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(71) Applicant: **CRRC Qingdao Sifang Co., Ltd.**
Qingdao, Shandong 266111 (CN)

(72) Inventors:
- **CAO, Hongyong**
  Qingdao, Shandong 266111 (CN)
- **YANG, Dongxiao**
  Qingdao, Shandong 266111 (CN)
- **CAO, Qingda**
  Qingdao, Shandong 266111 (CN)
- **YANG, Weidong**
  Qingdao, Shandong 266111 (CN)
- **YANG, Xin**
  Qingdao, Shandong 266111 (CN)

(74) Representative: **Winter, Brandl - Partnerschaft mbB**
Alois-Steinecker-Straße 22
85354 Freising (DE)

(54) TRACTION BEAM FOR RAIL TRAIN, AND TRACTION DEVICE

(57) A traction beam for a rail train, and a traction device. The traction device comprises the traction beam; the traction beam comprises an intermediate and two ends arranged at the two ends of the intermediate; a pin sleeve hole used for mounting a central pin sleeve is provided on the intermediate; a pull rod hole used for connecting a traction pull rod is provided on each end; the end comprises a main part, the cross-sectional area of the main part shrinking along a length direction of the traction beam; the end, having a larger cross-sectional area, of the main part is connected to the intermediate; a curved part is provided on a side surface of the intermediate; the side surface of the intermediate, by means of the curved surface part thereof, is in smooth transition with a side surface of the main part. The traction beam and the traction device provided by the present application are light in weight and high in structural strength, can fully satisfy bearing requirements, is small in size and small in occupied vertical installation space, and does not affect the arrangement of an anti-side rolling device.

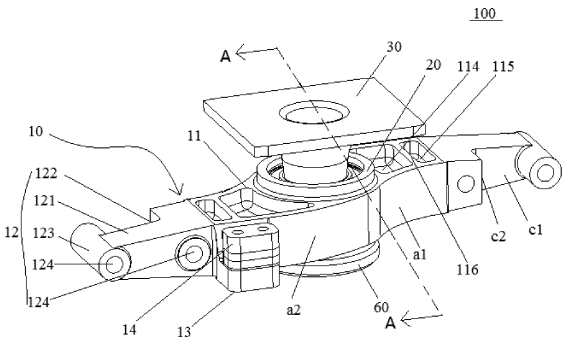

FIG. 1

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Description

[0001] This application claims the benefit of the priority to Chinese Patent Application No. 202011438180.3, titled "TRACTION BEAM FOR RAIL TRAIN AND TRACTION DEVICE", filed with the China National Intellectual Property Administration on December 10, 2020, which is incorporated herein by reference in its entirety.

FIELD

[0002] The present application relates to the technical field of rail trains, in particular to a traction beam for a rail train and a traction device.

BACKGROUND

[0003] There are many types of traction devices for a rail train, which are generally divided into a single-pull-rod traction device and a double-pull-rod traction device.

[0004] The single-pull-rod traction device is provided with only one traction pull rod. One end of the traction pull rod is connected with a traction pin seat, and the other end of the traction pull rod is connected with a frame. By the traction device, an anti-side-rolling device is difficult to be arranged and the requirements for a vehicle to pass through a small curve are difficult to be met.

[0005] The double-pull-rod traction device is provided with two traction pull rods, and the two traction pull rods are respectively connected with two ends of a traction beam. By the traction device, the requirements for a vehicle to pass through a small curve can be met, and the arrangement of an anti-side-rolling device does not be affected. However, the large self-weight of the double-pull-rod traction device requires high structural strength of the vehicle, which limits the application of the double-pull-rod traction device.

[0006] Therefore, it is necessary to lighten the double-pull-rod traction device. However, how to achieve lightweight while still ensuring structural strength is a difficult problem for those skilled in the art.

