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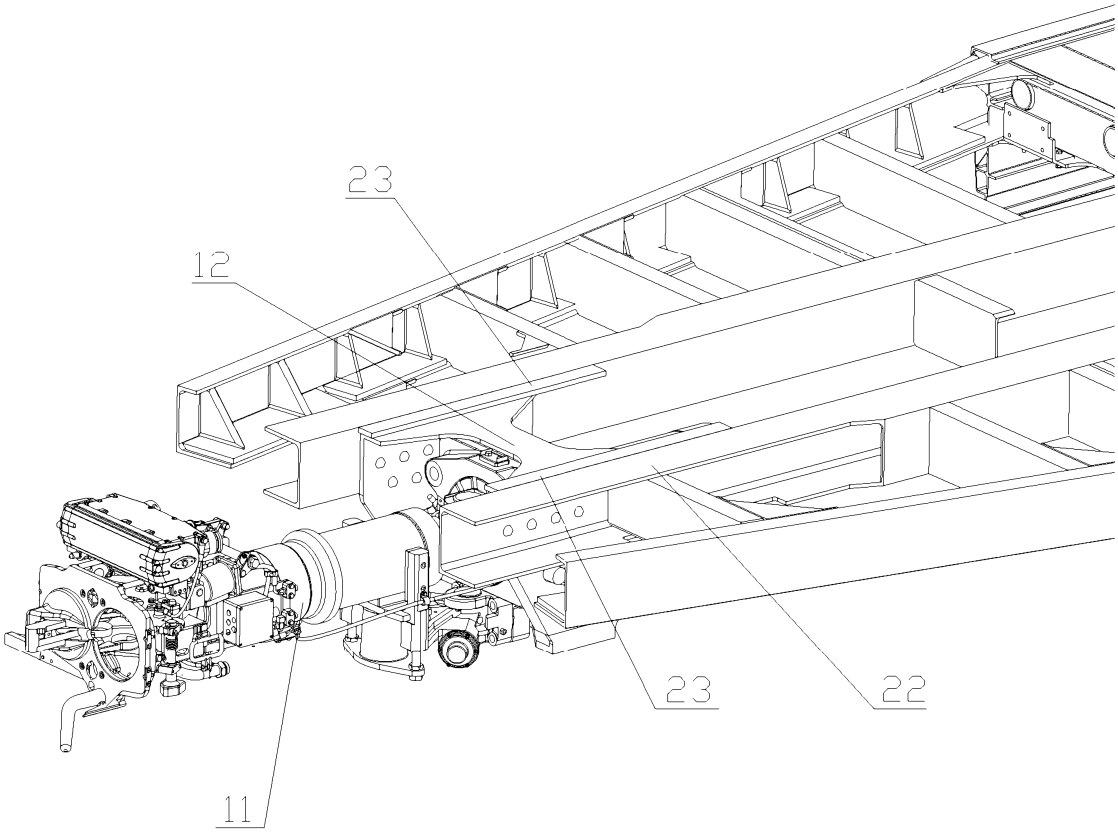
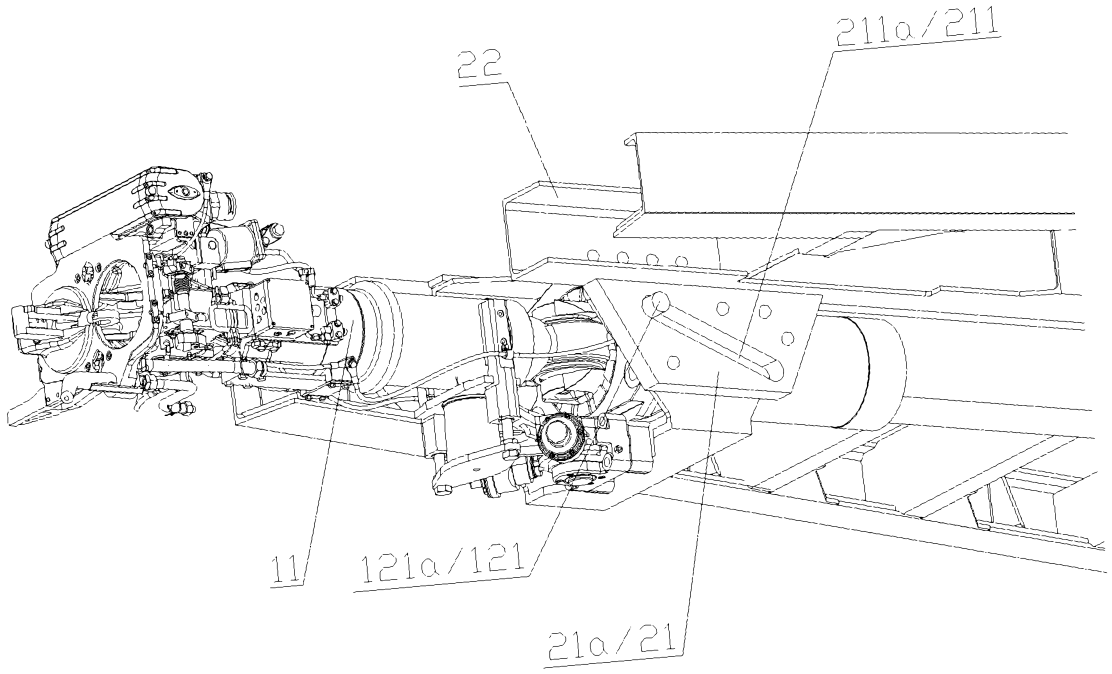


Figure 1



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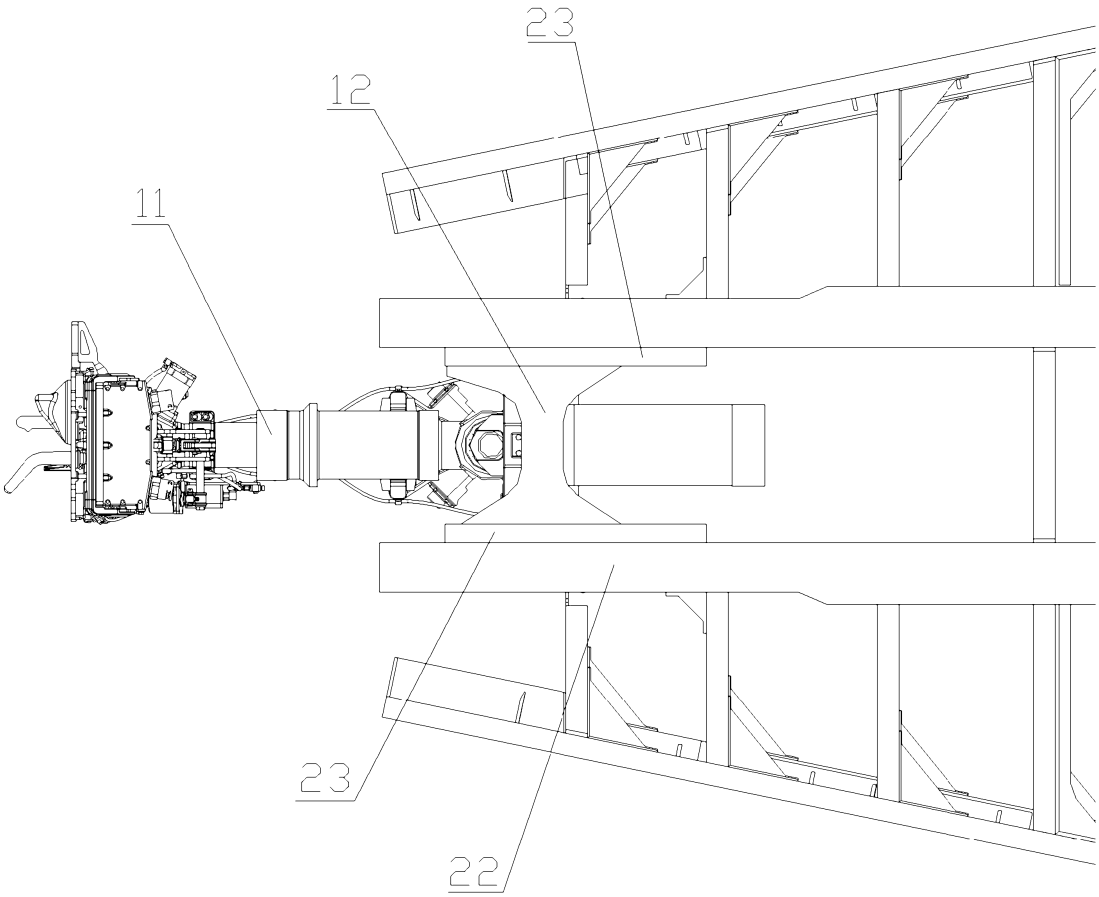

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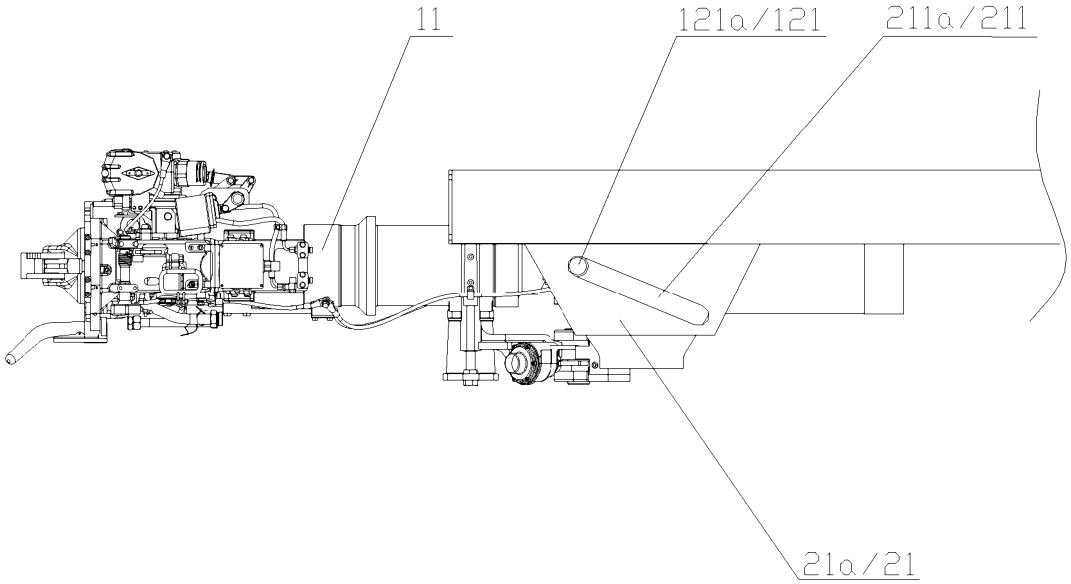


