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(54) **LUBRICATING STRUCTURE FOR GAUGE-CHANGEABLE WHEELSET AND GAUGE-CHANGEABLE WHEELSET**

(57) Disclosed are a lubricating structure for gauge-changing wheelset and a gauge-changing wheelset. The lubricating structure for gauge-changing wheelset comprises: wheels (1), an axle (2), and sliding mechanisms; the wheels are slidably provided at both ends of the axle, and the sliding mechanisms are respectively connected to outer sides of the wheels and are located in axle-box bodies at both ends of the axle; and the wheels are unlocked and locked by the sliding mechanisms. A sealing structure (6) is provided between an inner side of the wheel and the axle, a first cavity (7) is formed between the inner side of the wheel, the axle and the sealing structure, a second cavity (8) is formed between the outer side of the wheel and the sliding mechanism, and a third cavity (9) is formed between the sliding mechanism and the axle-box body. The wheel is provided with first oil injection holes (10) leading to a connection between the wheel and the axle, and the axle-box body is provided with second oil injection holes (11) leading to the sliding mechanism. The lubricating structure of the present application may increase the lubrication of a friction surface, and reduce the wear of the key wear-prone parts, thereby extending the overall service life of the gauge-changing wheelset.

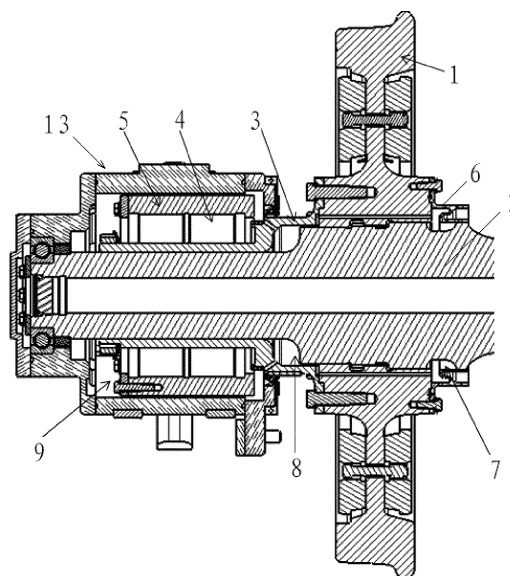


Fig. 1

Description**CROSS-REFERENCE TO RELATED APPLICATION**

5 [0001] The present application claims priority to Chinese Application No. 201910002745.4 filed on January 2, 2019, entitled "Lubricating Structure for Gauge-Changing Wheelset and Gauge-Changing Wheelset", the disclosure of which is hereby incorporated by reference in its entirety.

FIELD OF TECHNOLOGY

10 [0002] The present application relates to the technical field of rail vehicle gauge change, in particular to a lubricating structure for gauge-changing wheelset and a gauge-changing wheelset.

BACKGROUND

15 [0003] With the rapid evolution of global economic integration, transnational passenger and cargo transportation has grown rapidly in recent years. However, different rail gauges of various countries have seriously hindered the transnational rail transportation. In order to solve the problem that the different rail gauges of various countries hinder the transnational railway transportation, a gauge-changing wheelset is proposed, that is, when running on a railway of another country, a train changes the distance between the wheels of its own wheelset to adapt to the gauge of the railway of another country.

20 [0004] During the process of gauge change, a sliding mechanism on the wheelset will slide relative to an axle with the pushing of the ground guide rail. Relative friction will occur between the wheel and the axle, and the sliding mechanism and the axle. Therefore, it is urgent to adopt a lubrication design for key wear-prone parts.

BRIEF SUMMARY

25 (I) Technical problems to be solved

30 [0005] The present application is intended to address at least one of the technical problems existing in the prior art or related art.

[0006] It is an objective of the present application to provide a lubricating structure for a gauge-changeable wheelset and a gauge-changeable wheelset, so as to reduce the wear of key wear-prone parts and extend the overall service life of the gauge-changing wheelset.

35 (II) Technical solutions

[0007] In order to solve the technical problems above, an embodiment of the present invention provides a lubricating structure for gauge-changing wheelset, including wheels, an axle, and sliding mechanisms; the wheels are slidably provided at both ends of the axle, and the sliding mechanisms are respectively connected to outer sides of the wheels and are located in axle-box bodies at both ends of the axle; and the wheels are unlocked and locked by the sliding mechanisms. A sealing structure is provided between an inner side of the wheel and the axle, a first cavity is formed between the inner side of the wheel, the axle and the sealing structure, a second cavity is formed between the outer side of the wheel and the sliding mechanism, and a third cavity is formed between the sliding mechanism and the axle-box body. The wheel is provided with first oil injection holes leading to a connection between the wheel and the axle, and the axle-box body is provided with second oil injection holes leading to the sliding mechanism.

[0008] In an embodiment of the present application, the sliding mechanism includes an inner sleeve, the inner sleeve is in clearance fit with the axle, and one end of the inner sleeve facing the wheel extends beyond the axle-box body and is firmly connected with the wheel. A gauge change space is reserved between the extending end of the inner sleeve and the axle, and the gauge change space forms the second cavity.

