

EQUIPMENT AND METHODS FOR LOADING AND UNLOADING GOODS BY PALLET TRUCK AND AUTOMATED GUIDED VEHICLE

5 BACKGROUND OF THE DISCLOSURE

1. Field of the Disclosure:

The present disclosure relates to equipment, and more particularly, to an equipment and methods for loading and unloading goods by pallet truck and automated guided vehicle.

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2. Description of the Related Art:

An automated guided vehicle (AGV) is a type of robot for transporting goods in an unmanned environment. Specifically, the AGV is able to automatically navigate along a predetermined path and load or unload goods in order to achieve intelligent arrangement purpose, effectively moving goods between various workstations.

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However, in conventional goods transporting operation performed by an AGV, usage of a support frame is required to elevate the goods for creating a height difference between the

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goods and the ground, facilitating the movement of goods by the AGV. In addition, staff need to first operate machinery to place the goods onto the support frame, such that the AGV is allowed to successfully transport the goods.

5 On the other hand, currently in the market, there is no technology which is able to integrate multiple detection functions into the workstation to support the loading and unloading goods by pallet trucks and AGVs.

 Therefore, it is desirable for the industry to develop a
10 technological solution to address the aforementioned issues in order to improve the shortcomings of existing technologies.

SUMMARY OF THE DISCLOSURE

 The present disclosure aims at providing an equipment and
15 methods for loading and unloading goods by pallet truck and automated guided vehicle.

 The aforementioned objectives do not prevent the existence of other objectives. Those objectives derivable from the specification, claims, or drawings of the present disclosure by
20 a person having ordinary skill in the field of the invention are

also included in the scope of objectives of the present disclosure. Therefore, the objectives of the present disclosure are not limited to the aforementioned objectives.

For achieving the aforementioned objectives, the present disclosure provides an equipment for loading and unloading goods by pallet truck and automated guided vehicle, comprising:

an inbound area having an inbound position and a preset position, the inbound position used for receiving a cargo, the preset position arranged on a top side of the inbound position;

10 a cargo detection device disposed in the inbound area for detecting the cargo at the inbound position;

a cargo lifting device disposed in the inbound area for lifting the cargo; when the cargo detection device detects the cargo at the inbound position, the cargo lifting device lifts the cargo from the inbound position to the preset position;

15 a cargo moving device disposed in adjacent to the cargo lifting device for moving the cargo; when the cargo is at the preset position, the cargo moving device moves to the inbound position and receives the cargo at the preset position, and the cargo moving device outputs the cargo along an inbound

direction; and

an outbound area disposed in adjacent to the inbound area for receiving the cargo moved by the cargo moving device, such that the cargo is output to an automated guided vehicle.

5 In an embodiment, the present disclosure provides a method for loading and unloading goods by pallet truck and automated guided vehicle, comprising:

inputting a cargo to an inbound position of an inbound area;

detecting the cargo at the inbound position using a cargo
10 detection device, and detecting a machinery in proximity to the inbound area using a machinery detection device;

when the cargo detection device detects the cargo at the inbound position and the machinery detection device does not detect a machinery, a pallet detection device detects a width of
15 a pallet of the cargo; when the width does not match a preset width, the pallet detection device sends a width abnormality signal to a warehouse control system, and the warehouse control system sends the width error signal to a monitoring device;

when the cargo deviates from the inbound position, a pallet
20 alignment device is used to push the pallet to the inbound

position;

detecting a weight of the cargo at the inbound position using a weight detection device; when the weight does not match a preset weight, the weight detection device sends a
5 weight error signal to the warehouse control system, the warehouse control system sends the weight error signal to the monitoring device; detecting a volume of the cargo at the inbound position using a volume detection device; when the volume does not match a preset volume, the volume detection
10 device sends a volume error signal to the warehouse control system, and the warehouse control system sends the volume error signal to the monitoring device; reading a label information on the cargo at the inbound position using a cargo identification device; when the label information does not
15 match a cargo information, the cargo identification device sends a label error signal to the warehouse control system, and the warehouse control system sends the label error signal to the monitoring device;

when the weight, the volume, and the label information of
20 the cargo match the preset weight, the preset volume, and the

cargo information, a cargo lifting device lifts the cargo from the inbound position to a preset position of the inbound area; and

when the cargo is at the preset position, a cargo moving
5 device moves to the inbound position and receives the cargo at the preset position, and the cargo moving device outputs the cargo along an inbound direction to an automated guided vehicle.