SUMMARY

[0007] In order to solve the above technical problem, a traction beam for a rail train is provided according to the present application, the traction beam includes an intermediate body and two end bodies which are arranged at two ends of the intermediate body, a pin sleeve hole for mounting a central pin sleeve is defined in the intermediate body, a pull rod hole for connecting a traction pull rod is defined in each end body; each end body includes a main body portion, a cross-sectional area of the main body portion is decreased along a length direction of the traction beam; one end, having a larger cross-sectional area, of the main body portion is connected with the intermediate body; a curved surface portion is provided on a side surface of the intermediate body; the side surface of the intermediate body is in a smooth transition with a side surface of the main body portion by means of the curved surface portion of the intermediate body.

[0008] In an embodiment, a first curved surface portion which is recessed inward and a second curved surface portion which protrudes outward are provided on the side surface of the intermediate body, the side surface of the intermediate body is in a smooth transition with the side surface of the main body portion at one end by means of the first curved surface portion of the intermediate body, and is in a smooth transition with the side surface of the main body portion at the other end by means of the second curved surface portion of the intermediate body; the side surface on one side of the main body portion is in a smooth transition with the first curved surface portion of the side surface on one side of the intermediate body, and the side surface on the other side of the main body portion is in smooth transition with the second curved surface portion of the side surface on the other side of the intermediate body. The side surface of the traction beam is substantially S-shaped by providing the first curved surface portion which is recessed inward and the second curved surface portion which protrudes outward, so that the length of the pull rod is increased, and the compression amount of the pull rod node under the same rotation angle is reduced, which is beneficial to improving the service life of the pull rod node.

[0009] In an embodiment, a distance between a top surface and a bottom surface of the traction beam is relatively small, and a high-strength flat structure is used by the whole traction beam, so as to provide a space for the mounting of an anti-side-rolling torsion bar and other component of a bogie to avoid collision. The distance between the traction pull rod and the vehicle body is reduced, which is beneficial to lightweight design while ensuring the strength of the traction pin.

[0010] In an embodiment, a first weight reduction holes and a second weight reduction hole are defined in the intermediate body; the first weight reduction hole is arranged close to the pin sleeve hole, the second weight reduction hole is arranged close to the corresponding end bodies, and a reinforcing rib is formed between the first weight reduction hole and the second weight reduction hole.

[0011] In an embodiment, part of the side surface on one side of the main body portion is recessed inward to form a notch groove, the notch groove extends to an end surface of an end, away from the intermediate body, of the main body portion and extends from a top surface to a bottom surface of the main body portion, and a side wall c1 and an end wall c2 of the notch groove are in a smooth transition.

[0012] In an embodiment, each end body includes a connecting sleeve, the connecting sleeve is connected with an end, away from the intermediate body, of the main body portion by means of a circumferential surface of the connecting sleeve, two pull rod holes are defined in each end body, one pull rod hole is defined in the main

body portion, and the other pull rod hole is an inner hole of the connecting sleeve.

[0013] In an embodiment, the two pull rod holes are distributed along the length direction of the traction beam.

[0014] In an embodiment, a lifting stop is provided on the traction beam, and a connecting hole for connecting an adjusting cushion block is defined in the lifting stop.

[0015] In an embodiment, the traction beam has a central symmetric structure, a symmetrical center is a midpoint of a central axis of the pin sleeve hole, and an annular groove and a step surface facing the annular groove are provided on a hole wall of the pin sleeve hole.

[0016] A traction device is further provided according to the present application, which includes a traction beam, a central pin sleeve, a central pin, two traction pull rods, an elastic snap ring and a fastening assembly; the traction beam is the traction beam according to the above embodiment; the central pin sleeve is mounted in the pin sleeve hole, the elastic snap ring is mounted in the annular groove, one end of the central pin sleeve abuts against the step surface, the other end of the central pin sleeve abuts against the elastic snap ring, the central pin is mounted in an inner hole of the central pin sleeve and is fastened with the central pin sleeve by the fastening assembly, and the two traction pull rods are respectively connected to pull rod holes at the two ends of the traction beam.

[0017] In an embodiment, the fastening assembly includes a bolt, a pressure cover and a gasket, the central pin has a conical portion with an internal threaded hole, the inner hole of the central pin sleeve is a conical hole, the conical portion inserts into the conical hole, the bolt passes through the pressure cover and is screwed into the internal threaded hole, the pressure cover tightly abuts against the central pin sleeve under the fastening force of the bolt, and the conical portion tightly abuts against a hole wall of the conical hole.

