

STORAGE EQUIPMENT

CROSS-REFERENCE TO RELATED PATENT APPLICATION

This application claims the benefit of priorities to Taiwan Patent
5 Application No. 109131109 filed on September 10, 2020 and the U.S.
Provisional Patent Application Ser. No. 63/031813 filed on May 29, 2020. The
entire content of the above identified application is incorporated herein by
reference.

Some references, which may include patents, patent applications and
10 various publications, may be cited and discussed in the description of this
disclosure. The citation and/or discussion of such references is provided merely
to clarify the description of the present disclosure and is not an admission that
any such reference is “prior art” to the disclosure described herein. All
references cited and discussed in this specification are incorporated herein by
15 reference in their entireties and to the same extent as if each reference was
individually incorporated by reference.

FIELD OF THE DISCLOSURE

The present disclosure relates to storage equipment and more particularly
20 to storage equipment with high storage capacity.

BACKGROUND OF THE DISCLOSURE

In the current technology for a storage system, the storage and extraction
speed and the storage capacity for objects to be stored therein are still in need of
25 improvement. Accordingly, to increase the storage and extraction speed and the

storage capacity of the storage system and overcome the abovementioned inadequacies, modification of the structural design of the storage system has become one of the important issues to be addressed in this industry.

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SUMMARY OF THE DISCLOSURE

In response to the above-referenced technical inadequacies, a storage equipment for storing and extracting an object is provided in the present disclosure.

In one aspect, the present disclosure provides a storage equipment for
10 storing and extracting an object. The storage equipment includes a storage device, an object delivery platform, an object storage and extraction device, and a control device. The storage device is used to store the object. The storage device includes a rotating module and a storage module disposed on the rotating module, in which the rotating module drives the storage module to rotate. The
15 object delivery platform is adjacent to the storage device. The object storage and extraction device is adjacent to the storage device. The control device is electrically connected to the storage device and the object storage and extraction device. When the control device receives an object inbound command or an object outbound command, the control device controls the
20 rotating module according to the object inbound command or the object outbound command to drive the storage module to rotate around a rotation central axis of the rotating module, so that the storage module rotate to a storage and extraction position. When the control device receives the object inbound command or the object outbound command, the control device controls the
25 object storage and extraction device according to the object inbound command

or the object outbound command to move the object from the object delivery platform to the storage device or from the storage device to the object delivery platform.

Therefore, by virtue of “the storage device including a rotating module and
5 a storage module disposed on the rotating module” and “the rotating module driving the storage module to rotate,” the storage and extraction speed and the storing capacity of the storage equipment for objects can be improved.

These and other aspects of the present disclosure will become apparent from the following description of the embodiment taken in conjunction with the
10 following drawings and their captions, although variations and modifications therein may be affected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The present disclosure will become more fully understood from the following detailed description and accompanying drawings in which:

FIG. 1 is a schematic perspective view of a storage equipment according to an embodiment of the present disclosure.

FIG. 2 is another schematic perspective view of the storage equipment
20 according to the embodiments of the present disclosure.

FIG. 3 is yet another schematic perspective view of the storage equipment according to the embodiments of the present disclosure.

FIG. 4 is a functional block diagram of the storage equipment according to the embodiment of the present disclosure.

25 FIG. 5 is a schematic exploded perspective view of a storage device of the

storage equipment according to the embodiment of the present disclosure.

FIG. 6 is a schematic perspective view of a part of the storage equipment according to the embodiment of the present disclosure.

FIG. 7 is a schematic perspective view another part of the storage equipment according to the embodiment of the present disclosure.

FIG. 8 is a schematic perspective view of a labeling device of the storage equipment according to the embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

The present disclosure is more particularly described in the following examples that are intended as illustrative only since numerous modifications and variations therein will be apparent to those skilled in the art. Like numbers in the drawings indicate like components throughout the views. As used in the description herein and throughout the claims that follow, unless the context clearly dictates otherwise, the meaning of “a”, “an”, and “the” includes plural reference, and the meaning of “in” includes “in” and “on”. Titles or subtitles can be used herein for the convenience of a reader, which shall have no influence on the scope of the present disclosure.