50 [0009] In an embodiment of the present application, the sliding mechanism further includes a rolling bearing and an outer sleeve. The inner sleeve, the rolling bearing and the outer sleeve are tightly sleeved in sequence from inside to outside, and the outer sleeve is in clearance fit with an inner surface of the axle-box body. The third cavity is formed between an outer end surface of the outer sleeve and an outer end cover of the axle-box body.

55 [0010] In an embodiment of the present application, opposite sides outside the outer sleeve are respectively provided with bosses axially extending along the outer sleeve, and a plurality of flutes are disposed at intervals along the length direction of the bosses; an inner wall of the axle-box body is provided with concave arc surfaces corresponding to the flutes in a one-to-one manner; locking pins are provided in locking spaces defined by the flutes and the concave arc surfaces in the axle-box body, and the axle-box body is also provided with third oil injection holes communicating with

the concave arc surfaces.

[0011] In an embodiment of the present application, the third oil injection hole is provided on a side wall of the axle-box body corresponding to the locking pins.

[0012] In an embodiment of the present application, the axle-box body is provided therein with an axial through hole slidably fitted with the outer sleeve, and the second oil injection hole is vertically disposed from the top and/or bottom of the axle-box body and communicates with the axial through hole.

[0013] In an embodiment of the present application, an oil storage tank is provided in the radial direction of the axle between the inner side of the wheel and the sealing structure, and the first cavity is formed between the inner side of the wheel, the oil storage tank and the sealing structure.

[0014] In an embodiment of the present application, the sealing structure includes an outer ring, an inner ring and an elastic sleeve. The inner diameter of the outer ring is larger than the outer diameter of the inner ring. One end of the elastic sleeve is fixedly connected to an inner circumference of the outer ring, the other end of the elastic sleeve is fixedly connected with an outer circumference of the inner ring, and the outer ring may drive the elastic sleeve to move relative to the inner ring. The outer ring is configured to be fixedly sleeved on a hub of the wheel, the inner ring is configured to be fixedly sleeved on the axle, and the first cavity is formed between the outer ring, the elastic sleeve, the inner ring, the hub of the wheel, and the oil storage tank of the axle.

[0015] In an embodiment of the present application, an inner circumference of the wheel is provided with internal splines, both ends of the axle are respectively provided with external splines, the wheels and both ends of the axle are fitted and connected through the internal splines and the external splines, and an outlet of the first oil injection hole is located in a groove between two adjacent spline teeth of the internal splines.

[0016] In an embodiment of the present application, a plurality of first oil injection holes are provided, and the plurality of first oil injection holes are evenly distributed in the circumferential direction of the inner side surface of the wheel, and the first oil injection holes are disposed in a manner of sloping toward the connection between the wheel and the axle from the inner side surface of the wheel.

[0017] In the embodiment of the present application, the first oil injection hole, the second oil injection hole and the third oil injection hole are each provided with an internal thread section at an inlet thereof, and the inlet of each oil injection hole is sealed by screwing external thread fasteners on the corresponding internal thread section.

[0018] Another embodiment of the present application also provides a gauge-changing wheel set, including the lubricating structure for gauge-changing wheelset described in the above technical solutions.

(III) Beneficial effects

[0019] Compared with the prior art, the present application has the following advantages.

[0020] The embodiments of the present application provide a lubricating structure for gauge-changing wheelset, including wheels, an axle, and sliding mechanisms; the wheels are slidably provided at both ends of the axle, and the sliding mechanisms are respectively connected to outer sides of the wheels and are located in axle-box bodies at both ends of the axle; and the wheels are unlocked and locked by the sliding mechanisms. A sealing structure is provided between an inner side of the wheel and the axle, a first cavity is formed between the inner side of the wheel, the axle and the sealing structure, a second cavity is formed between the outer side of the wheel and the sliding mechanism, and a third cavity is formed between the sliding mechanism and the axle-box body. The wheel is provided with first oil injection holes leading to a connection between the wheel and the axle, the connection between the wheel and the axle is lubricated by injecting grease into the first oil injection holes, and the grease is stored in the first cavity. The axle-box body is provided with a second oil injection hole leading to the sliding mechanism, grease is injected into the second oil injection holes to lubricate between the axle-box body and the sliding mechanism and stored in the third cavity. The fitting position between the sliding mechanism and the axle is coated with grease to lubricate between the sliding mechanism and the axle, and the grease is stored in the second cavity. In the state that the wheel does not change the gauge, the grease is stored in the corresponding cavities, while the sliding mechanism moves during the gauge-changing process of the wheel, the volume of each cavity changes, thus the grease will be squeezed and flowed to fill the friction surfaces to form a lubricating layer, which plays the role of lubricating and protecting the friction surfaces, so as to reduce the wear of the key wear-prone parts, thereby extending the overall service life of the gauge-changing wheelset.

[0021] In addition, the first oil injection holes and the second oil injection holes are provided for maintenance and supplement of grease at any time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a partial axial cross-sectional view of a lubricating structure for gauge-changing wheelset according to an

embodiment of the present application;

FIG. 2 is a cross-sectional view of the axle-box body according to an embodiment of the present application;

FIG. 3 is a schematic diagram of a wheel according to an embodiment of the present application; and

FIG. 4 is a sectional view of B-B in FIG. 3.