Figure 4

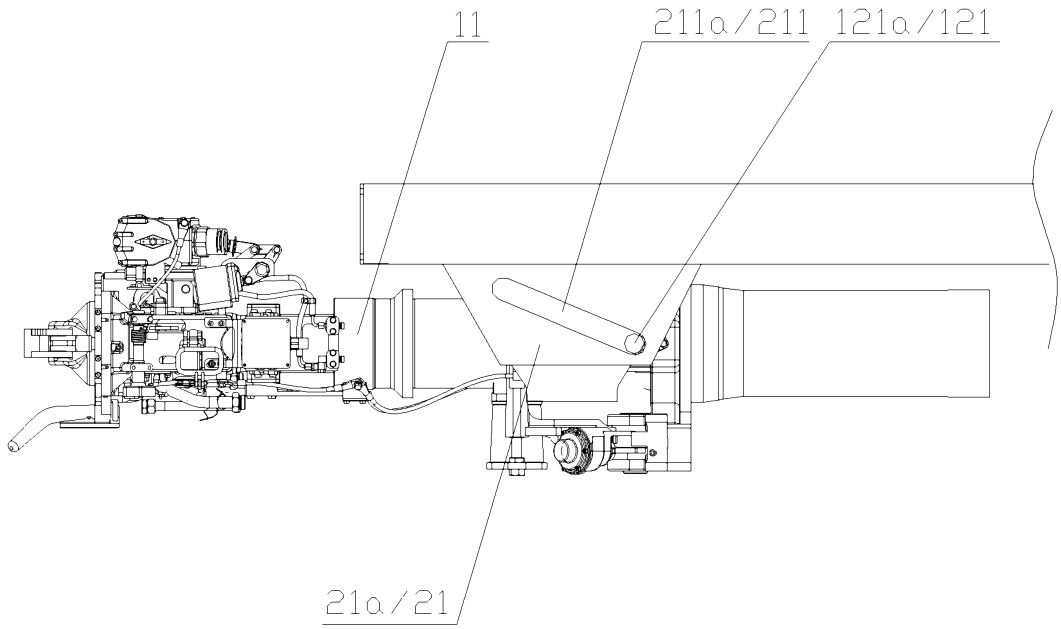


Figure 5

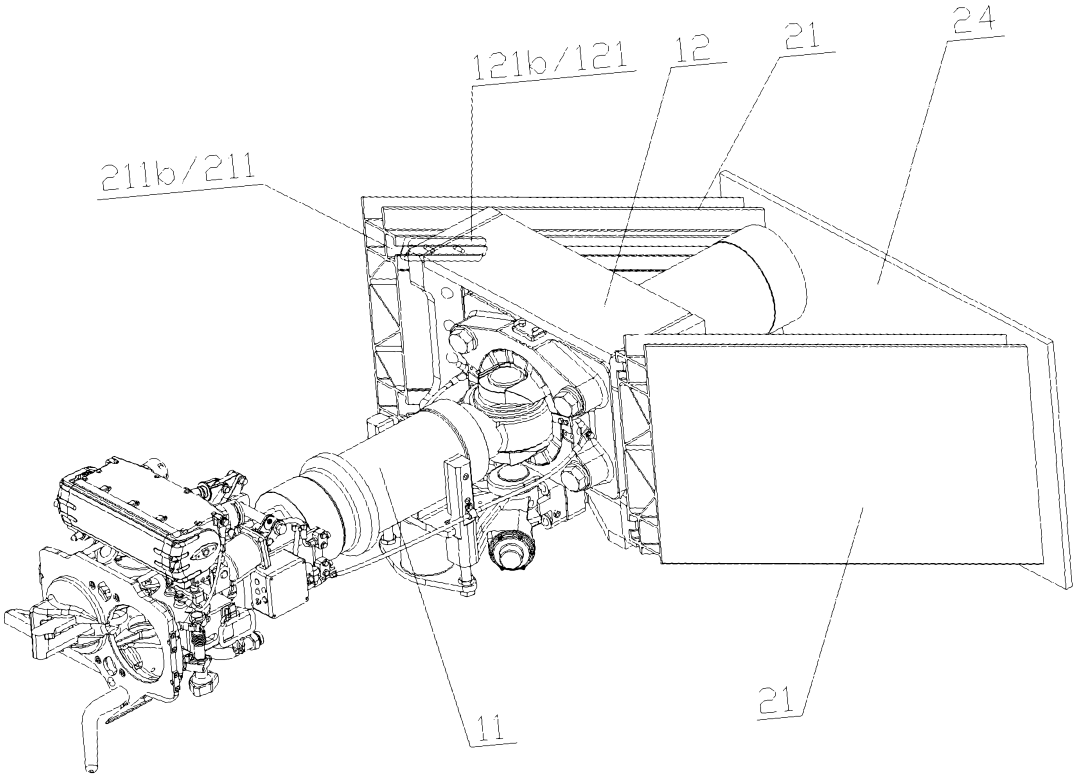


Figure 6

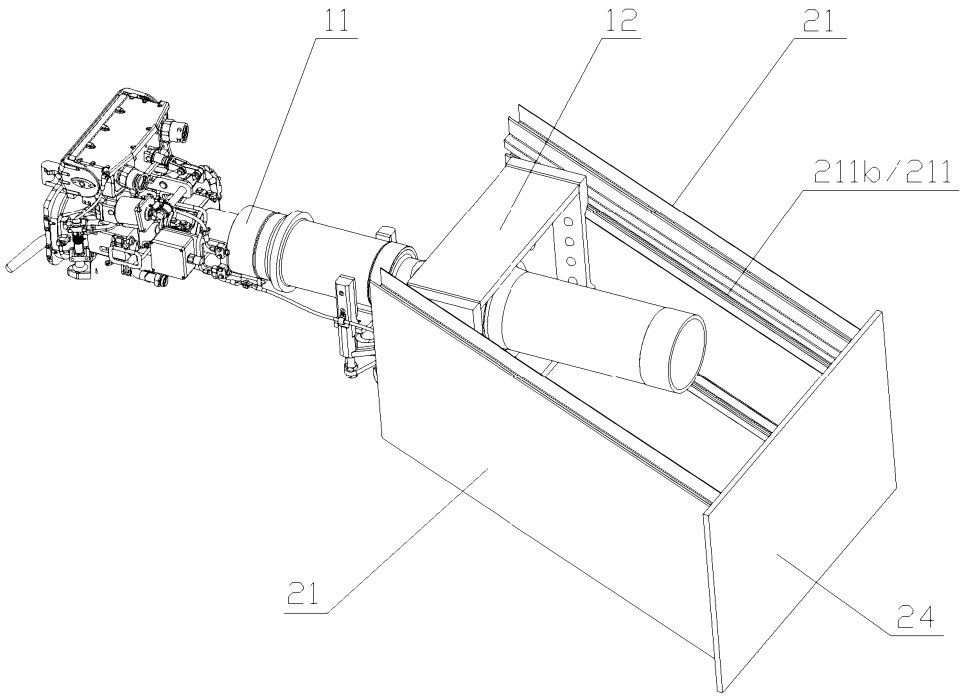
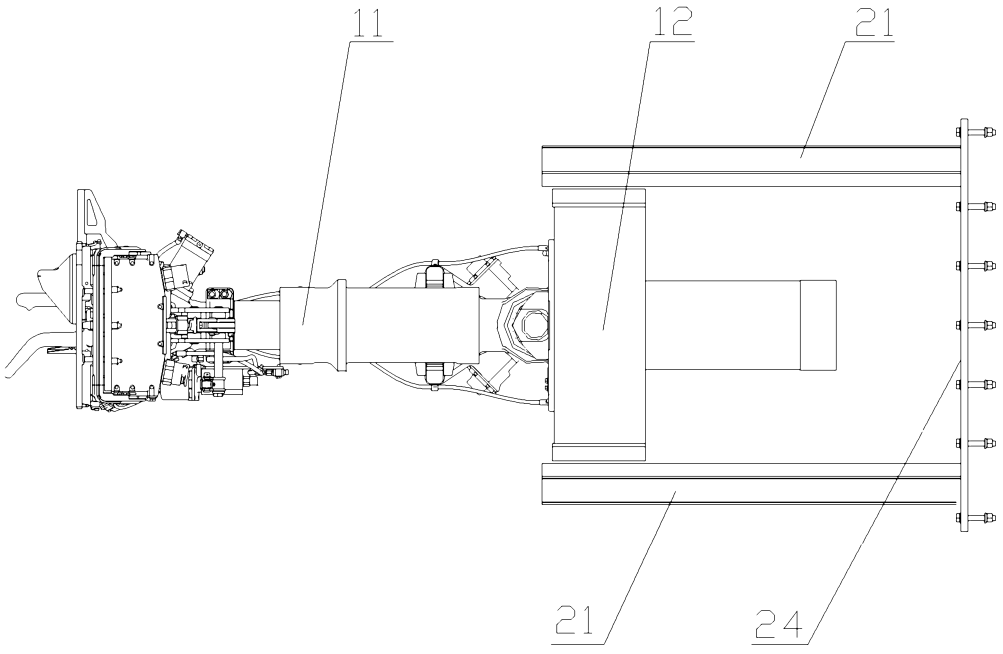


