills 2 are also flat surfaces with the same areas and corresponding shapes and inclination angles. This arrangement may ensure that the edge of the joints of the transverse sill 1 and the side sills 2 are smooth, the connection is reliable, and may facilitate material saving.

[0034] In the above embodiments, the outer side vertical plate of each of the connection portions may be an inwardly concaved arc-shaped plate. "Inwardly concaved" refers to being concaved toward the transverse centerline of the cross sill 1, so as to further expand an available space in the bogie frame, to reduce the stress concentration at the joints of the cross sill 1 to the side sills 2, and to improve the connection strength. Each of the connection portions of the cross sill 1 may be designed with a variable cross section, so as to reduce the stress concentration at the joints of the cross sill 1 to the side sills 2.

[0035] Alternatively, the outer side vertical plate of the connection portion may be formed by a first straight plate segment, a second straight plate segment and a transitional arc-shaped plate segment. The first straight plate segment is inserted into the corresponding socket 21. The second straight plate segment extends from a middle portion of the cross sill 1 and obliquely converges towards the transverse centerline of the cross sill 1. The transitional arc-shaped plate segment is arranged between the first straight plate segment and the second straight plate segment. That is, the outer side vertical plate of each of the connection portions of the cross sill 1 includes the second straight plate segment, the transitional arc-shaped plate segment and the first straight plate segment in the listed sequence from the middle portion to an outer side of the cross sill 1 in the width direction of the train. This arrangement is convenient to manufacture. In particular, providing a portion, inserted into the side sill 2 as a straight plate shape may facilitate determination of the orientation of connection.

[0036] Specifically, the outer side vertical plate of each of the connection portions of the cross sill 1 may be an integrally formed component including three segments, i.e., the second straight plate segment, the transitional arc-shaped plate segment and the first straight plate segment. Alternatively, the outer side vertical plate of each of the connection portions of the cross sill 1 may be formed by sequence welding.

[0037] In the above embodiments, the outer side vertical plate of each of the connection portions of the cross sill 1 may be inserted into a corresponding side sill 2 via a corresponding socket 21, and then connected by welding to the upper cover plate, the lower cover plate and the vertical plate of the side sill 2, so as to ensure the reliability of connection between the cross sill 1 and the side sill 2. A distance by which the outer side vertical plate of each of the connection

portions of the cross sill 1 is inserted into the side sill 2 may be determined in other way in practice.

[0038] In the above embodiments, the side sill 2 may be a U-shaped structural beam with a downwardly concaved middle portion, and the downwardly concaved structure may provide a mounting space for the components and parts. The socket 21 may be arranged at a downwardly concaved position of the side sill 2. This arrangement may ensure the overall strength of the bogie frame, and may increase the length of each of the joints of the cross sill 1 to the side sills 2 in a length direction of the train as long as possible, thereby ensuring the area of connection of the cross sill 1 to the side sills 2.

[0039] In the above embodiments, a secondary vertical damper seat 3 is provided at an outer side of the outer side vertical plate of each of the connection portions of the cross sill 1, and a connection portion, for connection to a top portion of a secondary vertical damper 5, of a body bolster 4 may be provided at a position, right above the secondary vertical damper seat 3 and corresponding to the secondary vertical damper seat 3, of the body bolster 4. This arrangement can allow the available space in the bogie frame to be sufficiently used while ensuring the damping effect, thereby reducing a stroke of the secondary vertical damper 5 generated by the rotation of the motor unit. Specifically, the two ends of the cross sill 1 in the width direction of the motor unit each may be provided with one secondary vertical damper seat 3.

[0040] In the above embodiments, each of the cross sill 1 and the side sill 2 may specifically be formed by castings which are fit up and welded to one another. A certain number of partition plates may be provided in the cross sill 1 and the side sill 2 as required, so as to further improve the torsional strength of the frame. In addition, the partition plate may be provided with a weight reduction hole, so as to reduce the overall weight of the bogie frame as much as possible and save the material while meeting a strength requirement of the bogie frame.

[0041] In the above embodiments, the upper cover plate of each of the connection portions of the cross sill 1 and a portion, forming part of the socket 21, of the upper cover plate of the corresponding side sill 2 may be located in a same plane and butt jointed to each other. The lower cover plate of each of the connection portions of the cross sill 1 and a portion, forming part of the socket 21, of the lower cover plate of the corresponding side sill 2 may be located in a same plane and butt jointed to each other. Each of connection positions where the cross sill 1 is connected to the side sills 2 is located in a plane, which may provide convenience for arranging other components on the connection position. Of course, the upper cover plate of each of the connection portions of the cross sill 1 may alternatively have a certain height difference from the portion, forming part of the socket 21, of the upper cover plate of the corresponding side sill 2, and the lower cover plate of each of the connection portions of the cross sill 1 may alternatively have a certain height difference from the portion, forming part of the socket 21, of the lower cover plate of the corresponding side sill 2.

