

## CLAIMS

1. A ~~transferring~~~~container depositing~~ robot, comprising: a master control and processing unit, a pick-and-place mechanism, and a marker detection unit, wherein a body of the robot  
5 runs on a plane of a storage region, the storage region is provided with an inventory bracket for storing an inventory container, and the marker detection unit is arranged on the pick-and-place mechanism, and wherein

the master control and processing unit is configured to: according to target deposit-removal position information of a target inventory container, control the robot body to  
10 move to a first horizontal position and control the pick-and-place mechanism to move to a first height position;

the marker detection unit comprises a marker detection device and / or an edge detection device, the marker detection device is configured to: detect by ~~a~~the marker detection device, in a case that the robot body and the pick-and-place mechanism stop moving, a target storage  
15 position marker provided at a target storage position in a view field comprising a target inventory bracket, or detect by the edge detection device, in a case that the robot body and the pick-and-place mechanism stop moving, at least two target container edges of a target inventory container in a view field comprising a target inventory bracket; and

the master control and processing unit is further configured to: calibrate a position of the  
20 pick-and-place mechanism according to a position of the target storage position marker; ~~and~~ and deposit a carried target inventory container at the target storage position on the target inventory bracket in a case that the calibration is completed; or calibrate a position of the pick-and-place mechanism according to positions of the at least two target container edges; and remove the stored target inventory container from a target storage position on the target  
25 inventory bracket in a case that the calibration is completed.

~~2. The container depositing robot according to claim 1, wherein the plane of the storage region comprises: a ground of the storage region, or a surface of a platform partition of the storage.~~

~~3. The container depositing robot according to claim 1 or 2, wherein the target deposit-removal position information comprises: a horizontal position coordinate of the target inventory container on the plane of the storage region, and a height position coordinate of the~~  
30

~~target inventory container relative to the plane of the storage region.~~

42. The ~~container-depositing~~transferring robot according to claim ~~3~~1, wherein for controlling the robot body to move to the first horizontal position according to the target deposit-removal position information of the target inventory container, the master control and  
5 processing unit is configured to:

acquire a navigation path of the robot on the plane of the storage region according to ~~the~~a horizontal position coordinate indicated by the target deposit-removal position information; and

control, based on the navigation path, the robot to travel to a first horizontal position  
10 aligned with the horizontal position indicated by the target deposit-removal position information.

~~5. The container-depositing robot according to claim 4, wherein the first horizontal position comprises: a position of a travel channel on a side of the target inventory bracket to which the target inventory container belongs.~~

63. The transferring robot according to claim ~~4 or 5~~2, wherein for controlling the robot to travel based on the navigation path, the master control and processing unit is further  
15 configured to:

determine a horizontal position of the robot body on the plane of the storage region and a traveling direction of the robot body in real time; and

correct, based on the horizontal position and the traveling direction determined in real  
20 time, a traveling deviation of the robot body on the plane of the storage region.

74. The ~~container-depositing~~transferring robot according to any one of claims 1 to ~~6~~3, wherein

the robot body is further provided with a lifting mechanism;

the master control and processing unit is further configured to control the lifting  
25 mechanism to lift the height of the pick-and-place mechanism; and

the master control and processing unit is further configured to detect a height of the pick-and-place mechanism relative to the plane of the storage region in real time, and stop the lifting when the pick-and-place mechanism is lifted to the first height position.

85. The ~~container depositing~~transferring robot according to claim 74, wherein the master control and processing unit is further configured to:

while controlling the robot body to move to the first horizontal position of the plane of the storage region, control the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism of the robot relative to the plane of the storage region; or

after controlling the robot body to move to the first horizontal position of the plane of the storage region and stop moving, control the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism of the robot relative to the plane of the storage region.

96. The ~~container depositing~~transferring robot according to claim 74 or 85, wherein the master control and processing unit is further configured to:

detect, by a wire-pull encoder or a position detection sensor, the height of the pick-and-place mechanism relative to the plane of the storage region in real time; and

if it is detected that the height of the pick-and-place mechanism relative to the plane of the storage region where the robot runs reaches the first height position, control the lifting mechanism for the pick-and-place mechanism to stop lifting.

