

CARRIAGE FRAME AND SPREADER OF SUSPENDED TRANSFER CARRIAGE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Chinese patent application No. 202111369153.X, filed on November 18, 2021 and entitled "CARRIAGE FRAME AND SPREADER OF SUSPENDED TRANSFER CARRIAGE", the disclosure of which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to a carriage frame and a spreader of suspended transfer carriage, and belongs to the technical field of logistics transportation.

BACKGROUND

[0003] At present, the loading and unloading equipment for road-rail intermodal transport of containers mainly includes Rail mounted gantry cranes, Rubber-tyred gantry cranes, and reach stackers and so on. However, for large container terminals with a long distance between the terminal and a stack yard, traditional transfer trucks, AGV and so on are not efficient due to a low degree of automation, thus easy to cause traffic congestion.

[0004] In order to solve the above-mentioned technical problems, a novel transit infrastructure for multimodal transport of containers has emerged in the prior art—an intelligent aerial rail collection and distribution system for multimodal transport. With the help of an aerial rail system and suspended transfer carriages for automatic loading, unloading and transportation, the intelligent aerial rail collection and distribution system realizes an interconnection among various container collection and distribution centers, integrates logistics systems such as railways, water transportation, highways and aviation, and fully achieves the requirement of “zero-distance transfer, seamless link-up”.

[0005] When the aerial rail transportation devices are utilized to transport containers over long distance, the existing spreaders are insufficient in the stability and thus prone to damage, and the containers may also be at risk of falling, thereby causing greater safety hazards.

SUMMARY

[0006] Aiming at the problems existing in the prior art, the present disclosure provides a carriage frame and a spreader of suspended transfer carriage, which at least partially solve the problem that the existing spreaders are insufficient in the stability and are prone to damage, and the containers may also be at risk of falling.

[0007] In one aspect of the present disclosure, a carriage frame is provided, which may include: an upper carriage frame; a lower carriage frame, comprising a lower longitudinal beam and two telescopic beams, where the two telescopic beams are disposed oppositely on both sides in a longitudinal direction of the lower longitudinal beam, and can be separated from or close to the lower longitudinal beam in the longitudinal direction through a telescopic assembly respectively; and telescopic locking mechanisms, comprising two telescopic locking mechanisms which are both disposed on the lower carriage frame, and where the two telescopic beams and the lower longitudinal beam are respectively locked in place by operating the two telescopic locking mechanisms.

[0008] In another aspect of the present disclosure, a spreader of suspended transfer carriage is provided, which may include the aforementioned carriage frame.

BRIEF DESCRIPTION OF DRAWINGS

[0009] FIG. 1 shows a schematic structural diagram of a spreader of suspended transfer carriage according to some embodiments of the present disclosure;

[0010] FIG. 2 shows a front view of a lower carriage frame in FIG. 1;

[0011] FIG. 3 shows a top view of the lower carriage frame in FIG. 2;

[0012] FIG. 4 shows a left view of the lower carriage frame in FIG. 2;

[0013] FIG. 5 shows an enlarged cross-sectional view of portion A in FIG. 3;

[0014] FIG. 6 shows an enlarged cross-sectional view of portion B in FIG. 3;

[0015] FIG. 7 shows a schematic structural diagram of a pulley seat in FIG. 2;

[0016] FIG. 8 shows a schematic structural diagram of a locking device in FIG. 2;

[0017] FIG. 9 shows a partial schematic structural diagram of the lower carriage frame in FIG. 2; and

[0018] FIG. 10 shows a schematic structural diagram of an anti-fall device in FIG. 4.

[0019] Illustration of reference signs: 1, bogie; 2, upper carriage frame; 3, lower carriage frame; 310, lower longitudinal beam; 321, first driving member; 322, telescopic push rod; 323, overhanging beam; 330, end beam; 341, second stopper; 342, third stopper; 343, reinforcement plate; 344, bolt; 4, telescopic locking mechanism; 410, second driving member; 420, first connecting rod; 430, second connecting rod; 440, slide block; 450, coulisse member; 460, first stopper; 470, limit detector; 5, lifting anti-sway assembly; 510, pulley seat; 511, pin roll; 512, first movable pulley; 513, second movable pulley; 514, third movable pulley; 520, lifting wire rope; 530, anti-sway wire rope; 6, locking device; 611, third driving member; 612, connecting member; 613, third connecting rod; 614, fourth connecting rod; 615, fifth connecting rod; 620, rotating handle; 630, lock head; 640, output shaft; 650, support seat; 660, manual driving rod; 7 anti-fall device; 710 fixed support seat; 711, fixing plate; 720, swing arm; 721, pin rod; 730, fourth driving member; 740, hook arm; 750, locking plate; 760, latch; 770, fifth driving member; 8 guiding device; 910, corner piece.

DESCRIPTION OF EMBODIMENTS

[0020] FIG. 1 is a structural schematic diagram of a spreader of suspended transfer carriage of the present disclosure. As shown in FIG. 1, the spreader may include a carriage frame and a bogie 1. Each carriage frame is equipped with at least two bogies 1, and the bogies 1 can travel on an aerial rail, and in turn drive the entire spreader to travel on the aerial rail. The bogie 1 may be a non-powered bogie, which can reduce the weight of the transfer carriage without affecting the travelling of the carriage frame compared with the bogie with a driving function.