Figure 7



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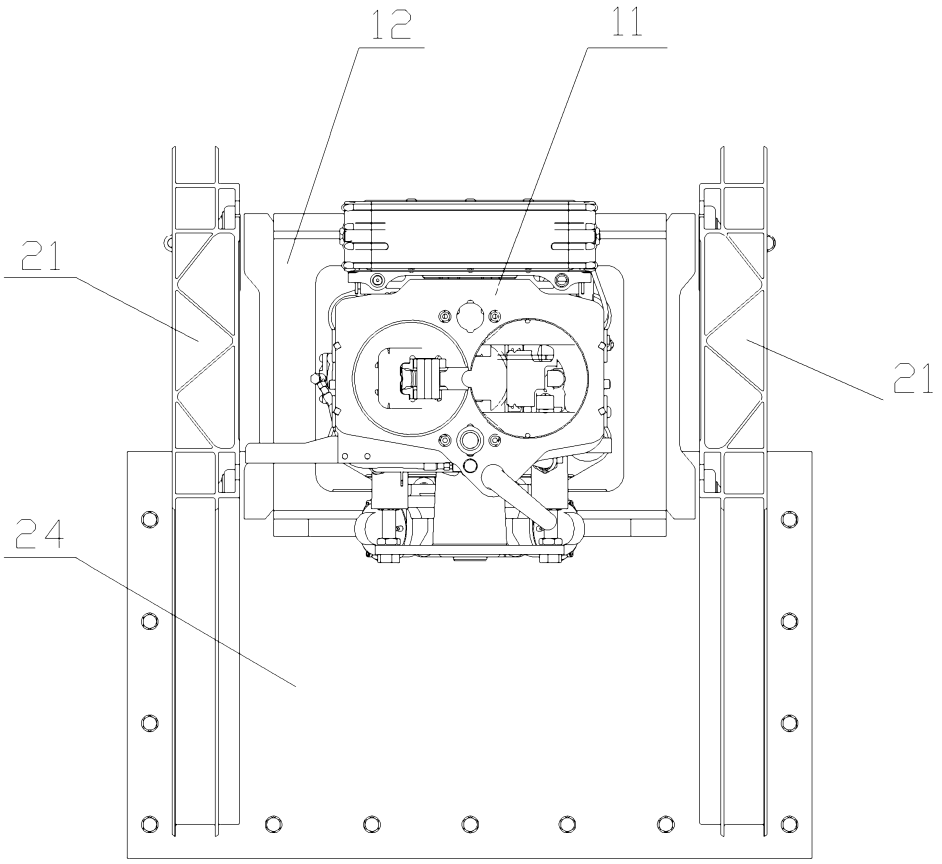