~~10. The robot according to any one of claims 7 to 9, wherein the first height position is determined based on a height position coordinate indicated by the target deposit-removal position information and a preset height deviation.~~

~~11. The container depositing robot according to any one of claims 1 to 10, wherein a relative height indicated by the first height position is greater than a storage height indicated by the target deposit-removal position information.~~

127. The ~~container depositing~~transferring robot according to any one of claims 1 to 116, wherein the marker detection device is arranged at a lower end of a fork holding assembly of the pick-and-place mechanism, and the target storage position marker at a distance from the marker detection device being less than a predetermined distance is in a detection view field of the marker detection device;

the edge detection device is arranged at an upper end of a fork holding assembly of the

pick-and-place mechanism, and the target container edge of the target inventory container at a distance from the edge detection device being less than a predetermined distance is in a detection view field of the edge detection device.

~~138~~. The ~~container-depositing~~transferring robot according to any one of claims 1 to ~~127~~,

5 wherein

the master control and processing unit is further configured to determine a relative position deviation between a marker center of the target storage position marker and a preset position of the pick-and-place mechanism, or determine a relative position deviation between a container center of the at least two target container edges and a preset position of the  
10 pick-and-place mechanism, wherein the relative position deviation comprises a horizontal position deviation and/or a height position deviation; and

the master control and processing unit is further configured to: if the relative position deviation does not meet a preset deviation condition,

control the robot body to move from the first horizontal position to a second  
15 horizontal position, to drive a horizontal position adjustment of the pick-and-place mechanism of the robot; and/or

control the pick-and-place mechanism of the robot to move from the first height position to a second height position, so that a relative position deviation between the marker center and the preset position of the pick-and-place mechanism after the movement meets the  
20 preset deviation condition.

~~149~~. The ~~container-depositing~~transferring robot according to claim ~~127~~, wherein

the fork holding assembly of the pick-and-place mechanism comprises a first fork component and a second fork component, the first fork component is provided with a first infrared sensor, the second fork component is provided with a second infrared sensor, and the  
25 first fork component has a same retractable direction as the second fork component;

the master control and processing unit is further configured to: after the pick-and-place mechanism of the robot moves to the first height position, control the robot body to move near a position aligned with the target inventory container; and

the master control and processing unit is further configured to: control the pick-and-place  
30 mechanism to be aligned with the target inventory container according to a change of a signal

acquired by the first infrared sensor and a change of a signal acquired by the second infrared sensor during the movement of the robot body.

~~15. A container removing robot, comprising: a master control and processing unit, a pick-and-place mechanism, and a marker detection unit, wherein a body of the robot runs on a plane of a storage region, the storage region is provided with an inventory bracket for storing an inventory container, and the marker detection unit is arranged on the pick-and-place mechanism, and wherein~~

~~the master control and processing unit is configured to: according to target deposit-removal position information of a target inventory container, control the robot body to move to a first horizontal position and control the pick-and-place mechanism to move to a first height position;~~

~~the marker detection unit is configured to: detect by an edge detection device, in a case that the robot body and the pick-and-place mechanism stop moving, at least two target container edges of a target inventory container in a view field comprising a target inventory bracket; and~~

~~the master control and processing unit is further configured to: calibrate a position of the pick-and-place mechanism according to positions of the at least two target container edges; and remove the stored target inventory container from a target storage position on the target inventory bracket in a case that the calibration is completed.~~

~~16. The container removing robot according to claim 15, wherein the plane of the storage region comprises: a ground of the storage region, or a surface of a platform partition of the storage.~~

~~17. The container removing robot according to claim 15 or 16, wherein the target deposit-removal position information comprises: a horizontal position coordinate of the target inventory container on the plane of the storage region, and a height position coordinate of the target inventory container relative to the plane of the storage region.~~

~~18. The container removing robot according to claim 17, wherein for controlling the robot body to move to the first horizontal position according to the target deposit-removal position information of the target inventory container, the master control and processing unit is configured to:~~

~~acquire a navigation path of the robot on the plane of the storage region according to the horizontal position coordinate indicated by the target deposit-removal position information; and~~

5 ~~control, based on the navigation path, the robot to travel to a first horizontal position aligned with the horizontal position indicated by the target deposit-removal position information.~~

~~19. The container removing robot according to claim 18, wherein the first horizontal position comprises: a position of a travel channel on a side of the target inventory bracket to which the target inventory container belongs.~~

10 ~~20. The container removing robot according to claim 18 or 19, wherein for controlling the robot to travel based on the navigation path, the master control and processing unit is further configured to:~~

~~determine a horizontal position of the robot body on the plane of the storage region and a traveling direction of the robot body in real time; and~~