[0042] In addition to the bogie frame described above, a bogie including the bogie frame is further provided according to the embodiments of the present application, the bogie frame not only facilitates fit-up and welding with a high reliability and a good stability, but also can provide, at the inner side region of each of the side sills, a sufficient mounting space for other components, thereby improving the flexibility of design of the bogie frame. Reference may be made to the conventional technology for the structures of other parts of the bogie, which will not be described herein.

[0043] The above embodiments in this specification are described in a progressive manner. Each of the embodiments is mainly focused on describing its differences from other embodiments, and references may be made among these embodiments with respect to the same or similar portions among these embodiments.

[0044] The above explanation of the disclosed embodiments enables the person skilled in the art to implement or use the present application. It is apparent for the person skilled in the art to make multiple modifications to these embodiments. The general principles defined herein may be implemented in other embodiments without departing from the technical solution or scope of the present application. Therefore, the present application is not limited to these embodiments illustrated herein, and should conform to a broadest scope in consistent with the principles and novel features disclosed herein.

Claims

1. A bogie frame, comprising:

two side sills (2); and
one cross sill (1) fixedly arranged between the two side sills (2),
wherein each of the cross sill (1) and the two side sills (2) is a box beam, the cross sill (1) is in an H-shape, and each of connection portions of the cross sill (1) at two ends thereof obliquely converges towards a transverse centerline of the cross sill (1); an inner side of each of the two side sills (2) is provided with a socket (21) formed by an upper cover plate and a lower cover plate of the respective side sill (2);
wherein an upper cover plate of each of the connection portions of the cross sill (1) is butt jointed to a portion, forming the socket (21), of the upper cover plate of the corresponding side sill (2), and a lower cover plate of

each of the connection portions of the cross sill (1) is butt joined to a portion, forming the socket (21), of the lower cover plate of the corresponding side sill (2);

wherein an outer side vertical plate of each of the connection portions of the cross sill (1) goes beyond an end portion of the upper cover plate and an end portion of the lower cover plate of the cross sill (1), and is inserted via the corresponding socket (21) into the respective side sill (2) to be connected to the respective side sill (2).

2. The bogie frame according to claim 1, wherein the upper cover plate and the lower cover plate of the side sill (2) extends inwards at a corresponding connection to the cross sill (1), to form the socket (21) corresponding to the connection portions of the cross sill (1).

3. The bogie frame according to claim 2, wherein an end surface, at a position where the socket (21) is formed, of the upper cover plate of each of the side sills (2) is adaptive to an end surface of the upper cover plate of the corresponding connection portion of the cross sill (1), and an end surface, at a position where the socket (21) is formed, of the lower cover plate of each of the side sills (2) is adaptive to an end surface of the lower cover plate of the corresponding connection portion of the cross sill (1).

4. The bogie frame according to claim 3, wherein the outer side vertical plate of each of the connection portions is an inwardly concaved arc-shaped plate.

5. The bogie frame according to claim 3, wherein the outer side vertical plate of each of the connection portions is formed by a first straight plate segment, a second straight plate segment and a transitional arc-shaped plate segment, wherein the first straight plate segment is inserted into the socket (21), the second straight plate segment extends from a middle portion of the cross sill (1) and obliquely converges towards the transverse centerline of the cross sill (1), and the transitional arc-shaped plate segment is arranged between the first straight plate segment and the second straight plate segment.

6. The bogie frame according to claim 1, wherein the outer side vertical plate of each of the connection portions of the cross sill (1) is inserted into the corresponding side sill (2) via the socket (21), and is connected by welding to the upper cover plate, the lower cover plate and a vertical plate of each of the corresponding side sill (2).

7. The bogie frame according to claim 1, wherein each of the side sills (2) is a U-shaped structural beam with a downwardly concaved middle portion, and the socket (21) is arranged at a downwardly concaved position of each of the side sills (2).

8. The bogie frame according to any one of claims 1 to 7, wherein a secondary vertical damper seat (3) is provided at an outer side of the outer side vertical plate of each of the connection portions of the cross sill (1), and a connection portion, for connection to a top portion of a secondary vertical damper (5), of a body bolster (4) is provided at a position, right above the secondary vertical damper seat (3) and corresponding to the secondary vertical damper seat (3), of the body bolster (4).

9. The bogie frame according to any one of claims 1 to 7, wherein the upper cover plate of each of the connection portions of the cross sill (1) and a portion, forming the socket (21), of the upper cover plate of the respective side sill (2) are located in a same plane and butt jointed to each other; and the lower cover plate of each of the connection portions of the cross sill (1) and a portion, forming the socket (21), of the lower cover plate of the corresponding side sill (2) are located in a same plane and butt jointed to each other.