In an embodiment, the present disclosure provides a method
10 for loading and unloading goods by pallet truck and automated guided vehicle, comprising:

detecting whether there is an foreign object in an outbound area using a foreign object detection device; when the foreign object detection device does not detect a foreign object in the
15 inbound area, a warehouse control system sends a permission signal to an automated guided vehicle for allowing the automated guided vehicle to enter the inbound area, and the automated guided vehicle places a cargo on a cargo lifting device;

20 reading a label information on the cargo in the outbound

area using a cargo identification device, and displaying the label information on a monitoring device; and

when the label information matches a cargo information, a cargo lifting device moves the cargo along a Z-axis direction to an outbound position of the outbound area.

With such configuration, the present disclosure achieves following advantages.

Through the collaborative operation of different devices, the present disclosure lifts the cargo to a certain height, allowing the automated guided vehicle to take over the cargo, so as to efficiently output the cargo.

Also, in addition to placing the cargo onto the AGV, the present disclosure integrates various detection functions, such as detecting the weight, volume, and information of the cargo, thereby enhancing the functionality of equipment.

Furthermore, the equipment not only supports an inbound mode but also provides an outbound mode, facilitating the handling operations of the AGV, thereby significantly increasing the practicality of the equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the equipment in accordance with an embodiment of the present disclosure, illustrating the appearance features of the equipment.

5 **Fig. 2** is a side view of the equipment in accordance with an embodiment of the present disclosure, illustrating the lateral sides of the inbound area and the outbound area.

Fig. 3 is another side view of the equipment in accordance with an embodiment of the present disclosure, illustrating the
10 arrangement of the inbound area and various objects.

Fig. 4 is a schematic view of the equipment in accordance with an embodiment of the present disclosure, illustrating the cargo received in the inbound area.

Fig. 5 is another schematic view of the equipment in
15 accordance with an embodiment of the present disclosure, illustrating the cargo at the inbound position.

Fig. 6 is another schematic view of the equipment in accordance with an embodiment of the present disclosure, illustrating the cargo being lifted from the inbound position to
20 the preset position.

Fig. 7 is another schematic view of the equipment in accordance with an embodiment of the present disclosure, illustrating the cargo outputted from the outbound area.

Fig. 8 is a structural block view of the equipment in accordance with an embodiment of the present disclosure, illustrating the coupling relationship between the objects of the equipment.

Fig. 9 is a flow chart of the method in accordance with an embodiment of the present disclosure.

Fig. 10 is another perspective view of the equipment in accordance with an embodiment of the present disclosure, illustrating the outbound mode of the equipment.

Fig. 11 is a flow chart of the method in accordance with another embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE DISCLOSURE

The aforementioned and further advantages and features of the present disclosure will be understood by reference to the description of the preferred embodiment in conjunction with the accompanying drawings where the components are illustrated

based on a proportion for explanation but not subject to the actual component proportion.

Embodiments of the present disclosure are illustrated in detail along with the drawings. However, the technical features
5 included by the present disclosure are not limited to certain embodiments hereby provided. Scope of the present disclosure shall be referred to the claims, which include all the possible replacements, modifications, and equivalent features.

Referring to **Fig. 1** to **Fig. 8**, in an embodiment, the present
10 disclosure provides an equipment **100** for loading and unloading of cargo **1** by pallet truck and automated guided vehicle, achieving the purpose of full automation.