The terms used herein generally have their ordinary meanings in the art. In the case of conflict, the present document, including any definitions given herein, will prevail. The same thing can be expressed in more than one way. Alternative language and synonyms can be used for any term(s) discussed herein, and no special significance is to be placed upon whether a term is elaborated or discussed herein. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this

specification including examples of any terms is illustrative only, and in no way limits the scope and meaning of the present disclosure or of any exemplified term. Likewise, the present disclosure is not limited to various embodiments given herein. Numbering terms such as “first”, “second” or “third” can be used to describe various components, signals or the like, which are for distinguishing one component/signal from another one only, and are not intended to, nor should be construed to impose any substantive limitations on the components, signals or the like.

[Embodiment]

Reference is made to FIG. 1 to FIG. 4. FIG. 1 to FIG. 3 are schematic perspective view of a storage equipment (apparatus) according to an embodiment of the present disclosure respectively. FIG. 4 is a functional block diagram of the storage equipment according to the embodiment of the present disclosure. A storage equipment U for storing and extracting an object P is provided in the embodiment of the present disclosure. The storage equipment U includes a storage device 1, an object delivery platform 2, an object storage and extraction device 3, and a control device 4. The storage device 1, the object delivery platform 2, the object storage and extraction device 3, and the control device 4 can be disposed on a carrier base S. The control device 4 can be electrically connected to the storage device 1 and/or the object storage and extraction device 3, so as to control an operation of the storage device 1 and/or the object storage and extraction device 3. In addition, it should be noted that for the clarity of the drawings, only the carrier base S is shown in FIG. 1. In order to clearly illustrate the structures of the storage device 1 and the object

storage and extraction device 3, the storage device 1 and the object storage and extraction device 3 are shown as if suspended in mid-air. In addition, for example, the object P may be a bottle, the storage device 1 can be used to store the object P, and the object storage and extraction device 3 can be used to move the object P. However, it should be noted that the storage equipment U for storing bottles is taken as an example, but the object P may be another object in another embodiment. The present disclosure is not limited to the specific forms of the object P provided herein.

As mentioned above, the storage device 1 includes a rotating module 11 and a storage module 12 disposed on the rotating module 11. The storage module 12 can be used to store the object P, and the rotating module 11 can drive the storage module 12 to rotate. It should be noted that for the clarity of the drawings, only two storage modules 12 and two rotating modules 11 are shown in FIG. 1, and only one storage module 12 and one rotating module 11 are illustrated in the other drawings as an example. The present disclosure is not limited to the numbers of the storage module 12 provided herein. In practice, the numbers of the rotating module 11 and the storage module 12 may be adjusted in accordance with the number of object P and the size of the factory space.

As mentioned above, the object delivery platform 2 can be disposed adjacent to the storage device 1, and the object storage and extraction device 3 can be disposed adjacent to the storage device 1. For example, the object storage and extraction device 3 can be disposed between the object delivery platform 2 and the storage device 1. Accordingly, the object storage and extraction device 3 can move the object P from the object delivery platform 2 to

the storage device 1 or from the storage device 1 to the object delivery platform 2. Moreover, the object P may include an object to be stored PA and an object to be taken out PB. It should be noted that the object “to be stored” PA and the object “to be taken out” PB herein are used to clarify different statuses of the object P. That is, after the object “to be stored” PA has been stored in the storage device 1, the object stored in the storage device 1 may become the object “to be taken out” PB. After the object “to be taken out” PB has been extracted from the storage device 1 and then needs to be placed back to the storage device 1, the object may become the object “to be stored” PA again.