[0018] The traction beam and the traction device provided by the present application are light in weight and high in structural strength, can fully satisfy bearing requirements, is small in size and small in occupied vertical mounting space, and does not affect the arrangement of an anti-side-rolling device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a perspective view of an embodiment of a traction device according to the present application; and

FIG. 2 is a cross-sectional view taken along line A-A in FIG. 1.

[0020] Reference numerals in the drawings are listed as follows:

10, traction beam;

11, intermediate body; 111, pin sleeve hole; 112, annular groove; 113, step surface; 114, first weight reduction hole; 115, second weight reduction hole; 116, reinforcing rib; a1, first curved surface portion; a2, second curved surface portion;

12, end body; 121, main body portion; 122, notch groove; c1, side wall; c2, end wall; 123, connecting sleeve; 124, pull rod hole;

13, lifting stop;

14, adjusting cushion block;

100, traction device;

20, central pin sleeve; 30, central pin; 40, elastic snap ring; 50, bolt; 60, pressure cover; 70, gasket.

DETAILED DESCRIPTION OF THE EMBODIMENTS

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

[0022] As shown in the figure, a traction device 100 for a rail train according to the present application includes a traction beam 10. The traction beam 10 includes an intermediate body 11 and two end bodies 12 which are arranged at two ends of the intermediate body 11.

[0023] A pin sleeve hole 111 is defined in the traction beam 10, and the pin sleeve hole 111 is further defined in the intermediate body 11. The traction beam 10 may have a central symmetric structure, a symmetrical center is a midpoint of a central axis of the pin sleeve hole 111, in other words, a left half (viewed from the perspective of FIG. 1) of the traction beam 10 can completely coincide with a right half of the traction beam 10 by rotating by 180° around the central axis of the pin sleeve hole 111.

[0024] The pin sleeve hole 111 axially extends from a top surface to a bottom surface of the intermediate body 11. As shown in FIG. 2, an annular groove 112 and a step surface 113 facing the annular groove 112 are provided on a hole wall of the pin sleeve hole 111. In order to facilitate assembly, the annular groove 112 may be arranged close to the top surface of the intermediate body 11, and the step surface 113 may be arranged close to the bottom surface of the intermediate body 11.

[0025] A thickness of one end of the intermediate body 11 may be the same with a thickness of one end, connected with the intermediate body 11, of the end body 12. From the perspective of FIG. 1, the thickness of the right end of the left end body 12 is the same with the thickness of the left end of the intermediate body 11, and

the thickness of the left end of the right end body 12 is the same with the thickness of the right end of the intermediate body 11.

[0026] Weight reduction holes may be defined in the intermediate body 11, so as to reduce the weight of the traction beam 10. Specifically, a first weight reduction hole 114 may be arranged close to the pin sleeve hole 111, a second weight reduction hole 115 may be arranged close to the corresponding end bodies 12, and a reinforcing rib 116 is formed between the first weight reduction hole 114 and the second weight reduction hole 115, so that the strength of the intermediate body 11 is enhanced while the weight is reduced. Preferably, the reinforcing rib 116 is arranged parallel to a width direction of the traction beam 10 (that is, a longitudinal direction of the rail train), so that the traction force can be guided to be transmitted on the reinforcing rib 116 in a straight line, thereby avoiding generating a large bending moment on the reinforcing rib 116.

[0027] Curved surface portions (a1 and a2 shown in the figure) may be provided on a side surface of the intermediate body 11. The side surface of the intermediate body 11 is in a smooth transition with a side surface of the end body 12 by means of the curved surface portion of the intermediate body 11. With this design, the overall strength of the traction beam 10 is high and can fully meet the stress requirements.

[0028] In the illustrated solution, a first curved surface portion a1 which is recessed inward and a second curved surface portion a2 which protrudes outward are provided on the side surface of the intermediate body 11, so that the side surface of the intermediate body 11 is substantially S-shaped. The side surface of the intermediate body 11 is in a smooth transition with the side surface of the end body 12 at one end by means of the first curved surface portion a1 of the intermediate body 11, and is in a smooth transition with the side surface of the end body 12 at the other end by means of the second curved surface portion a2 of the intermediate body 11. Such design can further enhance the strength and bearing capacity of the intermediate body 11.