Referring to **Fig. 1** to **Fig. 4**, the equipment **100** comprises an inbound area **IA**, a cargo detection device **10**, a cargo lifting
15 device **20**, a cargo moving device **30**, and an outbound area **OA**.

Referring to **Fig. 3**, the inbound area **IA** has an inbound position **P1** and a preset position **P2**. Referring to **Fig. 4** and **Fig. 5**, the inbound area **P1** is used for receiving a cargo **1**. The preset position **P2** is arranged on the top side of the inbound
20 position **P1**. Also, the inbound area **IA** has a support frame **2**,

on which the device is mounted.

The cargo detection device **10** is disposed in the inbound area **IA**. In the embodiment, the cargo detection device **10** is disposed on the support frame **2**. The cargo detection device **10** is configured to detect the cargo **1** at the inbound position **P1**; in other words, the cargo detection device **10** is used for detecting if the cargo **1** is at the inbound position **P1**.

The cargo lifting device **20** is disposed in the inbound area **IA**. The cargo lifting device **20** is configured to lift the cargo **1**. Referring to **Fig. 5** and **Fig. 6**, when the cargo detection device **10** detects the cargo **1** at the inbound position **P1**, the cargo lifting device **20** lifts the cargo **1** from the inbound position **P1** to the preset position **P2**, so that the cargo **1** is in alignment with the height of the automated guided vehicle **AGV**.

The cargo moving device **30** is disposed adjacent to the cargo lifting device **20**. The cargo moving device **30** is configured to move the cargo **1**. Referring to **Fig. 6**, when the cargo **1** is at the preset position **P2**, the cargo moving device **30** moves to the inbound position **P1** and receives the cargo **1** at the preset position **P2**. For example, the cargo moving device

30 has a receiving module **31** extending from one side of the cargo lifting device **20**, and the receiving module **31** moves to the inbound position **P1** below the preset position **P2** to receive the cargo **1**. Referring to **Fig. 7**, the cargo moving device **30**
5 outputs the cargo **1** along an inbound direction **M**.

The outbound area **OA** is disposed adjacent to the inbound area **IA**. The outbound area **OA** receives the cargo **1** moved by the cargo moving device **30**, so as to output the cargo **1**. Accordingly, the automated guided vehicle **AGV** is allowed
10 to enter the outbound area **OA** to receive the cargo **1** in the outbound area **OA**.

Referring to **Fig. 8**, to improve the functionality of the equipment **100**, the equipment **100** further comprises a pallet detection device **40** and a monitoring device **50**. The pallet
15 detection device **40** is coupled with the monitoring device **50**. The monitoring device **50** is allowed to be disposed in the inbound area **IA**. The cargo **1** comprises a pallet **1a** holding a storage item **1b** thereon. The pallet detection device **40** is configured to detect the width of the pallet **1a** at the inbound
20 position **P1**. When the width does not match a preset width, the

pallet detection device **40** sends a width error signal to a warehouse control system **WCS**, and the warehouse control system **WCS** sends the width error signal to the monitoring device **50** to notify on-site staff.

5 In an embodiment, to prevent machinery near the equipment **100** from affecting the operation of the equipment **100**, the equipment **100** further comprises a machinery detection device **60**. The machinery detection device **60** is disposed in the inbound area **IA** and configured to detect any machinery near
10 the inbound area **IA**. Therein, the machinery device **60** detects machinery through an infrared technology. When the machinery detection device **60** does not detect any machinery nearby, the pallet detection device **40** carries out the detection of the width of the pallet **1a**.

15 To prevent the positional deviation of the cargo **1** from affecting the operation of devices, the equipment **100** further comprises a pallet alignment device **70**. The pallet alignment device **70** is disposed in the inbound area **IA**, and configured to align the position of the cargo **1**. When the cargo **1** deviates
20 from the inbound position **P1**, the pallet alignment device **70**

pushes the pallet **1a** to the inbound position **P1**.