[0021] As shown in FIG. 1, the carriage frame may include an upper carriage frame 2 and a lower carriage frame 3. When the carriage frame travels on the aerial rail, the upper carriage frame 2 and the lower carriage frame 3 can be relatively locked. When a container needs to be lifted, the upper carriage frame 2 and the lower carriage frame 3 can be operated to be separated from each other.

[0022] FIG. 2 is a front view of the lower carriage frame in FIG. 1. FIG. 3 shows a top view of the lower carriage frame in FIG. 2, and FIG. 4 shows a left view of the lower carriage frame in FIG. 2. Referring to FIG. 1 to FIG. 4, the lower carriage frame 3 is located directly below

the upper carriage frame 2, and may include a lower longitudinal beam 310 and two telescopic beams. The two telescopic beams are disposed opposite to each other on both sides in a longitudinal direction of the lower longitudinal beam 310. The two telescopic beams can be separated from or close to each other in the longitudinal direction. When it is required to dispatch and transport containers with different dimensions, the lower carriage frame 3 can be operated to separate the two telescopic beams in the longitudinal direction, so that a dimension between ends of the two telescopic beams can be adapted to a length of the container, and in turn the containers with different dimensions can be loaded and unloaded.

[0023] In some embodiments, the two telescopic beams and the lower longitudinal beam 310 can be separated from or close to one another in the longitudinal direction through a telescopic assembly, and each telescopic beam may include one end beam 330 and two overhanging beams 323 that are disposed corresponding to the end beam 330. The end beam 330 is disposed in a lateral direction, and the overhanging beam 323 is disposed in the longitudinal direction. One end of the overhanging beam 323 is connected to the corresponding end beam 330, and another end of the overhanging beam 323 is movably disposed in the lower longitudinal beam 310 along the longitudinal direction. The telescopic assembly may include a first driving member 321, a telescopic push rod 322, and the overhanging beam 323. In some embodiments, two first driving members 321 may be disposed at an interval along the lateral direction within the lower longitudinal beam 310, and an output end of the first driving member 321 can move in the longitudinal direction, and each end beam 330 can be connected to the output end of the first driving member 321 through the telescopic push rod 322. When the dimension between the two end beams 330 needs to be adjusted, the telescopic push rod 322 can be driven to move by operating the output end of the first driving member 321 to move a predetermined stroke, and in turn the adjustment of the dimension between the two end beams 330 can be realized, and in turn the loading and unloading of the container can be realized.

[0024] In some implementations, the first driving member 321 may be of a structure such as an oil cylinder or a ball screw or the like, which is not limited in the present disclosure. The lower longitudinal beam 310 may be of a frame structure, and a plurality of reinforcement

seats may be disposed at intervals between the lower longitudinal beam 310 on both sides in the lateral direction, for strengthening a loading capacity of the lower carriage frame 3.

[0025] FIG. 5 is an enlarged cross-sectional view of portion A in FIG. 3. As shown in FIG. 2-FIG. 5, the carriage frame may further include a telescopic locking mechanism 4, and two telescopic locking mechanisms 4 are both disposed on the lower carriage frame 3. The two telescopic beams and the lower longitudinal beams 310 can respectively be locked in place by operating the two telescopic locking mechanisms 4 to prevent variation of protruding and extracting dimensions of the telescopic beam after subject to external force or impact, which will affect an alignment of containers with the lower carriage frame 3.

[0026] As shown in FIG. 5, the telescopic locking mechanism 4 may include a second driving member 410, a first connecting rod 420, a second connecting rod 430, a slide block 440, a coulisse member 450 and a first stopper 460. The second driving member 410 may be fixedly disposed on the lower longitudinal beam 310. One end of the first connecting rod 420 is connected to an output end of the second driving member 410, and the first connecting rod 420 can be driven by the second driving member 410 to rotate with the one end of the first connecting rod 420 as a rotation center. One end of the second connecting rod 430 is rotatably connected to another end of the first connecting rod 420, and another end of the second connecting rod 430 is rotatably connected to a side of the slide block 440 facing the second driving member 410. The coulisse member 450 is fixedly disposed on the lower longitudinal beam 310, and the coulisse member 450 is formed with a coulisse corresponding to the slide block 440 along the lateral direction. The slide block 440 can slide along the coulisse. Every two first stoppers 460 constitute one group and there are multiple groups of first stoppers 460 disposed at intervals on the telescopic push rod 322. A portion of the slide block 440 can operatively slide to a space between the two first stoppers 460 in each group. An upper surface of the telescopic push rod 322 is flush with a bottom surface of the coulisse on the coulisse member 450. When the telescopic push rod 322 moves a predetermined distance, the first connecting rod 420 is driven by the second driving member 410 to rotate, and then the second connecting rod 430 and the slide block 440 are in turn driven by the first connecting rod 420 to cause the slide block 440 to slide along the coulisse on the coulisse member 450, and in turn

the slide block 440 can slide into or out of the space between the two stoppers 460 in each group on the telescopic push rod 322. If the slide block 440 slides to the a space between the two stoppers 460 in each group, the telescopic push rod 322 can be locked, so that the telescopic push rod 322 cannot move along a length direction thereof, that is, the telescopic push rod 322 cannot perform a telescopic movement. The positions of multiple groups of the first stoppers 460 on the telescopic push rod 322 can be preset according to containers with different lengths. After the telescopic push rod 322 is locked, the distance between the two end beams 330 is not easily changed due to external force, and thus efficiency of the alignment of containers with the lower carriage frame 3 can be improved.

