



EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
05.05.2021 Bulletin 2021/18

(51) Int Cl.:
B61F 5/52 (2006.01)

(21) Application number: **19837364.9**

(86) International application number:
PCT/CN2019/096064

(22) Date of filing: **16.07.2019**

(87) International publication number:
WO 2020/015616 (23.01.2020 Gazette 2020/04)

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

- **CHEN, Jian**
Zhuzhou, Hunan 412001 (CN)
- **WANG, Zhiming**
Zhuzhou, Hunan 412001 (CN)
- **LIAO, Congjian**
Zhuzhou, Hunan 412001 (CN)
- **ZHOU, Xinpeng**
Zhuzhou, Hunan 412001 (CN)
- **XIAO, Ti**
Zhuzhou, Hunan 412001 (CN)
- **HE, Shizhong**
Zhuzhou, Hunan 412001 (CN)

(30) Priority: **17.07.2018 CN 201810782629**

(71) Applicant: **CRRC Zhuzhou Locomotive Co., Ltd**
Zhuzhou, Hunan 412001 (CN)

(72) Inventors:

- **LIU, Yulong**
Zhuzhou, Hunan 412001 (CN)
- **TAO, Gongan**
Zhuzhou, Hunan 412001 (CN)

(74) Representative: **Kramer Barske Schmidtchen**
Patentanwälte PartG mbB
European Patent Attorneys
Landsberger Strasse 300
80687 München (DE)

(54) **LIGHT RAIL VEHICLE BOGIE**

(57) A light rail vehicle bogie comprises a frame (1), the frame (1) comprises side beams (11) and a cross beam (12), a middle part of the side beam (11) is recessed, a top of the cross beam (12) is provided with a bolster (2), the cross beam (12) is composed of two tube bodies (121), both ends of each tube body (121) are provided with connecting seats (8), and the both ends of the tube body (121) are fixedly connected to the side beams (11) through the connecting seats (8); cantilever seats (16) extending inward are provided on two axle boxes of the light rail vehicle bogie, and a magnetic rail brake (9) provided right below the tube bodies (121) is suspended on the two cantilever seats (16); a vertical guide rod (17) is arranged at the top of the magnetic rail brake (9), two limit seats (10) right above two ends of the magnetic rail brake (9) is mounted on one side of each connecting seat (8), and the limit seat (10) is provided with a guide hole (18) for inserting the vertical guide rod (17). The bogie realizes low-position traction of a light rail vehicle, and the space of the cross beam is optimized.

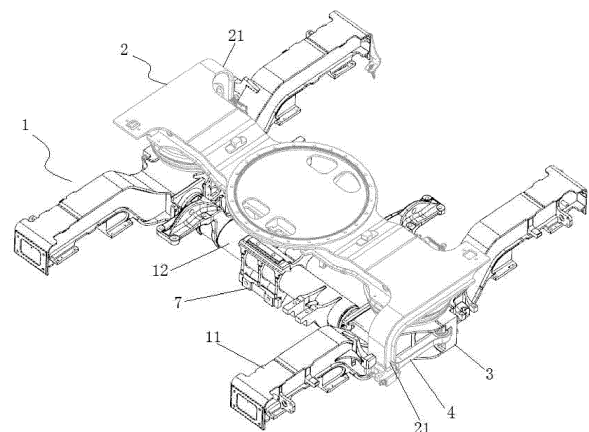


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention belongs to the field of rail transit, and specifically relates to a light rail vehicle bogie.

BACKGROUND OF THE INVENTION

[0002] A general subway bogie is of a bolsterless air spring structure. In order that a modern light rail vehicle passes a smaller curve radius, an air spring often matches a bolster structure to adapt to a large turning angle between a bogie and a vehicle body. Since the bolster needs to be installed, the equipment installation space of the bogie space is limited, which is specifically manifested as follows:

1. The traction device of the traditional light rail vehicle bogie is generally installed at a cross beam, or at a higher position on a side beam. If the traction device is installed at the cross beam, the space of the cross beam will be occupied, so that it is difficult to install other components on the cross beam. However, the form of installation on the side beam will lead to a high traction point and low adhesion utilization.
2. The magnetic rail brake is overhung and installed right above a rail surface through an L-shaped seat fixed on the cross beam, and the L-shaped seat will also occupy the space of the cross beam, so that the structure is complicated and it is difficult to guarantee the structural strength.
3. The motor mounting seat and lateral stop of the traditional light rail vehicle bogie are independently arranged on the cross beam, so the structure is loose, and large space of the cross beam is occupied.
4. As the equipment installation space of the bogie space is limited after the bolster is installed, it is difficult to design the installation position of a brake caliper, and it is even more difficult to arrange the magnetic rail brake device. The conventional magnetic rail stop is generally an overhung mounting seat, its structure is complicated, and it is difficult to guarantee the structural strength.

[0003] In addition, the existing light rail vehicle substantially does not have an integral lifting structure. When the entire light rail vehicle needs to be lifted, the vehicle body is bound with the frame by steel ropes for lifting, which takes time and effort.

[0004] In addition, the terms of directions mentioned in this case are defined below. In the field of rail vehicles, there are usually three directions recognized by technicians:

Vertical: the direction perpendicular to the rail sur-

face.

Longitudinal: the direction along the rail.

Transverse: the direction perpendicular to the rail horizontally.

The central axis of the frame is a vertical axis passing through the center of the frame.

Rotational symmetry about the central axis indicates that one object overlaps the other object after rotating a certain angle α about the central axis.

Related prior art: CN106809233A; CN201249778Y.

SUMMARY OF THE INVENTION

[0005] In view of the above problems, the present invention aims to provide a bogie that can realize low-position traction of a light rail vehicle and has a more optimized cross beam space.