Reference numerals:

[0023]

1 wheel	2 axle
3 inner sleeve	4 rolling bearing
5 outer sleeve	51 axial through hole
6 sealing structure	7 first cavity
8 second cavity	9 third cavity
10 first oil injection hole	11 second oil injection hole
12 third oil injection hole	13 axle-box body.

DETAILED DESCRIPTION

[0024] The specific embodiments of the present application are further described in detail below in conjunction with the drawings and embodiments. The following embodiments are intended to illustrate the present application, but are not intended to limit the scope of the present application.

[0025] In the description of the present application, it should be noted that the orientation or positional relationships indicated by terms such as "center", "longitudinal", "lateral", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside" and the like are based on the orientation or positional relationships shown in the drawings, and are merely for the convenience of describing the present application and simplifying the description, rather than indicating or implying that the device or component stated must have a particular orientation, be constructed and operated in a particular orientation, and thus should not be construed as limiting the present application. Moreover, the terms "first", "second", "third", and the like are used for descriptive purposes only and are not to be construed as indicating or implying relative importance.

[0026] In the description of the present application, it should be noted that unless otherwise explicitly stated and defined, the terms "installed", "connected with", and "connected" shall be understood in a broad sense, for example, it may be either fixedly connected or detachably connected, or may be integrally connected; it may be mechanically connected, or electrically connected; it may be directly connected, or indirectly connected through an intermediate medium, or the communication between the interior of two elements. The specific meanings of the terms above in the present application can be understood by a person skilled in the art in accordance with specific conditions.

[0027] In addition, in the description of the present application, "multiple", "a plurality of", and "multiple groups" mean two or more unless otherwise specified.

[0028] As shown in FIG. 1, an embodiment of the present application provides a lubricating structure for gauge-changing wheelset, including wheels 1, an axle 2, and sliding mechanisms; the wheels 1 are slidably provided at both ends of the axle 2, and the sliding mechanisms are respectively connected to outer sides of the wheels 1 and are located in axle-box bodies 13 at both ends of the axle 2; and the wheels 1 are unlocked and locked by the sliding mechanisms. A sealing structure 6 is provided between an inner side of the wheel 1 and the axle 2, a first cavity 7 is formed between the inner side of the wheel 1 and the axle 2 and the sealing structure 6, a second cavity 8 is formed between the outer side of the wheel 1 and the sliding mechanism, and a third cavity 9 is formed between the sliding mechanism and the axle-box body 13. As shown in FIG. 3, the wheel 1 is provided with first oil injection holes 10 leading to a connection between the wheel 1 and the axle 2. When the gauge of the wheel 1 changes, the wheel 1 will move relative to the axle 2, and a friction surface is between the wheel 1 and the axle 2. The connection between the wheel 1 and the axle 2 is lubricated by injecting grease into the first oil injection holes 10, thereby forming a lubricating layer on the friction surface, and the grease is stored in the first cavity 7. As shown in FIG. 2, the axle-box body 13 is provided with second oil injection holes 11 leading to the sliding mechanism. When the gauge of the wheel 1 changes, the sliding mechanism moves with the wheel 1, and the sliding mechanism moves relative to the axle-box body 13, and a friction surface is formed between the axle-box body 13 and the sliding mechanism. Grease is injected into the second oil injection holes 11 to lubricate

between the axle-box body 13 and the sliding mechanism, thereby forming a lubricating layer, and the grease is stored in the third cavity 9. When the wheel 1 moves, the sliding mechanism moves along the axle 2. Similarly, there is a friction surface between the sliding mechanism and the axle 2. The fitting position between the sliding mechanism and the axle 2 is coated with grease to lubricate the sliding mechanism and the axle 2, thereby forming a lubricating layer, and the grease is stored in the second cavity 8. In the state that the wheel 1 does not change the gauge, the grease is stored in the corresponding cavities, while the sliding mechanism moves during the gauge-changing process of the wheel 1, the volume of each cavity changes, the grease will be squeezed and flowed to fill the corresponding friction surfaces to form a lubricating layer, which plays the role of lubricating and protecting the friction surfaces, facilitating the improvement of lubrication efficiency so as to reduce the wear of the key wear-prone parts, thereby extending the overall service life of the gauge-changing wheelset.

[0029] In an embodiment of the present application, specifically, the sliding mechanism includes an inner sleeve 3, the inner sleeve 3 is in clearance fit with the axle 2, and one end of the inner sleeve 3 facing the wheel 1 extends beyond the axle-box body 13 and is firmly connected with the wheel 1 by fasteners. A gauge change space is reserved between the extending end of the inner sleeve 3 and the axle 2, so as to ensure that when the gauge is changed, the inner sleeve 3 has a sufficient distance to move along the axle 2 without interfering with the axle 2. The gauge change space forms the second cavity 8. To be specific, the axle 2 is configured as a stepped shaft with a diameter in the middle part greater than diameters at both ends. The wheels 1 are provided on an intermediate shaft of the stepped shaft and are respectively arranged at both ends of the intermediate shaft, and the sliding mechanism is provided on the two end shafts of the stepped shaft. An end of the inner sleeve 3 connected with the wheel 1 is configured as an outward-flared stepped hole. The inner diameter of the larger hole of the stepped hole is adapted to the outer diameter of the intermediate shaft of the stepped shaft, and the inner diameter of the smaller hole of the stepped hole is adapted to the inner diameters of both end shafts of the stepped shaft; the gauge change space is reserved between the larger hole of the stepped hole and the shoulder of the stepped shaft to form the second cavity 8. Before the sliding mechanism is installed, grease is first applied to the corresponding section in the inner sleeve 3 or outside the axle 2, and the inner sleeve 3 is then sleeved on the axle 2 and connected with the wheel 1. Since the grease has a certain fluidity, excess grease is stored in the second cavity 8. During the gauge change process, the grease will be squeezed and flowed to fill the friction surface between the inner sleeve 3 and the axle 2, thereby forming a lubricating layer, which plays the role of reducing friction and protecting the inner sleeve 3 and the axle 2.