[0027] In some implementations, the second driving member 410 may be a deceleration motor, and other types of braking devices may also certainly be used, which is not limited in the present disclosure.

[0028] In some embodiments, the telescoping locking mechanism 4 may further include two limit detectors 470. The two limit detectors 470 may be fixed on the lower longitudinal beam 310 and disposed corresponding to an output end of the second driving member 410, and a rotation angle of the first connecting rod 420 driven by the second driving member 410 may depends on a position of the limit detector 470. When another end of the first connecting rod 420 rotates to correspond to the two limit detectors 470, the second driving member 410 stops working. The positions of the two limit detectors 470 respectively correspond to a slide-in and slide-out of the sliding block 440 between the first stoppers 460, that is, respectively correspond to a locking and an unlocking of the telescopic push rod 322.

[0029] FIG. 6 is an enlarged cross-sectional view of portion B in FIG. 3; As shown in FIG. 6, second stoppers 341 may be disposed on both sides of another end of each overhanging beam 323 in the lateral direction, and two third stop stoppers 342 may be oppositely disposed at an overlapped area of both sides of the lower longitudinal beam 310 in the longitudinal direction and both sides of each overhanging beam 323 in the lateral direction. A reinforcement plate 343 is disposed between each third stopper 342 and the lower longitudinal beam 310, and each third stopper 342 and the corresponding reinforcement plate 343 can be both fixedly connected to the lower longitudinal beam 310 by bolts 344. A minimum distance

between every two third stoppers 342 disposed opposite to each other is smaller than a sum of a width of the overhanging beam 323 and a width of the second stoppers 341 on both sides of the overhanging beam 323.

[0030] In some embodiments, when the two end beams 330 are stretched out to match a 40 ft container, the end beams 330 reach a farthest stretching distance, and at this time, the second stoppers 341 on both sides of the overhanging beam 323 will be in collision with the third stoppers 342 on the lower longitudinal beam 310, and at this time a longest telescopic length of the telescopic push rod 322 is reached. During transportation, when there is an emergency acceleration or braking, the impact brought about by the inertia of the container on the end beam 330 is borne and offset by multiple groups of third stoppers 342, avoiding damage to other structures of the spreader. This structure that the lower longitudinal beam 310 is designed with the third stoppers 342 can cooperate with the telescopic locking mechanism 4 to effectively solve the problem that the dimensions of the lower carriage frame 3 are easily changed and inaccurate, in turn the efficiency of the alignment of containers with the lower carriage frame 3 is affected since the end beam 330 is subject to external force or impact, and the problem of large longitudinal impact due to acceleration and braking during transportation.

[0031] As shown in FIG. 6, a protruding guide coulisser may be disposed within the lower longitudinal beam 310 in the longitudinal direction. The overhanging beam 323 slides in the guide coulisser, and the third stoppers 342 are fixed at one end of the guide coulisser. The third stoppers 342 may be of a C-shaped structure, and the reinforcement plate 343 cooperates with the bolt 344 to connect the third stopper 342 to the lower side beam 310, and the reinforcement plates 343 also plays a certain role of buffering at the same time.

[0032] In some embodiments, the second stoppers 341, the third stoppers 342 and the reinforcement plates 343 may be made of plastic alloy, alloy steel and other materials with strong impact resistance, which are not limited in the present disclosure.

[0033] As shown in FIG. 2 - FIG. 4, the spreader may further include a lifting anti-sway assembly 5. At least two groups of the lifting anti-sway assemblies 5 are disposed opposite to each other in the longitudinal direction. The lower carriage frame 3 and the upper carriage frame 2 can be separated from or close to each other by operating the at least two groups of

the lifting anti-sway assemblies 5.

[0034] In some embodiments, each group of the lifting anti-sway assemblies 5 may include a pulley seat 510, a lifting motor, an anti-sway motor, a lifting wire rope 520 and an anti-sway wire rope 530. FIG. 7 is the schematic structural diagram of a pulley seat in FIG. 2. As shown in FIG. 1 - FIG. 4 and FIG. 7, two pulley seats 510 are disposed opposite to each other on the lower longitudinal beam 310 in the lateral direction, and each pulley seat 510 is clamped on a side of the lower longitudinal beam 310, and each pulley seat 510 is respectively connected to upper and lower surfaces of the lower longitudinal beam 310 by two pin shafts 511. Each pulley seat 510 is provided with a first movable pulley 512, a second movable pulley 513 and a third movable pulley 514. A pulley body of the first movable pulley 512 and a pulley body of the second movable pulley 513 are disposed parallel to each other, and the pulley body of the second movable pulley 513 and a pulley body of the third movable pulley 514 are disposed at an included angle to each other. Two lifting motors are disposed oppositely in the lateral direction on the upper carriage frame 2, and the lifting motor and the first movable pulley 512 are disposed in correspondence with each other. The two anti-sway motors are disposed oppositely on the upper carriage frame 2 in the lateral direction, and the anti-sway motor and the third movable pulley 514 are disposed in correspondence with each other. The lifting wire rope 520, the lifting motor and the first movable pulley 512 are disposed in correspondence with one another. The lifting wire rope 520 is disposed to pass through the corresponding first movable pulley 512. One end of the lifting wire rope 520 is fixedly disposed on the upper carriage frame 2, and another end of the lifting wire rope 520 may be in a reelable connection to the output end of the corresponding lifting motor. The anti-sway wire rope 530, the anti-sway motor, the second movable pulley 513, the third movable pulley 514 are disposed in correspondence with one another, and the anti-sway wire rope 530 is disposed to pass through the corresponding second movable pulley 513 and the third movable pulley 514. One end of the anti-sway wire rope 530 is fixedly disposed on the upper carriage frame 2 and another end of the anti-sway wire rope 530 is in the reelable connection to the output end of the corresponding anti-sway motor, and two anti-sway wire ropes 530 of each group of the lifting anti-sway assemblies 5 cross.