[0006] In order to solve the above technical problems, the technical solution adopted by the present invention is as follows:

A light rail vehicle bogie includes a frame, the frame includes side beams and a cross beam perpendicular to middle parts of the side beams, the middle part of the side beam is provided with a recessed area, a top of the cross beam is provided with a bolster, the cross beam is composed of two tube bodies spaced longitudinally, both ends of each tube body are provided with connecting seats, and the both ends of the tube body are fixedly connected to the side beams through the connecting seats; the light rail vehicle bogie further includes axle boxes respectively mounted on axle journals of a wheel set, cantilever seats extending inward are provided on the two axle boxes, and a rail brake is suspended on the two cantilever seats; a vertical guide rod is arranged at the top of the magnetic rail brake, a limit seat is mounted on one side of each connecting seat, two limit seats are respectively located right above two ends of the magnetic rail brake, the limit seat is provided with a through guide hole, and the vertical guide rod is inserted into the guide hole; and the magnetic rail brake is located right below the tube bodies.

[0007] In the above solution, by improving the structure of the bolster and changing the positions of traction points to recessed areas of the side beams, low-position traction of a light rail vehicle is realized, the vehicle adhesion utilization is improved, and the space of the cross beam is not occupied.

[0008] Further, the side beam includes an upper cover plate, a lower cover plate, and two side plates, the four plates define the box-type side beam, and skirts extending laterally are provided on edges of both sides of the upper cover plate and the lower cover plate of the side beam; grooves are laterally formed on the skirts of the upper cover plate and the lower cover plate corresponding to the mounting position of a pull rod mounting seat, the top of the pull rod mounting seat is clamped and fixed in the groove of the upper cover plate, the bottom of the pull rod mounting seat is clamped and fixed in the groove

of the lower cover plate, the top of the pull rod mounting seat is flush with the top of the upper cover plate, and the bottom of the pull rod mounting seat is flush with the bottom of the lower cover plate.

[0009] A pull rod mounting seat is fixedly connected to an outer surface of the middle recessed area of each side beam, both ends of the bolster are respectively provided with cantilevers extending downward in the vertical direction, a pull rod is arranged between each cantilever and the pull rod mounting seat on the same side, one end of the pull rod is mounted to the pull rod mounting seat, and the other end of the pull rod is fixedly connected to a lower end of the cantilever; the two structures assembled from the cantilevers, the pull rod mounting seats and the pull rods by connection are rotationally symmetrical about the central axis of the frame, and the rotation angle α is 180 degrees. In the above further improved solution, curved surfaces connected by the pull rod mounting seats and the side beams are increased by the grooves, and straight welding seams are changed into curved welding seams, thereby increasing the lengths of the welding seams and improving the connection strength.

[0010] Furthermore, a stop block extending laterally is provided on the outer surface of the side beam; a support block is longitudinally arranged on the cantilever, the stop block is provided right above the support block, and a gap is reserved between the stop block and the support block.

[0011] The above structure is designed to facilitate lifting. When the vehicle is running normally, there is a small gap between the stop block and the support block. When the entire vehicle needs to be lifted, the lifting point is on the vehicle body, and the lifting of the vehicle body will drive the bolster to move up, so that the support block abuts against the stop block, and the frame fixed with the stop block is lifted under the support of the support block. The design of this structure makes full use of the improved bolster structure and is the result of further creative thinking, the structure is compact and the design is ingenious, which improves the lifting efficiency of the light rail vehicle.

[0012] Further, the connecting seat is provided with a kidney-shaped hole, the long axis of the kidney-shaped hole is arranged longitudinally, and the limit seat and the connecting seat are fastened by a fastener inserted into the kidney-shaped hole. The fastener may be a bolt.

[0013] The limit seat for mounting transition can facilitate the adjustment of the gap during mounting.

[0014] Specifically, the cross beam is composed of two tube bodies spaced longitudinally. The so-called "spaced longitudinally" indicates the arrangement direction of the two tubes, and one single beam extends laterally.

[0015] Further, the two tube bodies are provided with a straddle-type seat that spans the two tube bodies and forms a hoop-type fixed connection with the two tube bodies at the same time, both lateral sides of the straddle-type seat are lateral stop contact surfaces, and both lon-

gitudinal end surfaces of the straddle-type seat are motor mounting surfaces.

[0016] The straddle-type seat integrates the functions of a motor mounting seat and a lateral stop, can serve as a lateral stop and can be used to mount a motor, so the structure is compact, the space of the cross beam is saved relative to the prior art mentioned in the background, and convenience is provided for the installation of other components.

[0017] Preferably, the frame of the present invention is an H-shaped frame.

[0018] The present invention adopts a compact design, and the traction pull rod mounting seat is arranged on the outer side of the middle part of the side beam, which ensures sufficient structural strength of the traction pull rod mounting seat and fully uses the design space. The magnetic rail stop device is cleverly arranged on the connecting seat of the cross beam and the side beam, so that the space is reasonably used, and the structural strength of the magnetic rail stop device is ensured.

[0019] The significant effects of the present invention are:

1. By improving the structure of the bolster and changing the positions of traction points to recessed areas of the side beams, low-position traction of a light rail vehicle is realized, and the vehicle adhesion utilization is improved. Curved surfaces connected by the pull rod mounting seats and the side beams are increased by the grooves, and straight welding seams are changed into curved welding seams, thereby increasing the lengths of the welding seams and improving the connection strength.
2. The lifting structure is cleverly designed to improve the lifting efficiency of the light rail vehicle.
3. The functions of the motor mounting seat and the lateral stop are integrated together, a series of improvements such as redesign of the installation mode and installation position of the magnetic rail brake structure save more space of the cross beam, the structure of the bogie is more compact, and the installation of other equipment is also more convenient.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The present invention will be further illustrated below in conjunction with the accompanying drawings.

- FIG. 1 is a schematic structural diagram of a bogie; FIG. 2 is a partial enlarged view of FIG. 1; FIG. 3 is a schematic structural diagram of a frame; FIG. 4 is a schematic structural diagram of an outer side of a side beam; FIG. 5 is a schematic structural diagram of an inner side of the side beam; FIG. 6 is an exploded view of a magnetic rail brake in FIG. 5;

FIG. 7 is a schematic structural diagram of a cross beam;

FIG. 8 is a front view of the bogie.