Figure 9

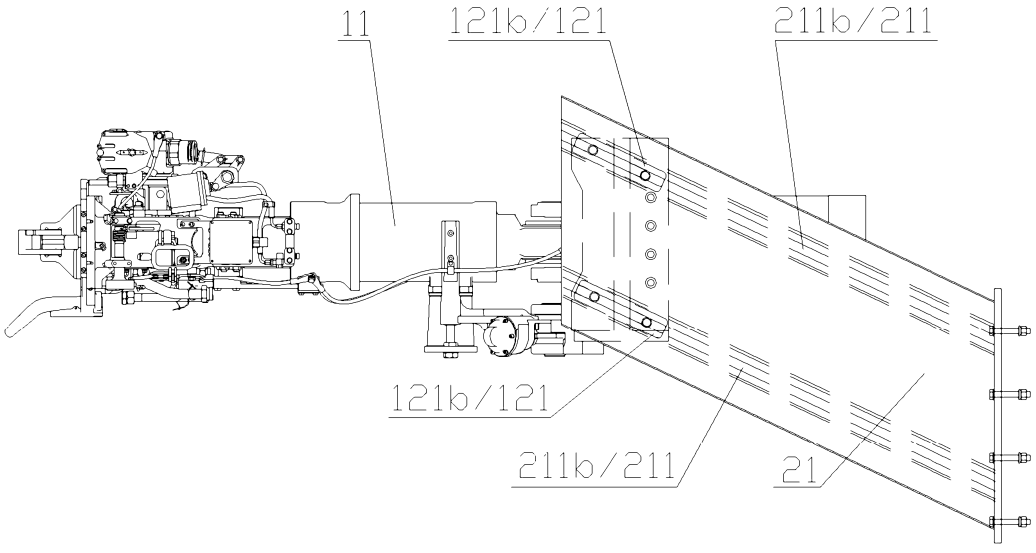

Figure 10

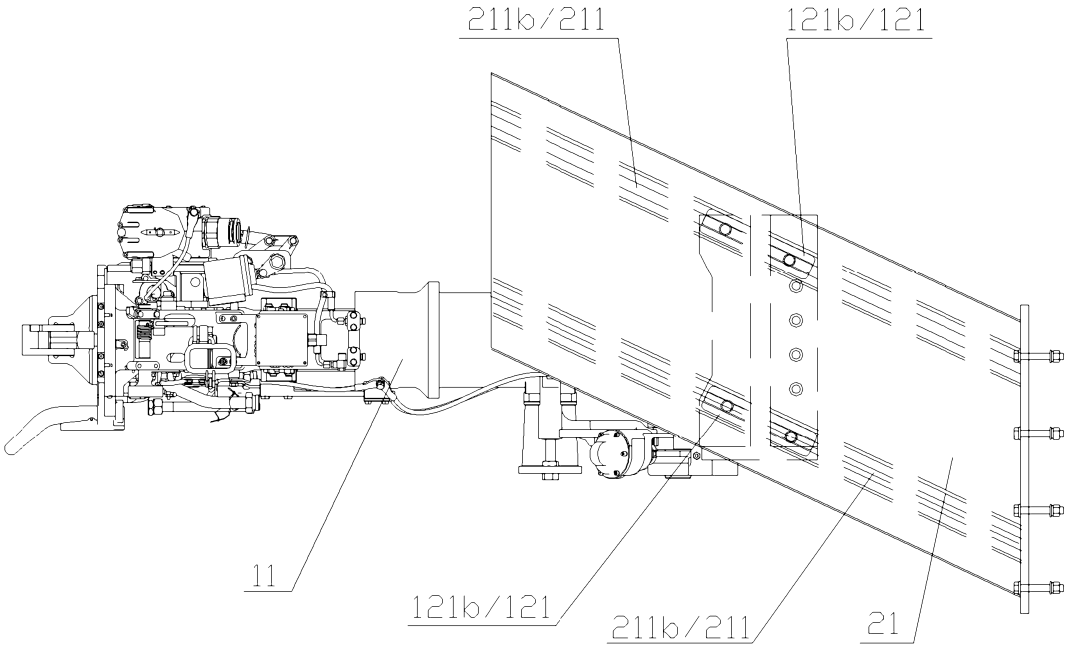

Figure 11

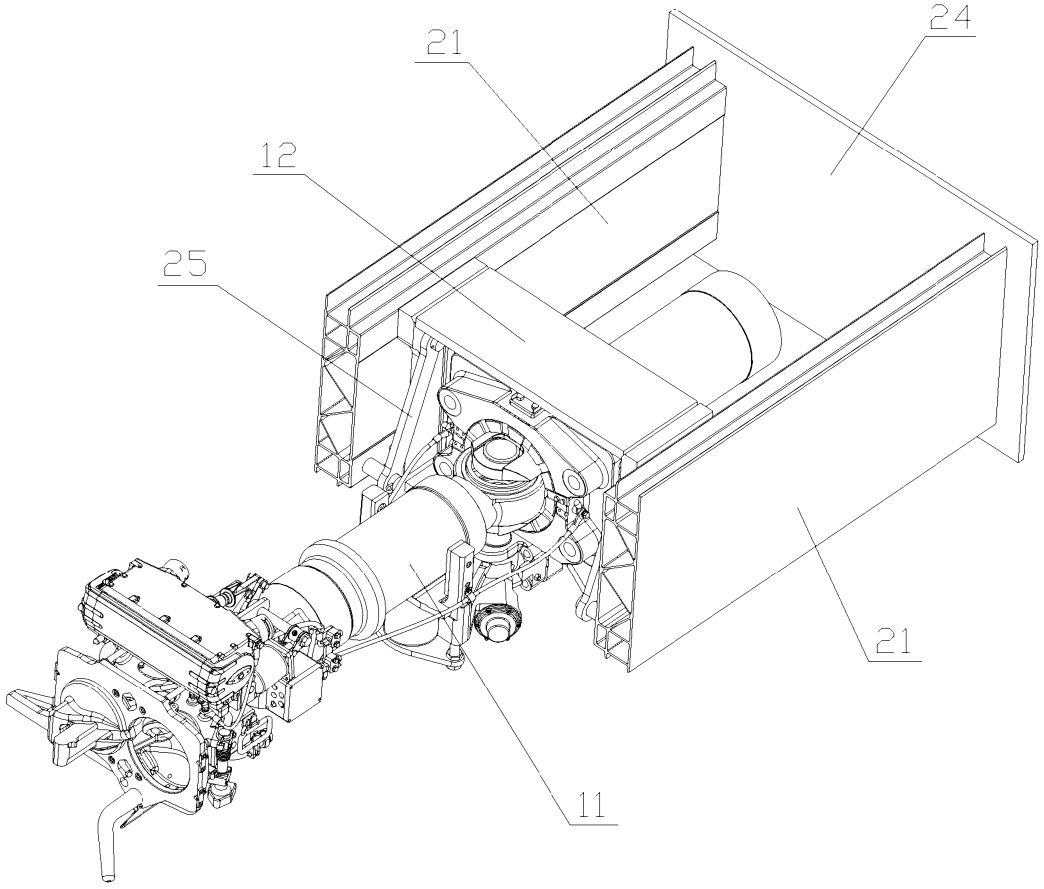

Figure 12

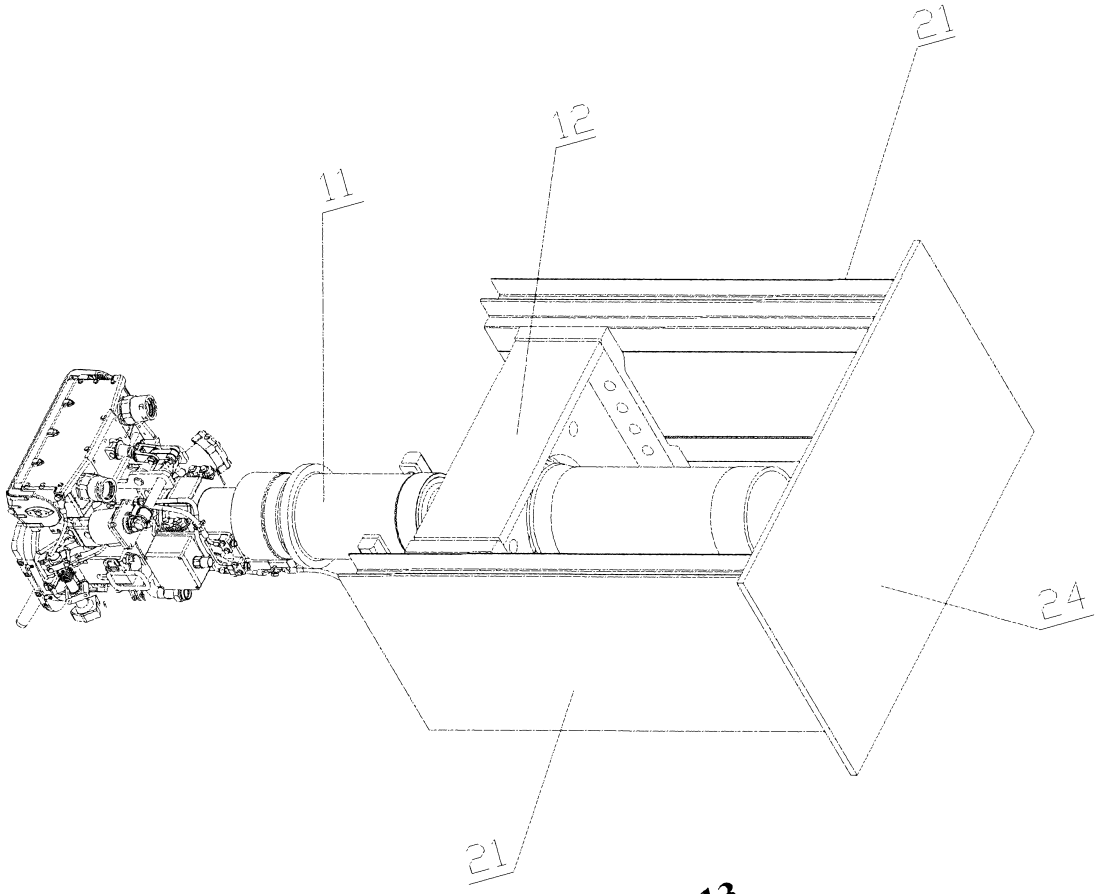

Figure 13

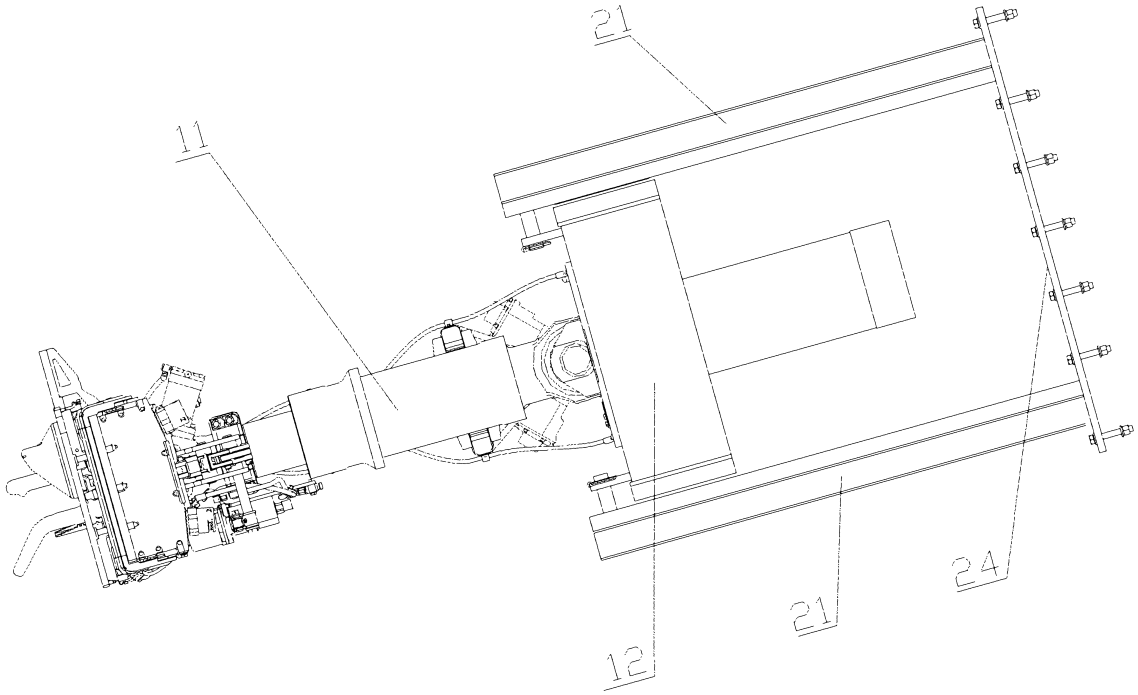

Figure 14

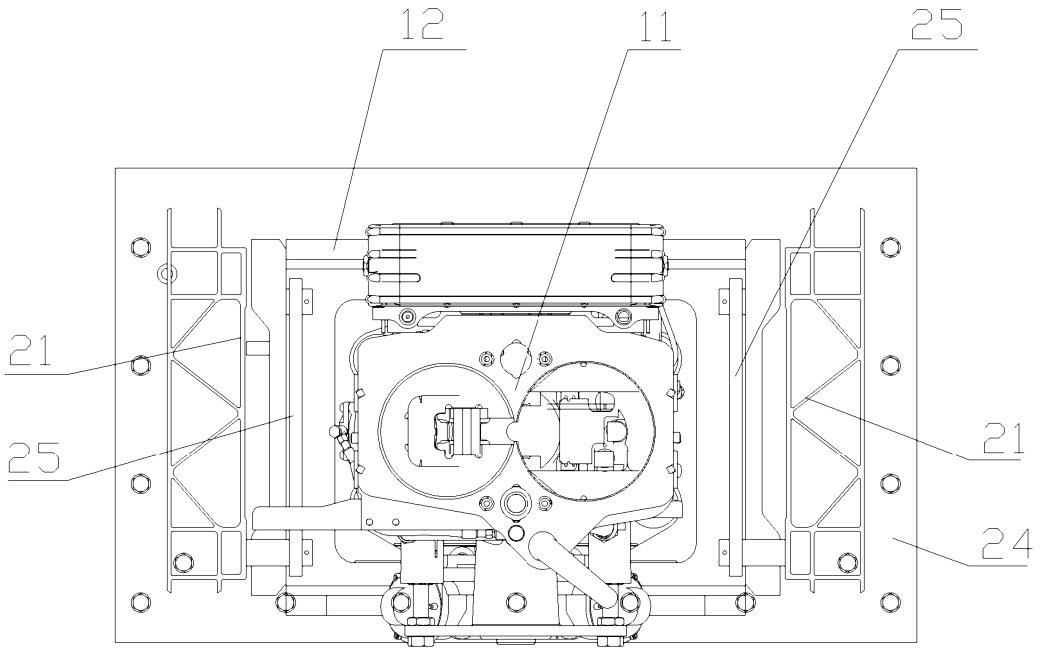

Figure 15

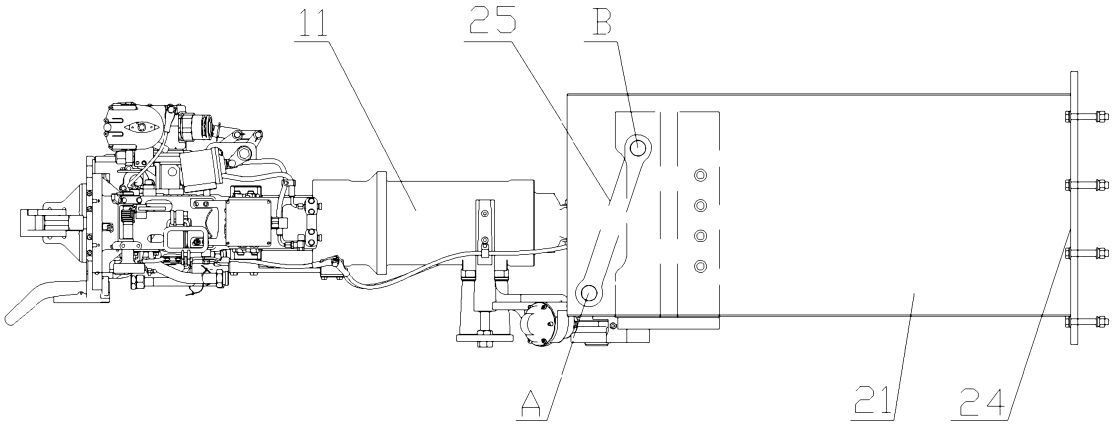

Figure 16

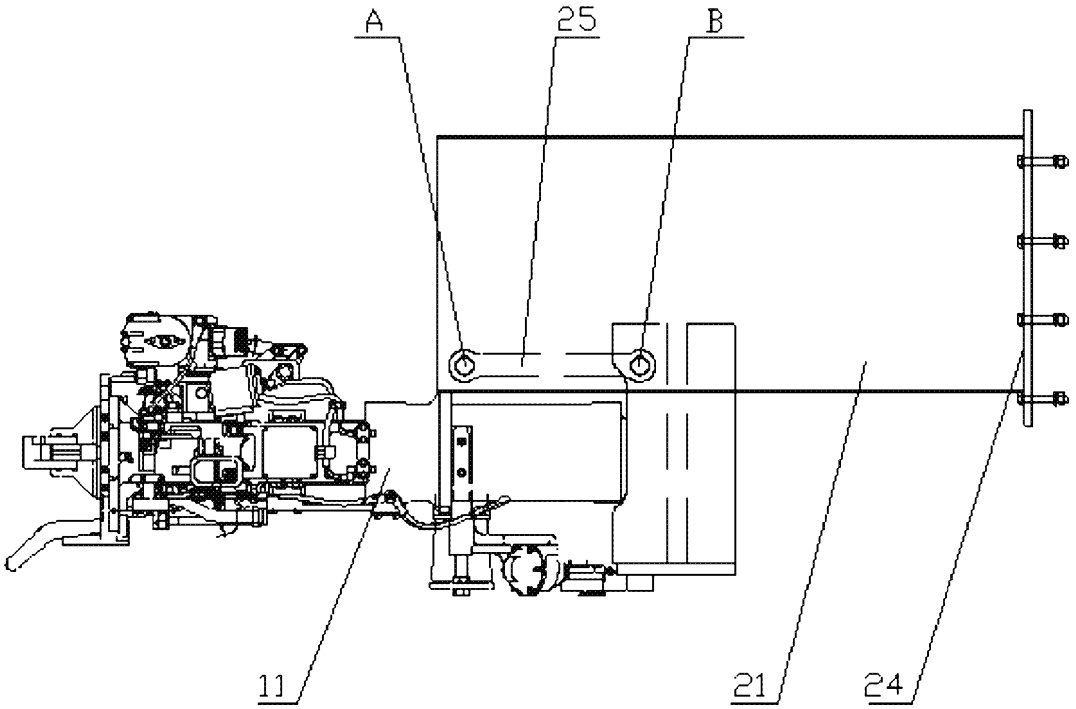

Figure 17

COUPLING ASSEMBLY AND RAIL VEHICLE HAVING SAME

FIELD

[0001] The present application relates to the technical field of rail vehicles, and more particularly to a coupler assembly and a rail vehicle having the coupler assembly.

BACKGROUND

[0002] With the increase of the traveling speed of high-speed trains, passive safety receives more and more attentions.

[0003] For reducing the air resistance and improving the starting performance, currently, head portions of trains are generally designed to have a streamlined shuttle shape. With this design, although the train may have a reduced traveling resistance and an increased speed, a front end portion of its head portion may have a narrow space, and can only accommodate a coupler assembly, and has no space for accommodating a large-scale energy-absorbing mechanism.

[0004] When two high-speed trains collide, the coupler assemblies are the members which are subjected to the shock first. Although a coupler can be configured as an energy-absorbing coupler, it can only absorb limited amount of energy, and cannot fully absorb the energy generated by the collision of trains. Thus, there is a hidden danger that in the retreating process after the coupler is collided, the coupler may intrude an upper part of the train head to damage the devices in the upper part or may fall onto a rail to increase the risk of derailment.

[0005] Therefore, the technical issue to be addressed by the person skilled in the art is to improve the structure of the conventional coupler, to fully ensure that an energy absorbing module of the rear end of the coupler can exert its function, to prevent the problems that in the retreating process after the coupler is collided, the coupler may intrude the upper part of the train head to damage the devices in the upper part or may fall onto the rail to increase the risk of derailment.

SUMMARY

[0006] A coupler assembly and a rail vehicle having the coupler assembly are provided according to the present application. The structural design of the coupler assembly can not only ensure a coupling function of a coupler in normal operation of the vehicle, but also can prevent the problems that in the retreating process after the coupler is collided, the coupler may intrude an upper part of a vehicle head to damage devices in the upper part or may fall onto a rail to increase the risk of derailment, thereby improving the passive safety of the rail vehicle in collision.

[0007] According to the invention, there is provided a coupler assembly configured to be arranged at a front end of a vehicle head of a rail vehicle, and the coupler assembly includes:

a coupler mounting base fixed to the vehicle head; and

a coupler fixedly mounted to the coupler mounting base,

wherein the coupler assembly further includes a supporting component and a rotating member both provided at each of two sides of the coupler mounting base;

the rotating member has one end rotatably connected to a lower end of the respective supporting component, a rotation center of this end is arranged horizontally and perpendicular to a length direction of the rail vehicle, and the rotating member has another end hinged to an upper end of the coupler mounting base; and

the coupler assembly is configured such that in an initial state, the coupler mounting base is fixedly connected to the supporting component, and a hinge point where the rotating member is hinged to the coupler mounting base is located above a rotational connection point where the rotating member is rotatably connected to the respective supporting component.

[0008] In the coupler assembly according to the present application, each of two sides of the coupler mounting base is provided with the supporting component and the rotating member, and the rotating member has one end rotatably connected to a lower end of the respective supporting component and another end hinged to an upper end of the coupler mounting base, and the coupler assembly is configured such that in an initial state, the coupler mounting base is fixedly connected to the supporting components, and the connection point where the rotating member is connected to the coupler mounting base is higher than the connection point where the rotating member is connected to the respective