[0029] A pull rod hole 124 is defined in the traction beam 10, and the pull rod hole 124 is further defined in the end body 12. Each end body 12 includes a main body portion 121, and may further include a connecting sleeve 123. The connecting sleeve 123 is connected to an end, away from the intermediate body 11, of the main body portion 121 by means of a circumferential surface of the connecting sleeve 123. As shown in the figure, two pull rod holes 124 are defined in each end body 12, one pull rod hole 124 is defined in the main body portion 121, and the other pull rod hole 124 is an inner hole of the connecting sleeve 123. Axes of the two pull rod holes 124 both extend along the width direction of the traction beam 10 (that is, the longitudinal direction of the rail train), and the two pull rod holes 124 are distributed along a length direction of the traction beam 10 (that is, a transverse direction of the rail train). Since the pull rod holes 124 extend along the transverse direction, a thickness of the traction beam 10 does not need to be arranged too thick, without occupying too much vertical mounting space.

[0030] A cross-sectional area of the main body portion 121 shrinks along the length direction of the traction beam 10, and the main body portion 121 has a wedge shape as a whole. An end, having a larger cross-sectional area, of the main body portion 121 is connected with the intermediate body 11. Specifically, a distance between two side surfaces of the main body portion 121 may shrink along the length direction of the traction beam 10, and/or, a distance between the top surface and the bottom surface of the main body portion 121 may shrink along the length direction of the traction beam 10. The main body portion 121 with such structure is beneficial to the lightweight of the traction beam 10.

[0031] The side surface of the main body portion 121 is in a smooth transition with the side surface of the intermediate body 11. In the illustrated solution, the side surface on one side of the main body portion 121 is in a smooth transition with the first curved surface portion a1 of the side surface on one side of the intermediate body 11, and the side surface on the other side of the main body portion 121 is in a smooth transition with the second curved surface portion a2 of the side surface on the other side of the intermediate body 11. Such design can further improve the overall strength of the traction beam 10.

[0032] Specifically, part of the side surface on one side of the main body portion 121 is recessed inward to form a notch groove 122, the notch groove 122 extends to an end surface of an end, away from the intermediate body 11, of the main body portion 121 and extends from the top surface to the bottom surface of the main body portion 121, and a side wall c1 and an end wall c2 of the notch groove 122 are in a smooth transition. In this way, the weight of the traction beam 10 can be further reduced, and the strength and bearing capacity of the end body 12 does not be greatly affected, which can still ensure that the strength and bearing capacity of the end body 12 meet the requirements.

[0033] A lifting stop 13 is provided on the traction beam 10, and a connecting hole for connecting an adjusting cushion block 14 is defined in the lifting stop 13. During lifting, adjustment cushion blocks 14 with different thicknesses can be connected to the lifting stop 13 as required. In the illustrated solution, the lifting stop 13 is integrated on the side surface of the intermediate body 11 and is located on a side of the weight reduction hole of the intermediate body 11, which can play a stopping role, and further enhance the strength of the intermediate body 11.

[0034] As shown in FIG. 2, the traction device 100 further includes a central pin 30, a central pin sleeve 20, two traction pull rods (not shown in the figure), an elastic snap ring 40 and a fastening assembly.

[0035] The central pin sleeve 20 is mounted in the pin sleeve hole 111 of the traction beam 10, a bottom end of the central pin sleeve 20 abuts against the step surface

113 of the pin sleeve hole 111, the elastic snap ring 40 is mounted in the annular groove 112 of the traction beam 10, a top end of the central pin sleeve 20 abuts against the elastic snap ring 40, and the elastic snap ring 40 cooperates with the step surface 113 to fix an axial position of the central pin sleeve 20.

