

CLAIMS

1. A goods picking apparatus, comprising: a goods picking assembly, a sensor, and a depth determining module;

wherein the sensor is provided on the goods picking assembly, the sensor being configured to collect a measurement signal when the goods picking assembly extends; wherein the measurement signal comprises one of a default signal and a preset obstruction signal, the default signal is a corresponding signal in a case that the sensor is not obstructed by a goods container, and the preset obstruction signal is a corresponding signal in a case that the sensor is obstructed by the goods container;

wherein the depth determining module is configured to determine a depth of the goods container according to the measurement signal; wherein the goods picking assembly is configured to pick or place the goods container according to the depth of the goods container;

wherein the depth is a length of the goods container in an extension direction of the goods picking assembly;

wherein the depth determining module is further configured to:

obtain a preset arm extension distance;

obtain, in a case that an arm extension distance of the goods picking assembly reaches the preset arm extension distance, the measurement signal outputted by the sensor;

control, in a case that the measurement signal is the default signal, the goods picking assembly to pick the goods container; and

generate, in a case that the measurement signal is the preset obstruction signal, preset arm extension distance error information.

2. The goods picking apparatus according to claim 1, wherein the goods picking assembly comprises a left arm and a right arm, wherein the left arm and the right arm are symmetrically arranged;

wherein the sensor is provided on at least one of the left arm and the right arm.

3. The goods picking apparatus according to claim 2, wherein the depth determining module is specifically configured to:

obtain, in a case that the measurement signal is changed from the default signal to the preset obstruction signal, a first state of the goods picking assembly;

obtain, in a case that the measurement signal is changed from the preset obstruction signal to the default signal, a second state of the goods picking assembly; and

determine the depth of the goods container according to the first state and the second state.

4. The goods picking apparatus according to claim 3, wherein the first state comprises a first extension length of the goods picking assembly, and the second state comprises a second extension length of the goods picking assembly, wherein the depth determining module is configured to determine the depth of the goods container according to a difference value between the first extension length and the second extension length.

5. The goods picking apparatus according to claim 3, wherein the sensor comprises a pair of through-beam sensors; wherein the pair of through-beam sensors comprise an emitting sensor and a receiving sensor; wherein the emitting sensor and the receiving sensor are symmetrically arranged on the left arm and the right arm;

wherein the preset obstruction signal is an output signal of the receiving sensor in a case that the receiving sensor does not receive a signal from the emitting sensor; and

wherein the default signal is an output signal of the receiving sensor in a case that the receiving sensor receives the signal from the emitting sensor.

6. The goods picking apparatus according to claim 2, wherein the sensor comprises $N+1$ pairs of through-beam sensors; wherein each pair of through-beam sensors are symmetrically arranged on the left arm and the right arm, and there is a set interval between two adjacent groups of through-beam sensors, wherein N is greater than or equal to 1; and

wherein the depth determining module is configured to:

determine, when output signals of receiving sensors of at least two pairs of through-beam sensors are the default signals and an M^{th} receiving sensor is the closest receiving sensor to a first receiving sensor among the receiving sensors of which the output signals are default signals, $(M-1)*L$ to be the depth of the goods container, wherein M is a positive integer less than or equal to N , L is the set interval, and the first receiving sensor is the receiving sensor

located at an end of the goods picking assembly in the extension direction of the goods picking assembly.

7. The goods picking apparatus according to claim 1, wherein the sensor is a visual sensor; the visual sensor is arranged on an upper surface of the goods picking assembly; and the measurement signal is a measurement image of a working region of the goods picking assembly photographed by the visual sensor.

8. The goods picking apparatus according to claim 2, wherein the sensor is a distance measurement sensor; the distance measurement sensor is arranged at an inner side of the left arm or the right arm; and the measurement signal is a measurement distance outputted by the distance measurement sensor.

9. The goods picking apparatus according to any one of claims 1 to 8, wherein the goods picking assembly comprises a pushing rod assembly; wherein the pushing rod assembly are movably mounted at one end of the goods picking assembly in the extension direction of the goods picking assembly;

wherein after the depth determining module determines the depth of the goods container, the pushing rod assembly is configured to rotate to a state of being perpendicular to an inner side surface of the goods picking assembly.

10. A depth measurement method executed by a goods picking apparatus of a warehousing robot, the goods picking apparatus comprising a goods picking assembly, a sensor, and a depth determining module;

wherein the method comprises:

collecting, by the sensor, a measurement signal when the goods picking assembly extends; wherein the measurement signal comprises one of a default signal and a preset obstruction signal, the default signal is a corresponding signal in a case that the sensor is not obstructed by a goods container, and the preset obstruction signal is a corresponding signal in a case that the sensor is obstructed by the goods container;

determining, by the depth determining module, a depth of the goods container according to the measurement signal; and

picking or placing, by the goods picking assembly, the goods container according to the depth of the goods container;

wherein the depth is a length of the goods container in an extension direction of the goods picking assembly;

wherein the method further comprises:

obtaining, by the depth determining module, a preset arm extension distance;

obtaining, in a case that an arm extension distance of the goods picking assembly reaches the preset arm extension distance, the measurement signal outputted by the sensor;

controlling, in a case that the measurement signal is the default signal, the goods picking assembly to pick the goods container according to the depth of the goods container; and

generating, in a case that the measurement signal is the preset obstruction signal, preset arm extension distance error information.