As mentioned above, for example, the object delivery platform 2 may include an object outbound platform 21, an object inbound platform 22 and/or a defective object platform 23. The object outbound platform 21 may be used to carry the object “to be taken out” PB. That is, the object P in the storage device 1 can be gripped and then transported to the object outbound platform 21 by the object storage and extraction device 3. In addition, the object inbound platform 22 may be used to carry the object “to be stored” PA. That is, the object P to be stored can be placed on the object inbound platform 22, and then is gripped and transported to the storage device 1 by the object storage and extraction device 3. Further, the defective object platform 23 may be used to carry the object P having flaws, for example, but not limited to, the substance in the bottle is expired or underweight. Accordingly, the object storage and extraction device 3 may be used to move the object P with flaws from the storage device 1 to the defective object platform 23 through the determination of the control device 4. In addition, it should be noted that the object outbound platform 21, the object inbound platform 22 and the defective object platform 23 that are mentioned

above may be of the same type or have the specification for carrying the object P, and the only difference among them is the functions that the platforms perform.

Accordingly, when the control device 4 receives an object inbound command or an object outbound command, the control device 4 may control the rotating module 11 according to the object inbound command or the object outbound command to drive the storage module 12 to rotate around a rotation central axis A1 of the rotating module 11, so that the storage module 12 rotates to a storage and extraction position. In addition, when the control device 4 receives the object inbound command or the object outbound command, the control device 4 controls the object storage and extraction device 3 according to the object inbound command or the object outbound command to move the object P from the object delivery platform 2 to the storage device 1 or from the storage device 1 to the object delivery platform 2.

Subsequently, reference is made to FIG. 1 to FIG. 4 again, which is to be read in conjunction with FIG. 5. FIG. 5 is a schematic exploded perspective view of a storage device of the storage equipment according to the embodiment of the present disclosure. The storage device 1 includes a rotating module 11 and a storage module 12 disposed on the rotating module 11. For example, rotating module 11 may be a motor for driving the storage module 12 to rotate around a rotation central axis A1 of the rotating module 11. However, the present disclosure is not limited to the examples of the rotating module 11. In addition, it should be noted that only portions of the objects P disposed on the storage module 12 are exemplified for description in the present disclosure.

As mentioned above, for example, the storage module 12 may include a

first base body 121 and a second base body 122 that are disposed on the rotating module 11, a plurality of carrier plates 123 disposed between the first base body 121 and the second base body 122, and a plurality of storage elements 124 disposed on each of the carrier plates 123 and the sequentially arranged along a length direction (Y direction) of each of the carrier plates 123. In addition, each of the storage elements 124 may include a fixed part 1241 and a storage socket 1242 connected to the fixed part 1241, and the object P may be placed into the storage socket 1242. Moreover, the storage socket 1242 may have a central axis A2. The central axis A2 of the storage socket 1242 and the rotation central axis A1 of the rotating module 11 form a predetermined angle θ therebetween ranging from 20° to 60° . Preferably, in one of the embodiments, the predetermined angle θ may be 40° , but the present disclosure is not limited thereto. Furthermore, it should be noted that for the clarity of the drawings, another imaginary rotation central axis A1 that is adjacent to the central axis A2 of the storage socket 1242 is further shown so as to denote the position of the predetermined angle θ .

In addition, the carrier plates 123 are disposed on the first base body 121 and the second base body 122 and surround the rotation center axis A1. For example, for the present disclosure, the first base body 121 may include a plurality of first slots 1210, the second base body 122 may include a plurality of second slots 1220, one end of each of the carrier plates 123 is disposed in the corresponding one of the first slots 1210, and the other end of each of the carrier plates 123 is disposed in the corresponding one of the second slots 1220. Accordingly, when the storage elements 124 or the carrier plates 123 have to be replaced, the storage elements 124 and/or the carrier plates 123 can be directly

dismantled and replaced. Further, the carrier plates 123 surrounding around the rotation central axis A1 define an air flow space G1, and two adjacent ones of the carrier plates 123 define an air flow gap G2 therebetween. Accordingly, when the storage equipment U provided herein is applied under a low
5 temperature environment or a nitrogen filling environment, an air may flow through the air flow space G1 and/or the air flow gap G2.