[0021] In which:

1-frame, 2-bolster, 3-pull rod mounting seat, 4-pull rod, 5-stop block, 6-support block, 7-straddle-type seat, 8-connecting seat, 9-magnetic rail brake, 10-limit seat, 11-side beam, 12-cross beam, 13-lateral stop mounting seat, 14-lateral stop, 15-kidney-shaped hole, 16-cantilever seat, 17-vertical guide rod, 18-guide hole, 21-cantilever, 71-lateral stop contact surface, 72-motor mounting surface, 111-upper cover plate, 112-lower cover plate, 113-side plate, 114-groove, 121-tube body.

DETAILED DESCRIPTION OF EMBODIMENTS

[0022] For ease of description, relative positional relationships (e.g., inside, outside, etc.) of respective components are described according to the layout directions of the drawings in the specification, and do not limit the structure of the patent.

[0023] As shown in FIGS. 1-8, a light rail vehicle bogie includes an H-shaped frame 1. The frame 1 includes side beams 11 and a cross beam 12 perpendicular to middle parts of the side beams 11. The middle part of the side beam 11 is provided with a recessed area, and the whole side beam is of a bow-shaped structure. A top of the cross beam 12 is provided with a bolster 2. A secondary air spring mounting seat is arranged at a lower plane of the middle part of the side beam for mounting an air spring and connecting the frame with the bolster. A traction pull rod mounting seat is arranged on an outer side of the side beam, and the traction pull rod mounting seat is connected with upper and lower cover plates of the side beam through butt welds based on the upper and lower cover plates, which ensures the structural strength of the traction pull rod mounting seat.

[0024] The bolster 2 is mounted above the frame through the air spring, and transmits traction force and braking force through a traction pull rod. One end of the traction pull rod is connected to the bolster, and the other end is connected to the traction pull rod mounting seat on the frame 1. The traction pull rod mounting seat is arranged at the middle recessed part of the side beam, which reduces the height of a traction point and improves the adhesion utilization of a vehicle.

[0025] The side beam is of a box-type beam structure, and the side beam 11 includes an upper cover plate 111, a lower cover plate 112, and two side plates 113. The four plates define the box-type side beam 11, and skirts extending laterally are provided on edges of both sides of the upper cover plate 111 and the lower cover plate 112 of the side beam 11. The middle part of the side beam provides an air spring mounting interface, and four primary rubber spring mounting seats are arranged below both sides of the side beam. The main structure of the side beam is a box-type beam structure welded by

high-strength low-alloy steel plates, grooves are reserved at the middle parts of the upper and lower cover plates of the side beam for welding the forged traction pull rod mounting seat, and a cylinder and a circular support plate are welded to the middle part of the upper cover plate of the side beam to form the secondary spring mounting seat. Four primary spring mounting seats of forged structures are arranged below two ends of the side beam.

[0026] Steel tubes of the cross beam are connected with connecting seats by annular butt welding, and the remaining mounting seats are welded to the steel tubes of the cross beam by annular fillet welds.

[0027] A pull rod mounting seat 3 is fixedly connected to the outer surface of the middle recessed area of each side beam 11. Grooves 114 are laterally formed on the skirts of the upper and lower cover plates corresponding to the mounting position of the pull rod mounting seat 3. The top of the pull rod mounting seat 3 is clamped in the groove 114 of the upper cover plate 111 and fixed by welding. The bottom of the pull rod mounting seat 3 is clamped in the groove 114 of the lower cover plate 112 and fixed by welding. The top of the pull rod mounting seat 3 is flush with the top of the upper cover plate 111, and the bottom is flush with the bottom of the lower cover plate 112.

[0028] Both ends of the bolster 2 are respectively provided with cantilevers 21 extending downward in the vertical direction. A pull rod 4 is arranged between each cantilever 21 and the pull rod mounting seat 3 on the same side. One end of the pull rod 4 is mounted to the pull rod mounting seat 3, and the other end is fixedly connected to the lower end of the cantilever 21. In other words, a downward overhanging section is on one side of the bolster 2, and the lower end of the overhanging section is a traction pull rod mounting point. An integral lifting device is arranged near the traction pull rod mounting point, and a lifting stop is welded to the side beam of the frame. When the vehicle body is lifted, the bogie can be lifted together with the vehicle body.

[0029] Both ends of the frame 1 are respectively provided with a cantilever pull rod structure, each cantilever pull rod structure is assembled from the cantilever 21, the pull rod mounting seat 3, and the pull rod 4 by connection, the two cantilever pull rod structures are rotationally symmetrical about the central axis of the frame 1, and the rotation angle α is 180 degrees.

[0030] A stop block 5 extending laterally is provided on the outer surface of the side beam 11. A horizontal support block 6 is longitudinally arranged on the cantilever 21. The stop block 5 is provided right above the support block 6. A gap is reserved between the stop block 5 and the support block 6.

[0031] The cross beam 12 is composed of two tube bodies 121 spaced longitudinally. Both ends of each tube body 121 are provided with connecting seats 8. The both ends of the tube body 121 are fixedly connected to the side beams 11 through the connecting seats 8. Prefera-

bly, the cross beam is composed of two seamless steel tubes, the middle part of the cross beam is provided with a motor mounting seat and a lateral stop seat, and the motor mounting seat and the lateral stop seat are of an integrated structure to connect the two cross beams. A gear box hanging seat and a brake caliper mounting seat are arranged on the two cross beam steel tubes by skew symmetry. The end of the cross beam is a connecting seat with the side beam, and an outer side of the connecting seat is provided with a boss and a bolt mounting hole for mounting a magnetic rail brake limit device.