supporting component. In practice, after the rail vehicle collides, the coupler mounting base, to which the coupler is fixedly mounted, is collided to be broken, the fixing state between the coupler mounting base and the supporting components is released, and at this time, since the rotating members are rotatably connected to the lower ends of the supporting components, the rotating members rotate towards the rear side of the vehicle body due to the effect of the collision, and since the coupler mounting base is hinged to the rotating members, the coupler and the coupler mounting base can be driven by the rotation of the rotating members to move along a circular-arc path to the rear lower side of the vehicle body. That is, the motion path of the coupler mounting base after being collided is limited, thus preventing the coupler mounting base from intruding an upper part above the supporting components and damaging the equipment in the upper part accordingly or falling onto the rail and increasing the risk of derailment accordingly, and thereby in turn improving the passive safety of the rail vehicle in collision. It is to be noted here that the couplers of two vehicles are coupled during the collision, therefore, the coupler driven by the rotation of the rotating members can be kept in a horizontal state all along.

[0009] In the coupler assembly, the motion path of the coupler mounting base after being collided is limited by providing related components. Specifically, the motion path of the coupler mounting base after being collided is towards a rear lower side of the vehicle body.

[0010] The rotating member is hinged to the coupler mounting base by a first rotating shaft, and the rotating member is rotatably connected to the respective supporting component by a second rotating shaft.

[0011] The first rotating shaft and the second rotating shaft are respectively fixed to the coupler mounting base and the respective supporting component by fasteners.

[0012] The coupler assembly further includes a mounting plate configured to be connected to the vehicle head. The mounting plate is fixedly connected to rear ends of two of the supporting components.

[0013] The supporting component is an extrudate structure.

[0014] The coupler is a coupler having an energy absorbing structure.

[0015] A rail vehicle is further provided according to the present application, which includes a vehicle head and a coupler assembly provided at a front end of the vehicle head.

The coupler assembly is the coupler assembly discussed above.

[0016] Since the above coupler assembly has the above technical effects, the rail vehicle having the coupler assembly also has the corresponding technical effects, which will not be repeated here.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Figure 1 is a schematic view showing the structure of a first unclaimed example of a coupler assembly that is useful for understanding the invention;

[0018] Figure 2 is a schematic view showing the structure of the coupler assembly in Figure 1 viewed from another angle;

[0019] Figure 3 is a top view of the coupler assembly in Figure 1;

[0020] Figure 4 is a schematic view showing the structure of the coupler assembly in Figure 1 and a front end of a vehicle head before collision;

[0021] Figure 5 is a schematic view showing the structure of the coupler assembly in Figure 1 and the front end of the vehicle head after the collision;

[0022] Figure 6 is a schematic view showing the structure of a second unclaimed example of a coupler assembly that is useful for understanding the invention;

[0023] Figure 7 is a schematic view showing the structure of the coupler assembly in Figure 6 viewed from another angle;

[0024] Figure 8 is a top view of the coupler assembly in Figure 6;

[0025] Figure 9 is a side view of the coupler assembly in Figure 6;

[0026] Figure 10 is a schematic view showing the structure of the coupler assembly in Figure 6 and a front end of a vehicle head before collision;

[0027] Figure 11 is a schematic view showing the structure of the coupler assembly in Figure 6 and the front end of the vehicle head after the collision;

[0028] Figure 12 is a schematic view showing the structure of a coupler assembly that is an embodiment of the invention;

[0029] Figure 13 is a schematic view showing the structure of the coupler assembly in

Figure 12 viewed from another angle;

[0030] Figure 14 is a top view of the coupler assembly in Figure 12;

[0031] Figure 15 is a side view of the coupler assembly in Figure 12;

[0032] Figure 16 is a schematic view showing the structure of the coupler assembly in Figure 12 and a front end of a vehicle head before collision; and

[0033] Figure 17 is a schematic view showing the structure of the coupler assembly in Figure 12 and the front end of the vehicle head after the collision.

[0034] One-to-one correspondences among names and reference numerals of components in Figures 1 to 17 are as follows:

11	coupler,	12	coupler mounting base,
121	sliding component,	121a	pin,
121b	sliding block;	21	supporting component,
21a	plate body,	211	guiding slide way,
211a	slide hole,	211b	guiding slide slot,
22	traction beam,	23	stop plate,
24	mounting plate,	25	rotating member.

