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(54) **MOTOR TRAIN UNIT AND SANDING LUBRICATION SYSTEM THEREFOR**

(57) An EMU and a sand lubrication system thereof are disclosed according to the present application. The sand lubrication system includes a sand box, a sand pipe, a sand spray nozzle, a lubricant supply device, a lubricating pipe and a fuel spray nozzle. When the EMU needs braking, the materials in the sand box are delivered to the sand spray nozzle through the sand pipe, and are sprayed to the wheels through the sand spray nozzle to improve the adhesive coefficient between the wheels and rails. When it is necessary to reduce the wear of the rims of the wheels, the lubricant is delivered by the lubricant supply device to the fuel spray nozzle through the lubricating pipe, and the lubricant is sprayed to the rims of the wheels through the fuel spray nozzle, which reduces the wear of the rims of the wheels, thus reducing the times and maintenance costs for maintaining and grinding the wheels, reducing the noise of the EMU in bends and tunnels, and reducing the risk of the wheels going off the rail. In summary, the wear of the wheels of the EMU and the slipping probability of the EMU during braking are reduced according to the present application.

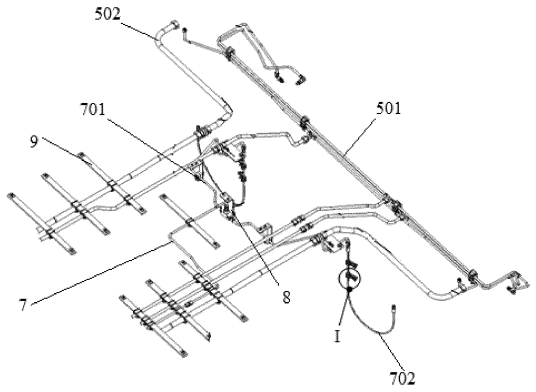

Figure 1

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Description

[0001] The present application claims the priority to Chinese Patent Application No. 201910141731.0, titled "ELECTRIC MULTIPLE UNIT AND SAND LUBRICATION SYSTEM THEREOF", filed with the China National Intellectual Property Administration on February 26, 2019, and the priority to Chinese Patent Application No. 201920243124.0, titled "ELECTRIC MULTIPLE UNIT AND SAND LUBRICATION SYSTEM THEREOF", filed with the China National Intellectual Property Administration on February 26, 2019, both of which are incorporated herein by reference in their entireties.

FIELD

[0002] The present application relates to the technical field of railway transportation, and in particular to an ELECTRIC MULTIPLE UNIT and a sand lubrication system thereof.

BACKGROUND

[0003] With the use of an electric multiple unit (EMU), the wear of rims of its wheels will be intensified, which will increase the times and maintenance costs for maintaining and grinding the wheels, and at the same time, increase the noise of the EMU in bends and tunnels, and greatly increase the risk of the wheels going off the rail. In addition, in the braking process of the EMU, the problem of wheel slipping is inevitable. With the increase of the vehicle speed, the probability of wheel slipping increases.

[0004] Therefore, how to reduce the wear of the wheels of the EMU and reduce the slipping probability of the EMU during braking is a technical problem to be solved urgently by those skilled in the art.

SUMMARY

[0005] In view of this, a first object of the present application is to provide a sand lubrication system, which can reduce the wear of the wheels of the EMU and reduce the slipping probability of the EMU during braking.

[0006] A second object of the present application is to provide an EMU.

[0007] In order to achieve the first object mentioned above, the present application provides the following solutions.

[0008] A sand lubrication system, which is used for the EMU, includes:

a sand box, where the EMU includes a chassis and a bogie, and the bogie is rotatably mounted on the chassis, a baffle is provided between the bogie and the dynamic front end of the chassis, and the sand box is arranged between the bogie and the dynamic front end of the chassis, and is integrated with the chassis;

a sand pipe and a sand spray nozzle, where one end of the sand pipe is in communication with an outlet of a bottom end of the sand box, and another end of the sand pipe is in communication with the sand spray nozzle by passing through the baffle, and the sand spray nozzle is configured to spray materials delivered by the sand pipe to wheels on the bogie;

a lubricant supply device, where the lubricant supply device is arranged between the bogie and the dynamic front end of the chassis, and is mounted on the chassis; and

a lubricating pipe and a fuel spray nozzle, where one end of the lubricating pipe is in communication with an outlet of the lubricant supply device, and another end of the lubricating pipe is in communication with the fuel spray nozzle by bypassing the baffle, the fuel spray nozzle is configured to spray the lubricant delivered by the lubricating pipe to rims of the wheels.

[0009] In a specific embodiment, the lubricant supply device includes a drive pump, an oil-gas mixing module and a distributor;
the drive pump is configured to pump the lubricant into the oil-gas mixing module; and
the distributor is mounted on the lubricating pipe and is in communication with an outlet of the oil-gas mixing module through the lubricating pipe, and two outlets of the distributor are respectively in communication with the fuel spray nozzles at two sides through the lubricating pipe.

[0010] In another specific embodiment, the distributor includes a vertical distribution valve and a horizontal distribution valve; and
the vertical distribution valve and the horizontal distribution valve are vertically arranged, an inlet of the vertical distribution valve is in communication with the oil-gas mixing module through the lubricating pipe, an inlet of the horizontal distribution

valve is in communication with an outlet of the vertical distribution valve, and two outlets of the horizontal distribution valve are in communication with the fuel spray nozzle.

