

GANGWAY AND GANGWAY COUPLING DEVICE HAVING SAME

TECHNICAL FIELD

[01] The present disclosure belongs to the technical field of rail traffic, and specifically relates to a gangway and a gangway coupling device having same.

BACKGROUND

[02] A gangway in the existing art is used to keep adjacent vehicles closely connected, prevent invasion of wind and rain, isolate high temperature and noise, and provide a good travel environment. There are the following shortcomings: two side wall panels that can move and/or swing relative to each other will frictionize each other during running of a vehicle body. In order to solve the technical problem of friction, an anti-wear bar is generally adhered between contact parts of the two side wall panels. However, by this anti-wear method, there is still friction between the two side wall panels after long-time running of the vehicle body, which finally causes a functional failure of the two side wall panels. Meanwhile, in order to facilitate extension, expansion and retraction, and swing of the two side wall panels when the vehicle body passes through a non-straight road section to make passengers lean against it and improve the safety, and to prevent an exposed corrugated bellow assembly from affecting the appearance, oscillating mechanisms are usually mounted on the two side walls to realize this function. However, this oscillating mechanism has the following problems when the vehicle body is running: 1) A guide rod is a single-sided guide slot. In an extreme motion state of a train, for example, when the vehicle body is stretched and/or raised, a positioning screw will slide out of the guide slot position, causing that a first side wall assembly and a second side wall assembly are separated and fall sideways, which is likely to cause potential personal safety hazards. 2) Two bearings in a first bracket assembly are installed at both ends of a tube. The other ends of the two bearings are provided with no other stoppers, so that bearing separation easily occurs in the motion process. One end of each of the two side wall panels that can move and/or swing relative to each other positions the vehicle body through a positioning pin, and a lock pin hole is formed in the positioning pin. A handle that can raise and unlock the side wall along a height direction of the side wall is plugged into the lock pin hole. When the side wall panels need to be opened to repair

and maintain the corrugated bellow assembly, a user usually forces apart a rubber gap covering at the upper parts of the side wall with one hand, and puts the other hand into the side wall and pulls the handle away from the lock pin hole formed in the positioning pin of the side wall panel, thus realizing removal of the side wall panels. When the side wall panels need to be installed, the user also puts a hand into the side wall to plug the handle into the lock pin hole of the positioning pin to realize installation of the side wall panels. The removal and installation methods are extremely tedious, and putting the hand to a position that cannot be visually observed easily causes the potential personal safety hazard. When the vehicle body needs to be coupled, a locking lever mechanism located in a couple frame accommodating slot in a couple frame assembly pulls a drive rod through a lock bar to perform traction to realize a locking function. The lock bar does a reciprocating linear motion in the couple frame accommodating slot in a perpendicular direction. The drive rod automatically rotates along a rotating shaft under the traction of the lock bar and overall moves in a couple frame. The lock bar in the locking lever mechanism drags the drive rod, and the drive rod drives a locking lever to do a reciprocating linear motion in the couple frame accommodating slot in a horizontal direction. By this structure, in most cases, the couple frame needs to have an enough large space to facilitate rotation of the drive rod because the drive rod requires a relatively large rotation space to satisfy the traction for the locking lever by the lock bar. The overall volume of the couple frame will be increased if a use function is satisfied. Meanwhile, the drive rod is of a one-piece structure only, so that motion positions of the lock bar and the locking lever in an actual space are unchanged and monotonous. Due to improper assembling or long-time motion wear, the motion positions of the lock bar and the locking lever changes, thus generating a problem of improper locking or poor locking effect.

SUMMARY

[03] In order to better solve the technical problems in the existing art, the present disclosure provides a gangway and a gangway coupling device having same to overcome the defects in the existing art.

[04] A gangway includes a first side wall, a side wall unlocking mechanism, and a locking lever mechanism. The first side wall is used in the gangway to cover a corrugated bellow assembly in the gangway and overhaul the gangway; the side wall unlocking mechanism is

connected to the first side wall and used to install and remove the first side wall in the gangway; and the locking lever mechanism is located at an end part of an outer side of the gangway and used to realize connection between the gangway and an external coupling assembly or coupling mechanism.

[05] Further, the first side wall includes a first side wall assembly, a second side wall assembly, a rotating shaft assembly, an oscillating mechanism, an anti-wear assembly, and a rotating shaft sleeve assembly; the first side wall assembly is connected with a vehicle body in a swayable and/or rotatable manner through the rotating shaft assembly; the second side wall assembly is detachably connected with the vehicle body through the rotating shaft sleeve assembly; the first side wall assembly is located outside the second side wall assembly; and an inner surface of the first side wall assembly and an outer surface of the second side wall assembly are approximately parallel to each other and have a constant spatial clearance.

[06] Further, the anti-wear assembly and the oscillating mechanism are respectively mounted on the first side wall assembly and the second side wall assembly; the anti-wear assembly is located between the inner surface of the first side wall assembly and the outer surface of the second side wall assembly; the oscillating mechanism is located on the inner surfaces of the first side wall assembly and the second side wall assembly; the first side wall assembly and the second side wall assembly extend and retract and/or swing through structures combined with the anti-wear assembly and the oscillating mechanism; one end of the rotating shaft assembly is mounted on the first side wall assembly, and the other end is mounted on the vehicle body; and one end of the rotating shaft sleeve assembly is mounted on the second side wall assembly, and the other end is mounted on a couple frame of the gangway.

[07] Further, the oscillating mechanism includes a pull rod seat assembly, a guide rod assembly, a screw group, a pore plate, a first bracket assembly and a bracket; the pull rod seat assembly and the guide rod assembly are connected into a whole through the screw group; the first bracket assembly is mounted on the guide rod assembly; the bracket and the pore plate are respectively mounted on two sides of the first bracket assembly, and are tightly connected with side wall panels through screws; the first bracket assembly is connected with the bracket and the pore plate in a swayable manner; and the first bracket assembly is movably connected with the guide rod assembly.

[08] Further, the guide rod assembly includes a stop piece and a guide rod; one end of the stop piece is used to weld or adhere the guide rod; the other end of the stop piece is in planar fit with the pull rod seat assembly and is connected with the pull rod seat assembly through the screw group to form a whole; the first bracket assembly is mounted on the guide rod; and the guide rod is of a double-sided opened guide slot structure.

[09] Further, the first bracket assembly includes a casting, a sliding bearing, a pipe and a guide screw; the sliding bearing is sleeved in the pipe; the pipe penetrates through the casting; the guide screw is mounted on the pipe; and the pipe has a first straight section, a second straight section, a shoulder part, a notch and a threaded hole.

[10] Further, the rotating shaft assembly includes a rotating shaft fixing part, a rotating shaft swing part and a rotating shaft part; the rotating shaft fixing part and the rotating shaft swing part are connected into a whole through the rotating shaft part; the rotating shaft fixing part is fixedly connected to the side wall panel; the rotating shaft swing part is connected with an external vehicle body; and the rotating shaft fixing part and the rotating shaft swing part rotate and/or swing through the rotating shaft part.

[11] Further, the rotating shaft swing part includes a rotating shaft plate pin shaft assembly, a rotating shaft base plate, a lining, a rotating shaft plate assembly and a screw washer group; the rotating shaft plate pin shaft assembly is welded with a pin shaft stud; the rotating shaft plate pin shaft assembly is inserted into a mounting hole of the rotating shaft base plate through the pin shaft stud, the lining is located outside the rotating shaft base plate and used to be sleeved on the pin shaft stud of the rotating shaft plate pin shaft assembly; the rotating shaft plate assembly is sleeved on an outer side of the lining; the screw washer group is used to stop the rotating shaft plate assembly to move in a central axial direction of the pin shaft stud on the rotating shaft plate pin shaft assembly; and the screw washer group is in threaded fastening with the pin shaft stud on the rotating shaft plate pin shaft assembly.

[12] Further, a waist-type hole of the rotating shaft plate assembly is set to have an included angle δ with a horizontal center axis of the rotating shaft plate assembly, and the included angle δ is 10-18°; a distance between a circle center of a circle in the waist-type hole of the rotating shaft plate assembly close to an outer end and an edge part is C, C=3-5 times of the radius of the circle of the outer end of the waist-type hole.

[13] Further, an included angle γ between the center of the waist-type hole in the rotating shaft plate assembly and a vertical center of the screw washer group is 60-80°; an included angle α between the center of the waist-type hole in the rotating shaft plate assembly and the vertical center of the screw washer group is 60-80°; and an included angle β between the center of the waist-type hole in the rotating shaft plate assembly and the vertical center of the screw washer group is 90-120°.

[14] Further, the anti-wear assembly includes an anti-wear component located on the inner surface of the first side wall assembly and a wear-resistant component located on the outer surface of the second side wall assembly; the anti-wear component is made of a soft material; the wear-resistant component is made of a steel material; the wear-resistant component is wrapped on the outer surface of the second side wall assembly; the anti-wear component is fixed on the inner surface of the first side wall assembly through a screw; and the wear-resistant component is fixed on the outer surface of the second side wall assembly through a rivet.

[15] Further, the rotating shaft sleeve assembly includes a fixed seat, a rotating shaft sleeve pin shaft, a lockup block and a positioning pin; the fixed seat of the rotating shaft sleeve assembly is mounted on the second side wall assembly; the fixed seat and the rotating shaft sleeve pin shaft are integrated into one piece; the rotating shaft sleeve pin shaft of the rotating shaft sleeve assembly is inserted into the lockup block fixedly mounted on the side wall unlocking mechanism through a fastener; the rotating shaft sleeve pin shaft and the lockup block have positioning holes having centers on the same axis and penetrate through each other; and part of the rotating shaft sleeve pin shaft of the rotating shaft sleeve assembly and the lockup block are threaded into the positioning holes through the positioning pin for connection and positioning.

[16] Further, the side wall unlocking mechanism includes a connection plate, an unlocking mechanism and a handle assembly; one end of the rotating shaft sleeve assembly is mounted on the second side wall assembly, and the other end is mounted on a first side of the connection plate; the handle assembly is mounted on a second side of the connection plate; an end part of the unlocking mechanism penetrates through the connection plate and is exposed from the second side of the connection plate, and at the same time, the unlocking mechanism penetrates through the rotating shaft sleeve assembly; the end part of the unlocking mechanism resists

against and contacts the handle assembly mounted on the second side of the connection plate; the handle assembly unlocks the unlocking mechanism; and the unlocking mechanism is fixed on the connection plate through a fastening screw located on the outer side of the connection plate.