[0032] The bogie of this embodiment further includes axle boxes respectively mounted on axle journals of a wheel set. Cantilever seats 16 extending inward are provided on the two axle boxes. A magnetic rail brake 9 is suspended on the two cantilever seats 16. A vertical guide rod 17 is arranged at the top of the magnetic rail brake 9. A limit seat 10 is mounted on one side of each connecting seat 8. The connecting seat 8 is provided with a kidney-shaped hole 15. The long axis of the kidney-shaped hole 15 is arranged longitudinally. The limit seat 10 and the connecting seat 8 are fastened by inserting a bolt into the kidney-shaped hole 15. The magnetic rail brake is mounted on the frame through the magnetic rail limit device and the connecting seat, which ensures the reliability of the magnetic rail brake.

[0033] Two limit seats 10 are respectively located right above two ends of the magnetic rail brake 9. The limit seat 10 is provided with a through guide hole 18. The vertical guide rod 17 is inserted into the guide hole 18. The magnetic rail brake 9 is located right below the tube body 121.

[0034] The two tube bodies 121 are provided with a straddle-type seat 7 that spans the two tube bodies 121 and forms a hoop-type fixed connection with the two tube bodies 121 at the same time. Both lateral sides of the straddle-type seat 7 are lateral stop contact surfaces 71. Both longitudinal end surfaces of the straddle-type seat 7 are motor mounting surfaces 72.

[0035] Lateral stop mounting seats 13 are arranged at the bottom of the bolster 2 and on the both lateral sides of the straddle-type seat 7. A lateral stop 14 is arranged on the lateral stop mounting seat 13. The lateral stop 14 is opposite to the lateral stop contact surface 71.

Claims

1. A light rail vehicle bogie, comprising a frame (1), the frame (1) comprises side beams (11) and a cross beam (12) perpendicular to middle parts of the side beams (11), the middle part of the side beam (11) is provided with a recessed area, and a top of the cross beam (12) is provided with a bolster (2), wherein; the cross beam (12) is composed of two tube bodies (121) spaced longitudinally, both ends of each tube body (121) are provided with connecting seats (8), and the both ends of the tube body (121) are fixedly

connected to the side beams (11) through the connecting seats (8);

the light rail vehicle bogie further comprises axle boxes respectively mounted on axle journals of a wheel set, cantilever seats (16) extending inward are provided on the two axle boxes, and a magnetic rail brake (9) is suspended on the two cantilever seats (16); a vertical guide rod (17) is arranged at the top of the magnetic rail brake (9), a limit seat (10) is mounted on one side of each connecting seat (8), two limit seats (10) are respectively located right above two ends of the magnetic rail brake (9), the limit seat (10) is provided with a through guide hole (18), and the vertical guide rod (17) is inserted into the guide hole (18); and the magnetic rail brake (9) is located right below the tube bodies (121).

2. The light rail vehicle bogie according to claim 1, wherein the side beam (11) comprises an upper cover plate (111), a lower cover plate (112), and two side plates (113), the four plates define the box-type side beam (11), and skirts extending laterally are provided on edges of both sides of the upper cover plate (111) and the lower cover plate (112) of the side beam (11);

grooves (114) are laterally formed on the skirts of the upper cover plate (111) and the lower cover plate (112) corresponding to the mounting position of a pull rod mounting seat (3), the top of the pull rod mounting seat (3) is clamped and fixed in the groove (114) of the upper cover plate (111), the bottom of the pull rod mounting seat (3) is clamped into the groove (114) of the lower cover plate (112) and fixed, the top of the pull rod mounting seat (3) is flush with the top of the upper cover plate (111), and the bottom of the pull rod mounting seat (3) is flush with the bottom of the lower cover plate (112).

3. The light rail vehicle bogie according to claim 1, wherein a pull rod mounting seat (3) is fixedly connected to the outer surface of the middle recessed area of each side beam (11), both ends of the bolster (2) are respectively provided with cantilevers (21) extending downward in the vertical direction, a pull rod (4) is arranged between each cantilever (21) and the pull rod mounting seat (3) on the same side, one end of the pull rod (4) is mounted to the pull rod mounting seat (3), and the other end of the pull rod (4) is fixedly connected to the lower end of the cantilever (21);

the two structures assembled from the cantilevers (21), the pull rod mounting seats (3) and the pull rods (4) by connection are rotationally symmetrical about the central axis of the frame (1), and the rotation angle α is 180 degrees.

4. The light rail vehicle bogie according to claim 1,

wherein a stop block (5) extending laterally is provided on the outer surface of the side beam (11); a support block (6) is longitudinally arranged on the cantilever (21), the stop block (5) is provided right above the support block (6), and a gap is reserved between the stop block (5) and the support block (6).

5. The light rail vehicle bogie according to claim 1, wherein the connecting seat (8) is provided with a kidney-shaped hole (15), the long axis of the kidney-shaped hole (15) is arranged longitudinally, and the limit seat (10) and the connecting seat (8) are fastened by a fastener inserted into the kidney-shaped hole (15).
6. The light rail vehicle bogie according to any one of claims 1-5, wherein the cross beam (12) is composed of two tube bodies (121) spaced longitudinally.
7. The light rail vehicle bogie according to claim 6, wherein the two tube bodies (121) are provided with a straddle-type seat (7) that spans the two tube bodies (121) and forms a hoop-type fixed connection with the two tube bodies (121) at the same time, both lateral sides of the straddle-type seat (7) are lateral stop contact surfaces (71), and both longitudinal end surfaces of the straddle-type seat (7) are motor mounting surfaces (72).
8. The light rail vehicle bogie according to any one of claims 1-5, wherein the frame (1) is an H-shaped frame.