[0030] In an embodiment of the present application, the sliding mechanism further includes a rolling bearing 4 and an outer sleeve 5. The inner sleeve 3, the rolling bearing 4 and the outer sleeve 5 are tightly sleeved in sequence from inside to outside. When the wheel 1 rotates, the inner sleeve 3 and the inner ring of the rolling bearing 4 rotate with the wheel 1, the outer sleeve 5 and the outer ring of the rolling bearing 4 remain relatively fixed, and the outer sleeve 5 is in clearance fit with an inner surface of the axle-box body 13 to facilitate the movement of the outer sleeve 5, the inner sleeve 3, and the rolling bearing 4 as a whole along the axle-box body 13. A space for allowing the sliding mechanism to move is reserved between the outer end surface of the outer sleeve 5 and the outer end cover of the axle-box body 13, thereby forming the third cavity 9 for filling the grease to lubricate between the outer sleeve 5 and the axle-box body 13.

[0031] In an embodiment of the present application, opposite sides outside the outer sleeve 5 are respectively provided with bosses axially extending along the outer sleeve 5, and a plurality of flutes are disposed at intervals along the length direction of the bosses; an inner wall of the axle-box body 13 is provided with concave arc surfaces corresponding to the flutes in a one-to-one manner; locking pins are provided in locking spaces defined by the flutes and the concave arc surfaces in the axle-box body 13, and the gauge of the wheel 1 is changed by the locking pins being inserted into locking spaces defined by the flutes and the concave arc surfaces, and switched between a plurality of the locking spaces under the action of an external force. In an embodiment, when the locking pin is inserted into the locking space, a part of the locking pin is located in the flute, and the other part fits the concave arc surface, and the outer sleeve 5 is fixed in position relative to the axle-box body 13 to be locked, at this time, the wheel 1 is fixed in position relative to the axle 2; when the gauge needs to be changed, the locking pin is released from the locking space under the action of an external force to be unlocked. In the present embodiment, it is preferable to use an upward thrust to make the locking pin released from the locking space; meanwhile, the wheels 1 are pushed to move outward or inward along the axle 2, and then the sliding mechanism is driven as a whole to move relative to the axle-box body 13 and the locking pins. When the locking space corresponding to the gauge to be changed moves to just below the locking pin, the locking pin is inserted into the locking space under the action of its own gravity and downward force, then the gauge of wheel 1 is changed completely. The axle-box body 13 is also provided with third oil injection holes 12 communicating with the concave arc surfaces to facilitate the injection of grease from the third oil injection holes 12 to the concave arc surfaces of the axle-box body 13, so as to lubricate the locking pin and the locking space in which the axle-box body 13 is located and thus reduce the friction between the axle-box body 13 and the outer sleeve 5 when the locking pin moves upwards and downwards.

[0032] In an embodiment of the present application, as shown in FIG. 2, in order to facilitate the arrangement of the third oil injection hole 12, the third oil injection hole 12 is provided on a side wall of the axle-box body 13 corresponding to the locking pin. The grease injected from the third oil injection holes 12 may flow and cover the entire locking space

between the concave arc surface and the flutes of the outer sleeve 5.

[0033] In an embodiment of the present application, as shown in FIG. 2, the axle-box body 13 is provided therein with an axial through hole 51 slidably fitted with the outer sleeve, and the second oil injection hole 11 is vertically disposed from the top and/or bottom of the axle-box body 13 and communicates with the axial through hole 51, so as to facilitate the injection of grease from the top of the axle-box body 13 from top to bottom to lubricate between the axle-box body 13 and the outer sleeve 5. Of course, it is also possible to inject grease from the bottom of the axle-box body 13 from bottom to top to lubricate between the axle-box body 13 and the outer sleeve 5. In order to fully cover the space between the axle-box body 13 and the outer sleeve 5, the second oil injection holes 11 are simultaneously provided at the top and bottom of the axle-box body 13. In order to improve the injection efficiency, a plurality of second oil injection holes 11 may be provided at the top and bottom of the axle-box body 13.

[0034] In an embodiment of the present application, in order to facilitate the storage of grease, an oil storage tank is provided in the radial direction of the axle 2 between the inner side of the wheel 1 and the sealing structure 6, and the first cavity 7 is formed between the inner side of the wheel 1, the oil storage tank and the sealing structure 6.