15 ~~correct, based on the horizontal position and the traveling direction determined in real time, a traveling deviation of the robot body on the plane of the storage region.~~

~~21. The container removing robot according to any one of claims 15 to 20, wherein the robot body is further provided with a lifting mechanism;~~

20 ~~the master control and processing unit is further configured to control the lifting mechanism to lift the height of the pick-and-place mechanism; and~~

~~the master control and processing unit is further configured to: detect a height of the pick-and-place mechanism relative to the plane of the storage region in real time, and stop the lifting when the pick-and-place mechanism is lifted to the first height position.~~

25 ~~22. The container removing robot according to claim 21, wherein the master control and processing unit is further configured to:~~

~~when controlling the robot body to move to the first horizontal position of the plane of the storage region, simultaneously control the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism of the robot relative to the plane of the storage region; or~~

after controlling the robot body to move to the first horizontal position of the plane of the storage region and stop moving, control the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism of the robot relative to the plane of the storage region.

23. The container removing robot according to claim 21 or 22, wherein the master control and processing unit is further configured to:

detect, by a wire pull encoder or a position detection sensor, the height of the pick-and-place mechanism relative to the plane of the storage region in real time; and

if it is detected that the height of the pick-and-place mechanism relative to the plane of the storage region where the robot runs reaches the first height position, control the lifting mechanism for the pick-and-place mechanism to stop lifting.

24. The container removing robot according to any one of claims 21 to 23, wherein the first height position is determined based on a height position coordinate indicated by the target deposit-removal position information and a preset height deviation.

25. The container removing robot according to any one of claims 15 to 24, wherein a relative height indicated by the first height position is smaller than a storage height indicated by the target deposit-removal position information.

26. The container removing robot according to claims 15 to 25, wherein the target container edge is a container structure feature at an edge of the target inventory container, and the target container edge is used to assist in locating the target inventory container placed at the target storage position to perform the container removing operation.

27. The container removing robot according to claim 26, wherein the edge detection device is arranged at an upper end of a fork holding assembly of the pick-and-place mechanism, and the target container edge of the target inventory container at a distance from the edge detection device being less than a predetermined distance is in a detection view field of the edge detection device.

2810. The ~~container removing~~transferring robot according to claim 279, wherein the edge detection device is configured to acquire at least three container edges from at least three sides of the target inventory container facing a side of the target inventory container, or acquire a complete container edge of the target inventory container.

29. ~~The container removing robot according to any one of claims 15 to 28, wherein~~

~~the master control and processing unit is further configured to determine a relative position deviation between a container center of the at least two target container edges and a preset position of the pick-and-place mechanism, wherein the relative position deviation comprises a horizontal position deviation and/or a height position deviation; and~~

~~the master control and processing unit is further configured to: if the relative position deviation does not meet a preset deviation condition,~~

~~control the robot body to move from the first horizontal position to a second horizontal position, to drive a horizontal position adjustment of the pick-and-place mechanism of the robot; and/or~~

~~control the pick-and-place mechanism of the robot to move from the first height position to a second height position, so that a relative position deviation between the container center and the preset position of the pick-and-place mechanism after the movement meets the preset deviation condition.~~

30. ~~The container removing robot according to claim 27, wherein~~

~~the fork holding assembly of the pick-and-place mechanism comprises a first fork component and a second fork component, the first fork component is provided with a first infrared sensor, the second fork component is provided with a second infrared sensor, and the first fork component has a same retractable direction as the second fork component;~~

~~the master control and processing unit is further configured to: after the pick-and-place mechanism of the robot moves to the first height position, control the robot body to move near a position aligned with the target inventory container; and~~

~~the master control and processing unit is further configured to: control the pick-and-place mechanism to be aligned with the target inventory container according to a change of a signal acquired by the first infrared sensor and a change of a signal acquired by the second infrared sensor during the movement of the robot body.~~

31. A ~~container depositing~~transferring method based on a robot, wherein the robot comprises a robot body and a pick-and-place mechanism, the robot body runs on a plane of a storage region, and the storage region is provided with an inventory bracket for storing an inventory container, and wherein the method comprises:

controlling the robot body to move to a first horizontal position and controlling the pick-and-place mechanism to move to a first height position according to target deposit-removal position information of a target inventory container;

detecting, by a marker detection device, a target storage position marker provided at a target storage position in a view field comprising a target inventory bracket in a case that the robot body and the pick-and-place mechanism stop moving, or detecting, by an edge detection device, at least two target container edges of the target inventory container in a view field comprising a target inventory bracket in a case that the robot body and the pick-and-place mechanism stop moving;

calibrating a position of the pick-and-place mechanism according to a position of the target storage position marker or positions of the at least two target container edges; and

depositing a carried target inventory container at the target storage position on the target inventory bracket in a case that the calibration is completed or removing the stored target inventory container from a target storage position on the target inventory bracket.