[17] Further, the handle assembly includes a handle, a longitudinal cushion block and a transverse cushion block; the longitudinal cushion block and the transverse cushion block are respectively fixed on the second side of the connection plate; the longitudinal cushion block is located on one side of the handle; and the transverse cushion block is located below the handle and used to limit a rotation position of the handle.

[18] Further, the unlocking mechanism includes a first positioning pin assembly, a second positioning pin assembly, a seat body, an elastic piece, and a rod part; the first positioning pin assembly and the seat body are integrated into one piece; the unlocking mechanism tightly connects the seat body with the lockup block in the rotating shaft sleeve assembly through a mounting screw penetrating through the seat body; the first positioning pin assembly is mounted, by a first fastener, at a first end of the rod part having a double-head thread; the second positioning pin assembly and the rod part are integrated into one piece; the elastic piece is located at a bottom of the second positioning pin assembly and is spatially spaced from the second positioning pin assembly; and the elastic piece is limited by a second fastener and mounted at a second end of the rod part having the double-head thread.

[19] Further, the locking lever mechanism is used to connect and lock the vehicle body in a rail transit vehicle, and includes a lock bar, a locking lever, a locking lever pin shaft and a corner connection assembly; the lock bar and the locking lever are both connected with the corner connection assembly through the locking lever pin shaft; the corner connection assembly is of a multi-section drive piece structure; and a center axis of the lock bar and a center axis of the locking lever are always approximately perpendicular.

[20] Further, the corner connection assembly includes a first end, a second end, a roller and a connection rod; the connection rod is paired; the first end and the second end are respectively located on two sides of the connection rod; the roller is mounted in the connection rod in a rolling manner; the lock bar drags, through the corner connection assembly, the locking lever to move synchronously; the first end of the corner connection assembly is connected with the lock bar through the locking lever pin shaft; the second end of the corner connection assembly is

connected with the locking lever through the locking lever pin shaft; and the lock bar drags, through the corner connection assembly, the locking lever to move synchronously.

[21] Further, the corner connection assembly is of a three-section type structure; and the first end and the second end of the corner connection assembly swing respectively.

[22] Further, when the locking lever mechanism moves from a first working position to a third working position, an included angle α between a center line of the first end of the corner connection assembly and the center axis of the lock bar is equal to 3.3-15.3°; when the locking lever mechanism moves from the first working position to the third working position, an included angle β between a center line of the second end of the corner connection assembly and the center axis of the locking lever is equal to 5.2-18.8°; when the locking lever mechanism moves from the first working position to the third working position, the corner connection assembly always moves in a tangential direction of an arc of an corner curved section of the couple frame accommodating slot in the couple frame assembly; at least one roller in a roller group of the corner connection assembly is always in linear contact with the corner curved section of the couple frame accommodating slot in the connection frame assembly.

[23] In another aspect, the present disclosure further provides a gangway coupling device having a gangway. The gangway coupling device further includes a second gangway. A latch hook of a coupling part of the first gangway is connected with a lock plate of a coupling part of the second gangway; a latch hook of the coupling part of the second gangway is connected with a lock plate of the coupling part of the first gangway; the first gangway is fixedly connected to a first vehicle body; the second gangway is fixedly connected to a second vehicle body; the first gangway includes a first corrugated bellow assembly and a first side wall; and the second gangway includes a second corrugated bellow assembly and a second side wall.

[24] The present disclosure has the beneficial effects below.

[25] For the first side wall part: 1. An opened notch in the pipe in the oscillating mechanism limits the sliding bearing, and a guide screw is mounted in an opened threaded hole to stop the sliding bearing, which effectively improves the usability of the sliding bearing. During replacement of the sliding bearing, the sliding bearing in the pipe can be directly removed and replaced, which effectively improves the maintainability. The guide rod is provided with slots in both sides to prevent the side walls from extending, retracting and swinging in extreme sizes to

cause the guide screw to fall off from the guide slot of the guide rod, which causes separation of the side walls and injures passengers' personal safety. 2. By means of the adoption of the rotating shaft plate assembly having the waist-type hole, the rotating shaft plate assembly swings between the rotating shaft swing parts, and the problem of a flash seam generated by the side wall assemblies of two pieces of side wall panels in a motion process of the vehicle body is compensated by self structures. The design of the waist-type hole of the rotating shaft plate can ensure that the standing space of passengers is not compressed when the side walls tilt during turning, which is favorable for improving the experience comfort of the passengers. 3. The anti-wear assembly formed by combining two kinds of materials with different hardness can better realize reduction of wear between the first side wall assembly and the second side wall assembly, which greatly prolongs the service lives of the side walls. When one or two of the anti-wear component and the wear-resistant component is or are nearly worn out, only the anti-wear component and/or the wear-resistant component is replaced, so that repair and maintenance are easy and convenient, and visible surfaces of the side walls can be effectively protected. Meanwhile, by the structural design, the side wall does not need to be replaced in whole, which can effectively save the production and manufacture cost. 4. The rotating shaft sleeve assembly is simple in structural design, which is convenient for lockup and removal of the second side wall assembly, greatly improves the side wall repair and maintenance efficiency, and is also favorable for quickly overhauling the corrugated bellow assemblies inside the side walls.

[26] For the unlocking mechanism: the unlocking mechanism is simple in structure and convenient to install, repair and maintain, and the potential safety hazard caused by the fact that the user puts the hands into the side walls to install and remove the second side wall assembly in the existing art is solved. Meanwhile, during manual installation and removal of the second side wall assembly, installation and removal can be realized by only pulling the handle of the handle assembly located outside the connection plate, so that the operation is simple and convenient and high in safety. This structural design is simple, which is convenient for lockup and removal of the second side wall assembly, greatly improves the side wall repair and maintenance efficiency, and is also favorable for quickly overhauling the corrugated bellow assemblies inside the side walls.

[27] For the locking lever mechanism: the locking lever mechanism realizes traction from the

lock bar to the locking lever by using the corner connection assembly of the three-section type structure; the first end and the second end of the corner connection assembly can both drag the lock bar and the locking lever respectively, and a traction angle is adjusted. By this structure, the adjustable angle range of the corner connection assembly is enlarged. The corner connection assembly in the locking lever mechanism moves in a manner of being fitted to the corner curved section of the couple frame accommodating slot. Such a structural design can narrow the accommodating slot formed in the couple frame, so that the volume of the couple frame can be reduced to reduce the overall weight of the couple frame on the premise of satisfying a locking function of the locking lever mechanism. Furthermore, the first end and the second end of the corner connection assembly both have an angle adjustment function, the center axis of the lock bar and the center axis of the locking lever can be always kept spatially approximately perpendicular, and the corner connection assembly always moves in the tangential direction of the arc of the corner curved section of the couple frame accommodating slot, so that the locking function of the locking lever mechanism is more stable, which is favorable for prolonging the service life of the locking mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

[28] In order to describe the technical solutions of the embodiments of the present disclosure more clearly, the accompanying drawings of the embodiments will be described briefly below. Apparently, the accompanying drawings in the following descriptions only relate to some embodiments of the present disclosure, and are not intended to limit the present disclosure.

[29] FIG. 1 is a schematic diagram of an overall three-dimensional structure of a gangway coupling device of the present disclosure;

[30] FIG. 2 is a schematic diagram of a main view structure of a gangway coupling device of the present disclosure;

[31] FIG. 3 is a schematic diagram of a left view structure of a gangway coupling device of the present disclosure;

[32] FIG. 4 is a schematic diagram of a three-dimensional structure of a first side wall of a gangway of the present disclosure;

[33] FIG. 5 is a schematic diagram of a sectional structure of a first side wall of a gangway of

the present disclosure;

[34] FIG. 6 is a schematic diagram of a three-dimensional structure of an oscillating mechanism of a first side wall of a gangway of the present disclosure;

[35] FIG. 7 is a schematic diagram of a three-dimensional exploded structure of an oscillating mechanism of a first side wall of a gangway of the present disclosure;

[36] FIG. 8 is a schematic structural diagram of a guide rod of an oscillating mechanism of a first side wall of a gangway of the present disclosure;

[37] FIG. 9 is a schematic diagram of a planar structure of a first bracket assembly of an oscillating mechanism of a first side wall of a gangway of the present disclosure;

[38] FIG. 10 is a schematic diagram of a sectional structure of a first bracket assembly of an oscillating mechanism of a first side wall of a gangway of the present disclosure;

[39] FIG. 11 is a schematic diagram of a sectional structure of a pipe of a first bracket assembly of an oscillating mechanism of a first side wall of a gangway of the present disclosure;

[40] FIG. 12 is a schematic diagram of a three-dimensional structure of a rotating shaft assembly of a first side wall of a gangway of the present disclosure;

[41] FIG. 13 is a schematic diagram of a three-dimensional exploded structure of a rotating shaft assembly of a first side wall of a gangway of the present disclosure;

[42] FIG. 14 is a schematic diagram of a three-dimensional exploded structure of a rotating shaft swing part of a first side wall of a gangway of the present disclosure;

[43] FIG. 15 is a schematic diagram of an original position of a rotating shaft swing part of a first side wall of a gangway of the present disclosure;

[44] FIG. 16 is a schematic diagram of a first working position of a rotating shaft swing part of a first side wall of a gangway of the present disclosure;

[45] FIG. 17 is a schematic diagram of a second working position of a rotating shaft swing part of a first side wall of a gangway of the present disclosure;

[46] FIG. 18 is a schematic structural diagram of a rotating shaft plate assembly of a first side wall of a gangway of the present disclosure;

[47] FIG. 19 is a schematic planar diagram of an anti-wear assembly structure of a first side wall of a gangway of the present disclosure;

[48] FIG. 20 is a schematic diagram of a three-dimensional structure of a rotating shaft sleeve

assembly of a first side wall of a gangway of the present disclosure;