[0035] In an embodiment of the present application, specifically, the sealing structure 6 includes an outer ring, an inner ring and an elastic sleeve. The inner diameter of the outer ring is larger than the outer diameter of the inner ring. One end of the elastic sleeve is fixedly connected with an inner circumference of the outer ring, the other end of the elastic sleeve is fixedly connected with an outer circumference of the inner ring, and the outer ring may drive the elastic sleeve to move relative to the inner ring. The outer ring is configured to be fixedly sleeved on a hub of the wheel 1, and the inner ring is configured to be fixedly sleeved on the axle 2. When the gauge is changed, the outer ring moves together with the wheel 1. The elastic sleeve moves along with the outer ring using its variability and recoverability in shape while the inner ring is fixed, which solves the sealing problem during the relative sliding of the wheel 1 and the axle 2 when the gauge is changed. The first cavity 7 is formed between the outer ring, the elastic sleeve, the inner ring, the hub of the wheel 1, and the oil storage tank of the axle 2. Grease is stored in the first cavity 7 to maintain continuous lubrication between the wheel 1 and the axle 2, thereby avoiding the wear of the seals caused by relative movement between the inner ring and the outer ring, and the sealing performance is good without leakage.

[0036] In an embodiment of the present application, an inner circumference of the wheel 1 is provided with internal splines, both ends of the axle 2 are provided with external splines, the wheels 1 and both ends of the axle 2 are fitted and connected through the internal splines and the external splines so as to facilitate not only the transmission of torque but also the movement of the wheels 1. An outlet of the first oil injection hole 10 is located in a groove between two adjacent spline teeth of the internal splines so as to facilitate the storage of the grease after injection as well as the formation of the lubricating layer when the internal and external splines are engaged. It should be avoided disposing the first oil injection holes 10 on the spline teeth of the internal spline, so as to reduce the weakening of the strength of the internal splines by the first oil injection hole 10.

[0037] As shown in FIG. 3, in an embodiment of the present application, multiple first oil injection holes 10 are provided, and the multiple first oil injection holes 10 are evenly distributed in the circumferential direction of the inner side surface of the wheel 1, so that regardless of the way in which the wheel 1 is parked, grease may be injected through the first oil injection hole 10 with a suitable angle. As shown in FIG. 4, the first oil injection holes 10 are disposed in a manner of sloping toward the connection between the wheel 1 and the axle 2 from the inner side surface of the wheel 1, so as to facilitate the flowing of grease into the connection between the wheel 1 and the axle 2 for lubrication.

[0038] In an embodiment of the present application, the first oil injection hole 10, the second oil injection hole 11 and the third oil injection hole 12 are each provided with an internal thread section at an inlet thereof, and the inlet of each oil injection hole is sealed by screwing external thread fasteners on the corresponding internal thread section to prevent the grease from being thrown out from the oil injection holes when the vehicle is running at high speed, which plays a reliable sealing role. The arrangement of each oil injection hole facilitates maintenance and supplement of grease at any time.

[0039] Another embodiment of the present application also provides a gauge-changing wheel set, including the lubricating structure for gauge-changing wheelset described in the above technical solutions. The wear of key wear-prone parts such as positions between the wheel 1 and the axle 2, the inner sleeve 3 and the axle 2, and the outer sleeve 5 and the axle-box body 13 is reduced and thus the overall service life of the gauge-changing wheelset is extended.

[0040] According to the embodiments above, by storing the grease in the corresponding cavities, while the sliding mechanism moves during the gauge-changing process of the wheel, the volume of each cavity changes, and the grease will be squeezed and flowed to fill the friction surfaces to form a lubricating layer, which plays the role of lubricating and protecting the friction surfaces, so as to reduce the wear of the key wear-prone parts, thereby extending the overall service life of the gauge-changing wheelset.

[0041] The embodiments above are only the preferred embodiments of the present application, and are not intended to limit the present application. Any modifications, equivalent substitutions, improvements, and the like which are within the spirit and principles of the present application, should be included in the protection scope of the present application.