In the embodiment, the pallet alignment device **70** comprises a push rod **71** and an abutment portion **72**. The push rod **71** is disposed in the inbound area **IA** and arranged on one side of the cargo moving device **30**. The abutment portion **72** is disposed in the inbound area **IA** and arranged on the same side of the cargo moving device **30** with the push rod **71**, wherein the abutment portion **72** and the push rod **71** are disposed in opposite to each other. Therein, the abutment portion **72** is disposed on the cargo lifting device **20**, so as to ascend and descend together along with the cargo lifting device **20**. When the cargo **1** deviates from the inbound position **P1**, the push rod **71** pushes the cargo **1** to the inbound position **P1**, such that the cargo **1** abuts against the abutment portion **72**, whereby the position of the cargo **1** is aligned.

The equipment **100** further comprises a weight detection device **80**. The weight detection device **80** is disposed in the inbound area **IA**. Therein, the weight detection device **80** is disposed on the bottom side of the inbound area **IA** and coupled with the monitoring device **50**. The weight detection device **80**

is configured to detect a weight of the cargo **1** at the inbound position **P1**. When the weight does not match a preset weight, the weight detection device **80** sends a weight error signal to the warehouse control system **WCS**, and the warehouse control
5 system **WCS** sends the weight error signal to the monitoring device **50** to notify on-site staff.

The equipment **100** further comprises a volume detection device **90**. The volume detection device **90** is allowed to be disposed in the inbound area **IA**. The volume detection device
10 **90** is coupled with the monitoring device **50**. The volume detection device **90** is configured to detect a volume of the cargo **1** at the inbound position **P1**. Therein, the volume detection device **90** detects the volume of the cargo through an optical inspection technology. When the volume does not match
15 a preset volume, the volume detection device **90** sends a volume error signal to the warehouse control system **WCS**, and the warehouse control system **WCS** sends the volume error signal to the monitoring device **50** to notify on-site staff.

The equipment **100** further comprises a cargo identification
20 device **C**. The cargo identification device **C** is allowed to be

disposed in the inbound area **IA**. The cargo identification device **C** is coupled with the monitoring device **50**. The cargo identification device **C** is configured to read a label information on the cargo **1** at the inbound position **P1**. Therein, the cargo
5 identification device **C** reads the label information of the cargo through a barcode recognition technology and radio frequency identification (RFID) technology. When the label information does not match a cargo information, the cargo identification device **C** sends a label error signal to the warehouse control
10 system **WCS**, and the warehouse control system **WCS** sends the label error signal to the monitoring device **50** to notify on-site staff.

The equipment **100** further comprises a foreign object detection device **D**. The foreign object detection device **D** is
15 allowed to be disposed in the inbound area **IA** and the outbound area **OA**. The foreign object detection device **D** is configured to detect whether there is a foreign object in the inbound area **IA** or the outbound area **OA**. Therein, the foreign object detection device **D** detects the existence of a foreign object
20 through an infrared technology. When the foreign object

detection device **D** does not detect any foreign object in the
outbound area **OA**, the warehouse control system **WCS** sends a
permission signal to the automated guided vehicle **AGV**,
allowing the automated guided vehicle **AGV** to enter the
5 outbound area **OA**. In an embodiment, when there is no foreign
object below the outbound area **OA**, the automated guided
vehicle **AGV** accordingly enters the outbound area **OA**.

Referring to **Fig. 9**, in an embodiment, the present
disclosure provides a method **200** for loading and unloading
10 goods by pallet truck and automated guided vehicle, comprising
following steps.

In step **I1**, a cargo **1** is input to an inbound position **P1** of
an inbound area **IA**.

In step **I2**, a cargo detection device **10** is used to detect the
15 cargo **1** at the inbound position **P1**, and a machinery detection
device **60** is used to detect machinery near the inbound area **IA**.
Accordingly, the cargo **1** is in position, and the absence of
machinery near equipment **100** is confirmed.