[49] FIG. 21 is a schematic diagram of a sectional structure of a rotating shaft sleeve assembly of a first side wall of a gangway of the present disclosure;

[50] FIG. 22 is a schematic diagram of a three-dimensional structure in a first direction of a side wall unlocking mechanism of a gangway of the present disclosure;

[51] FIG. 23 is a schematic diagram of a three-dimensional structure in a second direction of a side wall unlocking mechanism of a gangway of the present disclosure;

[52] FIG. 24 is a schematic partially enlarged diagram of a three-dimensional structure in a first direction of a side wall unlocking mechanism of a gangway of the present disclosure;

[53] FIG. 25 is a schematic partially enlarged diagram of a three-dimensional structure in a second direction of a side wall unlocking mechanism of a gangway of the present disclosure;

[54] FIG. 26 is a schematic diagram of a three-dimensional structure of a handle assembly in a side wall unlocking mechanism of a gangway of the present disclosure;

[55] FIG. 27 is a schematic diagram of a planar structure of a handle assembly in a side wall unlocking mechanism of a gangway of the present disclosure;

[56] FIG. 28 is a schematic diagram of a three-dimensional structure of an unlocking mechanism in a side wall unlocking mechanism of a gangway of the present disclosure;

[57] FIG. 29 is a schematic exploded structural diagram of an unlocking mechanism in a side wall unlocking mechanism of a gangway of the present disclosure;

[58] FIG. 30 is a schematic diagram of a three-dimensional structure of a locking lever mechanism of the present disclosure;

[59] FIG. 31 is a schematic diagram of a three-dimensional exploded structure of a locking lever mechanism of the present disclosure;

[60] FIG. 32 is a schematic structural diagram illustrating that a first working position of a locking level mechanism of the present disclosure in a couple frame;

[61] FIG. 33 is a schematic diagram of a first working position of a locking lever mechanism of the present disclosure;

[62] FIG. 34 is a schematic structural diagram illustrating that a second working position of a locking level mechanism of the present disclosure in a couple frame;

[63] FIG. 35 is a schematic diagram of a second working position of a locking lever

mechanism of the present disclosure;

[64] FIG. 36 is a schematic structural diagram illustrating that a third working position of a locking level mechanism of the present disclosure in a couple frame;

[65] FIG. 37 is a schematic diagram of a third working position of a locking lever mechanism of the present disclosure; and

[66] FIG. 38 is a schematic structural diagram of a corner connection assembly of the present disclosure.

[67] In the drawings:

[68] 1000: first side wall; 1100: first side wall assembly; 1200: second side wall assembly; 1300: rotating shaft assembly;

[69] 1310: rotating shaft fixing part; 1320: rotating shaft swing part; 1321: rotating shaft plate pin shaft assembly; 1322: rotating shaft base plate;

[70] 1323: lining; 1324: rotating shaft plate assembly; 1325: screw washer group; 1330: rotating shaft part; 1400: oscillating mechanism;

[71] 1410: pull rod seat assembly; 1420: guide rod assembly; 1421: stop piece; 1422: guide rod; 1430: screw group;

[72] 1440: pore plate; 1450: first bracket assembly; 1451: casting; 1452: sliding bearing; 1453: pipe;

[73] 14531: first straight section; 14532: second straight section; 14533: shoulder part; 14534: notch; 14535: threaded hole;

[74] 1454: guide screw; 1460: bracket; 1500: anti-wear assembly; 1510: anti-wear component; 1520: wear-resistant component;

[75] 1600: rotating shaft sleeve assembly; 1610: fixed seat; 1620: rotating shaft sleeve pin shaft; 1630: lockup block; 1640: positioning pin;

[76] 2000: side wall unlocking mechanism; 2100: connection plate; 2200: unlocking mechanism; 2210: first positioning pin assembly;

[77] 2220: second positioning pin assembly; 2230: seat body; 2240: elastic piece; 2250: rod part; 2260: first fastener; 2270: second fastener; 2280: mounting screw;

[78] 2300: handle assembly; 2301: handle; 2302: longitudinal cushion block; 2303: transverse cushion block; 3000: locking lever mechanism;

[79] 3100: lock bar; 3200: locking lever; 3300: locking lever pin shaft; 3400: corner connection assembly; 3401: first end;

[80] 3402: second end; 3403: roller; 3404: connection rod.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[81] FIG. 1 to FIG. 38 discussed below and various embodiments used to describe the principle of the present disclosure in this patent document are for illustration only, and should not be regarded as limiting the scope of the present disclosure in any way. Those skilled in the art will understand that the principles of the present disclosure can be implemented in any suitable gangway and gangway coupling device having same. The terms used to describe various embodiments are exemplary. It should be understood that these are provided only to help the understanding of the present specification, and their use and definitions do not limit the scope of the present disclosure in any way. The terms, i.e., first, second, etc. are used to distinguish objects with the same term set, and are not intended to indicate a chronological order in any way, unless explicitly stated otherwise. Group is defined as a non-empty group containing at least one element.

[82] In order to make the objectives, technical solutions and advantages of the embodiments of the present disclosure clearer, the technical solutions in the embodiments of the present invention are described clearly and completely below in conjunction with the drawings in the embodiments of the present disclosure. Obviously, the described embodiments are a part of the embodiments of the present disclosure, not all the embodiments. Based on the described embodiments of the present invention, all other embodiments obtained by those ordinarily skilled in the art without creative work shall fall within the protection scope of the present invention. It should be understood that the exemplary embodiments described herein should be regarded as descriptive only, and not for the purpose of limitation. Descriptions of features or aspects in each exemplary embodiment should generally be considered as being available for similar features or aspects in other exemplary embodiments.

[83] It is defined that a horizontal direction of a main view of a gangway coupling device is a Z-axis reference direction; a vertical direction of the main view of the gangway coupling device is a Y-axis reference direction; and a sliding direction between side wall panel assemblies inside

a first side wall or a second side wall is an X-axis reference direction.

[84] Embodiment 1

[85] As shown in FIG. 1 to FIG. 3, a gangway coupling device having a gangway includes a first gangway and a second gangway. The first gangway and the second gangway are used to keep tight connection between adjacent vehicles and prevent wind, rain, etc. from invading vehicle bodies, have functions of isolating high temperature and reducing noise, and can provide a good travel environment for passengers. A latch hook of a coupling part of the first gangway is connected with a lock plate of a coupling part of the second gangway; a latch hook of the coupling part of the second gangway is connected with a lock plate of the coupling part of the first gangway; the first gangway is fixedly connected to a first vehicle body; the second gangway is fixedly connected to a second vehicle body; and the first gangway and the second gangway are disposed in a symmetric back-to-back structure. The first gangway and the second gangway can be made into identical structures, which are convenient to produce and manufacture. Meanwhile, there is no need to design drawings, make molds, etc. for the two gangways, which greatly saves the Human, material and financial cost. The first gangway includes a first corrugated bellow assembly and a first side wall, and the second gangway includes a second corrugated bellow assembly and a second side wall.

[86] As shown in FIG. 4 to FIG. 5, the first side wall 1000 includes a first side wall assembly 1100, a second side wall assembly 1200, a rotating shaft assembly 1300, an oscillating mechanism 1400, an anti-wear assembly 1500, and a rotating shaft sleeve assembly 1600. When the vehicle bodies are in a static state, the first side wall assembly 1100 in a side wall is connected with the vehicle body in a swayable and/or rotatable manner through the rotating shaft assembly 1300. The second side wall assembly 1200 is detachably connected with the vehicle body through the rotating shaft sleeve assembly 1600. The first side wall assembly 1100 is located outside the second side wall assembly 1200. An inner surface of the first side wall assembly 1100 and an outer surface of the second side wall assembly 1200 are approximately parallel to each other and have a constant spatial clearance.

[87] The anti-wear assembly 1500 and the oscillating mechanism 1400 are respectively mounted on the first side wall assembly 1100 and the second side wall assembly 1200; the anti-wear assembly 1500 is located between the inner surface of the first side wall assembly

1100 and the outer surface of the second side wall assembly 1200, so as to reduce or decrease friction contact between the inner surface of the first side wall assembly 1100 and the outer surface of the second side wall assembly 1200 in a running process of the vehicle body to prolong the service lives of the first side wall assembly 1100 and the second side wall assembly 1200. The oscillating mechanism 1400 is located on the inner surfaces of the first side wall assembly 1100 and the second side wall assembly 1200 to realize spatial extension, retraction and swing after the first side wall assembly 1100 and the second side wall assembly 1200 are assembled. The first side wall assembly 1100 and the second side wall assembly 1200 extend, retract and/or swing through structures combined with the anti-wear assembly 1500 and the oscillating mechanism 1400. One end of the rotating shaft assembly 1300 is mounted on the first side wall assembly 1100, and the other end is mounted on the vehicle body to adjust a gap generated by the first side wall assembly 1100 and the second side wall assembly 1200 in the running process of the vehicle body. One end of the rotating shaft sleeve assembly 1600 is mounted on the second side wall assembly 1200, and the other end is mounted on a connection plate 2100 of a couple frame of the gangway to realize detachable connection between the rotating shaft sleeve assembly 1600 and the vehicle body.

[88] As shown in FIG. 6 to FIG. 11, the oscillating mechanism 1400 is mounted on a side wall panel of the vehicle and used to enable two side wall panels connected with each other to extend, retract and swing to cover the corrugated bellow assembly, so as to prevent exposure of the corrugated bellow assembly to affect the appearance. The oscillating mechanism 1400 is usually mounted on two side wall panels at the same time. The oscillating mechanism 1400 includes a pull rod seat assembly 1410, a guide rod assembly 1420, a screw group 1430, a pore plate 1440, a first bracket assembly 1450 and a bracket 1460. The pull rod seat assembly 1410 and the guide rod assembly 1420 are connected into a whole through the screw group 1430; the first bracket assembly 1450 is mounted on the guide rod assembly 1420; the bracket 1460 and the pore plate 1440 are respectively mounted on two sides of the first bracket assembly 1450, and are tightly connected with side wall panels through screws; the first bracket assembly 1450 is connected with the bracket 1460 and the pore plate 1440 in a swivable manner; and the first bracket assembly 1450 is movably connected with the guide rod assembly 1420.