[0035] In some embodiments, the lower carriage frame 3 and the upper carriage frame 2 can be fixedly connected to or separated from each other by operating the lifting anti-sway assembly 5, thereby in turn realizing the assembly and connection of the aerial transfer carriage to the container, and the specific operation thereof is that: output ends of various lifting motors are controlled to rotate synchronously, so that the corresponding lifting wire ropes 520 are elongated synchronously, and in turn the corresponding first movable pulleys 512 are lowered synchronously to drive the lower carriage frame 3 to be lowered to a preset height. After the container is assembled with the lower carriage frame 3, the output ends of various lifting motors are controlled to rotate reversely, so that the corresponding lifting wire ropes 520 are rewound synchronously, and in turn the corresponding first movable pulleys 512 are raised to drive the lower carriage frame 3 assembled with the container to be raised. After the upper carriage frame 2 is locked to the lower carriage frame 3, it is indicated that the assembly connection of the aerial transfer carriage with the container is completed. An unloading operation of the container is reverse to the above operation of assembly and connection of the aerial transfer carriage to the container .

[0036] In some embodiments, a tension sensor can be disposed on the lifting wire rope 520, and the tension sensor can monitor abnormal conditions, such as overloading or unequal force, so as to ensure the reliability of the assembly connection of the container to a body of the transfer carriage.

[0037] As shown in FIG. 1 - FIG. 4 and FIG. 7, the pulley body of the second movable pulley 513 and the pulley body of the third movable pulley 514 can be disposed at an included angle to each other, and an edge of the third movable pulley 514 faces towards the corresponding anti-sway motor, so that two anti-sway wire ropes 530 are disposed crosswise, thus the third movable pulley 514 are enabled to act as a guide for the anti-sway wire rope 530 to prevent the anti-sway wire rope 530 from slipping off. A movement of the lower carriage frame 3 is restricted by the two anti-sway wire ropes 530 disposed crosswise, therefore a good anti-sway effect is achieved, thereby reducing a phenomenon that a transportation efficiency is affected due to a swaying of wire ropes, and thus there is a good practicability.

[0038] It should be noted that, in some embodiments, when a relative movement takes place

between the upper carriage frame 2 and the lower carriage frame 3, the lifting motor and the anti-sway motor can act synchronously, that is, the first movable pulley 512, the second movable pulley 513 and the third movable pulley 514 raise or fall at a same speed. The first movable pulley 512, the second movable pulley 513 and the third movable pulley 514 can all be disposed on one pulley seat 510 to further ensure the anti-sway effect.

[0039] In some embodiments, the spreader does not have an upper frame structure, and the pulley seat 510 is fixed on the lower carriage frame 3 through four pin shafts 511. When the spreader needs to be maintained, only the pin shafts 511 need to be disassembled to complete a disassembly of the pulley seat 510 and a separation of the upper carriage frame with a lower carriage frame, therefore it is very convenient to disassemble and replace the spreader.

[0040] In some embodiments, after the lower carriage frame 3 is separated from the upper carriage frame 2, it is required to quickly assemble and connect the lower carriage frame 3 with the container. In order to realize a rapid assembly and connection of containers with different specifications to the lower frame 3, the spreader may further include a guide device 8, and the guide devices 8 may be provided on both sides of the two end beams 330. The guide device 8 may be the guide device disclosed in the Chinese patent application No. 201911423648.9, and the present disclosure will not be repeated here.

[0041] As shown in FIG. 1-FIG. 4, the spreader may further include a locking device 6, which is disposed on the lower carriage frame 3. When the lower carriage frame 3 and the upper carriage frame 2 are close to each other, the carriage frame 3 and the upper carriage frame 2 can be locked to each other by operating the locking device 6. When the lower carriage frame 3 and the container are close to each other, the lower carriage frame 3 and the container can be locked to each other by operating the locking device 6.

[0042] In some embodiments, there may be eight locking devices 6, four locking devices 6 being disposed upwards respectively at four corners of the lower longitudinal beam 310, the other four locking devices 6 being disposed downwards respectively at two ends of the end beams 330 of the two telescopic beams. The lower carriage frame 3 and the upper carriage frame 2 can be locked to each other by operating the locking devices 6 at the four corners of the lower longitudinal beam 310, and the lower carriage frame 3 and the container can be

locked to each other by operating the locking devices 6 at the two ends of the two end beams 330.