In step **I3**, when the cargo detection device **10** detects the
20 cargo **1** at the inbound position **P1** and the machinery detection

device **60** does not detect any machinery nearby, a pallet detection device **40** is used to detect the width of the pallet **1a** of the cargo **1**, so as to confirm if the width of the pallet **1a** meets the required width standard. If the width does not match
5 a preset width, the pallet detection device **40** sends a width error signal to a warehouse control system **WCS**, and the warehouse control system **WCS** sends the width error signal to a monitoring device **50** to notify on-site staff. In step **I31**, when the width issue of the pallet **1a** is resolved, the pallet detection
10 device **40** is used to detect the width of the pallet **1a** again. If the width of the pallet **1a** meets the requirement, the equipment **100** continues the inbound operation.

In step **I4**, when the cargo **1** deviates from the inbound position **P1**, a pallet alignment device **70** pushes the pallet **1a**
15 to the inbound position **P1**. In another embodiment, when the pallet alignment device **70** fails to align the position of the pallet **1a**, the pallet alignment device **70** sends an alignment error signal to the warehouse control system **WCS**, and the warehouse control system **WCS** sends the alignment signal to
20 the monitoring device **50**.

In step **I5**, a weight detection device **80** is used to detect a weight of the cargo **1** at the inbound position **P1**. When the weight does not match a preset weight, the weight detection device **80** sends a weight error signal to the warehouse control system **WCS**, and the warehouse control system **WCS** sends the weight error signal to the monitoring device **50**. In step **I51**, when the on-site staff resolve the weight issue of the cargo **1**, the weight detection device **80** detects the weight of the cargo **1** again. If the weight of the cargo **1** meets the requirement standard, the equipment **100** continues the inbound operation.

In step **I5**, a volume detection device **90** is used to detect a volume of the cargo **1** at the inbound position **P1**. When the volume does not match a preset volume, the volume detection device **90** sends a volume error signal to the warehouse control system **WCS**, and the warehouse control system **WCS** sends the volume error signal to the monitoring device **50**. In step **I51**, when the on-site staff resolve the volume issue of the cargo **1**, the volume detection device **90** detects the volume of the cargo **1** again. If the volume of the cargo **1** meets the requirement standard, the equipment **100** continues the inbound operation.

In step **I5**, a cargo identification device **C** reads a label information on the cargo **1** at the inbound position **P1**. When the label information does not match a cargo information, the cargo identification device **C** sends a label error signal to the
5 warehouse control system **WCS**, and the warehouse control system **WCS** sends the label error signal to the monitoring device **50**. In step **I51**, when the on-site staff resolve the correctness issue of the cargo **1**, the cargo identification device **C** detects the label information of the cargo **1** again. If the label
10 information matches the cargo information, the equipment **100** continues the inbound operation.

In step **I6**, when the weight, the volume, and the label information of the cargo **1** match the preset weight, the preset volume, and the cargo information, a cargo lifting device **20**
15 lifts the cargo **1** from the inbound position **P1** to a preset position **P2** of the inbound area **IA**.

In step **I7**, when the cargo **1** is at the preset position **P2**, a cargo moving device **30** moves to the inbound position **P1** and receives the cargo **1** at the preset position **P2**, and the cargo
20 moving device **30** outputs the cargo **1** along an inbound

direction **M** to an automated guided vehicle **AGV**. In an embodiment, a camera device **S** is further included, so that the present disclosure records the status of the cargo **1** using the camera device **S**.

5 Referring to **Fig. 10**, in an embodiment, the equipment **100** has an outbound mode. Referring to **Fig. 11**, the present disclosure provides a method **200** for loading and unloading goods by pallet truck and automated guided vehicle, comprising following steps.

