CLAIMS

1. A pick-and-place mechanism, comprising:

a base having an access opening for a target object to enter and exit;

an extension and retraction structure arranged on the base, wherein a free end of the extension and retraction structure is configured to selectively extend from or retract into the base through the access opening;

a pick-up assembly arranged at the free end, wherein the pick-up assembly is configured to move relative to the base under the drive of the free end, and the pick-up assembly is configured to act on a front end surface of the target object when picking up or returning the target object, so as to transfer the target object, wherein the front end surface of the target object is an end surface of the target object facing the pick-up assembly in a case that the target object is to be picked up or returned;

a driving structure connected to the extension and retraction structure, and configured to drive the free end to extend from or retract into the base, so as to drive the pick-up assembly to reciprocate between a target goods location and the base; and

a first detection structure configured to detect a moving distance of the pick-up assembly toward the target goods location, to determine a position of the pick-up assembly.

2. The pick-and-place mechanism according to claim 1, wherein

the driving structure is configured to be fitted with a power piece of the extension and retraction structure and provide power to the power piece, so that the power piece is configured to drive the extension and retraction structure to extend from or retract into the base; and

the pick-and-place mechanism further comprises:

a follower tray, wherein in a case that the pick-up assembly picks up or returns the target object, at least part of the follower tray is located in a movement path of the target object, and the follower tray is configured to extend from the base to support the target object in a case that the pick-up assembly carries the target object,

wherein, during a process of the extension and retraction structure retracting into the base, the power piece is configured to be fitted with the follower tray to drive the follower tray to retract into the base.

3. The pick-and-place mechanism according to claim 2, wherein the follower tray comprises:

a first follower tray arranged on the base, wherein at least part of the first follower tray is configured to extend from the base through the access opening to support the target object in the movement path of the target object;

a second follower tray arranged side by side with the first follower tray on the base, wherein at least part of the second follower tray is configured to extend from the base through the access opening to support the target object in the movement path of the target object; and

a connecting member connected to the first follower tray and the second follower tray in such a manner that the first follower tray and the second follower tray are configured to move synchronously relative to the base,

wherein the power piece is configured to be fitted with the connecting member to drive the first follower tray and the second follower tray to retract into the base,

wherein the first follower tray and the second follower tray are slidably arranged on the base; and the connecting member movably connects the first follower tray with the second follower tray,

wherein the connecting member comprises:

a first sub-connecting member connected to the first follower tray; and

a second sub-connecting member connected to the second follower tray,

wherein the first sub-connecting member is provided with a first shaft hole, and the second sub-connecting member is provided with a second shaft hole; and a pin shaft is inserted through the first shaft hole and the second

shaft hole in such a manner the first sub-connecting member is movably connected with the second sub-connecting member,

wherein the pin shaft comprises:

a first shaft segment inserted through the first shaft hole; and

a second shaft segment inserted through the second shaft hole;

wherein the first shaft segment is movably inserted through the first shaft hole, and/or the second shaft segment is movably inserted through the second shaft hole.

4. The pick-and-place mechanism according to claim 3, wherein a diameter of the first shaft hole is larger than a diameter of the second shaft hole, the first shaft segment is movably inserted through the first shaft hole, and the second shaft segment is threadedly connected to the second shaft hole,

wherein a diameter of the first shaft segment is larger than a diameter of the second shaft segment, and the diameter of the first shaft hole is larger than the diameter of the first shaft segment;

wherein the pin shaft further includes: a locking segment located at an end of the first shaft segment facing away from the second shaft segment, wherein a diameter of the locking segment is larger than the diameter of the first shaft hole, and the locking segment is configured to lock the first sub-connecting member and the second sub-connecting member along an axial direction of the pin shaft.

5. The pick-and-place mechanism according to claim 2, wherein the follower tray is slidably arranged on the base; and

the extension and retraction structure comprises a first force-applying member, the follower tray comprises a force-bearing portion, and the first force-applying member is configured to at least apply a force to the force-bearing portion in a case that the extension and retraction structure retracts, so as to drive the follower tray to retract into the base,

wherein the extension and retraction structure comprises a scissor structure, and the scissor structure comprises a plurality of first hinge joints and a plurality of second hinge joints; the plurality of first hinge joints are arranged along an extension and retraction direction of the scissor structure, and the plurality of second hinge joints are located on both sides of the arrangement of the plurality of first hinge joints; and

in a case that the scissor structure retracts and drives the follower tray to retract into the base, the first force-applying member is configured to be in contact with the force-bearing portion, and in a case that the follower tray retracted into the base, the first force-applying member is configured to apply a force to the force-bearing portion,

wherein the first force-applying member is arranged at one or more of the plurality of second hinge joints, and in a case that the scissor structure retracts and drives the follower tray to retract into the base, the first force-applying member is configured to be in sliding contact with the force-bearing portion,

wherein one of the first force-applying member and the force-bearing portion comprises a rolling member, and the rolling member is configured to be in rolling contact with the other of the first force-applying member and the force-bearing portion.