[0043] FIG. 8 is a schematic structural diagram of one locking device in FIG. 2. As shown in FIG. 8, the locking device 6 may include a driving mechanism, a rotating handle 620 and a lock head 630. The lock head 630 is fixedly disposed on a head portion of the rotating handle 620, and an output end of the driving mechanism is connected to the rotating handle 620, therefore the rotating handle 620 can be driven to rotate by operating the driving mechanism. A bottom of the upper carriage frame 2 and corner pieces 910 at four corners of the container are all opened thereon with through holes corresponding to the lock heads 630, and the lock heads 630 can be operatively passed through the through holes to be connected to the upper carriage frame 2 or the corner pieces 910 at the four corners of the container.

[0044] In some embodiments, the specific structure of the locking device 6 has been described in the Chinese patent application No. 201911423648.9 and entitled “VEHICLE FRAME AND AERIAL TRANSPORTATION VEHICLE”, which will not be repeated in the present disclosure.

[0045] It is different from the locking device 6 disclosed in the Chinese patent application No. 201911423648.9 in that, in some embodiments, the driving mechanism of the locking device 6 may include a third driving member 611, a connecting member 612, and a third connecting rod 613 and a fourth connecting rod 614; the connecting member 612 and the fourth connecting rod 614 are disposed in the lateral direction, and the third connecting rod 613 is disposed in the longitudinal direction; one end of the connecting member 612 is connected to an output end of the third driving member 611, and the connecting member 612 can be driven by the output end of the third driving member 611 to rotate with the one end of the connecting member 612 as a rotation center; another end of the connecting member 612 is rotatably connected to one end of the third connecting rod 613, and another end of the third connecting rod 613 is rotatably connected to one end of the fourth connecting rod 614; another end of the fourth connecting rod 614 is rotatably connected to the rotating handle 620. In this way, a rotation of the rotating handle 620 can be realized by controlling the output end of the third driving member 611 to work.

[0046] In some embodiments, as shown in FIG. 8, the driving mechanism may further include a fifth connecting rod 615; one end of the fifth connecting rod 615 is rotatably connected to another end of the third connecting rod 613, and another end of the fifth connecting rod 615 extends in a direction away from the fourth connecting rod 614, and is rotatably connected to another rotating handle 620, so that the rotation of two rotating handles 620 can be realized through one third driving member 611, and in turn a driving of the two locking devices 6 are realized.

[0047] In some implementations, the third driving member 611 may be a deceleration motor, and other types of braking devices may also certainly be used, which is not limited in the present disclosure.

[0048] In some embodiments, the four locking devices 6 at the four corners of the lower longitudinal beam 310 may be different in dimension from the four locking devices at the two ends of the two end beams 330, so as to respectively adapt to the locking between the lower carriage frame 3 and the upper carriage frame 2 or the locking between the lower carriage frame 3 and the container.

[0049] FIG. 9 is a partial structural schematic diagram of the lower carriage frame in FIG. 2. As shown in FIG. 8 and FIG. 9, a side of the connecting member 612 away from the third driving member 611 can be provided with a longitudinal output shaft 640; an axis of the output shaft 640 is disposed to pass through a rotation center around which the connecting member 612 rotates; the lower longitudinal beam 310, and the end beam 330 of the telescopic beam are both fixedly provided with support seats 650 corresponding to the output shafts 640; the output shaft 640 is disposed to rotatably pass through the corresponding support seat 650, and a portion of the output shaft 640 passing through the support seat 650 is sleeved with a manual driving rod 660. If the third driving member 611 fails so that the locking device 6 cannot be driven to be locked by the third driving member 611, the manual driving rod 660 instead can be manually rotated to drive the output shaft 640 to rotate, and in turn the connecting part 612 is driven by the output shaft 640 to rotate with one end of the connecting part 612 as a rotation center, and in turn the rotation of rotating handle 620 can be achieved, i.e. the locking of the locking device 6 is achieved.

[0050] In some embodiments, the portion of the output shaft 640 passing through the support seat 650 may be of a structure of polygonal prism, such as a hexagonal prism structure, to facilitate a rotation of the output shaft 640 driven by the manual driving rod 660, or the portion of the output shaft 640 passing through the support seat 650 can also be of other structures, such as splines disposed on a side surface of a cylindrical structure, etc., which are not limited in the present disclosure.

[0051] In some embodiments, the manual driving rod 660 is detachably sleeved on the output shaft 640. When a manual driving is required, the output shaft 640 can be inserted into a hole on the manual driving rod 660 that is matched with an end of the output shaft 640. The manual driving rod 660 may be configured with a structure of an L-shaped rod body, or in other structures, such as a Z-shaped rod body, which are not limited in the present disclosure.

[0052] Referring to FIG. 2 - FIG. 4, the spreader may further include an anti-fall device 7, which is disposed on the lower carriage frame 3, and the lower carriage frame 3 and the container can be locked with each other by operating the anti-fall device 7. The lower carriage frame 3 and the container are locked to each other by the locking device 6. In order to ensure the safety during transportation and avoid accidents such as a breaking of the locking device 6, the spreader is provided with an anti-fall device 7, so that a structure between the container and the lower carriage frame 3 is more stable.

[0053] In some embodiments, there may be four anti-fall devices 7 which are respectively disposed on both sides of the end beams 330 of the two telescopic beams. The four anti-fall devices 7 and the four locking devices 6 on the telescopic beams are disposed in correspondence with one another.