10 In step **O1**, a foreign object detection device **D** is used to detect whether there is a foreign object in the outbound area **OA**. When the foreign object detection device **D** does not detect any foreign object in the outbound area **OA**, a warehouse control system **WCS** sends a permission signal to an automated
15 guided vehicle **AGV**, allowing the automated guided vehicle **AGV** to enter the outbound area **OA**, such that the automated guided vehicle **AGV** places a cargo **1** on a cargo lifting device **20**.

In step **O2**, a cargo identification device **C** is used to read
20 a label information on the cargo **1** in the outbound area **OA**, and

display the label information on the monitoring device **50**,
facilitating the monitoring operation of staff.

In step **O3**, when the label information matches a cargo
information, a cargo lifting device **20** moves the cargo **1** along
5 a Z-axis direction to an outbound position **P3** of the outbound
area **OA**.

With the foregoing configuration, advantages of the present
disclosure will be illustrated below.

Through the collaborative operation of different devices,
10 the present disclosure lifts the cargo **1** to a certain height,
allowing the automated guided vehicle **AGV** to take over the
cargo **1**, so as to efficiently output the cargo **1**.

Also, the equipment **100** of the present disclosure
integrates various detection functions, such as detecting the
15 weight, volume, and information of the cargo **1**, thereby
enhancing the functionality of equipment **100**.

Furthermore, the equipment **100** not only supports an
inbound mode but also provides an outbound mode, facilitating
the handling operations of the automated guided vehicle **AGV**,
20 thereby significantly increasing the practicality of the

equipment.

Although particular embodiments of the disclosure have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing
5 from the scope of the disclosure. Accordingly, the disclosure is not to be limited except as by the appended claims.

What is claimed is:

1. An equipment for loading and unloading goods by pallet truck and automated guided vehicle, comprising:

an inbound area having an inbound position and a preset
5 position, the inbound position used for receiving a cargo, the preset position arranged on a top side of the inbound position;

a cargo detection device disposed in the inbound area for detecting the cargo at the inbound position;

a cargo lifting device disposed in the inbound area for
10 lifting the cargo; when the cargo detection device detects the cargo at the inbound position, the cargo lifting device lifts the cargo from the inbound position to the preset position;

a cargo moving device disposed in adjacent to the cargo lifting device for moving the cargo; when the cargo is at the
15 preset position, the cargo moving device moves to the inbound position and receives the cargo at the preset position, and the cargo moving device outputs the cargo along an inbound direction; and

an outbound area disposed in adjacent to the inbound area
20 for receiving the cargo moved by the cargo moving device, such

that the cargo is output to an automated guided vehicle.

2. The equipment for loading and unloading goods by
pallet truck and automated guided vehicle of claim 1, wherein
the equipment comprises a pallet detection device and a
5 monitoring device; the pallet detection device is coupled with
the monitoring device; the cargo comprises a pallet; the pallet
detection device is configured to detect a width of the pallet at
the inbound position; when the width does not match a preset
width, the pallet detection device sends a width error signal to
10 a warehouse control system, and the warehouse control system
sends the width error signal to the monitoring device.

3. The equipment for loading and unloading goods by
pallet truck and automated guided vehicle of claim 2, wherein
the equipment comprises a machinery detection device; the
15 machinery detection device is disposed in the inbound area; the
machinery detection device is configured to detect a machinery
in proximity to the inbound area; when the machinery detection
device does not detect a machinery, the pallet detection device
detects the width of the pallet.

20 4. The equipment for loading and unloading goods by

pallet truck and automated guided vehicle of claim 3, wherein the equipment comprises a pallet alignment device; the pallet alignment device is disposed in the inbound area; the pallet alignment device is configured to align a position of the cargo; 5 when the cargo deviates from the inbound position, the pallet alignment device pushes the pallet to the inbound position.