~~32. The method according to claim 31, wherein the plane of the storage region comprises: a ground of the storage region, or a surface of a platform partition of the storage.~~

~~33. The method according to claim 31 or 32, wherein the target deposit-removal position information comprises: a horizontal position coordinate of the target inventory container on the plane of the storage region, and a height position coordinate of the target inventory container relative to the plane of the storage region.~~

~~34~~<sup>12</sup>. The method according to claim ~~33~~<sup>11</sup>, wherein controlling the robot body to move to the first horizontal position according to the target deposit-removal position information of the target inventory container comprises:

acquiring a navigation path of the robot on the plane of the storage region according to the horizontal position coordinate indicated by the target deposit-removal position information; and

controlling, based on the navigation path, the robot to travel to a first horizontal position aligned with the horizontal position indicated by the target deposit-removal position information, wherein,

~~35. The method according to claim 34, wherein the first horizontal position comprises: a~~

~~position of a travel channel on a side of the target inventory bracket to which the target inventory container belongs.~~

~~36. The method according to claim 34 or 35, further comprising:—~~

determining a horizontal position of the robot body on the plane of the storage region  
5 and a traveling direction of the robot body in real time in a process of controlling the robot to travel based on the navigation path; and

correcting, based on the horizontal position and the traveling direction determined in real time, a traveling deviation of the robot body on the plane of the storage region.

~~37~~13. The method according to any one of claims ~~34~~11 to ~~36~~12, wherein controlling the  
10 pick-and-place mechanism to move to the first height position comprises:

controlling ~~a~~the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism; and

detecting a height of the pick-and-place mechanism relative to the plane of the storage region in real time, and stopping the lifting when the pick-and-place mechanism is lifted to  
15 the first height position, ~~wherein a relative height indicated by the first height position is greater than a storage height indicated by the target deposit-removal position information.~~

~~38~~14. The method according to claim ~~37~~13, wherein controlling the robot body to move to the first horizontal position and controlling the pick-and-place mechanism to move to the first height position according to the target deposit-removal position information of the target  
20 inventory container comprises:

while controlling the robot body to move to the first horizontal position of the plane of the storage region, controlling the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism of the robot relative to the plane of the storage region; or

25 after controlling the robot body to move to the first horizontal position of the plane of the storage region and stop moving, controlling the lifting mechanism for the pick-and-place mechanism to lift the height of the pick-and-place mechanism of the robot relative to the plane of the storage region.

~~39~~15. The method according to claim 13~~7~~ or ~~38~~14, wherein the controlling the

pick-and-place mechanism to move to the first height position comprises:

detecting, by a wire-pull encoder or a position detection sensor, the height of the pick-and-place mechanism relative to the plane of the storage region in real time; and

controlling the lifting mechanism for the pick-and-place mechanism to stop lifting if it is  
5 detected that the height of the pick-and-place mechanism relative to the plane of the storage region where the robot runs reaches the first height position, wherein, the first height position is determined based on a height position coordinate indicated by the target deposit-removal position information and a preset height deviation.

~~40. The method according to any one of claims 37 to 39, wherein the first height position  
10 is determined based on a height position coordinate indicated by the target deposit-removal position information and a preset height deviation.~~

~~41~~6. The method according to any one of claims ~~31~~11 to ~~40~~15, wherein the marker detection device is arranged at a lower end of a fork holding assembly of the pick-and-place mechanism, and the target storage position marker at a distance from the marker detection  
15 device being less than a predetermined distance is in a detection view field of the marker detection device;

the edge detection device is arranged at an upper end of a fork holding assembly of the pick-and-place mechanism, and the target container edge of the target inventory container at a distance from the edge detection device being less than a predetermined distance is in a  
20 detection view field of the edge detection device.