[0054] FIG. 10 is a structural schematic diagram of the anti-fall device in FIG. 4. As shown in FIG. 10, the anti-fall device 7 may include a fixed support seat 710, a swing arm 720, a fourth driving member 730 and a hook arm 740; the fixed support seat 710 is disposed on one side of the end beam 330 of the telescopic beam in the lateral direction; the swing arm 720 is disposed beneath the fixed support seat 710, and the swing arm 720 is rotatably connected to the fixed support seat 710 through a pin rod 721; the fourth driving member 730 is fixedly disposed on the end beam 330 of the telescopic beam along the lateral direction, and an output

end of the fourth driving member 730 is rotatably connected to the swing arm 720; the hook arm 740 is fixedly disposed on the swing arm 720, and the swing arm 720 can be driven by the fourth driving member 730 to rotate around the pin rod 721, so that hooks of the hook arms 740 can be operatively hooked into holes on sides of the corner pieces 910 at the four corners of the container. In this way, a connection or a release of the hook arm 740 with the corner pieces 910 at the four corners of the container can be controlled by controlling the output end of the fourth driving member 730.

[0055] In some embodiments, the fixed support seat 710 may include two fixing plates 711 disposed oppositely, both two fixing plates 711 are provided with circular holes disposed opposite to each other along the lateral direction; the pin rod 721 is disposed in the longitudinal direction and fixed on the swing arm 720; the swing arm 720 is movably disposed between the two fixing plates 711, and two ends of the pin rod 721 are rotatably disposed in the two circular holes of the fixing plate 711 respectively, in this way the swing arm 720 can be rotated with the pin rod 721 as a rotation center. The output end of the fourth driving member 730 can be rotatably connected to the swing arm 720 through a joint bearing; the swing arm 720 rotates in a small range, and a vertical stress generated by the rotation of the swing arm 720 is borne by the joint bearing, and thus an operation of the fourth driving member 730 is not affected.

[0056] In some embodiments, as shown in FIG. 10, each anti-fall device 7 may further include a locking plate 750, a fifth driving member 770 and a latch 760; the locking plate 750 is disposed along the lateral direction and fixed on the swing arm 720; one end of the locking plate 750 is extended to be between the telescopic beam and the corner pieces 910 at the four corners of the container; the locking plate 750 is opened with a locking hole extending vertically; the latch 760 is connected to an output end of the fifth driving member 770, and the latch 760 can be driven by the fifth driving member 770 to protrude and retract vertically; when the swing arm 720 is driven by the fourth driving member 730 so that the hooks of the hook arm 740 are hooked into the holes on the sides of the corner pieces 910 at the four corners of the container, the latch 760 can be driven by the fifth driving member 770 to be inserted into the locking hole to complete a locking of the hook arm 740. In this way the hooks

of the hook arms 740 are ensured to be always hooked in the holes on the sides of the corner pieces 910 at the four corners of the container without decoupling during transportation.

[0057] In some embodiments, the lower carriage frame 3 and the container can be further locked to each other by operating the anti-fall device 7, and the specific operation is that: during the loading and the unloading of the spreader, the swing arm 720 of the anti-fall device 7 is driven by the fourth driving member 730 to rotate outwards relative to the end beam 330 of the telescopic beam in the lateral direction, and at this time, there is no contact between the hook arm 740 and the container; after the alignment and locking of containers with the lower carriage frame 3 is completed, the hook arm 740 of the anti-fall device 7 is driven by the fourth driving member 730 to rotate inwards relative to the end beam 330 of the telescopic beam in the lateral direction, so that the hooks of the hook arms 740 are hooked into the holes on the sides of the corner pieces 910 at the four corners of the container, and at the same time the locking plate 750 on the swing arm 720 is driven to move with the swing arm 720 between the end beam 330 and the corner pieces 910 at the four corners of the container until the locking plate 750 is in a horizontal state, and in turn the locking hole on the locking plate 750 can be caused to correspond to the latch 760, at this moment, the latch 760 is driven by the fifth driver 770 to be in the locking hole to limit a movement of the hook arm 740 in a horizontal direction, ensuring that the hooks of the hook arms 740 are always hooked in the holes on the sides of the corner pieces 910 at the four corners of the container without decoupling.

[0058] In some embodiments, both the fourth driving member 730 and the fifth driving member 770 can be selected from servo liner actuators, or other mechanisms, such as hydraulic cylinders, etc., which are not limited in the present disclosure.

[0059] In some embodiments, multiple sensors may also be provided on the spreader to detect a position and an attitude of the spreader. For example, visual recognition sensors, height ranging sensors, inclination sensors, etc. may be installed on the upper carriage frame and the lower carriage frame to detect a dimensional space position of the spreader relative to the container and the dimensional space position between the upper carriage frame and the lower carriage frame, so as to realize the alignment of containers with the lower carriage frame,

and grabbing and unloading of containers with a fully automatic process, and at the same time, it is convenient for a real time adjustment implemented by a control system to ensure the stability of the suspending and transportation process.