[0011] In another specific embodiment, the lubricating pipe includes a lubricating hard pipe and a lubricating soft pipe; and

the distributor is arranged on the lubricating hard pipe, one end of the lubricating soft pipe is in communication with the lubricating hard pipe, and another end of the lubricating soft pipe is in communication with the fuel spray nozzle; and/or the sand pipe includes a sand soft pipe and a sand hard pipe;

one end of the sand hard pipe is in communication with the sand box; and

another end of the sand hard pipe is in communication with the sand soft pipe through a partition straight joint mounted on the baffle.

[0012] In another specific embodiment, the lubricating soft pipe is arranged in a U shape.

[0013] In another specific embodiment, the sand lubrication system includes multiple connecting plates; and

the connecting plates are mounted on the chassis, and the lubricating pipe and the sand pipe are both fixed on the connecting plates.

[0014] In another specific embodiment, the sand lubrication system further includes tensioning devices and pipe clamps;

the pipe clamps are respectively fixed on the sand soft pipe and the lubricating soft pipe, and each of the tensioning devices has one end connected with the corresponding pipe clamp, and another end connected with the chassis.

[0015] In another specific embodiment, the tensioning device includes a lifting socket, a lug, a wire rope and a rope puller;

the lifting socket is fixed on the chassis;

one end of the lug is fixed on the lifting socket, and another end of the lug is connected with the wire rope;

one end of the rope puller is connected with the wire rope, and another end of the rope puller is connected with the pipe clamp, and/or

each of the pipe clamps is an adjustable metal buckle.

[0016] In another specific embodiment, the sand lubrication system further includes a sand dry-air pipe;

the sand dry-air pipe is fixed together with the sand pipe; and/or

the sand lubrication system further includes a felt strip; and

the felt strip is configured to cover the lubricating soft pipe.

[0017] The various embodiments according to the present application can be combined arbitrarily as required, and the embodiments obtained after these combinations are also within the scope of the present application and are a part of the specific embodiments of the present application.

[0018] Not limited to any theory, it can be seen from the above disclosure that according to the sand lubrication system of the present application, when the EMU needs braking, the materials in the sand box are delivered to the sand spray nozzle through the sand pipe, and are sprayed to the wheels through the sand spray nozzle to improve the adhesive coefficient between the wheels and rails. When it is necessary to reduce the wear of the rims of the wheels, the lubricant is delivered by the lubricant supply device to the fuel spray nozzle through the lubricating pipe, and is sprayed to the rims of the wheels through the fuel spray nozzle, which reduces the wear of the rims of the wheels, thus reducing the times and maintenance costs for maintaining and grinding the wheels, reducing the noise of the EMU in bends and tunnels, and reducing the risk of the wheels going off the rail.

[0019] In addition, according to the present application, the sand box is integrated with the chassis of the EMU. Therefore, the reliable mounting of the sand lubrication system can be realized even if the baffle is mounted between the bogie and the dynamic front end of the chassis of the EMU, and the space for mounting the sand lubrication system is narrow.

[0020] In summary, the wear of the wheels of the EMU and the slipping probability of the EMU during braking are reduced according to the present application.

[0021] In order to achieve the second object mentioned above, the present application provides the following solutions.

[0022] An EMU includes a chassis, a bogie and the sand lubrication system as described in any one of the above; and

the bogie is rotatably mounted on the chassis, a baffle is arranged between the bogie and the dynamic front end of the chassis, and multiple guide grooves are opened on the baffle.

[0023] Since the EMU according to the present application includes any one of the above-mentioned sand lubrication systems, the beneficial effects of the above-mentioned sand lubrication system are all included in the EMU according to the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] For more clearly illustrating embodiments of the present application or technical solutions in the conventional technology, the drawing referred to describe the embodiments or the conventional technology will be briefly described

hereinafter. Apparently, the drawing in the following description is only an example of the present application, and for those skilled in the art, other drawings may be obtained based on the provided drawing without any creative efforts.

Figure 1 is a three-dimensional structural view of a sand lubrication system according to the present application;

Figure 2 is a partially enlarged schematic view showing the structure of Figure 1;

Figure 3 is a schematic front view showing the structure of the sand lubrication system mounted on the EMU according to the present application ;

Figure 4 is a schematic bottom view showing the structure of Figure 3;

Figure 5 is a schematic left view showing the structure of Figure 3; and

Figure 6 is a structural view of the distributor of the sand lubrication system according to the present application.

Reference numerals in Figures 1 to 6:

1	sand box	2	chassis
3	bogie	4	baffle
5	sand pipe	6	wheel
7	lubricating pipe	8	distributor
801	vertical distribution valve	802	horizontal distribution valve
701	lubricating hard pipe	702	lubricating soft pipe
501	sand soft pipe	502	sand hard pipe
9	connecting plate	10	tensioning device
11	pipe clamp	12	sand dry-air pipe
13	felt strip	14	partition straight joint

DETAILED DESCRIPTION

[0025] In order to provide those skilled in the art a better understanding of the solutions of the present application, the present application is described hereinafter in further detail in conjunction with the drawings and embodiments.