[89] The guide rod assembly 1420 includes a stop piece 1421 and a guide rod 1422; one end

of the stop piece 1421 is used to weld or adhere the guide rod 1422; the other end of the stop piece 1421 is in planar fit with the pull rod seat assembly 1410 and is connected with the pull rod seat assembly 1410 through the screw group 1430 to form a whole; the first bracket assembly 1450 is mounted on the guide rod 1422; and the guide rod 1422 is of a double-sided opened guide slot structure. The guide slot of the guide rod 1422 limits a movement position of the first bracket assembly 1450, and the guide rod 1422 has a lock hole for preventing relative movement of the side wall panels during installation of the side wall panels. The guide rod 1422 is made of 304 stainless steel. The guide rod 1422 is provided with guide slots in both sides, so that the first side wall assembly 1100 and the second side wall assembly 1200 are limited by guide screws 1454 in mutual motions to prevent the first side wall assembly 1100 and the second side wall assembly 1200 from extending, retracting and swinging in extreme sizes during running of the vehicle body to cause the guide screws 1454 to fall off from the guide slots of the guide rod 1422, which causes separation of the first side wall and the second side wall and injures passengers' personal safety.

[90] The oscillating mechanism 1400 is located on the inner surfaces of the first side wall assembly 1100 and the second side wall assembly 1200 to realize spatial extension, retraction, and swing of the first side wall assembly 1100 and the second side wall assembly 1200. The pull rod seat assembly 1410 and the guide rod assembly 1420 are fixedly connected through the screw group 1430, so that rotation around the screw group 1430 serving as an axis in the Z-axis reference direction can be realized. The first bracket assembly 1450 is sleeved on the guide rod assembly 1420, and the guide rod assembly 1420 slides for guidance through a guide screw 1454 on the first bracket assembly 1450 to realize that the guide rod assembly 1420 horizontally moves in the X-axis reference direction. The first bracket assembly 1450 is fixed between the bracket 1460 and the pore plate 1440 through a fastening screw. At the same time, twisting in the Y-axis reference direction can be realized through bearings at two ends of the first bracket assembly 1450. The guide rod assembly 1420 includes a guide rod 1422. Spatial extension, retraction and swing of the first side wall assembly 1100 and the second side wall assembly 1200 are realized under the guide effect of the guide rod 1422. The guide rod assembly 1420 includes a guide rod 1422 suitable for horizontally moving in the X-axis reference direction, and a stop piece 1421 fixed at an end part of the guide rod 1422. The stop piece 1421 can be welded with

the guide rod 1422, or can be in screw connection or adhered to the guide rod 1422.

[91] In the present embodiment, the first bracket assembly 1450 includes a casting 1451, a sliding bearing 1452, a pipe 1453, and a guide screw 1454. The sliding bearing 1452 is sleeved in the pipe 1453, and the pipe 1453 penetrates through the casting 1451. The guide screw 1454 is mounted on the pipe 1453. The pipe 1453 has a first straight section 14531, a second straight section 14532, a shoulder part 14533, a notch 14534, and a threaded hole 14535. The notch 14534 is formed in an inner hole wall of the first straight section 14531. The first straight section 14531 and the second straight section 14532 run through each other. The second straight section 14532 and the first straight section 14531 are steplike. The shoulder part 14533 is located on the inner hole wall of the first straight section 14531. The threaded hole 14535 is located on the second straight section 14532 and penetrates through the second straight section 14532. The guide screw 1454 is mounted in the threaded hole 14535. A material of the sliding bearing 1452 is PA66, and a material of the pipe 1453 is 304 stainless steel.

[92] The sliding bearing 1452 is mounted in the first straight section 14531 of the pipe 1453. A first end of the sliding bearing 1452 resists against the shoulder part 14533 of the first straight section 14531 of the pipe 1453. The notch 14534 is formed from the outside of the first straight section 14531 of the pipe 1453 to the shoulder part 14533 of the pipe 1453. By the notch 14534, when it is necessary to remove the sliding bearing 1452 from the first straight section 14531 of the pipe 1453, it is convenient to push out the sliding bearing 1452 with an external tool, thus conveniently and quickly replacing the sliding bearing 1452. The first straight section 14531 of the pipe 1453 limits the first end of the sliding bearing 1452 by means of a structure provided with the notch 14534. The pipe 1453 can also play a role of stopping the second end of the sliding bearing 1452 through the guide screw 1454 mounted in the threaded hole 14535 formed in the second straight section 14532 while the guide screw 1454 guides and limits the guide rod 1422, which effectively improves the usability of the sliding bearing 1452. When the sliding bearing 1452 needs to be replaced, the sliding bearing 1452 in the pipe 1453 can be directly removed and replaced, which effectively improves the maintainability.

[93] As shown in FIG. 12 to FIG. 18, in the present embodiment, the rotating shaft assembly 1300 is a complete set used on a side wall panel of the vehicle body to adjust a flash seam generated during running of the vehicle body, and includes a rotating shaft fixing part 1310, a

rotating shaft swing part 1320 and a rotating shaft part 1330. The rotating shaft fixing part 1310 and the rotating shaft swing part 1320 are connected into a whole through the rotating shaft part 1330. The rotating shaft fixing part 1310 is connected with the side wall panel to form a whole in a riveting, adhesion or screw connection manner, and screw connection is preferred. The rotating shaft swing part 1320 is in screw connection to an external vehicle body. The rotating shaft fixing part 1310 and the rotating shaft swing part 1320 rotate and/or swing through the rotating shaft part 1330. In the present disclosure, pulling and compression positions of the side wall panel are compensated in the running process of the vehicle body by means of the rotation motion between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320, the swing between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320, combination of the rotation motion and the swing between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320, and the rotation motion between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320. The swing between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320 compensates a swing position of the side wall panel when a flash seam is generated in the running process of the vehicle body. Since the complete set of rotating shaft assembly 1300 is mounted on the side wall panel, the following combinations of several relative motions can be satisfied to enable the side wall panel to be always in a good use state during running of the vehicle body. There are 9 working states in total: 1. a working state where a first rotating shaft assembly pulls the side wall and a second rotating shaft assembly pulls the side wall; 2. a working state where the first rotating shaft assembly pulls the side wall and the second rotating shaft assembly compresses the side wall; 3. a working state where the first rotating shaft assembly pulls the side wall and the second rotating shaft assembly swings the side wall; 4. a working state where the first rotating shaft assembly compresses the side wall and the second rotating shaft assembly pulls the side wall; 5. the first rotating shaft assembly compresses the side wall and the second rotating shaft assembly compresses the side wall; 6. a working state where the first rotating shaft assembly compresses the side wall and the second rotating shaft assembly swings the side wall; 7. a working state where the first rotating shaft assembly swings the side wall and the second rotating shaft assembly pulls the side wall; 8. a working state where the first rotating shaft assembly swings the side wall and the second rotating shaft assembly compresses the side wall; and 9. a working state where the first rotating shaft

assembly swings the side wall and the second rotating shaft assembly swings the side wall. Therefore, the rotating shaft assembly 1300 of this structure can satisfy the combinations of the above 9 actions according to different actual running conditions of the vehicle body, thus realizing accurate control of the position and the motion of the side wall panel of the vehicle body, so that a control range is wider to ensure that the side wall panel is always located at a constant position. The rotating shaft assembly 1300 of the structure is simple in overall structure and convenient to manufacture, install, repair and maintain.

[94] In the present embodiment, when the vehicle body is in a static state, a first rotation angle of a spatial position between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320 is between 10° and 170° , and the relative motion between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320 has a relatively large free position. When the rotating shaft swing part 1320 is in screw connection with the external vehicle body, and the vehicle body runs normally, a second rotation angle of the spatial position between the rotating shaft fixing part 1310 and the rotating shaft swing part 1320 is between 40° and 135° . When the second rotation angle is less than 40° , a pull rod shaft assembly of the first side wall assembly on the side wall panel will interfere with an end surface of the vehicle body. When the second rotation angle is greater than 135° , a pin shaft assembly of the second side wall assembly on the side wall panel will have position interference with the couple frame in the gangway connected to the vehicle body.

[95] In the present embodiment, the rotating shaft swing part 1320 includes a rotating shaft plate pin shaft assembly 1321, a rotating shaft base plate 1322, a lining 1323, a rotating shaft plate assembly 1324 and a screw washer group 1325; the rotating shaft plate pin shaft assembly 1321 is welded with a pin shaft stud; the rotating shaft plate pin shaft assembly 1321 is inserted into a mounting hole of the rotating shaft base plate 1322 through the pin shaft stud; the lining 1323 is located outside the rotating shaft base plate 1322 and used to be sleeved on the pin shaft stud of the rotating shaft plate pin shaft assembly 1321; the rotating shaft plate assembly 1324 is sleeved on an outer side of the lining 1323; the screw washer group 1325 is used to stop the rotating shaft plate assembly 1324 to move in a central axial direction of the pin shaft stud on the rotating shaft plate pin shaft assembly 1321; and the screw washer group 1325 is in threaded fastening with the pin shaft stud on the rotating shaft plate pin shaft assembly 1321.

[96] In the present embodiment, when the rotating shaft swing part 1320 is at an original position, an included angle γ between the center of a waist-type hole in the rotating shaft plate assembly 1324 and the vertical center of the screw washer group 1325 is between 60° and 80° , and γ is preferably 75° . When the rotating shaft swing part 1320 is at a first working position, an included angle α between the center of the waist-type hole in the rotating shaft plate assembly 1324 and the vertical center of the screw washer group 1325 is between 60° and 80° , and α is preferably 75° . During running of the vehicle body, when the end surface of the vehicle moves, since the first side wall assembly 1100 is fixed on the vehicle body, and the second side wall assembly 1200 is fixed on the couple frame, the couple frame does not move when the vehicle body moves, which causes a gap between the first side wall assembly 1100 and the second side wall assembly 1200. This angle realizes position compensation between the first side wall assembly 1100 and the second side wall assembly 1200 in the side wall panel. When the rotating shaft swing part 1320 is at a second working position, an included angle β between the center of the waist-type hole in the rotating shaft plate assembly 1324 and the vertical center of the screw washer group 1325 is between 90° and 120° , preferably 105° . During running of the vehicle body, when the end surface of the vehicle moves, the first side wall assembly 1100 in the side wall panel drags the second side wall assembly 1200 in the side wall panel, causing a height difference and generating a gap. This angle realizes position compensation between the first side wall assembly 1100 and the second side wall assembly 1200 in the side wall.