~~42. The method according to any one of claims 31 to 41, wherein the target storage position marker is used to assist in locating the target storage position required for the target inventory container to perform the container depositing operation, and the target storage position marker is set at a preset position of the target storage position.~~

~~43~~17. The method according to any one of claims ~~31-11~~ to ~~42~~16, wherein calibrating a position of the pick-and-place mechanism according to a position of the target storage position marker or positions of the at least two target container edges~~calibrating the position of the pick-and-place mechanism according to the position of the target storage position marker~~ comprises:  
30 determining a relative position deviation between a marker center of the target storage

position marker and a preset position of the pick-and-place mechanism, or determining a container center of the target inventory container according to the positions of the at least two target container edges, determining a relative position deviation between the container center and a preset position of the pick-and-place mechanism, wherein the relative position deviation

5 comprises a horizontal position deviation and/or a height position deviation; and

if the relative position deviation does not meet a preset deviation condition,

controlling the robot body to move from the first horizontal position to a second horizontal position, to drive a horizontal position adjustment of the pick-and-place mechanism of the robot; and/or

10 controlling the pick-and-place mechanism of the robot to move from the first height position to a second height position, so that a relative position deviation between the marker center and the preset position of the pick-and-place mechanism after the movement meets the preset deviation condition.

~~44. A container removing method based on a robot, wherein the robot comprises a robot  
15 body and a pick-and-place mechanism, the robot body runs on a plane of a storage region, and the storage region is provided with an inventory bracket for storing an inventory container, and wherein the method comprises:~~

~~controlling the robot body to move to a first horizontal position and controlling the  
pick-and-place mechanism to move to a first height position according to target  
20 deposit-removal position information of a target inventory container;~~

~~detecting, by an edge detection device, at least two target container edges of the target  
inventory container in a view field comprising a target inventory bracket in a case that the  
robot body and the pick-and-place mechanism stop moving;~~

~~calibrating a position of the pick-and-place mechanism according to positions of the at  
25 least two target container edges; and~~

~~removing the stored target inventory container from a target storage position on the  
target inventory bracket in a case that the calibration is completed.~~

~~45. The method according to claim 44, wherein controlling the pick-and-place  
mechanism to move to the first height position comprises:~~

controlling a lifting mechanism to lift the height of the pick-and-place mechanism; and

detecting a height of the pick-and-place mechanism relative to the plane of the storage region in real time, and stopping the lifting when the pick-and-place mechanism is lifted to the first height position, wherein a relative height indicated by the first height position is less than a storage height indicated by the target deposit-removal position information.

46. The method according to claim 44 or 45, wherein the target container edge is a container structure feature at an edge of the target inventory container, and the target container edge is used to assist in locating the target inventory container placed at the target storage position to perform the container removing operation.

47. The method according to any one of claims 44 to 46, wherein the edge detection device is arranged at an upper end of a fork holding assembly of the pick-and-place mechanism, and the target container edge of the target inventory container at a distance from the edge detection device being less than a predetermined distance is in a detection view field of the edge detection device.

48. The method according to any one of claims 44 to 47, wherein calibrating the position of the pick-and-place mechanism according to the positions of the at least two target container edges comprises:

determining a container center of the target inventory container according to the positions of the at least two target container edges;

determining a relative position deviation between the container center and a preset position of the pick-and-place mechanism, wherein the relative position deviation comprises a horizontal position deviation and/or a height position deviation; and

if the relative position deviation does not meet a preset deviation condition;

controlling the robot body to move from the first horizontal position to a second horizontal position, to drive a horizontal position adjustment of the pick-and-place mechanism of the robot; and/or

controlling the pick-and-place mechanism of the robot to move from the first height position to a second height position, so that a relative position deviation between the marker center and the preset position of the pick-and-place mechanism after the movement meets the preset deviation condition.

4918. The method according to any one of claims 4411 to 4817, further comprising:

after the pick-and-place mechanism of the robot moves to the first height position, controlling the robot body to move near a position aligned with the target inventory container; and

5 controlling the pick-and-place mechanism to be aligned with the target inventory container according to a change of a signal acquired by a first infrared sensor provided on the pick-and-place mechanism and a change of a signal acquired by a second infrared sensor provided on the pick-and-place mechanism during the movement of the robot body, wherein

10 the first infrared sensor is mounted on a first fork component of a fork holding assembly of the pick-and-place mechanism, and the second infrared sensor is mounted on a second fork component of the fork holding assembly of the pick-and-place mechanism.

19. A computer-readable storage medium having instructions stored thereon, wherein instructions, when executed by a processor, implement the steps of the method of any one of claims 11-18.

15 20. A computer program product having a computer software code, and the computer software code is used to realize the method of any one of claims 11-18 when it is run by a processor.