Claims

1. A lubricating structure for gauge-changing wheelset, **characterized in** comprising wheels, an axle, and sliding mechanisms; the wheels are slidably provided at both ends of the axle, and the sliding mechanisms are respectively connected to outer sides of the wheels and are located in axle-box bodies at both ends of the axle; and the wheels are unlocked and locked by the sliding mechanisms; a sealing structure is provided between an inner side of the wheel and the axle, a first cavity is formed between the inner side of the wheel, the axle and the sealing structure, a second cavity is formed between the outer side of the wheel and the sliding mechanism, and a third cavity is formed between the sliding mechanism and the axle-box body; the wheel is provided with first oil injection holes leading to a connection between the wheel and the axle, and the axle-box body is provided with second oil injection holes leading to the sliding mechanism.
2. The lubricating structure for gauge-changing wheelset of claim 1, **characterized in that**, the sliding mechanism comprises an inner sleeve, the inner sleeve is in clearance fit with the axle, and one end of the inner sleeve facing the wheel extends beyond the axle-box body and is firmly connected with the wheel; a gauge change space is reserved between the extending end of the inner sleeve and the axle, and the gauge change space forms the second cavity.
3. The lubricating structure for gauge-changing wheelset of claim 2, **characterized in that**, the sliding mechanism further comprises a rolling bearing and an outer sleeve; the inner sleeve, the rolling bearing and the outer sleeve are tightly sleeved in sequence from inside to outside, and the outer sleeve is in clearance fit with an inner surface of the axle-box body; and the third cavity is formed between an outer end surface of the outer sleeve and an outer end cover of the axle-box body.
4. The lubricating structure for gauge-changing wheelset of claim 3, **characterized in that**, opposite sides outside the outer sleeve are respectively provided with bosses axially extending along the outer sleeve, and a plurality of flutes are disposed at intervals along the length direction of the bosses; an inner wall of the axle-box body is provided with concave arc surfaces corresponding to the flutes in a one-to-one manner; locking pins are provided in locking spaces defined by the flutes and the concave arc surfaces in the axle-box body, and the axle-box body is also provided with third oil injection holes communicating with the concave arc surfaces.
5. The lubricating structure for gauge-changing wheelset of claim 4, **characterized in that**, the third oil injection hole is provided on a side wall of the axle-box body corresponding to the locking pin.
6. The lubricating structure for gauge-changing wheelset of claim 3, **characterized in that**, the axle-box body is provided therein with an axial through hole slidably fitted with the outer sleeve, and the second oil injection hole is vertically disposed from the top and/or bottom of the axle-box body and communicates with the axial through hole.
7. The lubricating structure for gauge-changing wheelset of claim 1, **characterized in that**, an oil storage tank is provided in the radial direction of the axle between the inner side of the wheel and the sealing structure, and the first cavity is formed between the inner side of the wheel, the oil storage tank and the sealing structure.
8. The lubricating structure for gauge-changing wheelset of claim 7, **characterized in that**, the sealing structure comprises an outer ring, an inner ring and an elastic sleeve; an inner diameter of the outer ring is larger than an outer diameter of the inner ring; one end of the elastic sleeve is fixedly connected to an inner circumference of the outer ring, the other end of the elastic sleeve is fixedly connected with an outer circumference of the inner ring, and the outer ring may drive the elastic sleeve to move relative to the inner ring; the outer ring is configured to be fixedly sleeved on a hub of the wheel, and the inner ring is configured to be fixedly sleeved on the axle, and the first cavity is formed between the outer ring, the elastic sleeve, the inner ring, the hub of the wheel, and the oil storage tank of the axle.
9. The lubricating structure for gauge-changing wheelset of claim 1, **characterized in that**, an inner circumference of the wheel is provided with internal splines, both ends of the axle are provided with external splines, the wheels and both ends of the axle are fitted and connected through the internal splines and the external splines, and an outlet of the first oil injection hole is located in a groove between two adjacent spline teeth of the internal splines.
10. The lubricating structure for gauge-changing wheelset of claim 1, **characterized in that**, a plurality of said first oil injection holes are provided, and the plurality of first oil injection holes are evenly distributed in the circumferential

direction of an inner side surface of the wheel, and the first oil injection holes are disposed in a manner of sloping toward the connection between the wheel and the axle from the inner side surface of the wheel.

5 **11.** The lubricating structure for gauge-changing wheelset of claim 4, **characterized in that**, the first oil injection hole, the second oil injection hole and the third oil injection hole are each provided with an internal thread section at an inlet thereof, and the inlet of each oil injection hole is sealed by screwing external thread fasteners on the corresponding internal thread section.

10 **12.** A gauge-changing wheelset, comprising the lubricating structure for gauge-changing wheelset of any of claims 1 to 11.