[97] In the present embodiment, the rotating shaft plate assembly 1324 is combined with the waist-type hole in the rotating shaft plate assembly 1324 along the outer contour of the lining 1323, which realizes reciprocating swing of the rotating shaft plate assembly 1324 between the first working position and the second working position. The waist-type hole of the rotating shaft plate assembly 1324 is set to form an included angle δ from a horizontal center axis. The included angle δ is $10-18^\circ$, and preferably 14° . A distance between a circle center of a circle in the waist-type hole of the rotating shaft plate assembly 1324 close to an outer end and an edge part is C, $C=3-5$ times of the radius of the circle of the outer end of the waist-type hole.

[98] The rotating shaft base plate 1322 and the lining 1323 are made of engineering plastic. The screw washer group 1325 has a washer made of engineering plastic. The engineering plastic is PA66 enhanced nylon. The washer in the screw washer group 1325 is in contact with the

rotating shaft plate assembly 1324. Since the swing of the rotating shaft assembly is actually rotation of the notch of the rotating shaft plate assembly 1324 around the rotating shaft plate pin shaft assembly 1321, noise is avoided, and the wear resistance is improved. Friction between metal and metal turns into friction between metal and nylon, and the self-lubrication characteristic of the nylon is used to improve the life and the replaceability of the whole rotating shaft.

[99] As shown in FIG. 19, in the present embodiment, the anti-wear assembly 1500 includes an anti-wear component 1510 located on the inner surface of the first side wall assembly 1100 and a wear-resistant component 1520 located on the outer surface of the second side wall assembly 1200; the anti-wear component 1510 is made of a soft material such as PA66 nylon; and the wear-resistant component 1520 is made of a steel material such as carbon steel or stainless steel. By means of combining the soft anti-wear component 1510 and the hard wear-resistant component 1520, in the running process of the vehicle body, when the anti-wear component 1510 on the inner surface of the first side wall assembly 1100 and the wear-resistant component 1520 on the outer surface of the second side wall assembly 1200 extends, retracts, and swings between the first side wall assembly 1100 and the second side wall assembly 1200 according to the friction between them, thus avoiding the problem of a functional failure of the side wall due to long-term wear between the first side wall assembly 1100 and the second side wall assembly 1200.

[100] The wear-resistant component 1520 is wrapped on the outer surface of the second side wall assembly 1200; the anti-wear component 1510 is fixed on the inner surface of the first side wall assembly 1100 through a screw; and the wear-resistant component 1520 is fixed on the outer surface of the second side wall assembly 1200 through a rivet. In the running process, when the vehicle body passes through a non-straight road section, planar relative friction movement occurs between the two side wall assemblies due to mutual extension, retraction and swing between the first side wall assembly 1100 and the second side wall assembly 1200. Specifically, relative friction movement is generated between the inner surface of the first side wall assembly 1100 and the outer surface of the second side wall assembly 1200. In the existing art, the relative friction is relieved by only adhering an anti-wear bar between the two side wall assemblies. In this design, the nylon PA66 anti-wear component 1510 is accommodated in a

cavity in the first side wall assembly 1100, and the steel, such as carbon steel or stainless steel, wear-resistant component 1520 is disposed at a position on the outer surface of the second side wall assembly 1200 opposite to the anti-wear component 1510. The wear-resistant component 1520 can be entirely wrapped on the outer surface of the second side wall assembly 1200, or can be partially fixed or wrapped on the outer surface of the second side wall assembly 1200. The anti-wear assembly 1500 formed by combining two kinds of materials with different hardness can better realize reduction of wear between them, which greatly prolongs the service life of the side wall. The anti-wear component 1510 is fixed on the inner surface of the first side wall assembly 1100 through a screw, and the wear-resistant component 1520 is fixed on the outer surface of the second side wall assembly 1200 through a rivet. When one or two of the anti-wear component 1510 and the wear-resistant component 1520 is or are nearly worn out, only the anti-wear component 1510 and/or the wear-resistant component 1520 needs to be replaced, so that the repair and maintenance are simple and convenient. The anti-wear component 1510 and/or the wear-resistant component 1520 have high replaceability and can effectively protect the visible surface of the side wall. Meanwhile, by the structural design, it is not necessary to replace the whole side wall, so that the cost of re-manufacture of a side wall can be effectively saved.

[101] As shown in FIG. 20 and FIG. 21, in the present embodiment, the rotating shaft sleeve assembly 1600 includes a fixed seat 1610, a rotating shaft sleeve pin shaft 1620, a lockup block 1630 and a positioning pin 1640; the fixed seat 1610 of the rotating shaft sleeve assembly 1600 is mounted on the second side wall assembly 1200; the fixed seat 1610 and the rotating shaft sleeve pin shaft 1620 are integrated into one piece; the rotating shaft sleeve pin shaft 1620 of the rotating shaft sleeve assembly 1600 is put into the lockup block 1630 fixedly mounted on the connection plate 2100 in a plugged or unplugged manner; and the rotating shaft sleeve pin shaft 1620 and the lockup block 1630 have positioning holes having centers on the same axis and penetrate through each other, so that an unlocking mechanism 2200 can lock the rotating shaft sleeve pin shaft 1620 and the lockup block 1630 in a penetrating manner to realize integrated connection between the second side wall assembly 1200 and the connection plate 2100. The rotating shaft sleeve pin shaft 1620 can enter and leave out of the lockup block 1630. ~~Part of the~~ rotating shaft sleeve pin shaft 1620 of the rotating shaft sleeve assembly 1600 is connected and

positioned to the lockup block 1630 through the positioning pin 1640. When the second side wall assembly 1200 and the connection plate 2100 need to be locked, only positioning pins in a first positioning pin assembly 2210 and a second positioning pin assembly 2220 in the unlocking mechanism 2200 need to be inserted into positioning holes of the rotating shaft sleeve pin shaft 1620 and the lockup block 1630. When the second side wall assembly 1200 and the connection plate 2100 need to be removed, only the positioning pins, arranged in the positioning holes of the rotating shaft sleeve pin shaft 1620 and the lockup block 1630, in the first positioning pin assembly 2210 and the second positioning pin assembly 2220 in the unlocking mechanism 2200 are unplugged, and the second side wall assembly 1200 is pulled to be removed. This structural design is simple, which is convenient for lockup and removal of the second side wall assembly 1200, greatly improves the side wall repair and maintenance efficiency, and is also favorable for quickly overhauling the corrugated bellow assemblies inside the side walls.

[102] As shown in FIG. 22 to FIG. 25, in the present embodiment, a side wall unlocking mechanism 2000 includes the connection plate 2100, the unlocking mechanism 2200, and a handle assembly 2300. The rotating shaft sleeve assembly 1600 is a complete set, one end of which is mounted on the second side wall assembly 1200 and the other end of which is mounted on a first side of the connection plate 2100. The rotating shaft sleeve assembly 1600 realizes installation or removal of the second side wall assembly 1200 and the connection plate 2100 through the internal rotating shaft sleeve pin shaft 1620 and the lockup block 1630. The handle assembly 2300 is mounted on a second side of the connection plate 2100 to operate an end part of the unlocking mechanism 2200, so as to realize locking and unlocking operations of the unlocking mechanism 2200. The unlocking mechanism 2200 is integrated with the lockup block 1630 of the rotating shaft sleeve assembly 1600, and penetrates through the lockup block 1630. The end part of the unlocking mechanism 2200 penetrates through the connection plate 2100 and is exposed from the second side of the connection plate 2100. The end part of the unlocking mechanism 2200 resists against and contacts the handle assembly 2300 mounted on the second side of the connection plate 2100. The unlocking mechanism 2200 realizes separation or assembling of the rotating shaft sleeve pin shaft 1620 and the lockup block 1630 in the rotating shaft sleeve assembly 1600 to realize separation or assembling of the second side wall assembly 1200 and the connection plate 2100. The handle assembly 2300 is used to lift or reset the end

part of the unlocking mechanism 2200 to realize the separation or assembling operation for the rotating shaft sleeve assembly 1600 by the unlocking mechanism 2200. The rotating shaft sleeve assembly 1600 and the unlocking mechanism 2200 are located on the first side of the connection plate 2100. The handle assembly 2300 is located on the second side of the connection plate 2100. The unlocking mechanism 2200 is mounted on the rotating shaft sleeve assembly 1600 in a penetrating manner. The end part of the unlocking mechanism 2200 penetrates through the connection plate 2100 and is exposed from the second side of the connection plate 2100. The unlocking mechanism 2200 is fixed on the connection plate 2100 through a fastening screw located on the outer side of the connection plate 2100. This structure can solve the problem that the side wall cannot be opened because of breakage of the positioning pins in the first positioning pin assembly 2210 and the second positioning pin assembly 2220 in the unlocking mechanism 2200 in the existing art ~~can be solved~~. In this design, the side wall can be opened by removing the fastening screw located on the outer side of the connection plate 2100. After the positioning pins in the first positioning pin assembly 2210 and the second positioning pin assembly 2220 in the unlocking mechanism 2200 in the existing art are broken, repair and replacement can be only conducted by opening and removing the side wall, so that the operation difficulty is high, and the operation time is long.