DETAILED DESCRIPTION

[0035] For making the person skilled in the art better understand the technical solutions of the present application, the present application is further described in detail hereinafter with reference to the drawings.

[0036] A front end of a vehicle head of a rail vehicle is equipped with a coupler assembly, and an equipment compartment is located at a rear side of the coupler assembly. It is to be noted that the locality term "front" herein refers to an end close to the vehicle head, and correspondingly, the locality term "rear" refers to an end away from the vehicle head.

[0037] Referring to Figures 1 to 3, Figure 1 is a schematic view showing the structure of a first unclaimed example of a coupler assembly; Figure 2 is a schematic view showing the structure of the coupler assembly in Figure 1 viewed from another angle; and Figure 3 is a top view of the coupler assembly in Figure 1.

[0038] In this example, the coupler assembly includes a coupler 11 and a coupler mounting base 12. The coupler 11 is fixedly mounted to the coupler mounting base 12.

[0039] In this solution, the coupler mounting base 12 is fixed to traction beams 22 of the vehicle head.

[0040] In this example, the coupler assembly further includes two supporting components 21 respectively located at two sides of the coupler mounting base 12. In this solution, the supporting components 21 are specifically embodied as plate bodies 21a, and each of the plate bodies 21a is provided with a guiding slide way 211.

[0041] It is to be noted that, the two sides of the coupler mounting base 12 herein refer to two sides in a transverse direction of the rail vehicle.

[0042] The plate body 21a may be fixed to the bottom of a respective traction beam 22.

[0043] The guiding slide way 211 of the plate body 21a is inclined in a longitudinal direction and has a front end higher than a rear end thereof, that is, the guiding slide way 211 is arranged to be inclined towards a rear lower side of a vehicle body. The longitudinal direction here refers to a length direction of the rail vehicle.

[0044] A sliding component 121 is fixedly arranged at each of two sides of the coupler mounting base 12, and the sliding component 121 slidably cooperates with the guiding slide way 211 of the plate body 21a at the respective side.

[0045] The coupler assembly is specifically configured such that in an initial state, that is, after the coupler assembly and the vehicle head are initially assembled, the coupler mounting base 12 is fixedly connected to all the plate bodies 21a, and each of the sliding components 121 is located at a front end of the respective guiding slide way 211.

[0046] It is to be emphasized here that, the cooperation between the sliding component 121 and the guiding slide way 211 is specifically configured such that: when the relative fixed state among the coupler mounting base 12, the traction beams 22 and the plate bodies 21a is released, the sliding components 121 can drive the coupler mounting base 12 and the coupler 11 to slide together along the guiding slide ways 211 respectively.

[0047] As described above, the coupler mounting base 12 of the coupler assembly is fixedly connected to the traction beams 22, the plate bodies 21a having the guiding slide ways 211 are provided at the two sides of the coupler mounting base 12, and the sliding

components 121 slidably cooperating with the guiding slide ways 211 respectively are fixedly arranged at the coupler mounting base 12, and specifically, each of the guiding slide ways 211 is inclined in the longitudinal direction of the vehicle body, and has a front end higher than a rear end thereof. In practice, when the rail vehicle collides, the fixed state among the coupler mounting base 12, to which the coupler 11 is fixed, the traction beams 22 and the plate bodies 21a is released, and since the sliding components 121 of the coupler mounting base 12 can slidably cooperate with the guiding slide ways 211 respectively, at this time the coupler mounting base 12 can slide together with the sliding components 121 along the guiding slide ways 211 towards the rear lower side of the vehicle body, that is, the motion path of the coupler mounting base 12 after being collided is limited, thereby preventing the coupler mounting base 12 from intruding an upper part above the traction beams 22 and damaging the devices in the upper part accordingly or from falling onto the rail and increasing the risk of derailment accordingly, and thereby in turn improving the passive safety of the rail vehicle in collision.

[0048] It is to be noted that the couplers 11 of two vehicles are coupled during the collision, therefore, the coupler 11 and the coupler mounting base 12 can be kept in a horizontal state while sliding along the guiding slide ways 211.

[0049] In an example, the coupler assembly further includes a stop plate 23 which is fixed to the traction beam 22 and is located above the coupler mounting base 12, to limit the upward movement of the coupler mounting base 12. It may be appreciated that the stop plate 23 is not in contact with the coupler mounting base 12.

[0050] Specifically, the stop plate 23 may be provided at each of two sides above the coupler mounting base 12.

[0051] Specifically, the stop plate 23 may be fixed to the traction beam 22 in various ways, such as by welding, or by bolting.

[0052] In a solution, the guiding slide way 211 of the plate body 21a is a slide hole 211a formed in the plate body 21a, and the sliding component 121 fixed to the coupler mounting base 12 is configured as a pin 121a. In the specific configuration, a large end of the pin 121a is retained by the slide hole 211a, to prevent the pin 121a from disengaging from the slide hole 211a and meanwhile allow the pin 121a to slide along the slide hole 211a.

[0053] Of course, the sliding component 121 in cooperation with the slide hole 211a may also be other structures such as a screw.

[0054] In a solution, the guiding slide way 211 of the plate body 21a may also be a slide slot formed in the plate body 21a, and the sliding component 121 fixed to the coupler mounting base 12 may be configured as a pulley. In the specific configuration, the pulley is fitted in the slide slot, and can slide smoothly along the slide slot.

[0055] It can be appreciated that the guiding slide way 211 of the plate body 21a and the sliding component 121 in cooperation with the guiding slide way 211 are not limited to the two structures described above and may be configured as different structures as necessary as long as the sliding component 121 can drive the coupler mounting base 12 and the coupler 11 fixed to the coupler mounting base 12 to slide together along the guiding slide way 211.

[0056] In a solution, two ends of the coupler mounting base 12 are fixedly connected to the traction beams 22 and the plate bodies 21a by fasteners. More specifically, the fasteners may be rivets, bolts, cotter pins or the like. In this way, the coupler mounting base 12 fixedly connected to the traction beams 22 and the plate bodies 21a is detachable, thus facilitating the maintenance.

[0057] In a solution, the coupler 11 is configured as a coupler having an energy absorbing structure, in this way, when the rail vehicle is in collision, the coupler 11 can absorb the energy generated by the collision to a certain extent, thereby further improving the passive safety of the vehicle in collision.

[0058] Reference is made to Figures 4 and 5, Figure 4 is a schematic view showing the structure of the coupler assembly in Figure 1 and a front end of a vehicle head before collision; and Figure 5 is a schematic view showing the structure of the coupler assembly in Figure 1 and the front end of the vehicle head after the collision.

[0059] As shown in Figure 4, in the initially assembled state, the coupler mounting base 12 and the plate bodies 21a of the coupler assembly are fixedly connected by fasteners, and at this time, each of the sliding components 121 fixed to the coupler mounting base 12 is located at a front end of the guiding slide way 211 of the respective plate body 21a.

[0060] When two rail vehicles collide, firstly, the couplers 11 of the two vehicles are coupled. Since the coupler 11 is an energy-absorbing coupler, its energy absorbing structure

begins to perform primary energy absorption. In the case that the collision energy is large and the energy generated by the collision cannot be completely absorbed by the energy absorption structure of the coupler 11, the fasteners between the coupler mounting base 12 and the traction beams 22 and the fasteners between the coupler mounting base 12 and the plate bodies 21a are subjected to force and absorb energy. When the energy generated by the collision reaches a certain value, it may cut off the fasteners, and a secondary energy absorption is performed by cutting off the fasteners. At this time, the fixation constraint among the coupler mounting base 12, the traction beams 22 and the plate bodies 21a is released, and since the sliding components 121 fixed to the coupler mounting base 12 can slidably cooperate with the guiding slide ways 211 of the plate bodies 21a respectively, the sliding components 121 at this time will drive the coupler mounting base 12 and the coupler 11 to slide along the guiding slide ways 211 towards the rear lower side of the vehicle body, to perform energy absorption by sliding. Moreover, since the guiding slide ways 211 limit the motion paths of the coupler 11 and the coupler mounting base 12, it can prevent the coupler 11 and the coupler mounting base 12 from intruding an upper part above the traction beams 22 and damaging the devices in the upper part or from falling onto the rail in the sliding process. As shown in Figure 5, Figure 5 is a schematic view showing the structure of the coupler 11 and the coupler mounting base 12 after sliding along the guiding slide ways 211 after the collision.

[0061] It is to be noted that since the couplers 11 of the two vehicles are coupled, the couplers 11 can be kept in the horizontal state all along in the sliding process.

[0062] It is also to be noted that, after the collision, when the coupler 11 and the coupler mounting base 12 are in the state shown in Figure 5 and the energy generated by the collision is not yet completely absorbed, the coupler 11 will continue to move backward from the position shown in Figure 5, however, the coupler 11 at this time has already avoided the equipment compartment, thus the continued backward moving of the coupler 11 will not cause damages to the equipment in the equipment compartment.

[0063] Therefore, the order of energy absorption in collision of the rail vehicle equipped with the coupler assembly is: the coupler 11 itself →the fasteners between the coupler mounting base 12 and the traction beams 22 and the fasteners between the coupler mounting base 12 and the plate bodies 21a→the guiding slide ways 211→the vehicle body.

[0064] It is further to be emphasized that the arrangement and the number of the fasteners between the coupler mounting base 12 and the traction beams 22 and the fasteners between the coupler mounting base 12 and the plate bodies 21a are determined after verification in accordance with the practical requirements, and should ensure that the fasteners will not be cut off when the coupler 11 is in normal coupled operation or subjected to a longitudinal impact, or encounters small collisions.