10. A bogie, comprising a bogie frame, wherein the bogie frame is the bogie frame according to any one of claims 1 to 9.

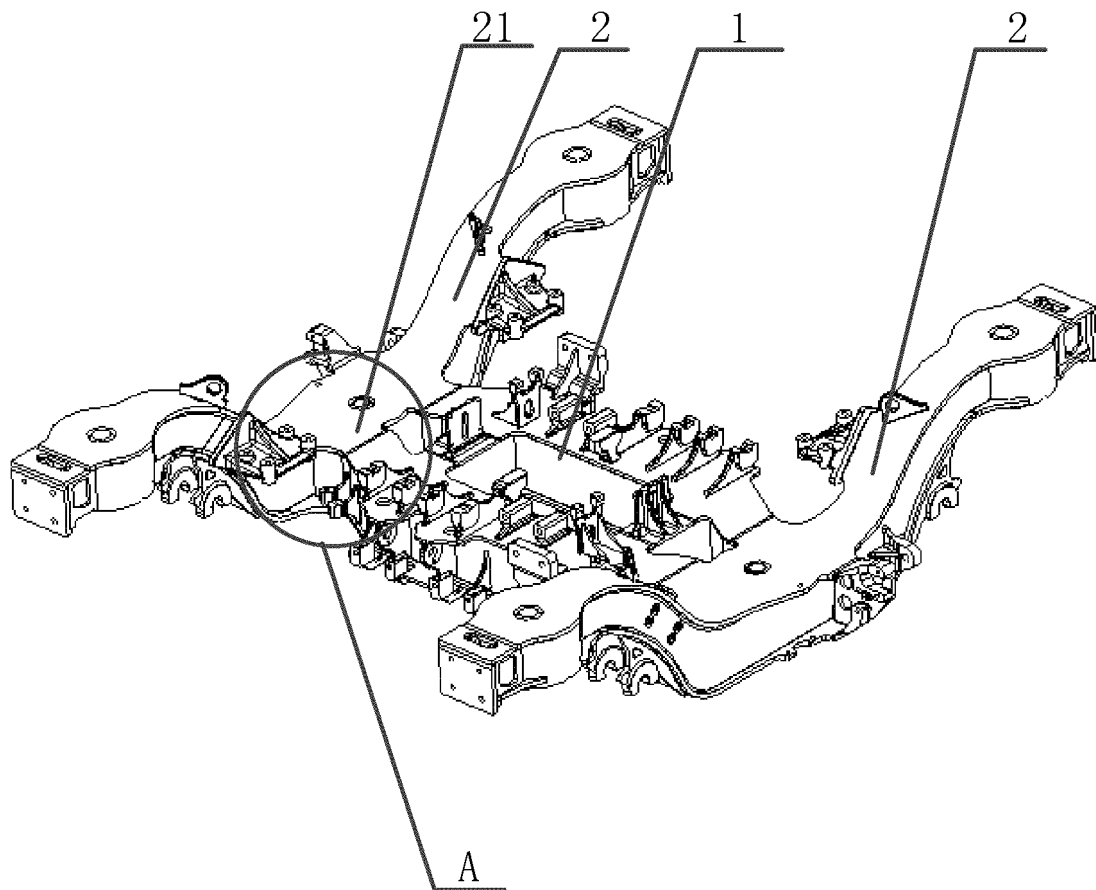


Figure 1

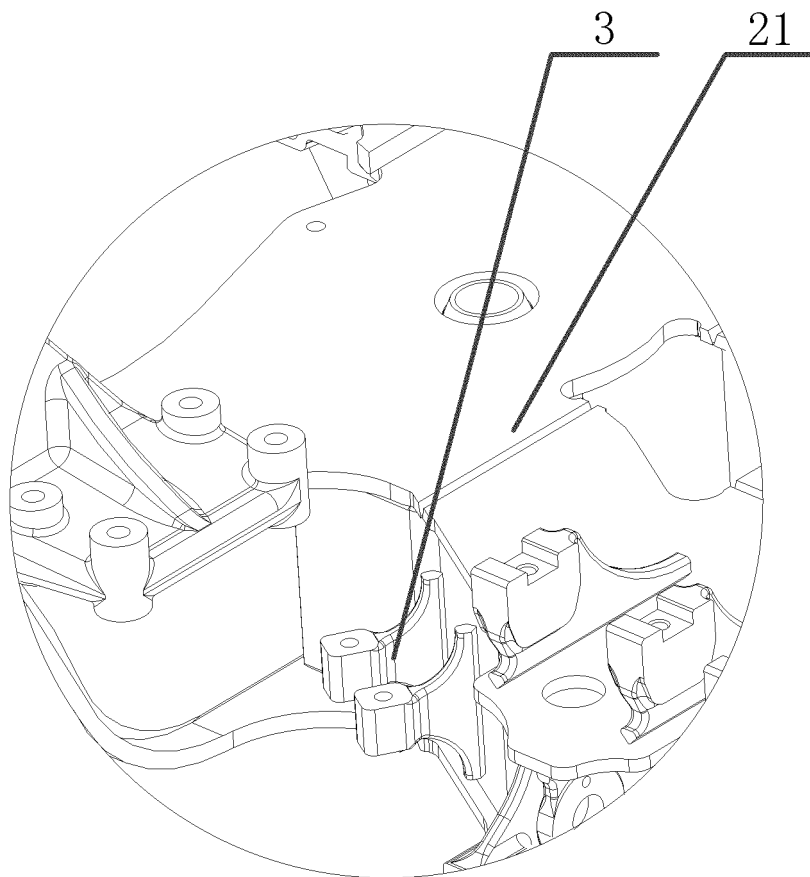


Figure 2

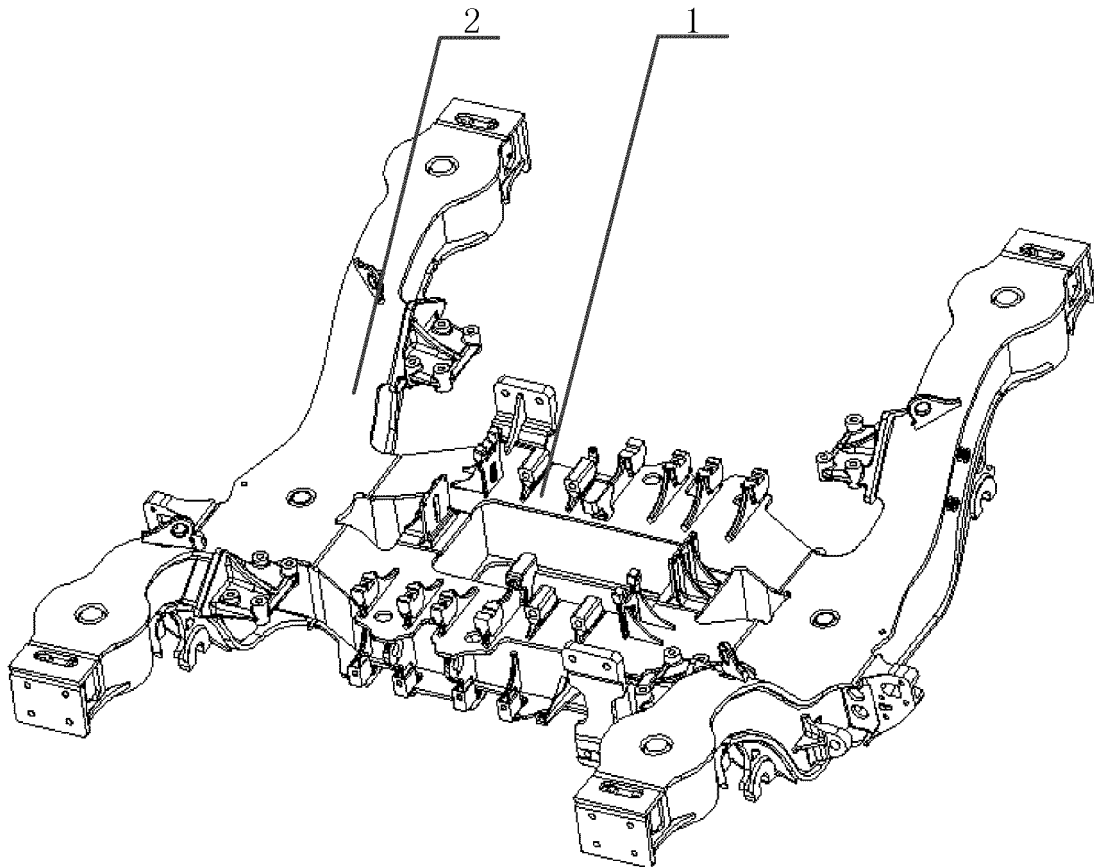


Figure 3

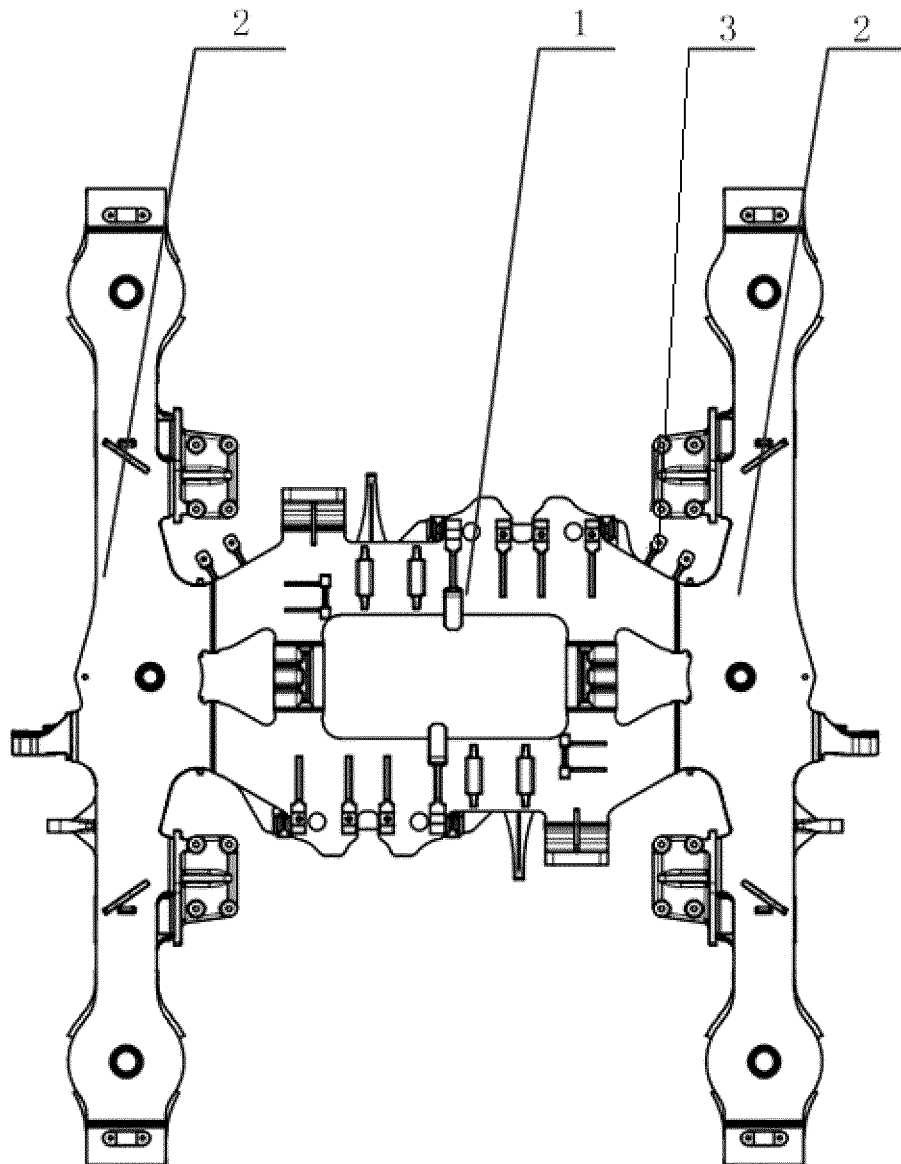


Figure 4

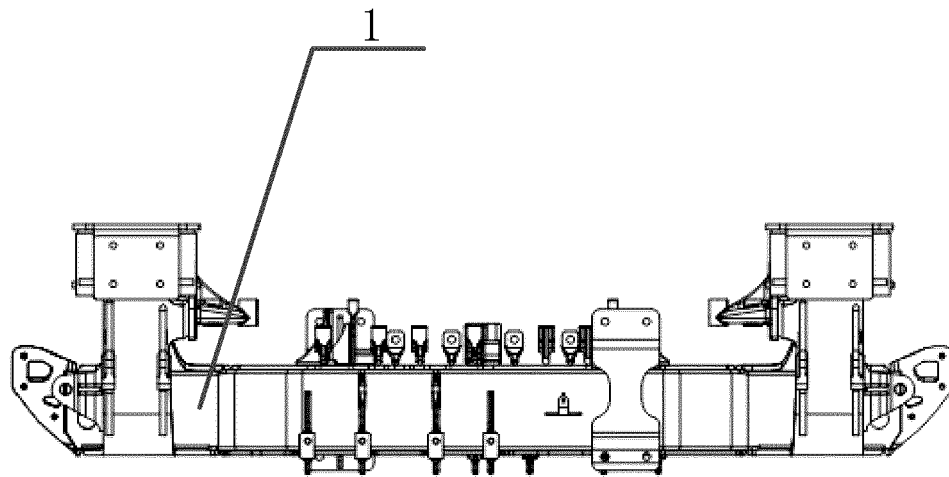


Figure 5

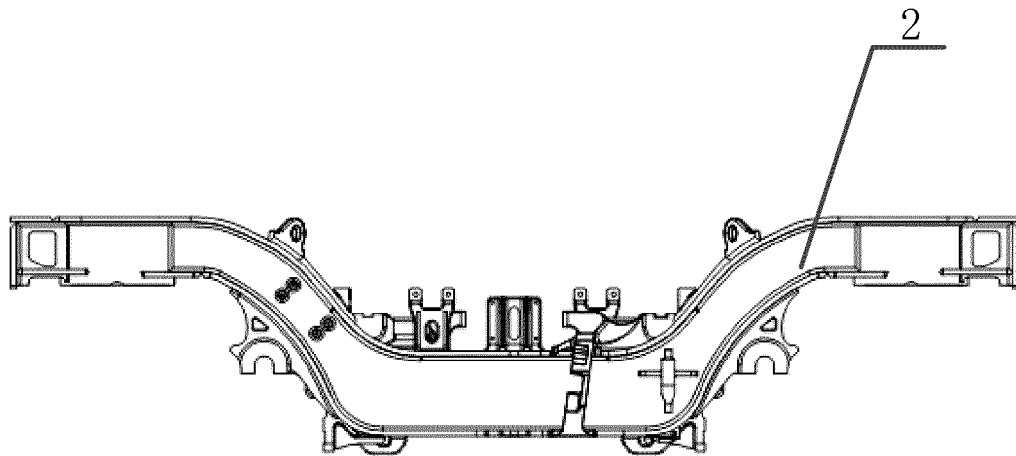


Figure 6

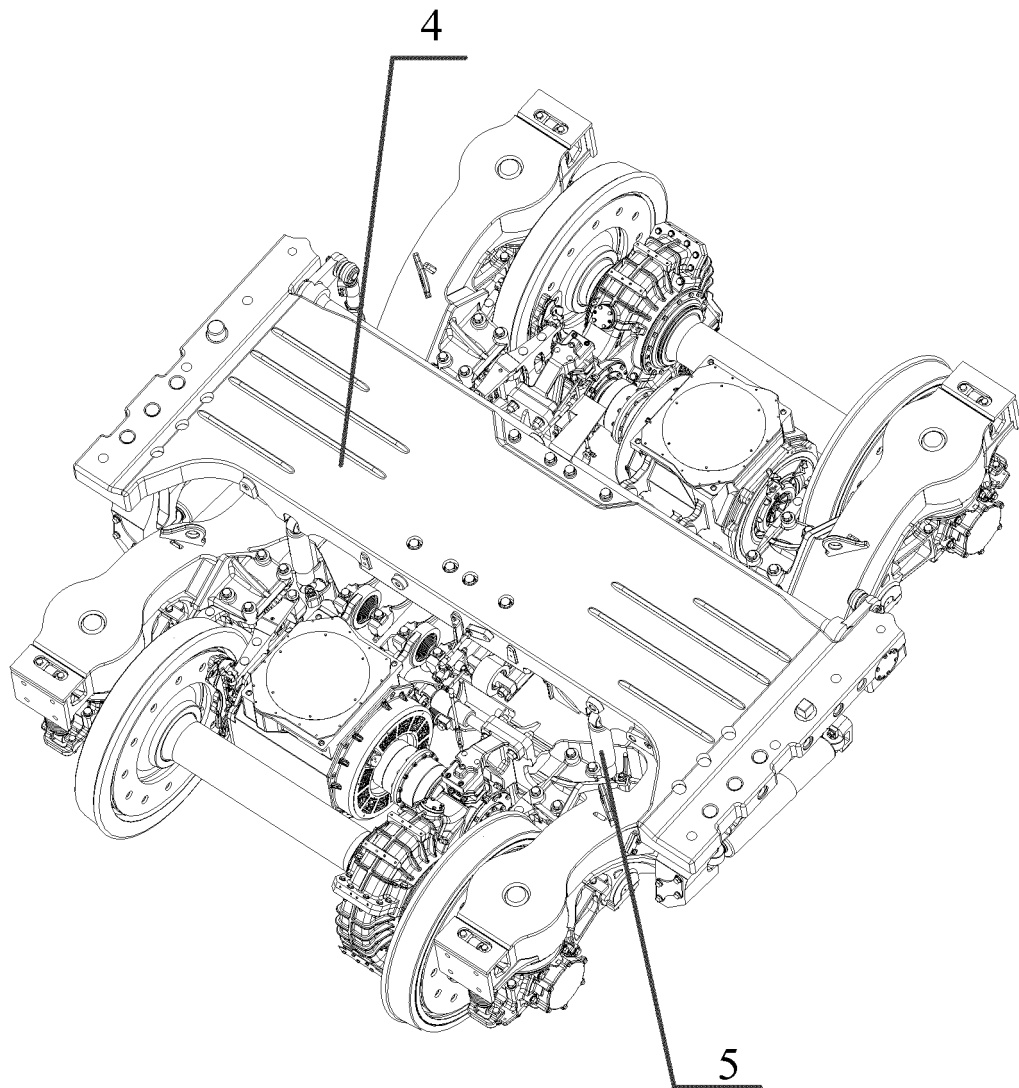


Figure 7