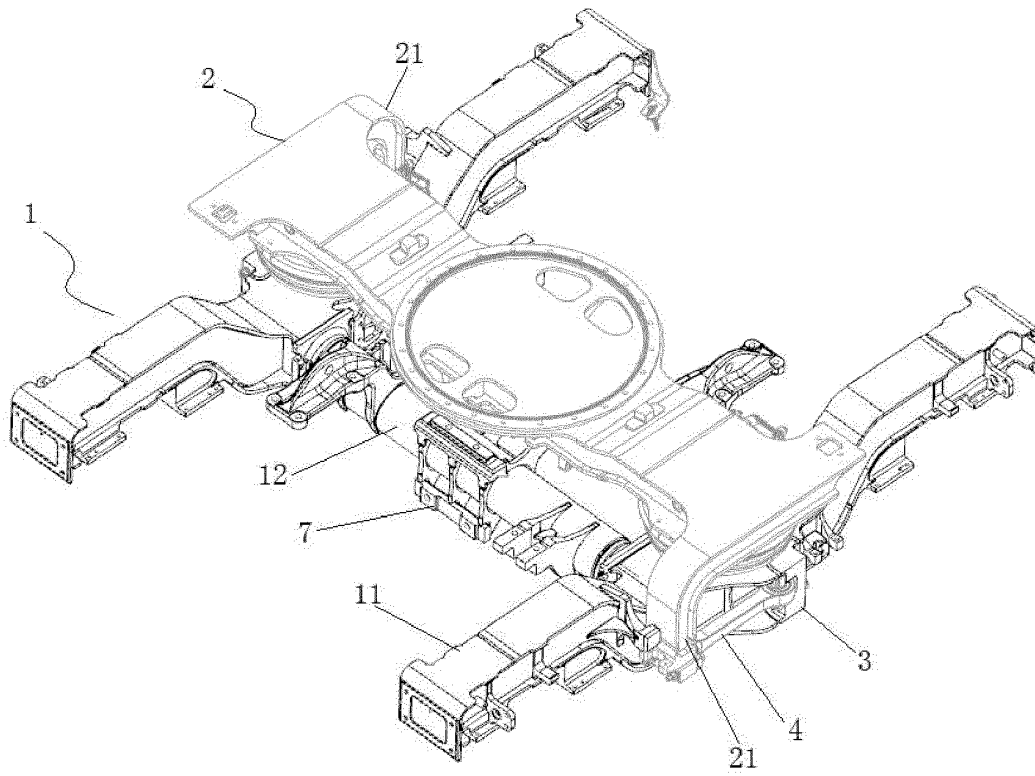


Fig. 1

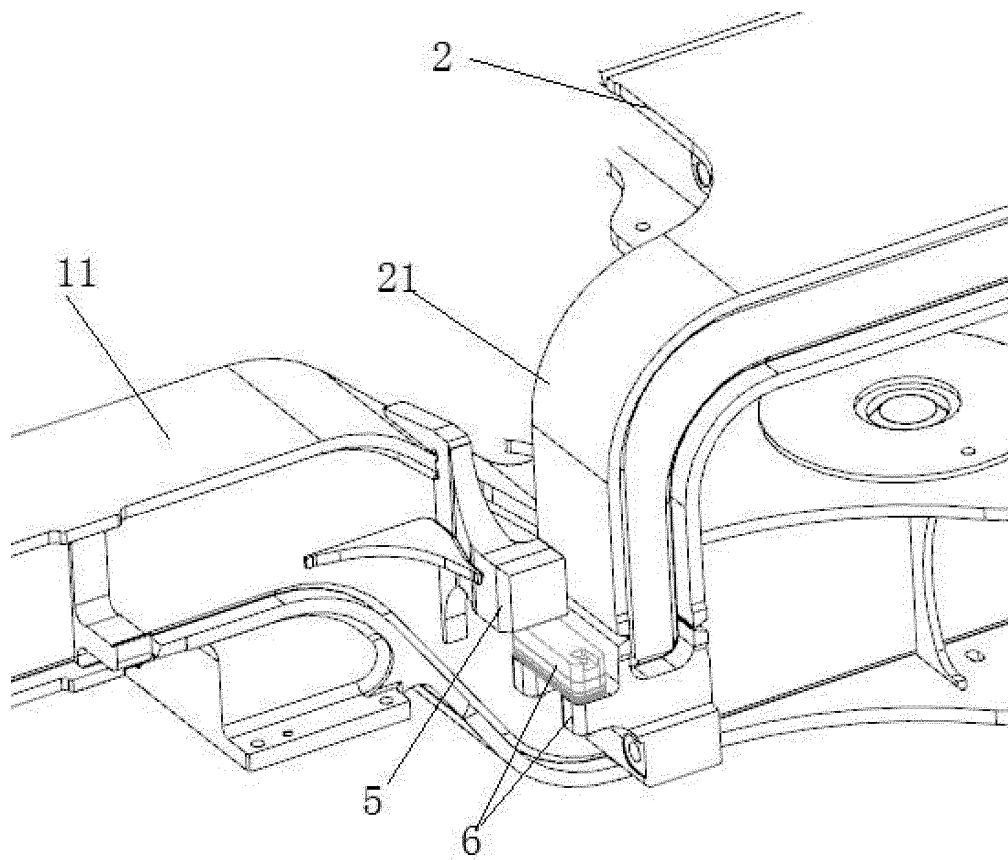


Fig. 2

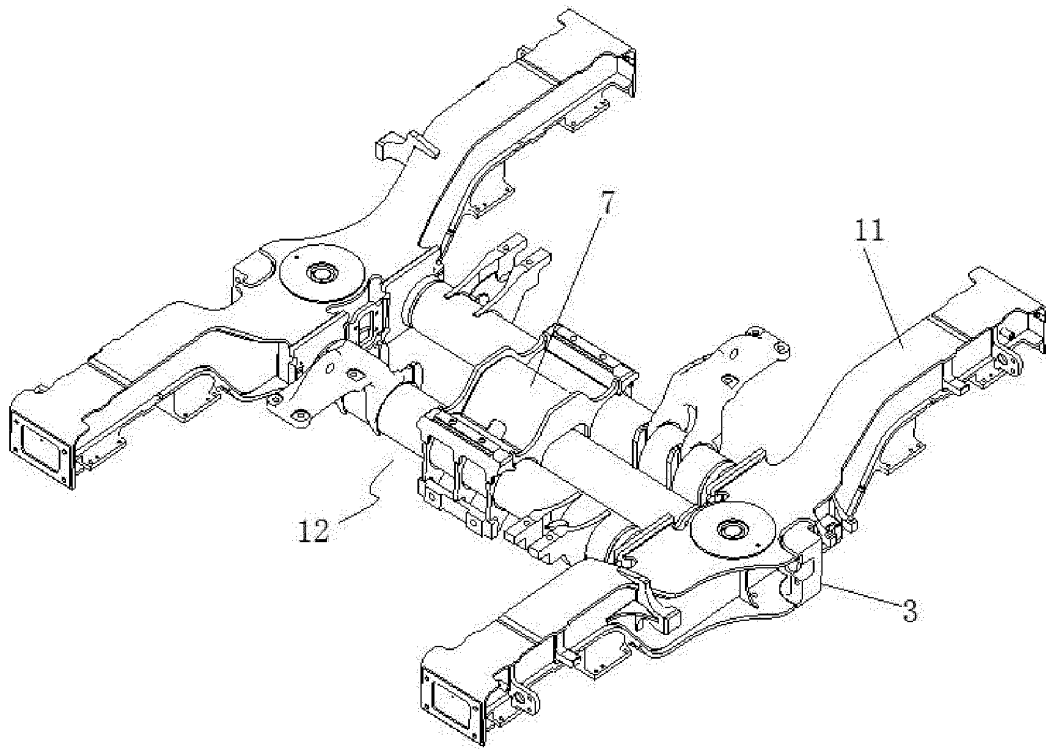


Fig. 3

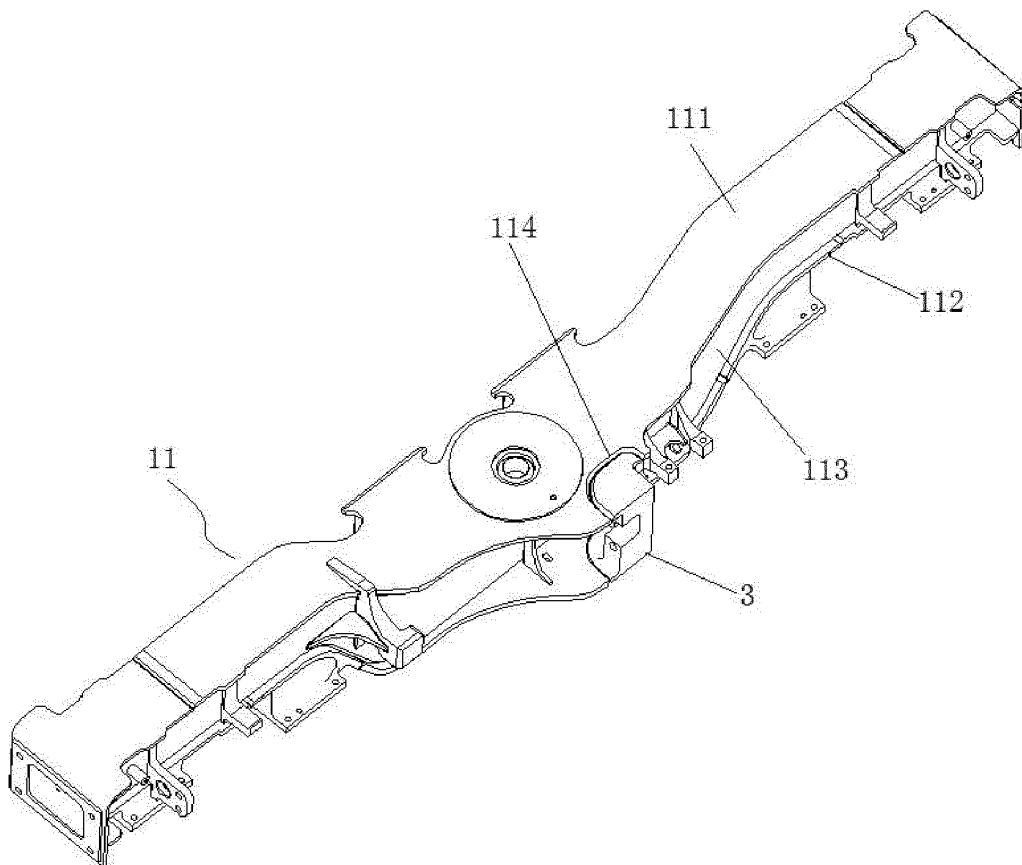


Fig. 4

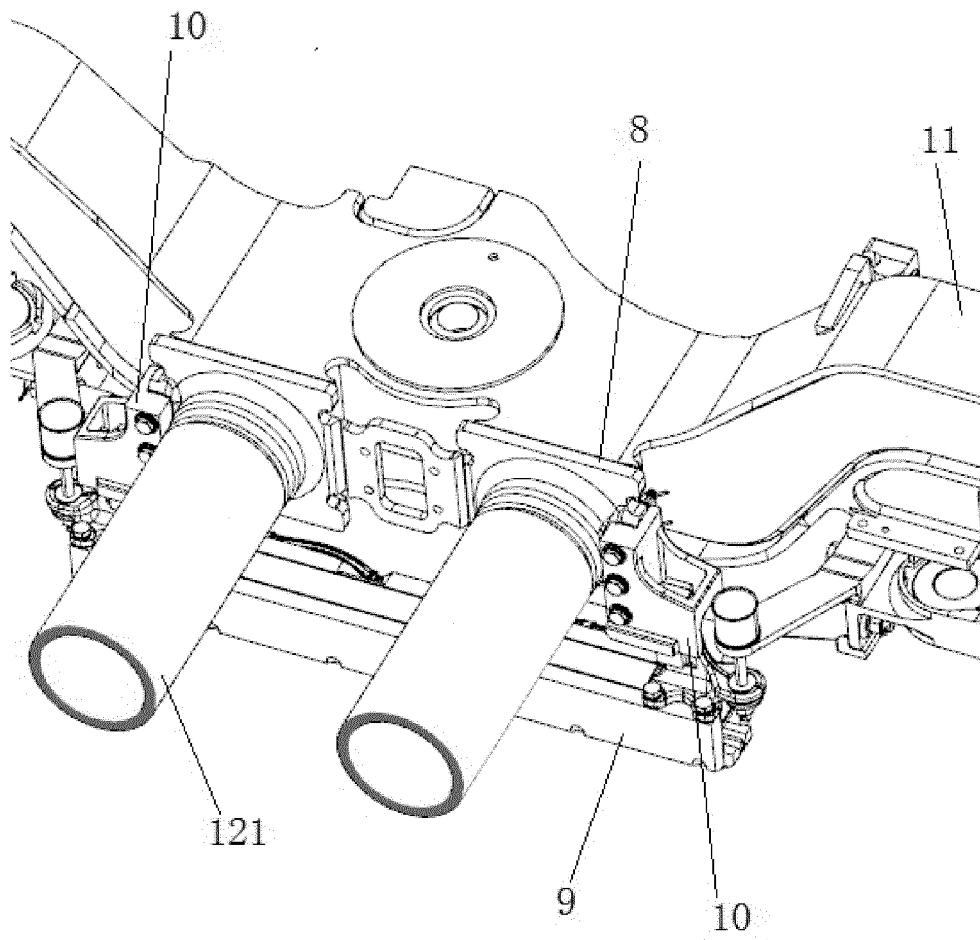


Fig. 5

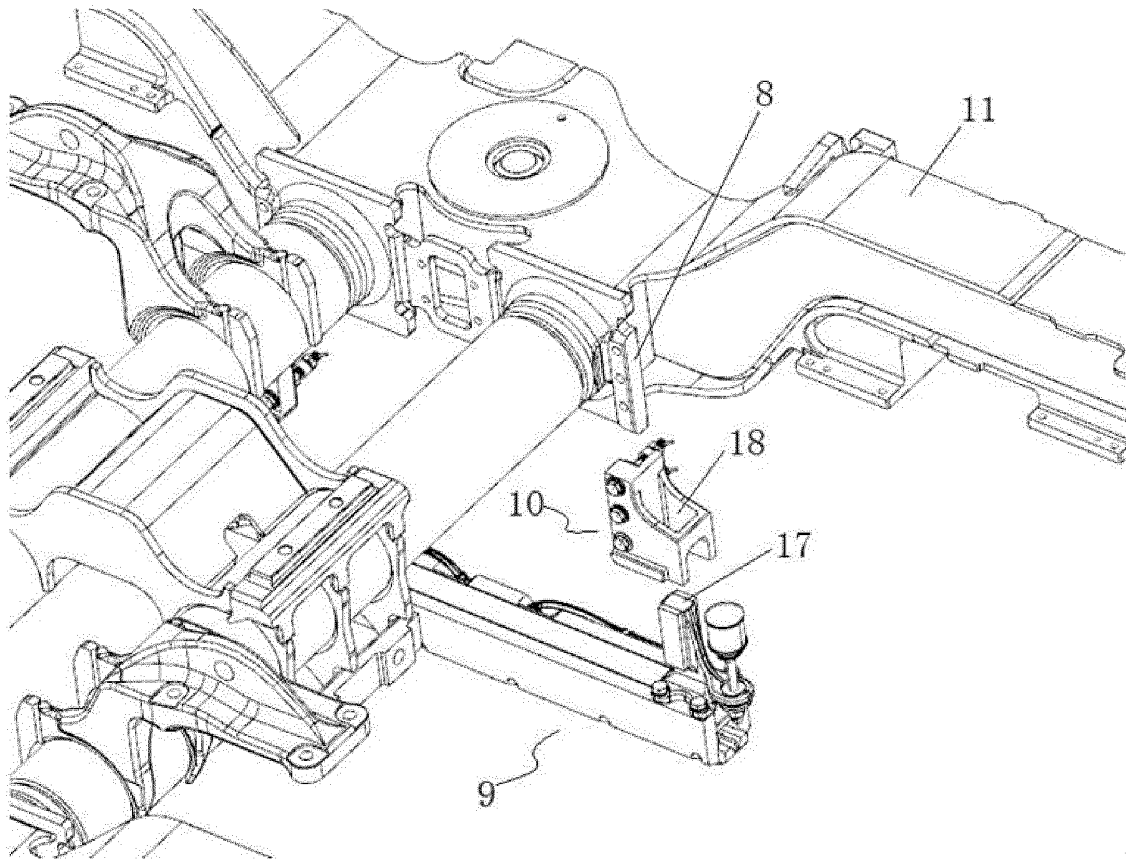


Fig. 6

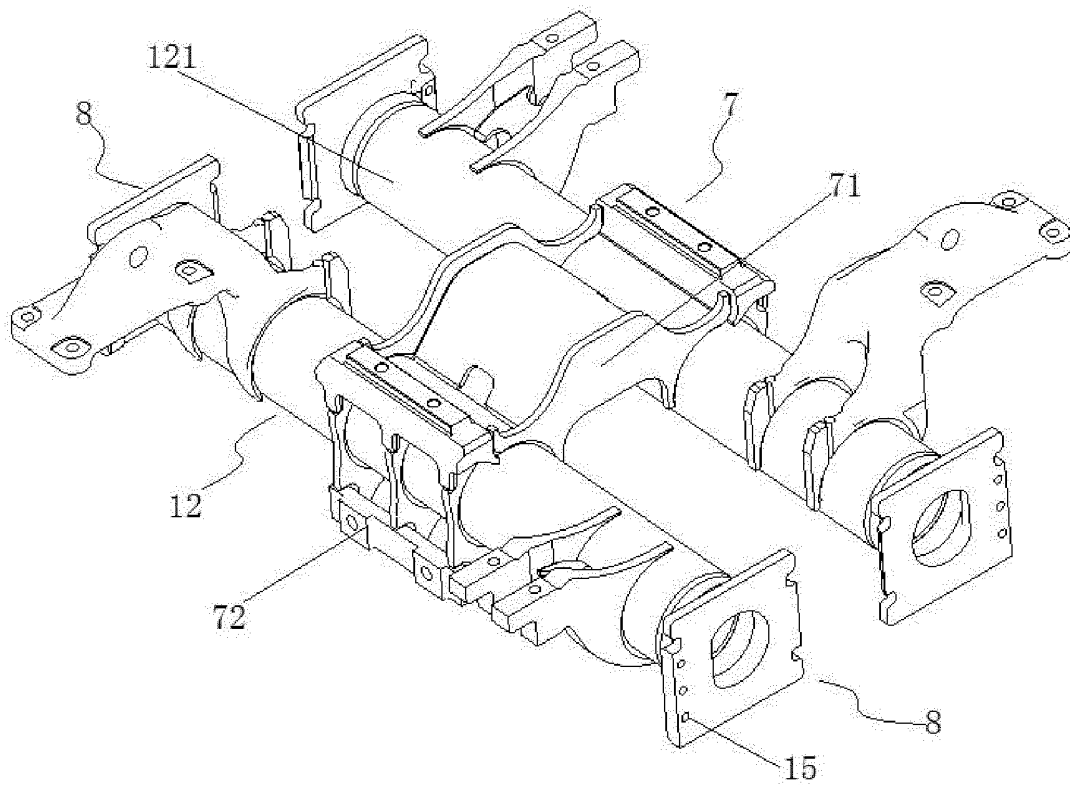


Fig. 7

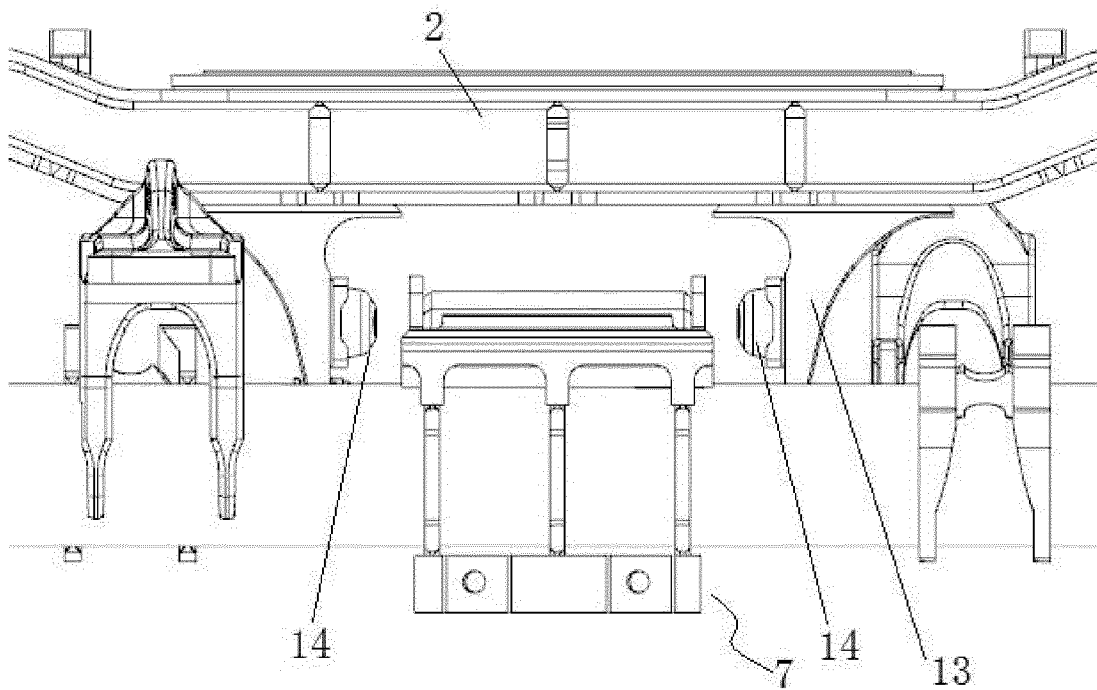


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/096064

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)

VEN, CNABS, CNKI: 转向架, 构架, 横梁, 摇枕, bogie, frame, beam, bolster