[103] As shown in FIG. 26 and FIG. 27, in the present embodiment, the handle assembly 2300 includes a handle 2301, a longitudinal cushion block 2302 and a transverse cushion block 2303. The longitudinal cushion block 2302 and the transverse cushion block 2303 are respectively fixed on the second side of the connection plate 2100. The longitudinal cushion block 2302 is located on one side of the handle 2301 and used to mount the handle 2301, so that the handle 2301 can smoothly rotate on the longitudinal cushion block 2302. The transverse cushion block 2303 is located below the handle 2301 and used to limit the rotation position of the handle 2301. The transverse cushion block 2303 limits the rotation position of the handle 2301, so that the handle 2301 can only rotate towards a direction A along a rotating shaft located on the longitudinal cushion block 2302. In the whole unlocking process of the unlocking mechanism 2200 in the side wall unlocking mechanism 2000, the handle 2301 needs to be manually operated to realize unlocking of the unlocking mechanism 2200 and resetting of the handle 2301. Meanwhile, in another implementation mode, a reset spring can be mounted at a position close to

the tail of the handle 2301. When the handle 2301 rotates towards the direction A along the rotating shaft located on the longitudinal cushion block 2302 to unlock the unlocking mechanism 2200 in the side wall unlocking mechanism 2000, the rotation of the handle 2301 overcomes a reset force of the reset spring. After the unlocking is completed, the rotation force applied to the handle 2301 is manually removed, and the handle 2301 is automatically reset towards a direction X along the rotating shaft located on the longitudinal cushion block 2302 under the acting force of the reset spring. The handle 2301 is clung to the transverse cushion block 2303 to effectively avoid noise between them in the running process of the vehicle body. Meanwhile, such a handle assembly 2300 has a simple structural design and is convenient to install, use and operate, and angle ranges of collection and working positions of the handle 2301 are constant, so that the structure is fool-proofing.

[104] As shown in FIG. 28 and FIG. 29, the unlocking mechanism 2200 includes a first positioning pin assembly 2210, a second positioning pin assembly 2220, a seat body 2230, an elastic piece 2240, and a rod part 2250; the first positioning pin assembly 2210 and the seat body 2230 are integrated into one piece; the unlocking mechanism 2200 tightly connects the seat body 2230 with the lockup block 1630 in the rotating shaft sleeve assembly 1600 through a mounting screw 2280 penetrating through the seat body 2230; the first positioning pin assembly 2210 is mounted, by a first fastener 2260, at a first end of the rod part 2250 having a double-head thread; the second positioning pin assembly 2220 and the rod part 2250 are integrated into one piece; the elastic piece 2240 is located at a bottom of the second positioning pin assembly 2220 and is spatially spaced from the second positioning pin assembly 2220; the elastic piece 2240 is used to limit a motion travel of the unlocking mechanism 2200; and the elastic piece 2240 is limited by a second fastener 2270 and mounted at a second end of the rod part 2250 having the double-head thread. The positioning pins of the first positioning pin assembly 2210 and the second positioning pin assembly 2220 are respectively inserted into the run-through positioning holes of the lockup block 1630 and the rotating shaft sleeve pin shaft 1620 of the rotating shaft sleeve assembly 1600, so that the fixed seat 1610 mounted and fixed on the second side wall assembly 1200 and the lockup block 1630 mounted on the connection plate 2100 are connected into a whole, thus realizing mutual connection between the second side wall assembly 1200 and the connection plate 2100 to realize multi-point type positioned installation of the second side wall

assembly 1200 by the unlocking mechanism 2200.

[105] In the present embodiment, the unlocking mechanism 2200 is always mounted on the lockup block 1630 of the complete set of rotating shaft sleeve assembly 1600 located on the first side of the connection plate 2100. The rod part 2250 of the unlocking mechanism 2200 always penetrates through the lockup block 1630 of the complete set of rotating shaft sleeve assembly 1600, is located at the bottom of the lockup block 1630 positioned by the second positioning pin assembly 2220 at the farthest end of the first positioning pin assembly 2210, and has the elastic piece 2240 that limits lifting and resetting of the unlocking mechanism 2200. The elastic piece 2240 can be a spring, an elastic plastic piece, and an elastic rubber piece. The elastic piece 2240 is sleeved on the rod part 2250. The second fastener 2270 located at the bottom of the elastic piece 2240 and mounted on the rod part 2250 is used to adjust the elastic force of the elastic piece 2240. The first positioning pin assembly 2210 is mounted on the seat body 2230. The seat body 2230 is in fastened connection with the lockup block 1630 of the rotating shaft sleeve assembly 1600 through a mounting screw 2280 to realize that the positioning pin of the first positioning pin assembly 2210 accurately position the lockup block 1630. The second positioning pin assembly 2220 and the first positioning pin assembly 2210 are simultaneously mounted on the rod part 2250 to realize linkage of the two positioning pin assemblies. An original state of the unlocking mechanism 2200 is that: the positioning pin of the first positioning pin assembly 2210 of the unlocking mechanism 2200 and the positioning pin of the second positioning pin assembly 2220 are respectively inserted into a positioning pin hole of the lockup block 1630 of the rotating shaft sleeve assembly 1600 to mount and position the lockup block 1630.

[106] When the side wall needs to be installed: the handle 2301 of the handle assembly 2300 located outside the connection plate 2100 is pulled. The handle 2301 of the handle assembly 2300 rotates towards an anticlockwise direction of A along the rotating shaft mounted on the longitudinal cushion block 2302 on the connection plate 2100. The handle 2301 of the handle assembly 2300 touches the end part of the first positioning pin assembly 2210 of the unlocking mechanism 2200 penetrating through the connection plate 2100 to lift the unlocking mechanism 2200. The positioning pin of the first positioning pin assembly 2210 of the unlocking mechanism 2200 and the positioning pin of the second positioning pin assembly 2220 are respectively

separated from the lockup block 1630 of the rotating shaft sleeve assembly 1600. The elastic piece 2240 located at the bottom end of the rod part 2250 limits a lifting height of the unlocking mechanism 2200 and the rotation angle of the handle 2301. The rotating shaft sleeve pin shaft 1620 of the rotating shaft sleeve assembly 1600 mounted on the second side wall assembly 1200 is inserted into the lockup block 1630 mounted on the connection plate 2100. The handle 2301 of the handle assembly 2300 located outside the connection plate 2100 is pulled. The handle 2301 of the handle assembly 2300 rotates towards a clockwise direction of A along the rotating shaft on the longitudinal cushion block 2302 mounted on the connection plate 2100, and the end part of the first positioning pin assembly 2210 penetrating through the connection plate 2100 is reset along with the rotation of the handle 2301. The positioning pin of the first positioning pin assembly 2210 of the unlocking mechanism 2200 and the positioning pin of the second positioning pin assembly 2220 are respectively simultaneously inserted into the run-through positioning holes of the lockup block 1630 and the rotating shaft sleeve pin shaft 1620 of the rotating shaft sleeve assembly 1600. When the handle 2301 rotates to and resists against a transverse cushion block 2303 mounted outside the connection plate 2100, the lockup block 1630 is completely positioned by the positioning pin of the first positioning pin assembly 2210 and the positioning pin of the second positioning pin assembly 2220. The second side wall assembly 1200 and the connection plate 2100 are mounted and connected into one piece. When the assembled side wall needs to be removed, the above actions need to be reversed, and descriptions thereof are omitted here.

[107] As shown in FIG. 30 and FIG. 31, in the present embodiment, the locking lever mechanism 3000 is used to connect and lock the vehicle body in the rail transit vehicle, and includes a lock bar 3100, a locking lever 3200, a locking lever pin shaft 3300 and a corner connection assembly 3400. The lock bar 3100 is connected with a first end 3401 of the corner connection assembly 3400 through the locking lever pin shaft 3300, and the locking lever 3200 is connected with a second end 3402 of the corner connection assembly 3400 through the locking lever pin shaft 3300. The corner connection assembly 3400 is a multi-section type drive piece structure, and specifically, a three-section type is preferred. The lock bar 3100 pulls the first end 3401 of the corner connection assembly 3400, so that the corner connection assembly 3400 is fitted to a corner curved section of a couple frame accommodating slot of the vehicle body, and

does reciprocating motion in a bending direction along the corner curved section of the couple frame accommodating slot. The lock bar 3100 does reciprocating linear motion in the couple frame accommodating slot in a vertical direction, i.e., a Y1/Y2 direction. The second end 3402 of the corner connection assembly 3400 drives the locking lever 3200 to do reciprocating linear motion in the couple frame accommodating slot in a horizontal direction, i.e., a Z1/Z2 direction. The center axis of the lock bar 3100 and the center axis of the locking lever 3200 are always approximately perpendicular.

[108] As shown in FIG. 38, in the present embodiment, the corner connection assembly 3400 includes a first end 3401, a second end 3402, a roller 3403 and a connection rod 3404. The connection rod 3404 is paired. The first end 3401 and the second end 3402 are respectively located on two sides of the connection rod 3404; the roller 3403 is mounted in the connection rod 3404 in a rolling manner; and the lock bar 3100 drags, through the corner connection assembly 3400, the locking lever 3200 to move synchronously to be integrally connected with the connection rod 3404 respectively in a swayable manner. The connection rod 3404 is paired, between which a roller group is mounted and fixed. The radius of the connection rod 3404 is consistent with the radius of the corner curved section of the couple frame accommodating slot. The roller 3403 is used to roll over in the couple frame accommodating slot to drive, through the first end 3401 and the second end 3402 of the corner connection assembly 3400, the lock bar 3100 and the locking lever 3200 to do reciprocating linear motion in the couple frame accommodating slot. The first end 3401 of the corner connection assembly 3400 is connected with the lock bar 3100 through the locking lever pin shaft 3300, and the second end 3402 of the corner connection assembly 3400 is connected with the locking lever 3200 through the locking lever pin shaft 3300; and the lock bar 3100 drags, through the corner connection assembly 3400, the locking lever 3200 to move. The corner connection assembly 3400 is of a three-section type structure, and the first end 3401 and the second end 3402 of the corner connection assembly 3400 can swing, respectively. The center axis of the lock bar 3100 and the center axis of the locking lever 3200 are always approximately perpendicular.

[109] As shown in FIG. 32 to FIG. 37, in the present embodiment, when the locking lever mechanism 3000 moves from a first working position to a third working position, an included angle α between a center line of the first end 3401 of the corner connection assembly 3400 and

the center axis of the lock bar 3100 is equal to $3.3-15.3^{\circ}$. When the locking lever mechanism 3000 moves from the first working position to the third working position, an included angle β between a center line of the second end 3402 of the corner connection assembly 3400 and the center axis of the locking lever 3200 is equal to $5.2-18.8^{\circ}$.