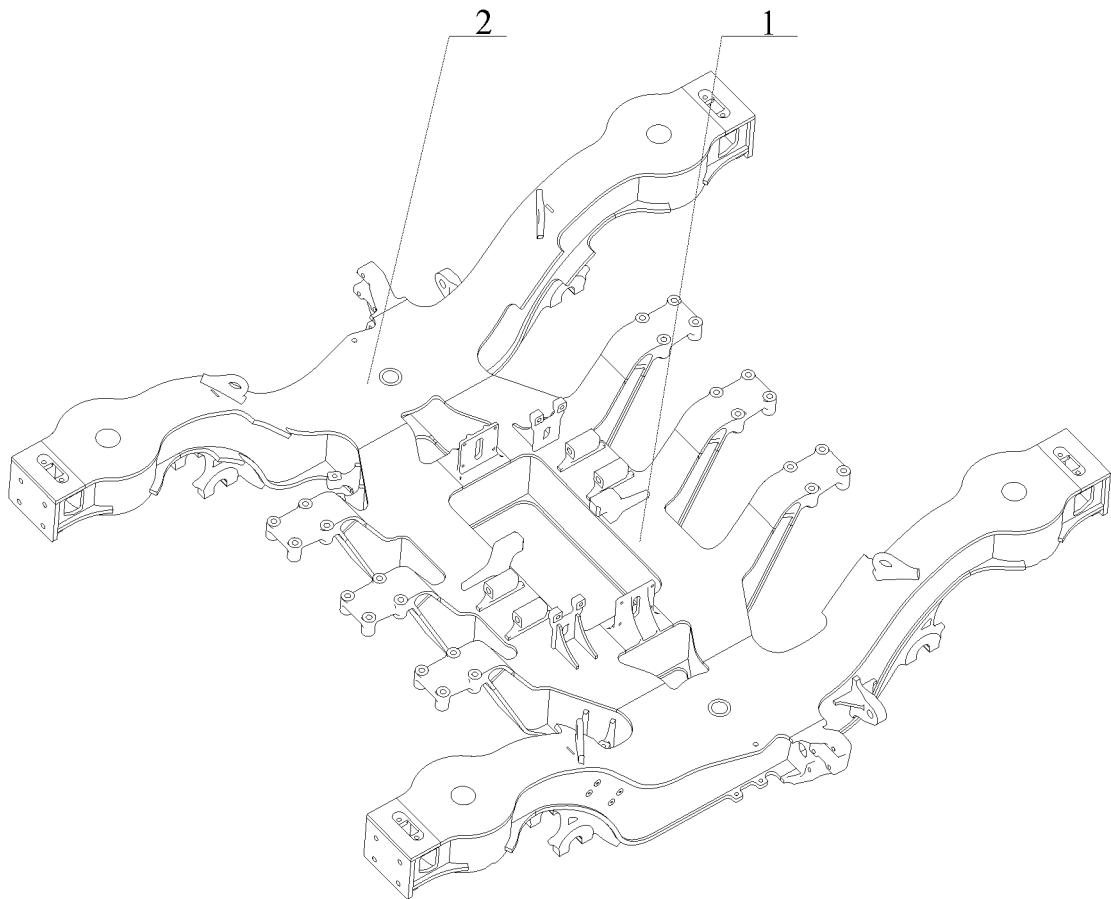


Figure 8

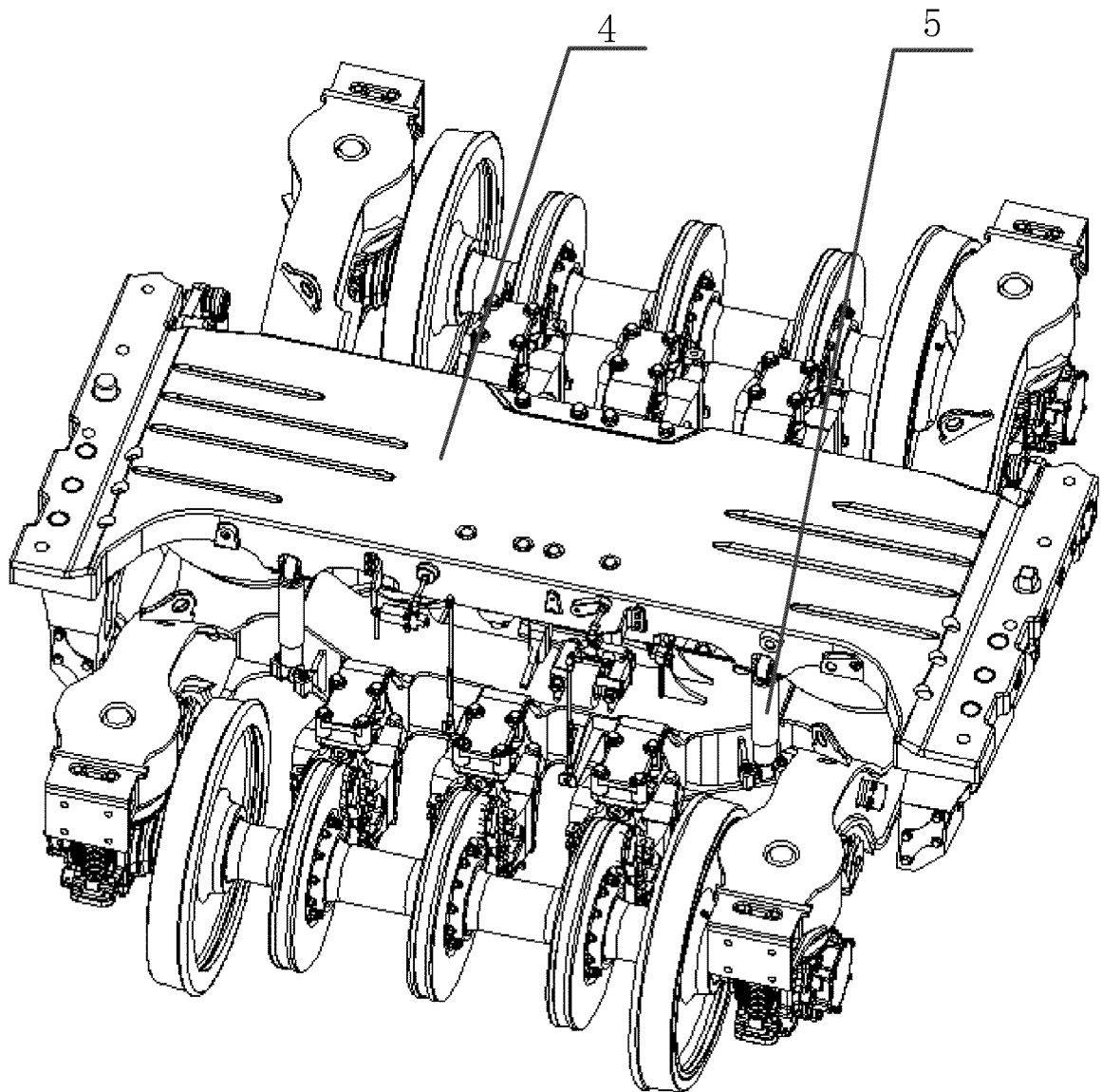


Figure 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/119258

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)

CNABS, CNTXT, SIPOABS, VEN: 转向架, 侧梁, 横梁, 箱体, 插, 斜 bogie w frame, side w beam, cross w beam, box, insert,
incline, oblique, slant+, tilt+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 102490754 A (JINAN RAILWAY VEHICLES EQUIPMENT CO., LTD.) 13 June 2012 (13.06.2012), description, paragraphs [0010], [0017], [0031] and [0032], and figures 1-3	1-10
X	CN 202413832 U (JINAN RAILWAY VEHICLES EQUIPMENT CO., LTD.) 05 September 2012 (05.09.2012), description, paragraphs [0010], [0017], [0031] and [0032], and figures 1-3	1-10
X	CN 205930741 U (CNR TANGSHAN LOCOMOTIVE VEHICLE CO., LTD.) 08 February 2017 (08.02.2017), description, paragraphs [0029] and [0030], and figure 1	1-10
A	CN 104890693 A (CSR ZHUZHOU ELECTRIC LOCOMOTIVE CO., LTD.) 09 September 2015 (09.09.2015), entire document	1-10
A	CN 204674606 U (CHANGCHUN RAIL CAR CO., LTD.) 30 September 2015 (30.09.2015), entire document	1-10

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

* Special categories of cited documents:	"I" 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
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search 10 May 2018	Date of mailing of the international search report 22 May 2018
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer WU, Xiaoxia Telephone No. (86-10) 62084157

Form PCT/ISA/210 (second sheet) (July 2009)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/119258

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2016139070 A1 (SIEMENS OESTERR AG) 09 September 2016 (09.09.2016), entire document	1-10

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Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/119258

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102490754 A	13 June 2012	CN 102490754 B	22 October 2014
CN 202413832 U	05 September 2012	None	
CN 205930741 U	08 February 2017	None	
CN 104890693 A	09 September 2015	CN 104890693 B	23 June 2017
		WO 2017000547 A1	05 January 2017
CN 204674606 U	30 September 2015	None	
WO 2016139070 A1	09 September 2016	AT 516923 A3	15 January 2018
		AT 516923 A2	15 September 2016
		EP 3221202 A1	27 September 2017
		US 2018043910 A1	15 February 2018

REFERENCES CITED IN THE DESCRIPTION

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