[0060] In some embodiments, the specific steps of suspending the container by utilizing the spreader of the suspended transfer carriage may be as follows: the suspended transfer carriage without a load travels to be in place and stops, at this time, the container is located directly under the spreader → the lifting anti-sway assembly 5 is operated to cause the upper carriage frame 2 and the lower carriage frame 3 to separate from each other → the lifting anti-sway assembly 5 is operated to cause the lower carriage frame 3 to fall → the anti-fall device 7 on the lower carriage frame 3 is rotated outwards → the telescopic locking mechanism 4 is operated to cause the end beam 330 on the lower carriage frame 3 to correspond to two sides of the container → the locking device 6 between the lower carriage frame 3 and the container is operated to complete the locking of the lower carriage frame 3 with the container → the anti-fall device 7 on the lower carriage frame 3 is rotated inwards, to cause the anti-fall device 7 to hold the container → the lifting anti-sway assembly 5 is operated to cause the lower carriage frame 3 and the container to be raised as a whole → the lifting anti-sway assembly 5 and the locking device 6 are operated to cause the upper carriage frame 2 to be locked with the lower carriage frame 3 → a loading process of the suspended transfer carriage is completed, and the suspended transfer carriage can start to transport. A process of unloading of the containers is in reverse to the process of loading of the containers.

[0061] In conclusion, a carriage frame and a spreader of suspended transfer carriage in the present disclosure have more stable structure and higher safety, since a process of lifting, suspending of containers and alignment of containers with the lower carriage frame 3 are improved by the telescopic locking mechanism 4 to be more stable; and a double protection of the locking of the upper carriage frame 2 with the lower carriage frame 3 is formed by disposing the lifting anti-sway assembly 5 and the locking device 6; and a double protection of the locking of the lower carriage frame 3 with the container is formed by disposing the locking device 6 and the anti-fall device 7.

CLAIMS:

1. A carriage frame, comprising:

an upper carriage frame;

a lower carriage frame, comprising a lower longitudinal beam and two telescopic beams, wherein the two telescopic beams are disposed oppositely on both sides in a longitudinal direction of the lower longitudinal beam, and can be separated from or close to the lower longitudinal beam in the longitudinal direction through a telescopic assembly, respectively; and

telescopic locking mechanisms, comprising two telescopic locking mechanisms which are both disposed on the lower carriage frame, and wherein the two telescopic beams and the lower longitudinal beam are respectively locked in place by operating the two telescopic locking mechanisms.

2. The carriage frame according to claim 1, wherein each of the telescopic beams comprises one end beam and two overhanging beams disposed in correspondence with the end beams; the end beam is disposed in a lateral direction; the overhanging beam is disposed in the longitudinal direction; one end of the overhanging beam is connected onto a corresponding end beam, and another end of the overhanging beam is movably disposed in a cavity of the lower longitudinal beam along the longitudinal direction; and

the telescopic assembly comprises:

first driving members, comprising two first driving members disposed at an interval along the lateral direction within the lower longitudinal beam, an output end of the first driving members being movable in the longitudinal direction; and

a telescopic push rod, through which each end beam is connected to the output end of the first driving members.

3. The carriage frame according to claim 2, wherein the telescopic locking mechanism comprises:

a second driving member, fixedly disposed on the lower longitudinal beam;

a first connecting rod, one end of which is connected to an output end of the second

driving member, and which can be driven by the second driving member to rotate with the one end of the first connecting rod as a rotation center;

a second connecting rod, one end of which is rotatably connected to another end of the first connecting rod;

a slide block, wherein the another end of the second connecting rod is rotatably connected to a side of the slide block facing the second driving member;

a coulis member, fixedly disposed on the lower longitudinal beam, and formed with a coulis corresponding to the slide block along the lateral direction, wherein the slide block can slide along the coulis; and

first stoppers, every two of which constitute one group, wherein there are multiple groups of first stoppers disposed at intervals on the telescopic push rod, and wherein a portion of the slide block can operatively slide to be between two first stoppers in each group.

4. The carriage frame according to claim 2, wherein second stoppers are disposed on both sides of the another end of each overhanging beam in the lateral direction;

two third stoppers are oppositely disposed at an overlapped area of both sides of the lower longitudinal beam in the longitudinal direction and both sides of each overhanging beam in the lateral direction;

a reinforcement plate is disposed between each third stopper and the lower longitudinal beam, and each third stopper and a corresponding reinforcement plate are both fixedly connected to the lower longitudinal beam by bolts; and

a minimum distance between every two third stoppers disposed oppositely is smaller than a sum of a width of the overhanging beam and a width of the second stoppers on both sides of the overhanging beam.

5. A spreader of suspended transfer carriage, comprising the carriage frame according to any one of claims 1-4.

6. The spreader of suspended transfer carriage according to claim 5, further comprising:

lifting anti-sway assemblies, comprising two groups of lifting anti-sway assemblies disposed at intervals in the longitudinal direction, wherein the lower carriage frame and the upper carriage frame can be separated from or close to each other by operating the two groups

of lifting anti-sway assemblies;

a locking device, disposed on the lower carriage frame, wherein when the lower carriage frame and the upper carriage frame are close to each other, the carriage frame and the upper carriage frame can be locked to each other by operating the locking device, and wherein when the lower carriage frame and the container are close to each other, the lower carriage frame and the container can be locked to each other by operating the locking device;

an anti-fall device, disposed on the lower carriage frame, wherein the lower carriage frame and the container can be locked to each other by operating the anti-fall device.