First Embodiment

[0026] As shown in Figures 1 to 6, the present application discloses a sand lubrication system used for an EMU. Since the braking and lubrication of the EMU are mainly on the head vehicle of the EMU, the sand lubrication system disclosed by the present application is often used on the head vehicle of the EMU, and it should be noted that it may also be mounted on other vehicle bodies that require lubrication and braking.

[0027] The sand lubrication system includes a sand box 1, a sand pipe 5, a sand spray nozzle, a lubricant supply device, a lubricating pipe 7 and a fuel spray nozzle.

[0028] The EMU includes a chassis 2 and a bogie 3, the bogie 3 is rotatably mounted on the chassis 2, and a baffle 4 is arranged between the bogie 3 and the dynamic front end of the chassis 2 to improve the dynamic performance of the EMU and reduce the running resistance of the EMU. The sand box 1 is arranged between the bogie 3 and the dynamic front end of the chassis 2, and the sand box 1 is integrated with the chassis 2. Specifically, the sand box 1 may be welded with the chassis 2 or integrally formed, which avoids the shaking of the sand box along with the vibration of the EMU, further avoids the shaking of the sand pipe 5, and improves the service life of the sand pipe 5.

[0029] One end of the sand pipe 5 is in communication with the outlet at the bottom of the sand box 1, and another end of the sand pipe 5 is in communication with the sand spray nozzle by passing through the baffle 4, and the sand spray nozzle may spray the materials delivered by the sand pipe 5 to the wheels 6 on the bogie 3. In order to facilitate sand discharge, the present application further discloses that the height of the sand spray pipe is higher than that of the sand spray nozzle.

[0030] The lubricant supply device is arranged between the bogie 3 and the dynamic front end of the chassis 2, and the lubricant supply device is mounted on the chassis 2. Specifically, the lubricant supply device may be any structure capable of supplying lubricant to the fuel spray nozzle.

[0031] One end of the lubricating pipe 7 is in communication with the outlet of the lubricant supply device, and another end of the lubricating pipe 7 is in communication with the fuel spray nozzle by bypassing the baffle 4, and the fuel spray nozzle may spray the lubricant delivered by the lubricating pipe 7 on the rims of the wheels 6.

[0032] For the sand lubrication system disclosed by the present application, when the EMU needs braking, the materials in the sand box 1 are delivered to the sand spray nozzle through the sand pipe 5, and are sprayed to the wheels 6 through the sand spray nozzle to improve the adhesive coefficient between the wheels and rails. When it is necessary to reduce the wear of the rims of the wheels 6, the lubricant is delivered by the lubricant supply device to the fuel spray nozzle through the lubricating pipe 7, and is sprayed to the rims of the wheels 6 through the fuel spray nozzle, which reduces the wear of the rims of the wheels 6, thus reducing the times and maintenance costs for maintaining and grinding the wheel 6, reducing the noise of the EMU in bends and tunnels, and reducing the risk of the wheels 6 going off the rail.

[0033] In addition, the sand box 1 of the present application is integrated with the chassis 2 of the EMU. Therefore, the reliable mounting of the sand lubrication system can be realized even if the baffle 4 is mounted between the bogie 3 and the dynamic front end of the chassis 2 of the EMU, and the space for mounting the sand lubrication system is narrow.

[0034] In summary, the wear of the wheels 6 of the EMU and the slipping probability of the EMU during braking are reduced according to the present application.

Second Embodiment

[0035] In the second embodiment according to the present application, the structure of the sand lubrication system in this embodiment is similar to that in the first embodiment, so the similarities will not be described again, and only the differences will be introduced.

[0036] In this embodiment, the application specifically discloses that the lubricant supply device includes a drive pump, an oil-gas mixing module and a distributor 8.

[0037] The drive pump can pump lubricant into the oil-gas mixing module. The distributor 8 is mounted on the lubricating pipe 7, and is in communication with the outlet of the oil-gas mixing module through the lubricating pipe 7. The two outlets of the distributor 8 are respectively in communication with the fuel spray nozzles on both sides through the lubricating pipe 7, so as to spray lubricant on the wheels 6 on both sides of the EMU.

[0038] Specifically, the drive pump may be a pneumatic plunger pump. It should be noted that it may also be other types of pumps. In this embodiment, the drive pump is a pneumatic plunger pump as an example. In use, the lubricant is pumped into the oil-gas mixing module by the pneumatic plunger pump, and the lubricant and air are mixed in the oil-gas mixing module. Under the action of compressed air, the lubricant is delivered along the inner wall of the lubricating pipe 7, distributed by the distributor 8 and then supplied to the fuel spray nozzle, from which the lubricant is sprayed onto the rims of the wheels 6.

[0039] Further, the present application discloses that the distributor 8 includes a vertical distribution valve 801 and a horizontal distribution valve 802. The vertical distribution valve 801 and the horizontal distribution valve 802 are vertically arranged to realize the steering of the lubricating pipe 7. The inlet of the vertical distribution valve 801 is in communication with the oil-gas mixing module through the lubricating pipe 7, the inlet of the horizontal distribution valve 802 is in communication with the outlet of the vertical distribution valve 801, and the two outlets of the horizontal distribution valve 802 are in communication with the fuel spray nozzle.