11. The method according to claim 10, wherein the goods picking assembly comprises a left arm and a right arm;

wherein the determining the depth of the goods container according to the measurement signal comprises:

obtaining, in a case that the measurement signal is changed from the default signal to the preset obstruction signal, a first state of the goods picking assembly;

obtaining, in a case that the measurement signal is changed from the preset obstruction signal to the default signal, a second state of the goods picking assembly; and

determining the depth of the goods container according to the first state and the second state.

12. The method according to claim 11, wherein the sensor comprises a pair of through-beam sensors; wherein the pair of through-beam sensors comprise an emitting sensor and a receiving sensor; wherein the emitting sensor and the receiving sensor are symmetrically arranged on the left arm and the right arm;

wherein the preset obstruction signal is an output signal of the receiving sensor in a case that the receiving sensor does not receive a signal from the emitting sensor; and

wherein the default signal is an output signal of the receiving sensor in a case that the receiving sensor receives the signal from the emitting sensor.

13. The method according to claim 10, wherein the goods picking assembly comprises a left arm and a right arm; wherein the sensor comprises at least two pairs of through-beam

sensors; wherein each pair of through-beam sensors are symmetrically arranged on the left arm and the right arm, and there is a set interval between two adjacent groups of through-beam sensors;

wherein the determining the depth of the goods container according to the measurement signal comprises:

determining the depth of the goods container according to the set interval and measurement signals collected by the at least two pairs of through-beam sensors.

14. The method according to claim 10, wherein the sensor is a visual sensor; the visual sensor is arranged on an upper surface of the goods picking assembly;

wherein the collecting, by the sensor, the measurement signal when the goods picking assembly extends comprises:

photographing, by the visual sensor, a measurement image of a working region of the goods picking assembly when the goods picking assembly extends;

wherein the determining the depth of the goods container according to the measurement signal comprises:

determining the depth of the goods container according to the measurement image.

15. The method according to claim 10, wherein the goods picking assembly comprises a left arm and a right arm; wherein the sensor is a distance measurement sensor; wherein the distance measurement sensor is arranged at an inner side of the left arm or the right arm;

wherein the collecting, by the sensor, the measurement signal when the goods picking assembly extends comprises:

collecting, by the distance measurement sensor, a measurement distance when the goods picking assembly extends;

wherein the determining the depth of the goods container according to the measurement signal comprises:

determining the depth of the goods container according to the measurement distance.

16. The method according to any one of claims 10 to 15, wherein the goods picking assembly comprises a pushing rod assembly; wherein the pushing rod assembly is movably mounted at one end of the goods picking assembly in the extension direction of the goods picking assembly;

wherein after determining the depth of the goods container according to the measurement signal, the method comprises:

controlling the pushing rod assembly to inwards rotate to a state of being perpendicular to an inner side surface of the goods picking assembly.

17. The method according to any one of claims 10 to 15, wherein the step of picking or placing the goods container according to the depth of the goods container comprises:

picking, by the goods picking assembly, the goods container according to the depth of the goods container;

wherein after the picking the goods container according to the depth of the goods container, the method comprises:

placing, according to the depth of the goods container, the goods container on a buffer mechanism of the warehousing robot.

18. The method according to claim 16, further comprising:

determining, according to the measurement signal in a case that the goods picking apparatus is initialized, whether there is the goods container on the goods picking assembly;

wherein the controlling the pushing rod assembly to inwards rotate to the state of being perpendicular to the inner side surface of the goods picking assembly comprises:

determining that there is the goods container on the goods picking assembly;

based on a determination that there is the goods container on the goods picking assembly, controlling the pushing rod assembly to inwards rotate to the state of being perpendicular to the inner side surface of the goods picking assembly.

19. A warehousing robot, comprising a moving chassis and the goods picking apparatus according to any one of claims 1 to 9, wherein the goods picking apparatus is connected to the moving chassis and configured to pick and/or place the goods container according to the depth of the goods container.

20. The warehousing robot according to claim 19, further comprising:

a buffer mechanism mounted on the moving chassis and configured to place the goods container;

wherein the goods picking apparatus is configured to place the goods container on the buffer mechanism according to the depth of the goods container.

21. A warehousing system, comprising the warehousing robot according to claim 19 or 20, a goods shelf, and a warehouse management module;

wherein the warehousing robot is communicatively connected to the warehouse management module;

wherein the moving chassis is configured to move, according to an instruction of the warehouse management module, to a position where the goods container is located, and the goods picking assembly is configured to pick the goods container according to the depth of the goods container, wherein the goods container is placed on the goods shelf.

22. A warehousing system, comprising the warehousing robot according to claim 19 or 20, a goods shelf, and a warehouse management module;

wherein the warehousing robot is communicatively connected to the warehouse management module;

wherein the moving chassis is configured to move, according to an instruction of the warehouse management module, to a position where the goods container is to be placed, and the goods picking assembly is configured to place the goods container to the position according to the depth of the goods container.

23. A computer readable storage medium, storing computer executable instructions, wherein the computer executable instructions, when executed by a processor, are configured to implement the depth measurement method according to any one of claims 10 to 18.