7. The spreader of suspended transfer carriage according to claim 5, wherein each group of lifting anti-sway assemblies comprises:

pulley seats, wherein two pulley seats are disposed oppositely on the lower longitudinal beam in the lateral direction; each pulley seat is clamped on a side of the lower longitudinal beam; each pulley seat is respectively connected to upper and lower surfaces of the lower longitudinal beam by two pin shafts; each pulley seat is provided with a first movable pulley, a second movable pulley and a third movable pulley; and a pulley body of the first movable pulley and a pulley body of the second movable pulley are disposed parallel to each other, and the pulley body of the second movable pulley and a pulley body of the third movable pulley are disposed at an included angle to each other;

lifting motors, comprising two lifting motors disposed oppositely in the lateral direction on the upper carriage frame, wherein the lifting motors and the first movable pulley are disposed in correspondence with each other;

anti-sway motors, comprising two anti-sway motors disposed oppositely on the upper carriage frame in the lateral direction, wherein the anti-sway motors and the third movable pulley are disposed in correspondence with each other;

a lifting wire rope, wherein the lifting wire rope, the lifting motor and the first movable pulley are disposed in correspondence with one another; and

wherein the lifting wire rope is disposed to pass through a corresponding first movable pulley, one end of the lifting wire rope being fixedly disposed on the upper carriage frame, and another end of the lifting wire rope being in a reelable connection to an output end of a

corresponding lifting motor;

the anti-sway wire rope, the anti-sway motor, the second movable pulley, and the third movable pulley are disposed in correspondence with one another, and the anti-sway wire rope is disposed to pass through a corresponding second movable pulley and third movable pulley; and

one end of the anti-sway wire rope is fixedly disposed on the upper carriage frame and another end of the anti-sway wire rope is in the reelable connection to an output end of a corresponding anti-sway motor, and wherein two anti-sway wire ropes of each group of lifting anti-sway assemblies are disposed crosswise.

8. The spreader of suspended transfer carriage according to claim 5, wherein there are eight locking devices, four locking devices being disposed upwards respectively at four corners of the lower longitudinal beam, the other four locking devices being disposed downwards respectively at two ends of the end beams of the two telescopic beams;

the locking devices comprise a driving mechanism, a rotating handle and a lock head;

the lock head is fixedly disposed on a head portion of the rotating handle, and an output end of the driving mechanism is connected to the rotating handle, so that the rotating handle can be driven to rotate by operating the driving mechanism;

a bottom of the upper carriage frame and corner pieces at four corners of the container are all opened thereon with through holes corresponding to the lock heads; and

the lock head can be operatively passed through the through hole to be connected to the upper carriage frame or the corner pieces at the four corners of the container.

9. The spreader of suspended transfer carriage according to claim 8, wherein the driving mechanism comprises a third driving member, a connecting member, a third connecting rod and a fourth connecting rod;

the connecting member and the fourth connecting rod are disposed in the lateral direction, and the third connecting rod is disposed in the longitudinal direction;

one end of the connecting member is connected to an output end of the third driving member, and the connecting member can be driven by the output end of the third driving member to rotate with the one end of the connecting member as a rotation center;

another end of the connecting member is rotatably connected to one end of the third connecting rod, and another end of the third connecting rod is rotatably connected to one end of the fourth connecting rod; and

another end of the fourth connecting rod is rotatably connected to the rotating handle.

10. The spreader of suspended transfer carriage according to claim 9, wherein a side of the connecting member away from the third driving member is provided with a longitudinal output shaft;

an axis of the output shaft is disposed to pass through a rotation center around which the connecting member rotates;

the lower longitudinal beam, and the telescopic beam are both fixedly provided with support seats corresponding to the output shafts;

the output shafts are disposed to rotatably pass through corresponding support seats; and

a portion of the output shafts passing through the support seats is of a structure of polygonal prism, and is sleeved with a manual driving rod.

11. The spreader of suspended transfer carriage according to claim 5, wherein there are four anti-fall devices which are respectively disposed on both sides of the end beams of the two telescopic beams;

the anti-fall devices comprise a fixed support seat, a swing arm, a fourth driving member and a hook arm; and

wherein the fixed support seat is disposed on one side of the end beam of the telescopic beam in the lateral direction;

the swing arm is disposed beneath the fixed support seat, and rotatably connected to the fixed support seat through a pin rod;

the fourth driving member is fixedly disposed on the end beam of the telescopic beam along the lateral direction, and an output end of the fourth driving member is rotatably connected to the swing arm; and

the hook arm is fixedly disposed on the swing arm, and the swing arm can be driven by the fourth driving member to rotate around the pin rod, so that hooks of the hook arms can be operatively hooked into holes on sides of the corner pieces at the four corners of the container.

12. The spreader of suspended transfer carriage according to claim 11, wherein each anti-fall device further comprises a locking plate, a fifth driving member and a latch, and wherein,

the locking plate is disposed along the lateral direction and fixed on the swing arm;

one end of the locking plate is extended to be between the telescopic beam and the corner pieces at the four corners of the container;

the locking plate is opened with a locking hole extending vertically;

the latch is connected to an output end of the fifth driving member, and can be driven by the fifth driving member to protrude and retract vertically; and

when the swing arm is driven by the fourth driving member so that the hooks of the hook arm are hooked into the holes on the sides of the corner pieces at the four corners of the container, the latch can be driven by the fifth driving member to be inserted into the locking hole.