[110] Definition: at the first working position, an included angle between a projection of the center line of the first end 3401 of the corner connection assembly 3400 and a projection of the center axis of the lock bar 3100 on a plane is α_1 ; at the first working position, an included angle between a projection of the center line of the second end 3402 of the corner connection assembly 3400 and a projection of the center axis of the locking lever 3200 on the plane is β_1 ; at the second working position, an included angle between the projection of the center line of the first end 3401 of the corner connection assembly 3400 and the projection of the center axis of the lock bar 3100 on the plane is α_2 ; at the second working position, an included angle between the projection of the center line of the second end 3402 of the corner connection assembly 3400 and the projection of the center axis of the locking lever 3200 on the plane is β_2 ; at the third working position, an included angle between the projection of the center line of the first end 3401 of the corner connection assembly 3400 and the projection of the center axis of the lock bar 3100 on the plane is α_3 ; and at the third working position, an included angle between the projection of the center line of the second end 3402 of the corner connection assembly 3400 and the projection of the center axis of the locking lever 3200 on the plane is β_3 .

[111] The lock bar 3100 in the locking lever mechanism 3000 does reciprocating motion in the Y1/Y2 direction, and the corner connection assembly 3400 dragged by the lock bar 3100 moves from the first working position to the third working position. An included angle between the center line of the first end 3401 of the corner connection assembly 3400 and the center axis of the lock bar 3100 is $\alpha=3.3-15.3^{\circ}$. When α is greater than 15.3° , the vehicle body is in an uncoupled state, and the locking lever pin shaft 3300 reaches an extreme position, so that the whole locking lever mechanism 3000 will stop. When α is less than 3.3° , the vehicle body is in a coupled state, the locking lever mechanism 3000 will stop moving, and the handle is locked in a self-locked state.

[112] The locking lever 3200 in the locking lever mechanism 3000 does reciprocating motion in a Z1/Z2 direction, and is dragged by the corner connection assembly 3400 to move from the

first working position to the third working position. An included angle between the center line of the second end 3402 of the corner connection assembly 3400 and the center axis of the locking lever 3200 is $\beta=5.2-18.8^\circ$. When β is greater than 18.8° , the vehicle body is in a coupled state, and the locking lever pin shaft 3300 reaches an extreme position, so that the whole locking lever mechanism 3000 will be stopped. When β is less than 5.2° , the vehicle body is in an uncoupled state, the locking lever mechanism 3000 will stop moving, and the handle is locked in a self-locked state.

[113] When the vehicle body needs to be coupled, the locking lever mechanism 3000 is at the first working position, i.e., a locked position, α_1 ranges from 2.5° to 4.5° , preferably 3.3° ; β_1 ranges from 17° to 22° , preferably 18.8° . When the locking lever mechanism 3000 is at a second working position, i.e., an empty position, α_2 ranges from 6° to 9° , preferably 7.6° , and β_2 ranges from 9° to 13° , preferably 11° . When the vehicle body needs to be uncoupled, the locking lever mechanism 3000 is at the third working position, i.e., an unlocked position, α_3 ranges from 13° to 17° , preferably 15.3° ; β_3 ranges from 4° to 7° , preferably 5.2° . When the locking lever mechanism 3000 moves from the first working position to the third working position, the corner connection assembly 3400 always moves in a tangential direction of an arc of the corner curved section of the couple frame accommodating slot. At least one roller in the roller group of the corner connection assembly 3400 is always in linear contact with the corner curved section of the couple frame accommodating slot in the couple frame assembly.

[114] The present invention has the beneficial effects that:

[115] For the first side wall part: 1. An opened notch in the pipe in the oscillating mechanism limits the sliding bearing, and a guide screw is mounted in an opened threaded hole to stop the sliding bearing, which effectively improves the usability of the sliding bearing. During replacement of the sliding bearing, the sliding bearing in the pipe can be directly removed and replaced, which effectively improves the maintainability. The guide rod is provided with slots in both sides to prevent the side walls from extending, retracting and swinging in extreme sizes to cause the guide screw to fall off from the guide slot of the guide rod, which causes separation of the side walls and injures passengers' personal safety. 2. By means of the adoption of the rotating shaft plate assembly having the waist-type hole, the rotating shaft plate assembly swings between the rotating shaft swing parts, and the problem of a flash seam generated by the side

wall assemblies of two pieces of side wall panels in a motion process of the vehicle body is compensated by self structures. The design of the waist-type hole of the rotating shaft plate can ensure that the standing space of passengers is not compressed when the side walls tilt during turning, which is favorable for improving the experience comfort of the passengers. 3. The anti-wear assembly formed by combining two kinds of materials with different hardness can better realize reduction of wear between the first side wall assembly and the second side wall assembly, which greatly prolongs the service lives of the side walls. When one or two of the anti-wear component and the wear-resistant component is or are nearly worn out, only the anti-wear component and/or the wear-resistant component is replaced, so that repair and maintenance are easy and convenient, and visible surfaces of the side walls can be effectively protected. Meanwhile, by the structural design, the side wall does not need to be replaced in whole, which can effectively save the production and manufacture cost. 4. The rotating shaft sleeve assembly is simple in structural design, which is convenient for lockup and removal of the second side wall assembly, greatly improves the side wall repair and maintenance efficiency, and is also favorable for quickly overhauling the corrugated bellow assemblies inside the side walls.

[116] For the unlocking mechanism: the unlocking mechanism is simple in structure and convenient to install, repair and maintain, and the potential safety hazard caused by the fact that the user puts the hands into the side walls to install and remove the second side wall assembly in the existing art is solved. Meanwhile, during manual installation and removal of the second side wall assembly, installation and removal can be realized by only pulling the handle of the handle assembly located outside the connection plate, so that the operation is simple and convenient and high in safety. This structural design is simple, which is convenient for lockup and removal of the second side wall assembly, greatly improves the side wall repair and maintenance efficiency, and is also favorable for quickly overhauling the corrugated bellow assemblies inside the side walls.

[117] For the locking lever mechanism: the locking lever mechanism realizes traction from the lock bar to the locking lever by using the corner connection assembly of the three-section type structure; the first end and the second end of the corner connection assembly can both drag the lock bar and the locking lever respectively, and a traction angle is adjusted. By this structure, the adjustable angle range of the corner connection assembly is enlarged. The corner connection

assembly in the locking lever mechanism moves in a manner of being fitted to the corner curved section of the couple frame accommodating slot. Such a structural design can narrow the accommodating slot formed in the couple frame, so that the volume of the couple frame can be reduced to reduce the overall weight of the couple frame on the premise of satisfying a locking function of the locking lever mechanism. Furthermore, the first end and the second end of the corner connection assembly both have an angle adjustment function, the center axis of the lock bar and the center axis of the locking lever can be always kept spatially approximately perpendicular, and the corner connection assembly always moves in the tangential direction of the arc of the couple curved section of the couple frame accommodating slot, so that the locking function of the locking lever mechanism is more stable, which is favorable for prolonging the service life of the locking mechanism.

[118] On the basis of the above-mentioned embodiments, the present embodiment takes the above-mentioned ideal embodiments according to the present disclosure as inspiration. Through the above-mentioned description, relevant personnel can make various changes and modifications without departing from the scope of the technical idea of the present disclosure. The technical scope of the present disclosure is not limited to the content of the specification, and must be determined according to the scope of the claims.

Claims

1. A gangway, comprising a first side wall (1000), a side wall unlocking mechanism (2000), and a locking lever mechanism (3000), wherein the first side wall (1000) is used in the gangway to cover a corrugated bellow assembly in the gangway and overhaul the gangway; the side wall unlocking mechanism (2000) is connected to the first side wall (1000) and used to install and remove the first side wall (1000) in the gangway; and the locking lever mechanism (3000) is located at an end part of an outer side of the gangway and used to realize connection between the gangway and an external coupling assembly or coupling mechanism;

characterized in that

the side wall unlocking mechanism (2000) further comprises:

a connection plate (2100), an unlocking mechanism (2200), and a handle assembly (2300);

the handle assembly (2300) is mounted on a second side of the connection plate (2100); and

the handle assembly (2300) unlocks the unlocking mechanism (2200);

further characterized in that

the unlocking mechanism (2200) includes an end part that penetrates through the connection plate (2100) and is exposed from the second side of the connection plate (2100), and at the same time, the unlocking mechanism (2200) penetrates through the rotating shaft sleeve assembly (1600) on the first side wall (1000);

the end part of the unlocking mechanism (2200) resists against and contacts the handle assembly (2300) mounted on the second side of the connection plate (2100); and

the unlocking mechanism (2200) is fixed on the connection plate (2100) through a fastening screw located on the outer side of the connection plate (2100).

2. The gangway according to claim 1, wherein the first side wall (1000) comprises a first side wall assembly (1100), a second side wall assembly (1200), a rotating shaft assembly (1300), an oscillating mechanism (1400), an anti-wear assembly (1500), and a rotating shaft sleeve

assembly (1600); the first side wall assembly (1100) is connected with the vehicle body in a swayable and/or rotatable manner through the rotating shaft assembly (1300); the second side wall assembly (1200) is detachably connected with the vehicle body through the rotating shaft sleeve assembly (1600); the first side wall assembly (1100) is located outside the second side wall assembly (1200); and an inner surface of the first side wall assembly (1100) and an outer surface of the second side wall assembly (1200) are approximately parallel to each other and have a constant spatial clearance.

3. The gangway according to claim 2, wherein the anti-wear assembly (1500) and the oscillating mechanism (1400) are respectively mounted on the first side wall assembly (1100) and the second side wall assembly (1200); the anti-wear assembly (1500) is located between the inner surface of the first side wall assembly (1100) and the outer surface of the second side wall assembly (1200); the oscillating mechanism (1400) is located on the inner surfaces of the first side wall assembly (1100) and the second side wall assembly (1200); the first side wall assembly (1100) and the second side wall assembly (1200) extend and retract and/or swing through structures combined with the anti-wear assembly (1500) and the oscillating mechanism (1400); one end of the rotating shaft assembly (1300) is mounted on the first side wall assembly (1100), and the other end is mounted on the vehicle body; and one end of the rotating shaft sleeve assembly (1600) is mounted on the second side wall assembly (1200), and the other end is mounted on a couple frame of the gangway.