[0040] Further, the present application discloses that the lubricating pipe 7 includes a lubricating hard pipe 701 and a lubricating soft pipe 702. The distributor 8 is mounted on the lubricating hard pipe 701. One end of the lubricating soft pipe 702 is in communication with the lubricating hard pipe 701, and another end of the lubricating soft pipe 702 is in communication with the fuel spray nozzle. Specifically, In order to avoid the baffle 4, the lubricating soft pipe 702 is arranged in a U shape.

[0041] Further, the present application discloses that the sand pipe 5 includes a sand soft pipe 501 and a sand hard pipe 502. One end of the sand hard pipe 502 is in communication with the sand box 1, and another end of the sand hard pipe 502 is in communication with the sand soft pipe 501 through a partition straight joint 14 mounted on the baffle 4.

[0042] Further, the present application discloses that the sand lubrication system includes multiple connecting plates 9. The connecting plates 9 are mounted on the chassis 2, and both the lubricating pipe 7 and the sand pipe 5 are fixed on the connecting plates 9. Each of the connecting plates 9 is specifically a strip-shaped plate, through which both the lubricating pipe 7 and the sand pipe 5 are fixed on the chassis 2, thus realizing the compact connection between the lubricating pipe 7 and the sand pipe 5.

[0043] Further, the present application discloses that the sand lubrication system includes tensioning devices 10 and pipe clamps 11. The pipe clamps 11 are respectively fixed on the sand soft pipe 501 and the lubricating soft pipe 702. Each of the tensioning devices 10 has one end connected with the corresponding pipe clamp 11, and another end connected with the chassis 2.

[0044] In order to improve the fatigue resistance of the pipe clamps 11, the present application discloses that each of the pipe clamps 11 is a metal pipe clamp.

[0045] Further, the present application specifically discloses that each of the tensioning devices 10 includes a lifting socket, a lug, a wire rope and a rope puller. The lifting socket is fixed on the chassis 2. Specifically, the lifting socket is welded on the chassis 2 which improves the mounting strength of the lifting socket and the chassis 2. It should be noted that the lifting socket may be detachably connected to the chassis 2 by screws or the like.

[0046] One end of the lug is fixed on the lifting socket, and another end of the lug is connected with the wire rope. One end of the rope puller is connected with the wire rope, and another end of the rope puller is connected with the metal pipe clamp 11.

[0047] Since the sand soft pipe 501 and the lubricating soft pipe 702 are easy to shake with the vibration of the EMU. With the tightening action of the tightening device 10, on the one hand, the sagging of the sand soft pipe 501 and the lubricating soft pipe 702 is avoided, and on another hand, the shaking amplitude of the sand soft pipe 501 and the lubricating pipe 702 is reduced.

[0048] Further, the present application discloses that a lifting socket is provided with multiple lifting rings for fixing lugs, and the multiple lifting rings are uniformly distributed to realize the connection and adjustment of the pipe clamps 11 at different positions.

[0049] Further, the present application discloses that the sand lubrication system includes a sand dry-air pipe 12. The sand dry-air pipe 12 and the sand pipe 5 are fixed together to realize the drying of the borax in the sand pipe 5.

[0050] Further, the present application discloses that the sand lubrication system includes a felt strip 13. The felt strip 13 covers the lubricating soft pipe 702 to reduce wear on the lubricating soft pipe 702.

[0051] Further, the felt strip 13 can also cover the sand soft pipe 501 to reduce wear on the sand soft pipe 501.

[0052] When the present application is used, a baffle 4 is added between the lower part of the dynamic front end and the bogie 3 of the EMU. First, the sand pipe 5 is connected to the sand box 1 and is fastened. Then, the baffle 4 is mounted, and then the tensioning device 10 is assembled. Finally, the pipe clamp 11 and a hanger plate are mounted on the tensioning device 10. A suitable distance is chosen to cover the lubricating soft pipe 702 with a felt strip 13 for protection, and then the pipe clamp 11 and the hanger plate are connected to the wire rope of the sand soft pipe 501 through the tensioning device 10. A suitable distance is further chosen and a set of such tensioning device 10 is added, and the tensioning device 10 is finally connected to the gas path port of the fuel spray nozzle of the bogie 3. If the distance is not suitable, it will be determined after the vehicle completes the small curve test. In this manner, the lubricating soft pipe 702 will swing along with the bogie 3 and the sand soft pipe 501 to avoid interference. Under the condition of limited space, the reasonable arrangement of the sand pipe 5 and the lubricating pipe 7 is realized, and the sand and rim lubrication functions of the head vehicle are realized.