6. The pick-and-place mechanism according to any one of claims 2 to 5, wherein a scissor structure of the extension and retraction structure comprises two sets of scissor units arranged opposite to each other, one or more first connecting rods and one or more second connecting rods;

the one or more first connecting rods are connected between the first hinge joints of the two sets of scissor units, and the one or more second connecting rods are connected between the second hinge joints of the two sets of scissor units; and

the power piece comprises one of the one or more first connecting rod and an extension member, wherein the

extension member is connected to the one of the one or more first connecting rods, and the extension member is configured to be fitted with the follower tray,

wherein the base comprises:

a bottom plate; and

a first mounting plate arranged on the bottom plate, wherein the first mounting plate is located at an end of the bottom plate opposite to the access opening; and a third guide rail is arranged on the first mounting plate,

wherein the scissor structure comprises at least one scissor piece, a first scissor piece of the at least one scissor piece comprises two transmission rods, the two transmission rods are rotatably connected at the first hinge joint, and the two transmission rods are slidably arranged to the third guide rail.

7. The pick-and-place mechanism according to claim 6, wherein the third guide rail comprises:

a first fixing portion fixedly connected to the first mounting plate; and

a first guide portion located on a side of the first fixing portion,

wherein each of the two transmission rods comprises a third slider, the third slider is fitted over the first guide portion, and the third slider is rotatably connected to the transmission rod;

wherein the pick-up assembly comprises:

a second mounting plate movably arranged to a second scissor piece of the at least one scissor piece, wherein a fourth guide rail is arranged on the second mounting plate; and the second scissor piece comprises two transmission rods, the two transmission rods are rotatably connected at the first hinge joint, and the two transmission rods are slidably arranged to the fourth guide rail; and

a second force-applying member arranged on the second mounting plate, and configured to apply a force to the front end surface of the target object to transfer the target object,

wherein the front end surface of the target object is the end surface of the target object facing the pick-up assembly in a case that the target object is to be picked up or returned;

wherein the fourth guide rail comprises:

a second fixing portion fixedly connected to the second mounting plate;

a second guide portion located on a side of the second fixing portion; and

a third guide portion arranged side by side with the second guide portion and arranged on another side of the second fixing portion,

wherein each of the two transmission rods comprises a fourth slider, the fourth slider is fitted over the second guide portion and the third guide portion, and the fourth slider is rotatably connected to the transmission rod.

8. The pick-and-place mechanism according to claim 2, further comprising: a second limiting member arranged on the base and located at a front end of the follower tray, wherein the second limiting member has a first state and a second state,

in the first state, at least part of the second limiting member extends from a support surface of the follower tray; and in the second state, the second limiting member is lower than the support surface of the follower tray, wherein the support surface is configured to support the target object,

wherein in a case that the target object is moved to a preset position to trigger an action signal, the limiting member is configured to switch to the first state according to the action signal, to limit the target object within the base, wherein the preset position is located at a side of the second limiting member facing the base,

wherein the second limiting member is configured to be in the second state in a case that the follower tray at least partially extends out of the base, and to be in the first state in a case that the follower tray is located within the base, so as to limit a movement direction of the target object on the follower tray,

wherein the second limiting member comprises a first portion and a second portion, the first portion and the second portion have an included angle therebetween, a connection portion of the first portion and the second portion is rotatably connected to the base, and the first portion is located at a bottom of the follower tray; and

an abutment member is arranged at the front end of the follower tray, the abutment member is arranged between the first portion and the second portion, and the abutment member is configured to: push the second portion in a case that the front end of the follower tray extends out of the base, so that the second portion rotates to a bottom of the support surface of the follower tray, and the second limiting member is in the second state; and to push the first portion in a case that the front end of the follower tray retracts into the base, so that the second portion rotates to extend from the support surface of the follower tray, and the second limiting member is in the first state.

9. The pick-and-place mechanism according to claim 8, further comprising:

a second driving member arranged on the base, and configured to drive the second limiting member to switch between the first state and the second state,

wherein the second driving member is configured to drive the second limiting member to switch to the first state in a case that the target object is moved to the preset position,

wherein the second limiting member is rotatably arranged on the base, and the second driving member is configured to drive the second limiting member to rotate to switch between the first state and the second state,

wherein the pick-and-place mechanism further comprises:

a first sensor arranged on the base, wherein the first sensor is configured to detect a position of the target object and trigger a first trigger signal in a case that the target object is at the preset position,

wherein the second limiting member is configured to switch from the second state to the first state according to the first trigger signal; and the action signal comprises the first trigger signal,

wherein the first sensor is further configured to cooperate with a power piece of the extension and retraction structure to trigger the first trigger signal; and

the driving structure is configured to stop driving the power piece according to the first trigger signal.