[0036] One traction pull rod is connected to the pull rod hole 124 at one end of the traction beam 10 by the fastening assembly, the other traction pull rod is connected to the pull rod hole 124 at the other end of the traction beam 10 by the fastening assembly, and the two traction pull rods are respectively located on two sides of the traction beam 10.

[0037] The central pin 30 is mounted in an inner hole of the central pin sleeve 20 and is fastened with the central pin sleeve 20 by the fastening assembly.

[0038] The central pin 30 includes a conical portion, and an internal threaded hole is defined in the conical portion. The inner hole of the central pin sleeve 20 is a conical hole which fits for the conical portion. The conical portion inserts into the conical hole, and an outer circumferential surface of the conical portion is in contact with a hole wall of the conical hole.

[0039] The fastening assembly includes a bolt 50, a pressure cover 60 and a gasket 70. The bolt 50 passes through the pressure cover 60 and is screwed into the internal threaded hole, the pressure cover 60 applies an abutting pressure toward a top side of the central pin sleeve 20 under the fastening force of the bolt 50, and the conical portion tightly abuts against the hole wall of the conical hole, thereby realizing the fixing of the central pin 30.

[0040] In summary, the traction beam 10 and the traction device 100 according to the present application are light in weight and high in structural strength, which can meet the bearing requirements.

[0041] The traction beam for the rail train and the traction device according to the present application are described in detail. The principle and embodiments of the present application are described through specific examples herein. The description of the above embodiments is merely used to facilitate understanding the method and core idea of the present application. It should be noted that several improvements and modifications can be made to the present application by those skilled in the art without departing from the principles of the present disclosure. These improvements and modifications shall fall within the scope of the claims of the present application.

Claims

1. A traction beam for a rail train, wherein the traction beam (10) comprises an intermediate body (11) and two end bodies (12) which are arranged at two ends of the intermediate body (11), a pin sleeve hole (111) for mounting a central pin sleeve (20) is defined in the intermediate body (11), a pull rod hole (124) for connecting a traction pull rod is defined in each end body (12); wherein each end body (12) comprises a main body portion (121), wherein a cross-sectional area of the main body portion (121) is decreased along a length direction of the traction beam (10); one end, having a relatively large cross-sectional area, of the main body portion (121) is connected with the intermediate body (11); a curved surface portion is provided on a side surface of the intermediate body (11); the side surface of the intermediate body (11) is in a smooth transition with a side surface of the main body portion (121) by means of the curved surface portion of the intermediate body (11).

2. The traction beam for the rail train according to claim 1, wherein a first curved surface portion (a1) which is recessed inward and a second curved surface portion (a2) which protrudes outward are provided on the side surface of the intermediate body (11), the side surface of the intermediate body (11) is in a smooth transition with the side surface of the main body portion (121) at one end by means of the first curved surface portion (a1) of the intermediate body (11), and is in a smooth transition with the side surface of the main body portion (121) at the other end by means of the second curved surface portion (a2) of the intermediate body (11); the side surface on one side of the main body portion (121) is in a smooth transition with the first curved surface portion (a1) of the side surface on one side of the intermediate body (11), and the side surface on the other side of the main body portion (121) is in a smooth transition with the second curved surface portion (a2) of the side surface on the other side of the intermediate body (11).

3. The traction beam for the rail train according to claim 1, wherein a first weight reduction hole (114) and a second weight reduction hole (115) are defined in the intermediate body (11); the first weight reduction hole (114) is arranged close to the pin sleeve hole (111), the second weight reduction hole (115) is arranged close to the corresponding end bodies (12), and a reinforcing rib (116) is formed between the first weight reduction hole (114) and the second weight reduction hole (115).

4. The traction beam for the rail train according to claim 1, wherein part of the side surface on one side of the main body portion (121) is recessed inward to form a notch groove (122), the notch groove (122) reaches to an end surface of an end, away from the intermediate body (11), of the main body portion (121) and to a top surface and a bottom surface of the main body portion (121), and a side wall (c1) and an end wall (c2) of the notch groove (122) are in a smooth transition.