[0065] Referring to Figures 6 to 9, Figure 6 is a schematic view showing the structure of a second unclaimed example of a coupler assembly; Figure 7 is a schematic view showing the structure of the coupler assembly in Figure 6 viewed from another angle; Figure 8 is a top view of the coupler assembly in Figure 6; and Figure 9 is a side view of the coupler assembly in Figure 6.

[0066] In this example, the coupler assembly includes a coupler 11 and a coupler mounting base 12. The coupler 11 is fixedly mounted to the coupler mounting base 12.

[0067] In this example, the coupler assembly further includes a supporting component 21 arranged on each of two sides of the coupler mounting base 12, and each of the supporting components 21 is provided with a guiding slide way 211. The supporting components 21 are fixedly connected to the vehicle head.

[0068] It is to be noted that two sides of the coupler mounting base 12 herein refer to two sides in a transverse direction of the rail vehicle.

[0069] The guiding slide way 211 of the supporting component 21 is inclined in a longitudinal direction and has a front end higher than a rear end thereof, that is, the guiding slide way 211 is arranged to be inclined towards a rear lower side of a vehicle body, and the longitudinal direction here refers to a length direction of the rail vehicle.

[0070] A sliding component 121 is fixedly arranged at each of the two sides of the coupler mounting base 12, and the sliding component 121 slidably cooperates with the guiding slide way 211 of the supporting component 21 at the respective side.

[0071] In this solution, the guiding slide way 211 is specifically configured as a guiding slide slot 211b formed in the supporting component 21, and the sliding component 121 is specifically configured as a sliding block 121b.

[0072] The coupler assembly is specifically configured such that in an initial state, that is,

after the coupler assembly and the vehicle head are initially assembled, the coupler mounting base 12 is fixedly connected to all the supporting components 21, and each of the sliding blocks 121b is located at a front end of the respective guiding slide slot 211b cooperating with the sliding block 121b.

[0073] It is to be emphasized here that, the cooperation between the sliding block 121b and the guiding slide slot 211b is specifically configured such that when the relative fixed state between the coupler mounting base 12 and the supporting components 21 is released, the sliding blocks 121b can drive the coupler mounting base 12 and the coupler 11 to slide together along the guiding slide slots 211b respectively.

[0074] As described above, the supporting components 21 are fixedly provided at the two sides of the coupler mounting base 12 of the coupler assembly respectively, the supporting component 21 has the guiding slide slot 211b, and the guiding slide slot 211b is inclined in the longitudinal direction of the vehicle body, and has a front end higher than a rear end thereof, and the sliding blocks 121b slidably cooperating with the guiding slide slots 211b at the respective sides are fixedly arranged at the two sides of the coupler mounting base 12. In practice, when the rail vehicle collides, the fixed state between the coupler mounting base 12, to which the coupler 11 is fixedly mounted, and the supporting components 21 is released, and since the sliding blocks 121b of the coupler mounting base 12 can slidably cooperate with the guiding slide slots 211b respectively, at this time the coupler mounting base 12 can slide together with the sliding blocks 121b along the guiding slide slots 211b respectively towards the rear lower side of the vehicle body, that is, the motion path of the coupler mounting base 12 after being collided is limited, thus preventing the coupler mounting base 12 from intruding an upper part above the supporting components 21 and damaging the devices in the upper part accordingly or from falling onto the rail and increasing the risk of derailment accordingly, and thereby in turn improving the passive safety of the rail vehicle in collision.

[0075] It is to be noted here that the couplers 11 of two vehicles are coupled during the collision, therefore, the coupler 11 and the coupler mounting base 12 can be kept in a horizontal state while sliding along the guiding slide slots 211b.

[0076] In a solution, the coupler assembly further includes a mounting plate 24, the mounting plate 24 is fixedly connected to rear ends of the two supporting components 21

and is configured to be connected to the vehicle head of the rail vehicle.

[0077] Specifically, the mounting plate 24 may be fixed to the supporting components 21 by welding, which is convenient and reliable. Of course, they may be fixed in other fixing manners.

[0078] In a solution, each of the supporting components 21 is provided with two or more guiding slide slots 211b, and apparently, the guiding slide slots 211b are in parallel with each other.

[0079] Preferably, the guiding slide slots 211b of the supporting component 21 are arranged uniformly, which can allow the coupler mounting base 12 to slide along the guiding slide slots 211b relatively smoothly after the collision.

[0080] Apparently, the number of the sliding blocks 121b at each side of the coupler mounting base 12 is identical with the number of the guiding slide slots 211b of the supporting component 21 at the corresponding side.

[0081] In a solution, the supporting component 21 is an extrudate structure. In this way, the supporting component 21 can have a high strength and flexibility, and can improve the passive safety of the coupler assembly.

[0082] In a solution, the two sides of the coupler mounting base 12 are fixedly connected to the supporting components 21 by fasteners. More specifically, the fasteners may be rivets, bolts, cotter pins, or the like. In this way, the coupler mounting base 12 fixedly connected to the supporting components 21 is detachable, thus facilitating the maintenance.

[0083] In a solution, the coupler 11 is configured as a coupler having an energy absorbing structure, and in this way, when the rail vehicle is in collision, the coupler 11 can absorb the energy generated by the collision to a certain extent, thereby further improving the passive safety of the vehicle in collision.

[0084] Reference is made to Figures 10 and 11, Figure 10 is a schematic view showing the structure of the coupler assembly in Figure 6 and a front end of a vehicle head before collision; and Figure 11 is a schematic view showing the structure of the coupler assembly in Figure 6 and the front end of the vehicle head after the collision.

[0085] In the solution shown in Figures 10 and 11, the supporting component 21 has two guiding slide slots 211b. It may be appreciated that, in practical configuration, the number of

the guiding slide slots 211b is not limited to this.

[0086] As shown in Figure 10, in the initially assembled state, the coupler mounting base 12 and the supporting components 21 of the coupler assembly are fixedly connected by fasteners, and at this time, each of the sliding blocks 121b fixed to the coupler mounting base 12 is located at a front end of the guiding slide slot 211b of the respective supporting component 21.

[0087] When two rail vehicles collide, firstly, the couplers 11 of the two vehicles are coupled. Since the coupler 11 is an energy-absorbing coupler, its energy absorbing structure begins to perform primary energy absorption. In the case that the collision energy is large and the energy generated by the collision cannot be completely absorbed by the energy absorption structure of the coupler 11, the fasteners between the coupler mounting base 12 and the supporting components 21 are subjected to force and absorb energy. When the energy generated by the collision reaches a certain value, it may cut off the fasteners, and a secondary energy absorption is performed by cutting off the fasteners. At this time, the fixation constraint between the coupler mounting base 12 and the supporting components 21 is released, and since the sliding blocks 121b fixed to the coupler mounting base 12 can slidably cooperate with the guiding slide slots 211b of the supporting components 21 respectively, the sliding blocks 121b at this time will drive the coupler mounting base 12 and the coupler 11 to slide along the guiding slide slots 211b towards the rear lower side of the vehicle body to perform energy absorption by sliding. Moreover, since the guiding slide slots 211b limit the motion paths of the coupler 11 and the coupler mounting base 12, it can prevent the coupler 11 and the coupler mounting base 12 from colliding with the equipment compartment at the rear side during the sliding process. As shown in Figure 11, Figure 11 is a schematic view showing the structure of the coupler 11 and the coupler mounting base 12 after sliding along the guiding slide slots 211b after the collision.

[0088] It is to be noted that since the couplers 11 of the two vehicles are coupled, the couplers 11 can be kept in the horizontal state all along in the sliding process.

[0089] It is also to be noted that, after the collision, when the coupler 11 and the coupler mounting base 12 are in the state shown in Figure 11 and the collision energy is not yet completely absorbed, the coupler 11 will collide the mounting plate 24 at the position where the coupler 11 is located after sliding and further collide the vehicle body, however, the

coupler 11 at this time has already avoided the equipment compartment, thus the continued backward moving of the coupler 11 will not cause damages to the equipment in the equipment compartment.

[0090] Therefore, the order of energy absorption of the rail vehicle equipped with the coupler assembly in collision is: the coupler 11 itself →the fasteners between the coupler mounting base 12 and the supporting components 21→the supporting components 21→the mounting plate 24→the vehicle body.

[0091] It is also to be emphasized that the arrangement and the number of the fasteners between the coupler mounting base 12 and the supporting components 21 are determined after verification in accordance with the practical requirements, and should ensure that the fasteners will not be cut off when the coupler 11 is in normal coupled operation or subjected to a longitudinal impact, or encounters small collisions.

[0092] Referring to Figures 12 to 15, Figure 12 is a schematic view showing the structure of an embodiment of a coupler assembly according to the present invention; Figure 13 is a schematic view showing the structure of the coupler assembly in Figure 12 viewed from another angle; Figure 14 is a top view of the coupler assembly in Figure 12; and Figure 15 is a side view of the coupler assembly in Figure 12.

[0100] In this embodiment, the coupler assembly includes a coupler 11 and a coupler mounting base 12. The coupler 11 is fixedly mounted to the coupler mounting base 12.

[0101] In this embodiment, the coupler assembly further includes a supporting component 21 and a rotating member 25 both arranged at each of two sides of the coupler mounting base 12. The supporting components 21 are fixedly connected to the vehicle head.

[0102] It is to be noted that two sides of the coupler mounting base 12 herein refer to two sides in a transverse direction of the rail vehicle.

[0103] The rotating member 25 has one end rotatably connected to a lower end of the respective supporting component 21, and the rotation center of this end is arranged horizontally and perpendicular to the length direction of the rail vehicle. The rotating member 25 has another end hinged to an upper end of the coupler mounting base 12.

[0104] The coupler assembly is specifically configured such that in an initial state, that is, after the coupler assembly and the vehicle head are initially assembled, the coupler mounting

base 12 is fixedly connected to the supporting components 21, and a hinge point where the rotating member 25 is hinged to the coupler mounting base 12 is located above a rotational connection point where the rotating member 25 is rotatably connected to the respective supporting component 21.