10. The pick-and-place mechanism according to claim 9, wherein the first sensor comprises:

a first signal transmitting portion arranged on the base;

a first signal receiving portion arranged on the base, wherein the first signal receiving portion is configured to receive a signal transmitted by the first signal transmitting portion; and

a trigger member movably arranged on the base, wherein the trigger member is configured to move synchronously with the target object in a case that the target object enters or exits the base, and the first sensor is configured to trigger the first trigger signal in a case that the trigger member is located between the first signal transmitting portion and the first signal receiving portion,

wherein the trigger member is fitted with the power piece, and the trigger member and the power piece are configured to move synchronously relative to the base in a case that the extension and retraction structure moves relative to the base; and/or

the extension and retraction structure is fitted with the trigger member to drive the trigger member to move relative to the base; and the trigger member is configured to be located between the first signal transmitting portion and the first signal receiving portion in a case that the pick-up assembly is located at an initial position on the base,

wherein the pick-and-place further comprises:

a second sensor arranged on the base, and configured to detect whether the target object is present at the preset position before the second limiting member switches to the first state,

wherein the second limiting member is configured to switch to the first state according to the action signal,

in a case that the target object is present at the preset position to trigger the action signal,

wherein the second sensor is configured to trigger a second trigger signal in a case that the target object is present at the preset position; and

the second limiting member is configured to switch to the first state according to the first trigger signal and the second trigger signal, and the action signal comprises the first trigger signal and the second trigger signal;

wherein the second sensor comprises:

a second signal transmitting portion arranged on the base; and

a second signal receiving portion arranged on the base, and configured to receive a signal transmitted by the second signal transmitting portion, wherein a signal transmission path between the second signal transmitting portion and the second signal receiving portion intersects with a movement path of the target object, to determine whether the target object is located at the preset position.

11. The pick-and-place mechanism according to claim 1, further comprising a third detection structure,

wherein the third detection structure is configured to determine a distance between the pick-up assembly and the target object, and in a case that the distance is less than or equal to a fourth preset distance, the pick-up assembly is configured to move toward the target object at a first preset speed, wherein the first preset speed is less than a second preset speed, and the second preset speed is a moving speed of the pick-up assembly in a case that the distance between the pick-up assembly and the target object is greater than the fourth preset distance.

12. The pick-and-place mechanism according to claim 1, further comprising: at least one of a depth camera, a two-dimensional code camera, a first sensor, a second sensor, a third sensor and a fourth sensor, and a controller, wherein the controller is configured to determine a height of the target goods location according to a recognition state of a two-dimensional code of the target goods location by the two-dimensional code camera, and/or, the controller is configured to determine an offset distance according to an image of the target goods location taken by the depth camera; and the controller is configured to adjust the position of the pick-up assembly based on the height of the target goods location and/or the offset distance, to allow the pick-up assembly to move to a specified position of a target carrier;

the controller is further configured to determine whether the pick-up assembly is at an initial position according to a first trigger signal of the first sensor, or the controller is further configured to determine whether the pick-up assembly is at an initial position according to a zero position signal of a motor encoder of the driving structure;

the controller is further configured to determine whether the target object is present on the pick-up assembly at the initial position according to a second trigger signal of the second sensor;

the controller is further configured to determine whether the target object is present in the target goods location according to a third trigger signal of the third sensor; and

the controller is further configured to determine a position state between the target object and the pick-up assembly according to a fourth trigger signal of the fourth sensor,

wherein the position state refers to that in a case that a distance between the pick-up assembly and the target object in the target goods location is less than or equal to a first preset distance during a process of the pick-up assembly moving toward the target goods location, the controller is configured to control the pick-up assembly to approach the target object at a first preset speed; or, the position state refers to that in a case that a distance between the pick-up assembly and the target object is less than or equal to a second preset distance during a process of the pick-up assembly retracting into the base, the controller is configured to determine that the target object is present on the pick-up assembly.

13. An object transferring method, comprising:

determining a working distance between a pick-up assembly and a target goods location in a case that a pick-and-place mechanism reaches a specified position;

driving, by a driving structure, the pick-up assembly to move toward the target goods location;

obtaining a moving distance of the pick-up assembly toward the target goods location, and determining that the pick-up assembly reaches the target goods location in a case that the moving distance is equal to the working distance; and

transferring a target object between the pick-and-place mechanism and the target goods location.

14. The object transferring method according to claim 13, wherein the parameter information comprises a distance between the pick-up assembly and the target object, and in a case that the distance is less than or equal to a third preset distance, it is determined that the force applied by the pick-up assembly to the target object is greater than or equal to the preset force; and/or

the parameter information comprises a vacuum degree of an inner cavity of a suction cup structure, and in a case that the vacuum degree is greater than or equal to a preset vacuum degree, it is determined that the force applied by the pick-up assembly to the target object is greater than or equal to the preset force;

wherein the driving structure driving the pick-up assembly to move toward the target goods location, and/or the pick-up assembly moving toward the target object, comprises:

obtaining a distance between the pick-up assembly and the target object, and in a case that the distance is less than or equal to a fourth preset distance, reducing a moving speed of the pick-up assembly so that the pick-up assembly approaches the target object at a first preset speed, wherein the first preset speed is less than a second preset speed, the second preset speed is a moving speed of the pick-up assembly in a case that the distance between the pick-up assembly and the target object is greater than the fourth preset distance, and the distance between the pick-up assembly and the target object is detected by a third detection structure.

15. A transfer robot, comprising:

a chassis;

a mast arranged on the chassis; and

a pick-and-place mechanism according to any one of claims 1 to 12, arranged on the mast, and configured to be lifted and lowered along the mast.