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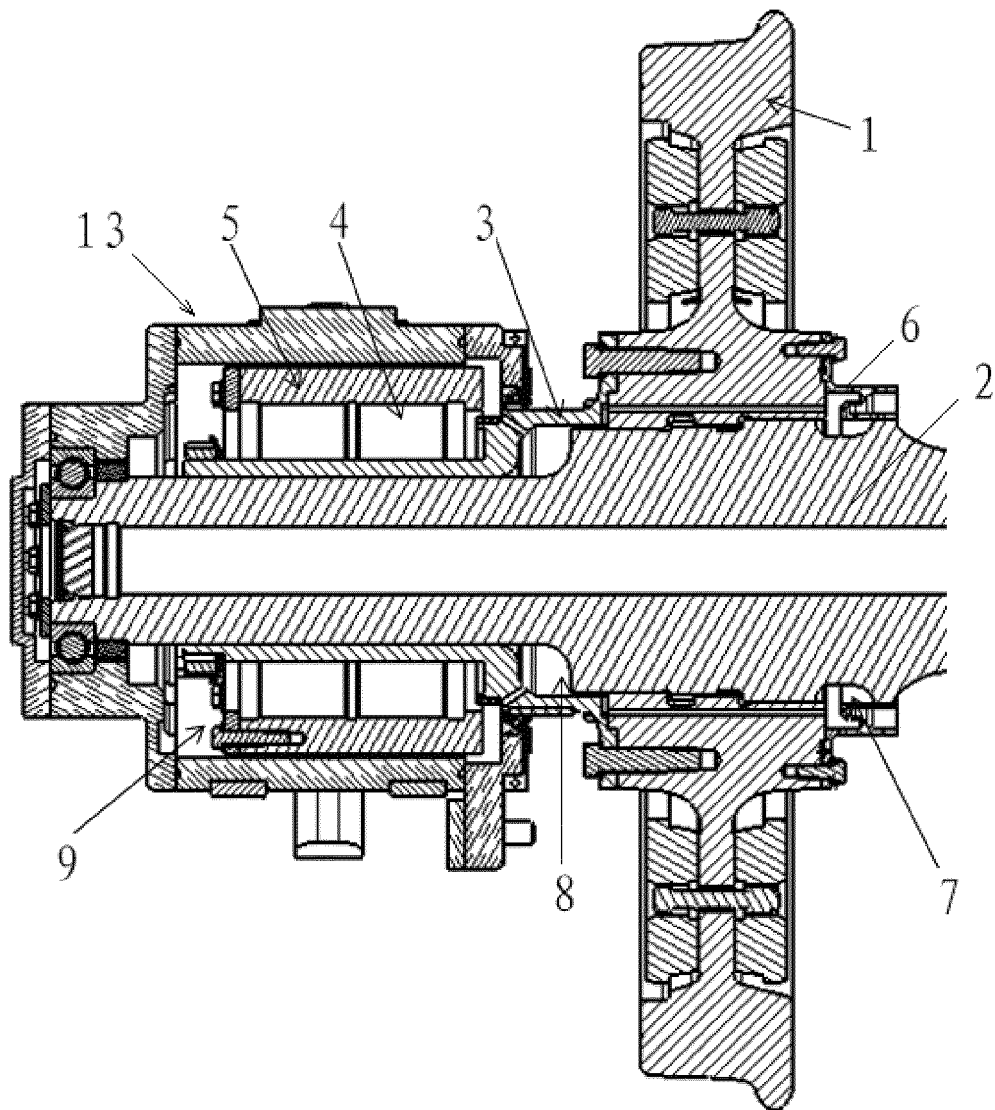