4. The gangway according to claim 3, wherein the oscillating mechanism (1400) comprises a pull rod seat assembly (1410), a guide rod assembly (1420), a screw group (1430), a pore plate (1440), a first bracket assembly (1450) and a bracket (1460); the pull rod seat assembly (1410) and the guide rod assembly (1420) are connected into a whole through the screw group (1430); the first bracket assembly (1450) is mounted on the guide rod assembly (1420); the bracket (1460) and the pore plate (1440) are respectively mounted on two sides of the first bracket assembly (1450), and are tightly connected with side wall panels through screws; the first bracket assembly (1450) is connected with the bracket (1460) and the pore plate (1440) in a swayable manner; and the first bracket assembly (1450) is movably connected with the guide rod

assembly (1420).

5. The gangway according to claim 4, wherein the guide rod assembly (1420) comprises a stop piece (1421) and a guide rod (1422); one end of the stop piece (1421) is used to weld or adhere the guide rod (1422); the other end of the stop piece (1421) is in planar fit with the pull rod seat assembly (1410) and is connected with the pull rod seat assembly (1410) through the screw group (1430) to form a whole; the first bracket assembly (1450) is mounted on the guide rod (1422); and the guide rod (1422) is of a double-sided opened guide slot structure.

6. The gangway according to claim 4, wherein the first bracket assembly (1450) comprises a casting (1451), a sliding bearing (1452), a pipe (1453) and a guide screw (1454); the sliding bearing (1452) is sleeved in the pipe (1453); the pipe (1453) penetrates through the casting (1451); the guide screw (1454) is mounted on the pipe (1453); and the pipe (1453) has a first straight section (14531), a second straight section (14532), a shoulder part (14533), a notch (14534) and a threaded hole (14535).

7. The gangway according to claim 2, wherein the rotating shaft assembly (1300) comprises a rotating shaft fixing part (1310), a rotating shaft swing part (1320) and a rotating shaft part (1330); the rotating shaft fixing part (1310) and the rotating shaft swing part (1320) are connected into a whole through the rotating shaft part (1330); the rotating shaft fixing part (1310) is fixedly connected to the side wall panel; the rotating shaft swing part (1320) is connected with an external vehicle body; and the rotating shaft fixing part (1310) and the rotating shaft swing part (1320) rotate and/or swing through the rotating shaft part (1330).

8. The gangway according to claim 7, wherein the rotating shaft swing part (1320) comprises a rotating shaft plate pin shaft assembly (1321), a rotating shaft base plate (1322), a lining (1323), a rotating shaft plate assembly (1324) and a screw washer group (1325); the rotating shaft plate pin shaft assembly (1321) is welded with a pin shaft stud; the rotating shaft plate pin shaft assembly (1321) is inserted into a mounting hole of the rotating shaft base plate (1322) through the pin shaft stud, the lining (1323) is located outside the rotating shaft base plate (1322) and used to be sleeved on the pin shaft stud of the rotating shaft plate pin shaft assembly (1321); the

rotating shaft plate assembly (1324) is sleeved on an outer side of the lining (1323); the screw washer group (1325) is used to stop the rotating shaft plate assembly (1324) to move in a central axial direction of the pin shaft stud on the rotating shaft plate pin shaft assembly (1321); and the screw washer group (1325) is in threaded fastening with the pin shaft stud on the rotating shaft plate pin shaft assembly (1321).

9. The gangway according to claim 8, wherein a waist-type hole of the rotating shaft plate assembly (1324) is set to have an included angle δ with a horizontal center axis of the rotating shaft plate assembly (1324), and the included angle δ is 10-18°; and a distance between a circle center of a circle in the waist-type hole of the rotating shaft plate assembly (1324) close to an outer end and an edge part is C, C=3-5 times of the radius of the circle of the outer end of the waist-type hole.

10. The gangway according to claim 8, wherein an included angle γ between the center of the waist-type hole in the rotating shaft plate assembly (1324) and a vertical center of the screw washer group (1325) is 60-80°; an included angle α between the center of the waist-type hole in the rotating shaft plate assembly (1324) and the vertical center of the screw washer group (1325) is 60-80°; and an included angle β between the center of the waist-type hole in the rotating shaft plate assembly (1324) and the vertical center of the screw washer group (1325) is 90-120°.

11. The gangway according to claim 2, wherein the anti-wear assembly (1500) comprises an anti-wear component (1510) located on the inner surface of the first side wall assembly (1100) and a wear-resistant component (1520) located on the outer surface of the second side wall assembly (1200); the anti-wear component (1510) is made of a soft material; the wear-resistant component (1520) is made of a steel material; the wear-resistant component (1520) is wrapped on the outer surface of the second side wall assembly (1200); the anti-wear component (1510) is fixed on the inner surface of the first side wall assembly (1100) through a screw; and the wear-resistant component (1520) is fixed on the outer surface of the second side wall assembly (1200) through a rivet.

12. The gangway according to claim 2, wherein the rotating shaft sleeve assembly (1600)

comprises a fixed seat (1610), a rotating shaft sleeve pin shaft (1620), a lockup block (1630) and a positioning pin (1640); the fixed seat (1610) of the rotating shaft sleeve assembly (1600) is mounted on the second side wall assembly (1200); the fixed seat (1610) and the rotating shaft sleeve pin shaft (1620) are integrated into one piece; the rotating shaft sleeve pin shaft (1620) of the rotating shaft sleeve assembly (1600) is inserted into the lockup block (1630) fixedly mounted on the side wall unlocking mechanism (2000) through a fastener; the rotating shaft sleeve pin shaft (1620) and the lockup block (1630) have positioning holes having centers on the same axis and penetrate through each other; and part of the rotating shaft sleeve pin shaft (1620) of the rotating shaft sleeve assembly (1600) and the lockup block (1630) are threaded into the positioning holes through the positioning pin (1640) for connection and positioning.

13. The gangway according to claim 1, wherein the handle assembly (2300) comprises a handle (2301), a longitudinal cushion block (2302) and a transverse cushion block (2303); the longitudinal cushion block (2302) and the transverse cushion block (2303) are respectively fixed on the second side of the connection plate (2100); the longitudinal cushion block (2302) is located on one side of the handle (2301); and the transverse cushion block (2303) is located below the handle (2301) and used to limit a rotation position of the handle (2301).

14. The gangway according to claim 1, wherein the unlocking mechanism (2200) comprises a first positioning pin assembly (2210), a second positioning pin assembly (2220), a seat body (2230), an elastic piece (2240), and a rod part (2250); the first positioning pin assembly (2210) and the seat body (2230) are mounted into a whole; the unlocking mechanism (2200) tightly connects the seat body (2230) with the lockup block (1630) in the rotating shaft sleeve assembly (1600) on the first side wall (1000) through a mounting screw (2280) penetrating through the seat body (2230); the first positioning pin assembly (2210) is mounted, by a first fastener (2260), at a first end of the rod part (2250) having a double-head thread; the second positioning pin assembly (2220) and the rod part (2250) are mounted into a whole; the elastic piece (2240) is located at a bottom of the second positioning pin assembly (2220) and is spatially spaced from the second positioning pin assembly (2220); and the elastic piece (2240) is limited by a second fastener (2270) and mounted at a second end of the rod part (2250) having the double-head

thread.

15. The gangway according to claim 1, wherein the locking lever mechanism (3000) is used to connect and lock the vehicle body in a rail transit vehicle, and comprises a lock bar (3100), a locking lever (3200), a locking lever pin shaft (3300) and a corner connection assembly (3400); the lock bar (3100) and the locking lever (3200) are both connected with the corner connection assembly (3400) through the locking lever pin shaft (3300); the corner connection assembly (3400) is of a multi-section drive piece structure; and a center axis of the lock bar (3100) and a center axis of the locking lever (3200) are always approximately perpendicular.

16. The gangway according to claim 15, wherein the corner connection assembly (3400) comprises a first end (3401), a second end (3402), a roller (3403) and a connection rod (3404); the connection rod (3404) is paired; the first end (3401) and the second end (3402) are respectively located on two sides of the connection rod (3404); the roller (3403) is mounted in the connection rod (3404) in a rolling manner; the lock bar (3100) drags, through the corner connection assembly (3400), the locking lever (3200) to move synchronously; the first end (3401) of the corner connection assembly (3400) is connected with the lock bar (3100) through the locking lever pin shaft (3300); the second end (3402) of the corner connection assembly (3400) is connected with the locking lever (3200) through the locking lever pin shaft (3300); and the lock bar (3100) drags, through the corner connection assembly (3400), the locking lever (3200) to move.

17. The gangway according to claim 16, wherein the corner connection assembly (3400) is of a three-section type structure; and the first end (3401) and the second end (3402) of the corner connection assembly (3400) swing respectively.

18. The gangway according to claim 17, wherein when the locking lever mechanism (3000) moves from a first working position to a third working position, an included angle α between a center line of the first end (3401) of the corner connection assembly (3400) and the center axis of the lock bar (3100) is equal to 3.3-15.3°; when the locking lever mechanism (3000) moves from the first working position to the third working position, an included angle β between a center line

of the second end (3402) of the corner connection assembly (3400) and the center axis of the locking lever (3200) is equal to 5.2-18.8°; when the locking lever mechanism (3000) moves from the first working position to the third working position, the corner connection assembly (3400) always moves in a tangential direction of an arc of an corner curved section of the couple frame accommodating slot in the couple frame assembly; at least one roller in a roller group of the corner connection assembly (3400) is always in linear contact with the corner curved section of the connection frame accommodating slot in the couple frame assembly.

19. A gangway coupling device having a gangway, comprising the first gangway according to any one of claims 1 to 18, and further comprising a second gangway, wherein latch hook of a coupling part of the first gangway is connected with a lock plate of a coupling part of the second gangway; a latch hook of the coupling part of the second gangway is connected with a lock plate of the coupling part of the first gangway; the first gangway is fixedly connected to a first vehicle body; the second gangway is fixedly connected to a second vehicle body; the first gangway includes a first corrugated bellow assembly and a first side wall; and the second gangway includes a second corrugated bellow assembly and a second side wall.