[0105] It is to be emphasized here that when the relative fixed state between the coupler mounting base 12 and the supporting components 21 is released, the rotating members 25 can respectively rotate about the rotational connection points where the rotating members 25 are rotatably connected to the respective supporting components 21, and can meanwhile drive the coupler mounting base 12 to move. That is, when the coupler mounting base 12 and the supporting components 21 are in the fixed state, the rotation of the rotating members 25 is restricted.

[0106] As described above, the supporting components 21 and the rotating members 25 are provided at two sides of the coupler mounting base 12 of the coupler assembly, and each of the rotating members 25 has one end rotatably connected to a lower end of the respective supporting component 21 and another end hinged to an upper end of the coupler mounting base 12. The coupler assembly is configured such that in an initial state, the coupler mounting base 12 is fixedly connected to the supporting components 21, and the connection point where the rotating member 25 is connected to the coupler mounting base 12 is higher than the connection point where the rotating member 25 is connected to the respective supporting component 21. In practice, after the rail vehicle collides, the coupler mounting base 12, to which the coupler 11 is fixedly mounted, is collided to be broken, the fixing state between the coupler mounting base 12 and the supporting components 21 is released, and at this time, since the rotating members 25 are rotatably connected to the lower ends of the supporting components 21, the rotating members 25 rotate towards the rear side of the vehicle body due to the collision, and since the coupler mounting base 12 is hinged to the rotating members 25, the coupler 11 and the coupler mounting base 12 are driven by the rotation of the rotating members 25 to move along a circular-arc path to the rear lower side of the vehicle body. That is, the motion path of the coupler mounting base 12 after being collided is limited, thus preventing the coupler mounting base 12 from intruding into an upper part above the supporting components 21 and damaging the devices in the upper part accordingly or falling onto the rail and increasing the risk of derailment accordingly, and thereby in turn improving the passive safety of the rail vehicle in collision.

[0107] It is to be noted here that, the couplers 11 of two vehicles are coupled during the collision, therefore, the coupler 11 driven by the rotation of the rotating members 25 can be kept in a horizontal state all along.

[0108] In a solution, the coupler assembly further includes a mounting plate 24, the mounting plate 24 is fixedly connected to rear ends of the two supporting components 21 and is configured to be connected to the vehicle head of the rail vehicle.

[0109] Specifically, the mounting plate 24 may be fixed to the supporting components 21 by welding, which is convenient and reliable. Of course, they may be fixed in other fixing manners.

[0110] In a practical application, the supporting component 21 may be embodied as an extrudate structure. In this way, the supporting component 21 can have a high strength and flexibility, and can improve the passive safety of the coupler assembly. Of course, the supporting component 21 may also be embodied as other structures, and the rotating member 25 may be embodied as a beam structure.

[0111] In a solution, each of the rotating members 25 is hinged to the coupler mounting base 12 by a first rotating shaft, and is rotatably connected to the respective supporting component 21 by a second rotating shaft.

[0112] The first rotating shaft and the second rotating shaft may be fixed respectively to the coupler mounting base 12 and the respective supporting component 21 by fasteners. More specifically, the fasteners may be rivets, bolts, cotter pins or the like.

[0113] In an embodiment, two ends of the coupler mounting base 12 are fixedly connected to the supporting components 21 also by fasteners. Similarly, the fasteners may be structures such as a rivet or bolt or cotter pin.

[0114] In a solution, the coupler 11 is configured as a coupler having an energy absorbing structure, and in this way, when the rail vehicle is in collision, the coupler 11 can absorb the energy generated by the collision to a certain extent, thereby further improving the passive safety of the vehicle in collision.

[0115] Reference is made to Figures 16 and 17, Figure 16 is a schematic view showing the structure of the coupler assembly in Figure 12 and a front end of a vehicle head before collision; and Figure 17 is a schematic view showing the structure of the coupler assembly in

Figure 12 and the front end of the vehicle head after the collision.

[0116] For facilitating the description, in Figures 16 and 17, a rotational connection point where the rotating member 25 is rotatably connected to the respective supporting component 21 is marked as A, and the hinge point where the rotating member 25 is hinged to the coupler mounting base 12 is marked as B.

[0117] As shown in Figure 16, in the initially assembled state, the coupler mounting base 12 and the supporting components 21 of the coupler assembly are fixedly connected by fasteners, and in this case, the hinge point B where the rotating member 25 is hinged to the coupler mounting base 12 is located above the rotational connection point A where the rotating member 25 is rotatably connected to the respective supporting component 21.

[0118] In this state, since the coupler mounting base 12 is fixedly connected to the supporting component 21, the rotation of the rotating member 25 is restricted.

[0119] When two rail vehicles collide, firstly, the couplers 11 of the two vehicles are coupled. Since the coupler 11 is an energy-absorbing coupler, its energy absorbing structure begins to perform primary energy absorption. In the case that the collision energy is large and the energy generated by the collision cannot be completely absorbed by the energy absorption structure of the coupler 11, the fasteners between the coupler mounting base 12 and the supporting components 21 are subjected to force and absorb energy. When the energy generated by the collision reaches a certain value, it may cut off the fasteners, and a secondary energy absorption is performed by cutting off the fasteners. At this time, the fixation constraint between the coupler mounting base 12 and the supporting components 21 is released,, the restriction to the rotation of each of the rotating members 25 is released, and under the action of the energy generated by the collision, the rotating member 25 can rotate about the point A towards the rear side of the vehicle body. In the examples shown in Figures 16 and 17, the rotating member 25 rotates clockwise about the point A, and since the coupler mounting base 12 is hinged to the rotating members 25, and also since the couplers 11 of the two vehicles are coupled, at this time the coupler mounting base 12 driven by the rotating members 25 can be kept in a horizontal state and moves along the circular arc-shaped path towards the rear lower side of the vehicle body, to avoid the equipment compartment. As shown in Figure 17, Figure 17 is a schematic view showing the structure of the coupler 11 and the coupler mounting base 12 after moving along the circular arc-shaped path towards

the rear lower side of the vehicle body after the collision.

[0120] It is to be noted that, after the collision, when the coupler 11 and the coupler mounting base 12 are in the state shown in Figure 17 and if the collision energy is not yet completely absorbed, the coupler 11 will collide the mounting plate 24 and further the vehicle body at the position where the coupler 11 is located after sliding down, however, the coupler 11 at this time has already avoided the equipment compartment, thus the continued backward moving of the coupler 11 will not cause damages to the equipment in the equipment compartment.

[0121] Therefore, the order of energy absorption of the rail vehicle equipped with the coupler assembly in collision is: the coupler 11 itself →the fasteners between the coupler mounting base 12 and the supporting components 21→the rotating members 25→the mounting plate 24→the vehicle body.

[0122] It is also to be emphasized that the arrangement and the number of the fasteners between the coupler mounting base 12 and the supporting components 21 are determined after verification in accordance with the practical requirements, and should ensure that the fasteners will not be cut off when the coupler 11 is in normal coupled operation or subjected to a longitudinal impact, or encounters small collisions.

[0123] In addition to the above coupler assembly, a rail vehicle is further provided according to the present application, which includes a vehicle head and a coupler assembly arranged at a front end of the vehicle head, and the coupler assembly is the coupler assembly according to the above embodiment.

[0124] Since the above coupler assembly has the above technical effects, the rail vehicle having the coupler assembly also has corresponding technical effects, which will not be repeated here.

[0125] It is to be noted that, the main body part of the rail vehicle is not a key point of the present application and may be implemented according to the conventional technology, which will not be repeated here.

[0126] The coupler assembly and the rail vehicle having the coupler assembly according to the present application are described in detail hereinbefore. The above description of examples is only intended to help the understanding of the method and idea of the present

application. It should be noted that, for the person skilled in the art, a few of modifications and improvements may be made to the present application without departing from the principle of the present application, and these modifications and improvements are also deemed to fall into the scope of protection of the present application defined by the claims.

CLAIMS

1. A coupler assembly, configured to be arranged at a front end of a vehicle head of a rail vehicle, the coupler assembly comprising:

a coupler mounting base (12) fixed to the vehicle head; and

a coupler (11) fixedly mounted to the coupler mounting base (12),

wherein the coupler assembly further comprises a supporting component (21) and a rotating member (25) both provided at each of two sides of the coupler mounting base (12);

the rotating member (25) has one end rotatably connected to a lower end of the supporting component (21), and a rotation center of this end is arranged horizontally and perpendicular to a length direction of the rail vehicle, and the rotating member (25) has another end hinged to an upper end of the coupler mounting base (12); and

the coupler assembly is configured such that in an initial state, the coupler mounting base (12) is fixedly connected to the supporting component (21), and a hinge point where the rotating member (25) is hinged to the coupler mounting base (12) is located above a rotational connection point where the rotating member (25) is rotatably connected to the respective supporting component (21).

2. The coupler assembly according to claim 1, wherein the rotating member (25) is hinged to the coupler mounting base (12) by a first rotating shaft, and the rotating member (25) is rotatably connected to the respective supporting component (21) by a second rotating shaft.

3. The coupler assembly according to claim 2, wherein the first rotating shaft and the second rotating shaft are respectively fixed to the coupler mounting base (12) and the respective supporting component (21) by fasteners.

4. The coupler assembly according to any one of claims 1 to 3, further comprising a mounting plate (24) configured to be connected to the vehicle head, wherein the mounting plate (24) is fixedly connected to rear ends of two of the supporting components (21).

5. The coupler assembly according to any one of claims 1 to 3, wherein the supporting component (21) is an extrudate structure.

6. A rail vehicle, comprising a vehicle head and a coupler assembly provided at a front end of the vehicle head, wherein the coupler assembly is the coupler assembly according to any one of claims 1 to 5.