[0053] In the present application, the sand box 1 is directly integrated on the vehicle body and is integrated with the dynamic front end of the vehicle body, and a baffle 4 is added between the dynamic front end and the bogie 3, so that the rim lubrication and the sand pipe 5 respectively go through two pipelines, and a fixed point (the connection point between the tensioning device 10 and the lubricating pipe 7) is added to the lubricating pipe 7. Due to the limited space between the bogie 3 and the baffle 4, the lubricating soft pipe 702 is connected in U shape. When the bogie 3 swings within 7 degrees left and right from the longitudinal center of the vehicle body, in order to prevent interference with the lubricating soft pipe 702, both the lubricating hard pipe 701 and the sand hard pipe 502 are connected to the chassis 2 through the connecting plate 9 to make the horizontal straight section of the lubricating hard pipe 701 as close as possible to the baffle 4. In order to prevent the lubricating soft pipe 702 from rubbing against the wire rope directly, the lubricating soft pipe 702 is covered with the felt strip 13 for protection, and two sets of fixing devices are added to connect with the wire rope, thus a consistent swing can be maintained as the bogie 3 swings, thereby effectively avoiding the interference of abrasion and collision. The sand pipe 5 is connected by the partition straight joint 14 on a vertical partition of the baffle 4, passes between the dynamic front end and the baffle 4, and is fixed by a bracket welded below the dynamic front end. The assembly error is effectively reduced because the sand box 1 and the chassis 2 are integrated. Under the limited space condition between the bogie 3 and the baffle 4 of the head vehicle of the EMU, the reliability of the connection between the lubricating pipe 7 and the bogie 3 is solved, and the reliable work of the sand lubrication system can be ensured when the EMU goes through turnouts and bends.

Third Embodiment

[0054] The present application provides an EMU, including a chassis 2, a bogie 3 and the sand lubrication system according to any one of the above embodiments.

[0055] The bogie 3 may be rotatably mounted on the chassis 2, and a baffle 4 is arranged between the bogie 3 and the dynamic front end of the chassis 2. Multiple guide grooves are opened on the baffle 4 to improve the dynamic performance of the EMU and reduce the running resistance of the EMU

[0056] Since the EMU according to the present application includes the sand lubrication system according to any one of the above embodiments, the beneficial effects of the sand lubrication system are all included in the EMU according to the present application.

[0057] In the present application, "first" and "second" are different in description and have no other special meanings.

[0058] In the description of the present application, it is to be understood that the orientation or positional relationships indicated by terms "horizontal", "vertical", "bottom" 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 the simplification of the description, and do not indicate or imply that the device or element referred to must be in a particular orientation, or be constructed and operated in a particular orientation, and therefore should not be construed as a limit to the scope of the present application.

[0059] The description of the embodiments herein enables the person skilled in the art to implement or use the present application. Various modifications to the embodiments are apparent to the person skilled in the art, and the general principle defined herein can be implemented in other embodiments without departing from the spirit or scope of the present application. Therefore, the present application is not limited to the embodiments described herein, but should be in accordance with the broadest scope consistent with the principle and novel features disclosed herein.

Claims

1. A sand lubrication system, which is used for an electric multiple unit (EMU), comprising:

a sand box (1), wherein the EMU comprises a chassis (2) and a bogie (3), and the bogie (3) is rotatably mounted on the chassis (2), a baffle (4) is provided between the bogie (3) and a dynamic front end of the chassis (2), and the sand box (1) is arranged between the bogie (3) and the dynamic front end of the chassis (2), and is integrated with the chassis (2);
a sand pipe (5) and a sand spray nozzle, wherein one end of the sand pipe (5) is in communication with an outlet of a bottom end of the sand box (1), and another end of the sand pipe (5) is in communication with the sand spray nozzle by passing through the baffle (4), and the sand spray nozzle is configured to spray materials delivered by the sand pipe (5) to wheels (6) on the bogie;
a lubricant supply device, wherein the lubricant supply device is arranged between the bogie (3) and the dynamic front end of the chassis (2), and is mounted on the chassis (2); and
a lubricating pipe (7) and a fuel spray nozzle, wherein one end of the lubricating pipe (7) is in communication with an outlet of the lubricant supply device, and another end of the lubricating pipe (7) is in communication with the fuel spray nozzle by bypassing the baffle (4), and the fuel spray nozzle is configured to spray the lubricant delivered by the lubricating pipe (7) to rims of the wheels (6).

2. The sand lubrication system according to claim 1, wherein, the lubricant supply device comprises a drive pump, an oil-gas mixing module and a distributor (8);
the drive pump is configured to pump the lubricant into the oil-gas mixing module; and
the distributor (8) is mounted on the lubricating pipe (7) and is in communication with an outlet of the oil-gas mixing module through the lubricating pipe (7), and two outlets of the distributor (8) are respectively in communication with the fuel spray nozzles at two sides through the lubricating pipe (7).

3. The sand lubrication system according to claim 2, wherein, the distributor (8) comprises a vertical distribution valve (801) and a horizontal distribution valve (802); and
the vertical distribution valve (801) and the horizontal distribution valve (802) are vertically arranged, an inlet of the vertical distribution valve (801) is in communication with the oil-gas mixing module through the lubricating pipe (7), an inlet of the horizontal distribution valve (802) is in communication with an outlet of the vertical distribution valve (801), and two outlets of the horizontal distribution valve (802) are in communication with the fuel spray nozzle.

4. The sand lubrication system according to claim 2, wherein, the lubricating pipe (7) comprises a lubricating hard pipe (701) and a lubricating soft pipe (702);
the distributor (8) is arranged on the lubricating hard pipe (701), one end of the lubricating soft pipe (702) is in communication with the lubricating hard pipe (701), and another end of the lubricating soft pipe (702) is in communication with the fuel spray nozzle; and/or
the sand pipe (5) comprises a sand soft pipe (501) and a sand hard pipe (502);
one end of the sand hard pipe (502) is in communication with the sand box (1); and
another end of the sand hard pipe (502) is in communication with the sand soft pipe (501) through a partition straight joint (14) mounted on the baffle (4).