Fig. 1

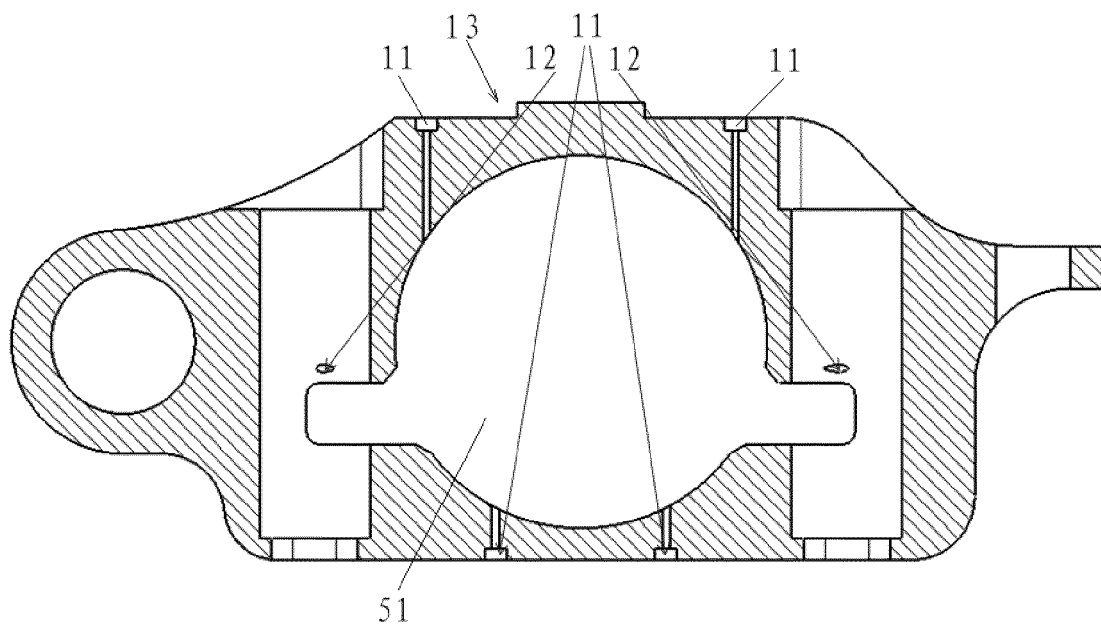


Fig. 2

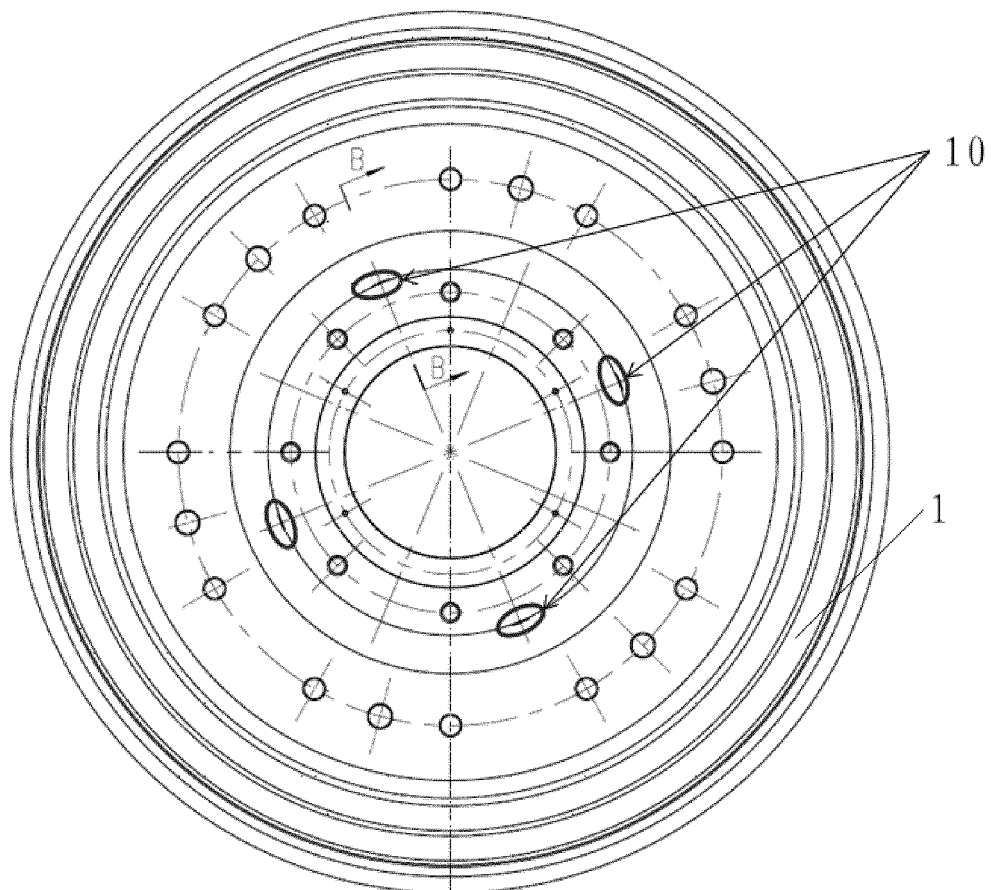


Fig. 3

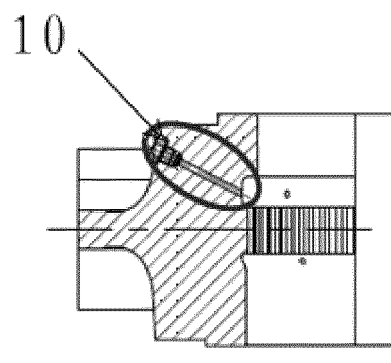


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/110241

A. CLASSIFICATION OF SUBJECT MATTER B61F 17/30(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, VEN, CNKI: 润滑, 密封, 轮, 轴, 空腔, 孔, lubricat+, seal, wheel ,shaft, cavity, aperture																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT																					
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>CN 108407839 A (CRRC QINGDAO SIFANG CO., LTD.) 17 August 2018 (2018-08-17) description, pp. 2 and 3, and figures 1-3</td> <td>1-12</td> </tr> <tr> <td>A</td> <td>CN 108909358 A (CRRC QINGDAO SIFANG CO., LTD. et al.) 30 November 2018 (2018-11-30) entire document</td> <td>1-12</td> </tr> <tr> <td>A</td> <td>CN 107697090 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 16 February 2018 (2018-02-16) entire document</td> <td>1-12</td> </tr> <tr> <td>A</td> <td>CN 105492292 A (OGI EJES DE ANCHO VARIABLE S.L.; AZVI, S.A.; RUBIO DE HITA, INGENIERIA Y TECNICA DEL TRANSPORTE TRIA, S.A.) 13 April 2016 (2016-04-13) entire document</td> <td>1-12</td> </tr> <tr> <td>A</td> <td>DE 4405861 A1 (PKP TS B K et al.) 08 September 1994 (1994-09-08) entire document</td> <td>1-12</td> </tr> <tr> <td>PX</td> <td>CN 109733435 A (CRRC QINGDAO SIFANG CO., LTD.) 10 May 2019 (2019-05-10) claims 1-12</td> <td>1-12</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	CN 108407839 A (CRRC QINGDAO SIFANG CO., LTD.) 17 August 2018 (2018-08-17) description, pp. 2 and 3, and figures 1-3	1-12	A	CN 108909358 A (CRRC QINGDAO SIFANG CO., LTD. et al.) 30 November 2018 (2018-11-30) entire document	1-12	A	CN 107697090 A (CRRC ZHUZHOU LOCOMOTIVE CO., LTD.) 16 February 2018 (2018-02-16) entire document	1-12	A	CN 105492292 A (OGI EJES DE ANCHO VARIABLE S.L.; AZVI, S.A.; RUBIO DE HITA, INGENIERIA Y TECNICA DEL TRANSPORTE TRIA, S.A.) 13 April 2016 (2016-04-13) entire document	1-12	A	DE 4405861 A1 (PKP TS B K et al.) 08 September 1994 (1994-09-08) entire document	1-12	PX	CN 109733435 A (CRRC QINGDAO SIFANG CO., LTD.) 10 May 2019 (2019-05-10) claims 1-12	1-12
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PX	CN 109733435 A (CRRC QINGDAO SIFANG CO., LTD.) 10 May 2019 (2019-05-10) claims 1-12	1-12																			
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Date of the actual completion of the international search 24 December 2019	Date of mailing of the international search report 17 January 2020																				
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.																				

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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