5. The traction beam for the rail train according to claim 1, wherein each end body (12) comprises a connecting sleeve (123), the connecting sleeve (123) is connected with an end, away from the intermediate body (11), of the main body portion (121) by means of a circumferential surface of the connecting sleeve (123), two pull rod holes (124) are defined in each end body (12), one pull rod hole (124) is defined in the main body portion (121), and the other pull rod hole (124) is an inner hole of the connecting sleeve (123).

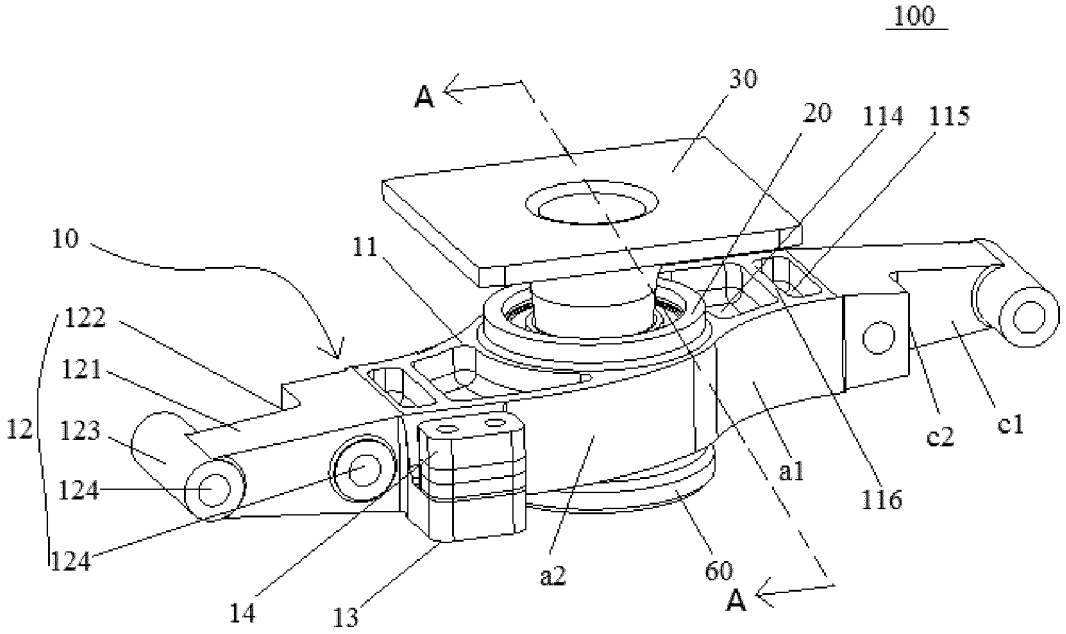
6. The traction beam for the rail train according to claim 5, wherein the two pull rod holes (124) are distributed along the length direction of the traction beam (10).

7. The traction beam for the rail train according to claim 1, wherein a lifting stop (13) is provided on the traction beam (10), and a connecting hole for connecting an adjusting cushion block (14) is defined in the lifting stop (13).

8. The traction beam for the rail train according to any one of claims 1 to 7, wherein the traction beam (10) has a central symmetric structure, a symmetrical center is a midpoint of a central axis of the pin sleeve hole (111), and an annular groove (112) and a step surface (113) facing the annular groove (112) are provided on a hole wall of the pin sleeve hole (111).

9. A traction device, comprising a traction beam, a central pin sleeve (20), a central pin (30), two traction pull rods, an elastic snap ring (40) and a fastening assembly, wherein the traction beam is the traction beam (10) according to claim 8; the central pin sleeve (20) is mounted in the pin sleeve hole (111), the elastic snap ring (40) is mounted in the annular groove (112), one end of the central pin sleeve (20) abuts against the step surface (113), the other end of the central pin sleeve (20) abuts against the elastic snap ring (40), the central pin (30) is mounted in an inner hole of the central pin sleeve (20) and is fastened with the central pin sleeve (20) by the fastening assembly, and the two traction pull rods are respectively connected to pull rod holes (124) at the two ends of the traction beam (10).