5. The sand lubrication system according to claim 4, wherein, the lubricating soft pipe (702) is arranged in a U shape.

6. The sand lubrication system according to any one of claims 1 to 5, further comprising a plurality of connecting plates (9);
wherein the connecting plates (9) are mounted on the chassis (2), and the lubricating pipe (7) and the sand pipe (5) are both fixed on the connecting plates (9).

7. The sand lubrication system according to claim 4, further comprising tensioning devices (10) and pipe clamps (11);
wherein the pipe clamps (11) are respectively fixed on the sand soft pipe (501) and the lubricating soft pipe (702), and each of the tensioning devices (10) has one end connected with corresponding the pipe clamp (11), and another end connected with the chassis (2).

8. The sand lubrication system according to claim 7, wherein, each of the tensioning devices (10) comprises a lifting socket, a lug, a wire rope and a rope puller;
the lifting socket is fixed on the chassis (2);
one end of the lug is fixed on the lifting socket, and another end of the lug is connected with the wire rope;
one end of the rope puller is connected with the wire rope, and another end of the rope puller is connected with the corresponding pipe clamp (11); and/or
each of the pipe clamps (11) is an adjustable metal buckle.

9. The sand lubrication system according to claim 4, further comprising a sand dry-air pipe (12);
the sand dry-air pipe (12) is fixed together with the sand pipe (5); and/or
the sand lubrication system further comprises a felt strip (13); and
the felt strip (13) is configured to cover the lubricating soft pipe (702).

10. An EMU, comprising a chassis (2), a bogie (3) and the sand lubrication system according to any one of claims 1 to 9; and
wherein the bogie (3) is rotatably mounted on the chassis (2), a baffle (4) is arranged between the bogie (3) and a dynamic front end of the chassis (2), and a plurality of guide grooves are opened on the baffle (4).