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 106809233 A (CRRC YANGTZE CO., LTD.) 09 June 2017 (2017-06-09) description, pages 5-10, and figures 1-19	1-8
A	CN 105151068 A (TANGSHAN RAILWAY VEHICLE CO., LTD.) 16 December 2015 (2015-12-16) entire document	1-8
A	CN 108099937 A (ZHUZHOU TIMES ELECTRONIC TECHNOLOGY CO., LTD.) 01 June 2018 (2018-06-01) entire document	1-8
A	CN 201249778 Y (CRRC DALIAN INSTITUTE CO., LTD.) 03 June 2009 (2009-06-03) entire document	1-8
A	FR 2349482 A1 (ALSTHOM CGEE) 30 December 1977 (1977-12-30) entire document	1-8
PX	CN 108725495 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 02 November 2018 (2018-11-02) claims 1-7	1-8

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

* Special categories of cited documents:

“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

“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)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

15 August 2019

Date of mailing of the international search report

03 September 2019

Name and mailing address of the ISA/CN

China National Intellectual Property Administration
No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing
100088
China

Authorized officer

Facsimile No. (86-10)62019451

Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2019/096064

5

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report			Publication date (day/month/year)		Patent family member(s)			Publication date (day/month/year)	
CN	106809233	A	09 June 2017		None				
CN	105151068	A	16 December 2015		None				
CN	108099937	A	01 June 2018		None				
CN	201249778	Y	03 June 2009		None				
FR	2349482	A1	30 December 1977		BR	7702675	A	17 January 1978	
CN	108725495	A	02 November 2018		None				

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 106809233 A [0004]
- CN 201249778 Y [0004]