10. The traction device according to claim 9, wherein the fastening assembly comprises a bolt (50), a pressure cover (60) and a gasket (70), the central pin (30) has a conical portion with an internal threaded hole, the inner hole of the central pin sleeve (20) is a conical hole, the conical portion inserts into the conical hole, the bolt (50) passes through the pressure cover (60) and is screwed into the internal threaded hole, the pressure cover (60) tightly abuts against the central pin sleeve (20) under the fastening force of the bolt (50), and the conical portion tightly abuts against a hole wall of the conical hole.


100
A
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114
115
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121
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123
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124
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13
a2
60
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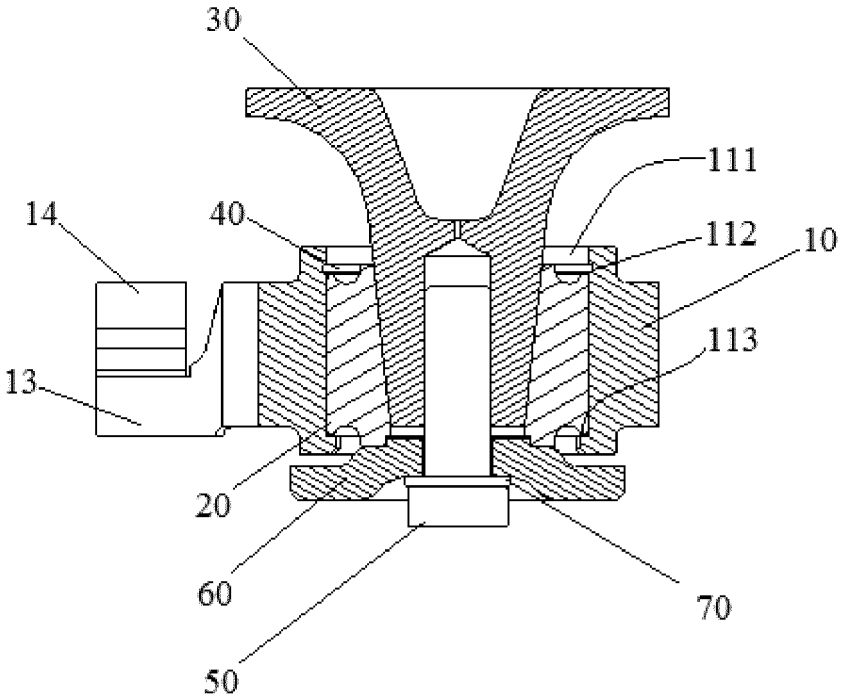
a1
116
c2
c1

FIG. 1


30
111
14
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112
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113
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50

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/137049

A. CLASSIFICATION OF SUBJECT MATTER

B61F 5/16(2006.01)i; B61F 5/18(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)

CNPAT, CNKI, WPI, EPODOC; 牵引梁, 牵引座, 牵引销座, 中心销座, 牵引拉杆连接座, 牵引销, 中心销, 牵引拉杆; s形, s型, 曲面, 弧面, 弧形; 卡环; center, centre, traction+, king, tow+, draw+; pin?, bolt

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 203358607 U (CSR ERQI CO., LTD.) 25 December 2013 (2013-12-25) description, specific embodiments, and figures 1-7	1-10
Y	CN 211494071 U (CRRC QINGDAO SIFANG CO., LTD.) 15 September 2020 (2020-09-15) description, specific embodiments, and figures 1-5	1-10
Y	CN 201646749 U (CSR QINGDAO SIFANG CO., LTD.) 24 November 2010 (2010-11-24) description, specific embodiments, and figures 1 and 2	8-10
PX	CN 112606862 A (CRRC QINGDAO SIFANG CO., LTD.) 06 April 2021 (2021-04-06) claims 1-10	1-10
Y	CN 107472287 A (CRRC QINGDAO SIFANG CO., LTD.) 15 December 2017 (2017-12-15) description, specific embodiments, and figures 1 and 2	8-10
A	JP 2005335558 A (KINKI SHARYO K.K.) 08 December 2005 (2005-12-08) entire document	1-10

☐ 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
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"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
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Date of the actual completion of the international search	Date of mailing of the international search report
11 February 2022	**01 March 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/137049

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202011438180 **[0001]**