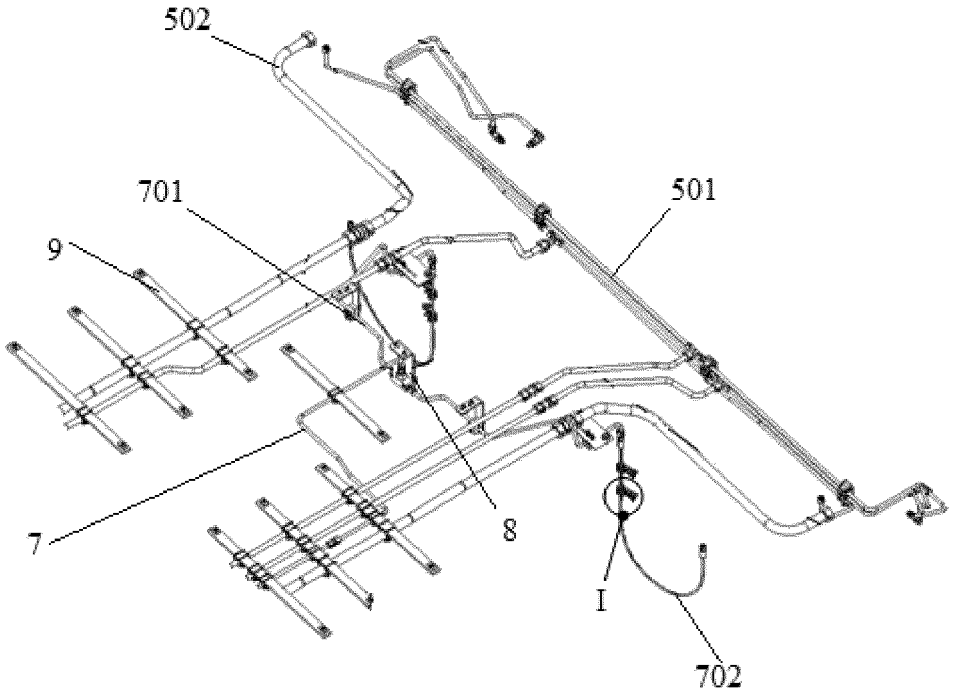

Figure 1

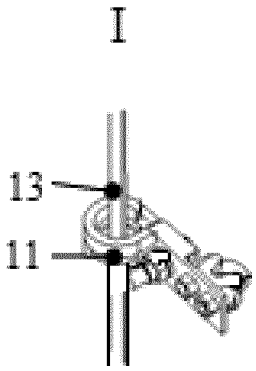

Figure 2

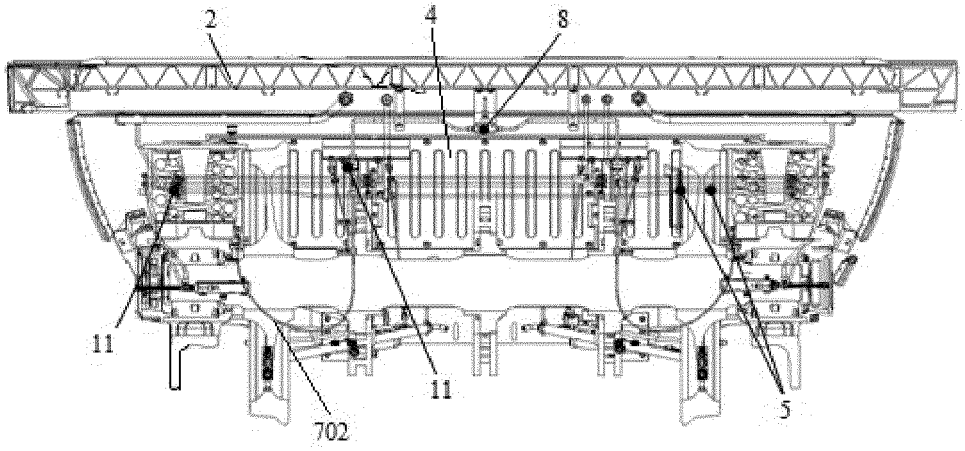

Figure 3

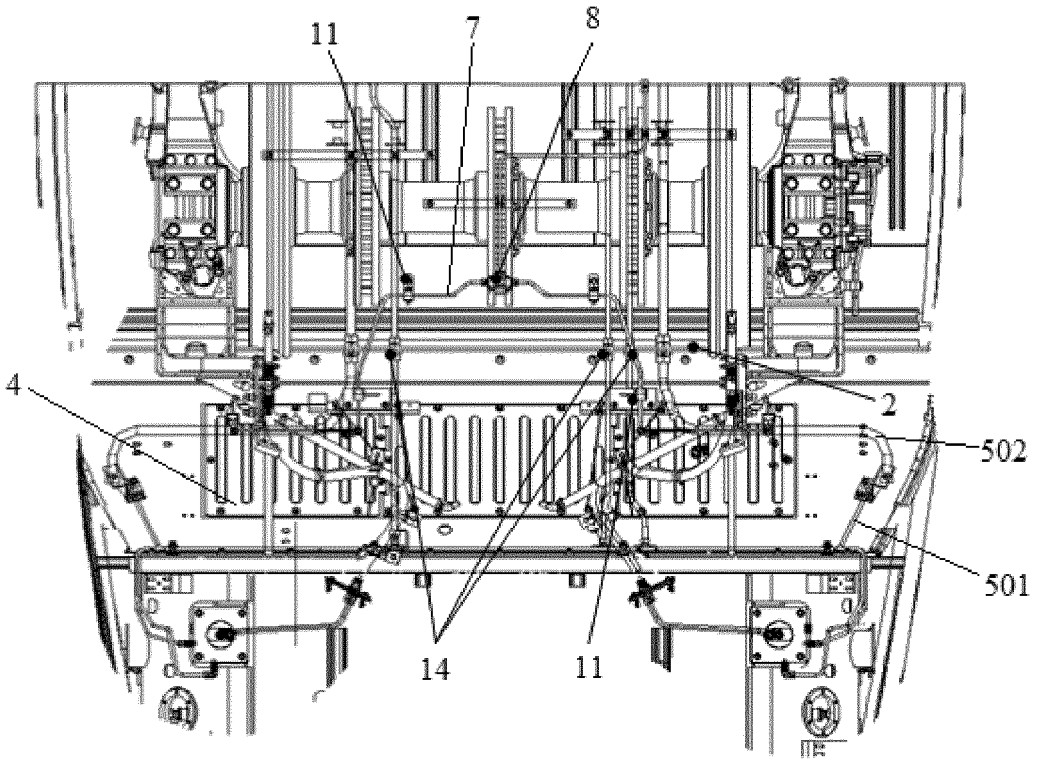

Figure 4

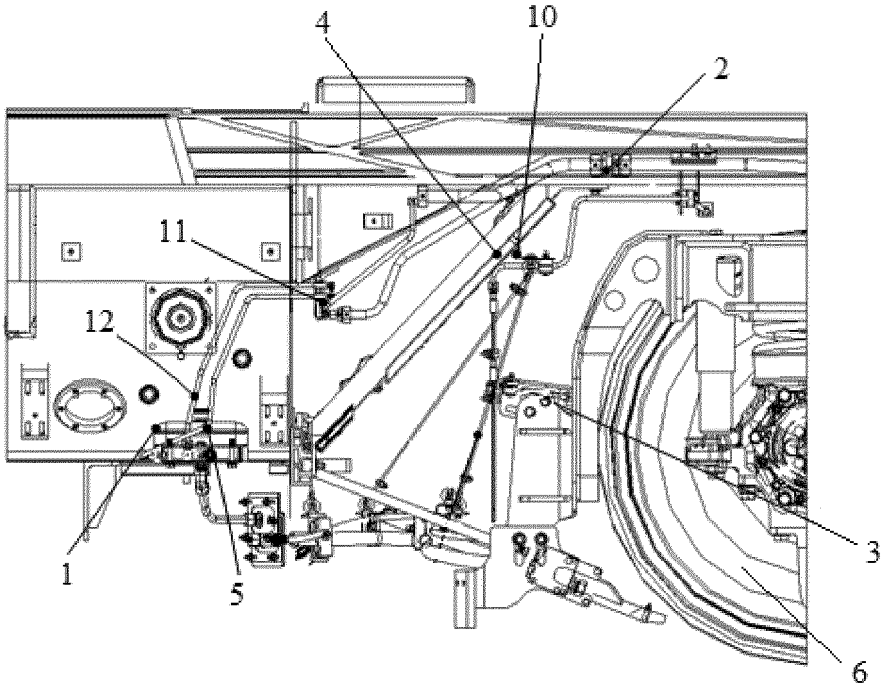

Figure 5

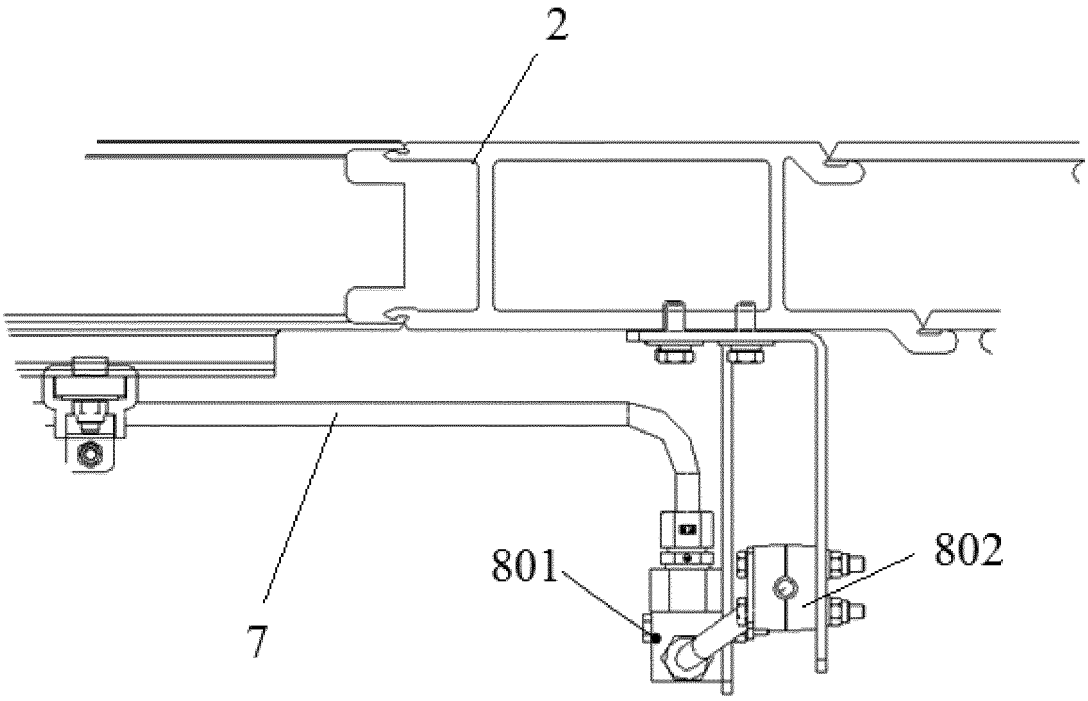

Figure 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/072390

A. CLASSIFICATION OF SUBJECT MATTER

B61C 15/10(2006.01)i; B61K 3/02(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)

B61K; B61C

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: 动车, 铁路, 润滑, 管, 砂, 沙, 导流板, train, lubricat+, pipe?, sand+, guid+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109849962 A (CRRC CHANGCHUN RAILWAY VEHICLES CO., LTD.) 07 June 2019 (2019-06-07) description, paragraphs [0054]-[0087], and figures 1-6	1-10
PX	CN 209700688 U (CRRC CHANGCHUN RAILWAY VEHICLES CO., LTD.) 29 November 2019 (2019-11-29) description, paragraphs [0054]-[0087], and figures 1-6	1-10
A	CN 203888791 U (CSR ZHUZHOU ELECTRIC LOCOMOTIVE CO., LTD.) 22 October 2014 (2014-10-22) description, paragraphs [0037]-[0060], and figures 1 and 2	1-10
A	CN 106882198 A (CRRC TAIYUAN CO., LTD.) 23 June 2017 (2017-06-23) entire document	1-10
A	CN 108189856 A (CRRC CHANGCHUN RAILWAY VEHICLES CO., LTD.) 22 June 2018 (2018-06-22) entire document	1-10
A	CN 205890880 U (CHENGDU XINZHU ROAD & BRIDGE MACHINERY CO., LTD.) 18 January 2017 (2017-01-18) entire document	1-10

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

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Date of the actual completion of the international search	Date of mailing of the international search report
16 April 2020	**22 April 2020**

Name and mailing address of the ISA/CN	Authorized officer
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Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/072390

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004075280 A1 (GENERAL ELECTRIC COMPANY) 22 April 2004 (2004-04-22) entire document	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/072390

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 109849962 A	07 June 2019	None	
CN 209700688 U	29 November 2019	None	
CN 203888791 U	22 October 2014	None	
CN 106882198 A	23 June 2017	CN 207000471 U	13 February 2018
CN 108189856 A	22 June 2018	CN 207955660 U	12 October 2018
CN 205890880 U	18 January 2017	None	
US 2004075280 A1	22 April 2004	CA 2444896 A1	18 April 2004

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REFERENCES CITED IN THE DESCRIPTION

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