5. The equipment for loading and unloading goods by pallet truck and automated guided vehicle of claim 4, wherein the equipment comprises a weight detection device; the weight 10 detection device is disposed in the inbound area; the weight detection device is coupled with the monitoring device; the weight detection device is configured to detect a weight of the cargo at the inbound position; when the weight does not match a preset weight, the weight detection device sends a weight 15 error signal to the warehouse control system, and the warehouse control system sends the weight error signal to the monitoring device.

6. The equipment for loading and unloading goods by pallet truck and automated guided vehicle of claim 5, wherein 20 the equipment comprises a volume detection device; the volume

detection device is coupled with the monitoring device; the volume detection device is configured to detect a volume of the cargo at the inbound position; when the volume does not match a preset volume, the volume detection device sends a volume error signal to the warehouse control system, and the warehouse control system sends the volume error signal to the monitoring device.

7. The equipment for loading and unloading goods by pallet truck and automated guided vehicle of claim 6, wherein the equipment comprises a cargo identification device; the cargo identification device is coupled with the monitoring device; the cargo identification device is configured to read a label information on the cargo at the inbound position; when the label information does not match a cargo information, the cargo identification device sends a label error signal to the warehouse control system, and the warehouse control system sends the label error signal to the monitoring device.

8. The equipment for loading and unloading goods by pallet truck and automated guided vehicle of claim 7, wherein the equipment comprises a foreign object detection device; the

foreign object detection device is coupled with an automated guided vehicle; the foreign object detection device is configured to detect whether there is a foreign object in the outbound area; when the foreign object detection device does not detect a foreign object in the outbound area, the warehouse control system sends a permission signal to the automated guided vehicle, allowing the automated guided vehicle to enter the outbound area.

9. A method for loading and unloading goods by pallet truck and automated guided vehicle, comprising:

inputting a cargo to an inbound position of an inbound area; detecting the cargo at the inbound position using a cargo detection device, and detecting a machinery in proximity to the inbound area using a machinery detection device;

when the cargo detection device detects the cargo at the inbound position and the machinery detection device does not detect a machinery, a pallet detection device detects a width of a pallet of the cargo; when the width does not match a preset width, the pallet detection device sends a width abnormality signal to a warehouse control system, and the warehouse control

system sends the width error signal to a monitoring device;

when the cargo deviates from the inbound position, a pallet alignment device is used to push the pallet to the inbound position;

5 detecting a weight of the cargo at the inbound position using a weight detection device; when the weight does not match a preset weight, the weight detection device sends a weight error signal to the warehouse control system, the warehouse control system sends the weight error signal to the
10 monitoring device; detecting a volume of the cargo at the inbound position using a volume detection device; when the volume does not match a preset volume, the volume detection device sends a volume error signal to the warehouse control system, and the warehouse control system sends the volume
15 error signal to the monitoring device; reading a label information on the cargo at the inbound position using a cargo identification device; when the label information does not match a cargo information, the cargo identification device sends a label error signal to the warehouse control system, and
20 the warehouse control system sends the label error signal to the

monitoring device;

when the weight, the volume, and the label information of the cargo match the preset weight, the preset volume, and the cargo information, a cargo lifting device lifts the cargo from the inbound position to a preset position of the inbound area;
5 and

when the cargo is at the preset position, a cargo moving device moves to the inbound position and receives the cargo at the preset position, and the cargo moving device outputs the cargo along an inbound direction to an automated guided vehicle.
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10. A method for loading and unloading goods by pallet truck and automated guided vehicle, comprising:

detecting whether there is an foreign object in an outbound area using a foreign object detection device; when the foreign object detection device does not detect a foreign object in the outbound area, a warehouse control system sends a permission signal to an automated guided vehicle for allowing the automated guided vehicle to enter the outbound area, and the automated guided vehicle places a cargo on a cargo lifting
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device;

reading a label information on the cargo in the outbound area using a cargo identification device, and displaying the label information on a monitoring device; and

- 5 when the label information matches a cargo information, a cargo lifting device moves the cargo along a Z-axis direction to an outbound position of the outbound area.