Subsequently, reference is made to FIG. 1 to FIG. 4 again, which is to be read in conjunction with FIG. 6 to FIG. 8. FIG. 6 to FIG. 8 is a schematic perspective view of a part of the storage equipment according to the
10 embodiment of the present disclosure. In one of the embodiments, the storage equipment U may further include a weighing device 5 and a labeling device 6, and the weighing device 5 and the labeling device 6 both are arranged adjacent to the storage device 1. In addition, the control device 4 may electrically connected to the weighing device 5 and the labeling device 6. The control
15 device 4 may receive a weight information of the object P measured by the weighing device 5, and the control device 4 may control the labeling device 6 to attach an identification label 60 on the object P. Moreover, it should be noted that the identification label 60 only shown in a parts of the object P of FIG. 8.

As mentioned above, to the present disclosure, the storage equipment U
20 may further include an object carrying platform 7, and the object carrying platform 7 may be arranged adjacent to the storage device 1, so that the object carrying platform 7 serves as a midway transfer position for the object P. In addition, the object storage and extraction device 3 may include a first object storage and extraction module 31 and a second object storage and extraction
25 module 32. The object carrying platform 7 may be arranged between the first

object storage and extraction module 31 and the second object storage and extraction module 32, so that both of the first object storage and extraction module 31 and the second object storage and extraction module 32 may move the object P to the object carrying platform 7 or move the object P out of the object carrying platform 7.

As mentioned above, for example, the first object storage and extraction module 31 may include a robotic arm 311, a first object storage and extraction unit 312 disposed on the robotic arm 311, and an image recognition unit 313 disposed on the robotic arm 311. The first object storage and extraction unit 312 may be a claw to carry and move the object P. In addition, the image recognition unit 313 may be an image capture lens. The image recognition unit 313 may be used to recognize a label (for example, but not limited to, a label including a Quick Response Code (QR code), not shown) disposed on one of the storage elements 124, so as to further confirm whether the first object storage and extraction module 31 corresponds to a correct one of the storage elements 124 or not. Subsequently, the robotic arm 311 moves the object P to the storage elements 124 or moves the object P out of the storage elements 124. In addition, it should be noted that the first object storage and extraction unit 312 is exemplified as a claw for description herein, but in another embodiment, the first object storage and extraction unit 312 may also be a sucker. The present disclosure is not limited to the specific structure of the first object storage and extraction unit 312. That is, the first object storage and extraction unit 312 may be replaced or adjusted according to different kind of the object P. In addition, the robotic arm 311 may drive the first object storage and extraction unit 312 to move in a plurality of axial directions, so that the first object storage and

extraction unit 312 is moved to a suitable position for moving the object P.

As mentioned above, for example, the second object storage and extraction module 32 may include a base 321, a first moving unit 322 disposed on the base 321, a second moving unit 323 disposed on the first moving unit 322, a third moving unit 324 disposed on the second moving unit 323, and a second object storage and extraction unit 325 disposed on the third moving unit 324. The second object storage and extraction unit 325 may be a claw to carry and move the object P. In addition, it should be noted that the second object storage and extraction unit 325 is illustrated as a claw as an example herein, but the second object storage and extraction unit 325 may also be a sucker in the another embodiment. The present disclosure is not limited to the specific structure of the second object storage and extraction unit 325. That is, the second object storage and extraction unit 325 may be replaced or adjusted according to different kinds of the object P. In addition, each of the first moving unit 322, the second moving unit 323, and the third moving unit 324 may be a slide rail, but the present disclosure is not limited thereto.

As mentioned above, for example, the first moving unit 322 may move relative to the base 321 along a first movement direction (X direction), the second moving unit 323 may move relative to the base 321 along a second movement direction (Y direction), and the third moving unit 324 may move relative to the base 321 along a third movement direction (Z direction). The first movement direction (X direction), the second movement direction (Y direction), and the third movement direction (Z direction) are perpendicular to one another. In other words, the second object storage and extraction unit 325 may move on any one of the three directions that are perpendicular to one another, so that the

second object storage and extraction unit 325 is driven to a suitable position to move the object P.

Accordingly, in one of the embodiments, when the control device 4 receives the object inbound command, the control device 4 may control the first object storage and extraction module 31 according to the object inbound command to move the object P from the object inbound platform 22 of the object delivery platform 2 to the object carrying platform 7. Subsequently, the control device 4 may control the second object storage and extraction module 32 according to the object inbound command to move the object P from the object carrying platform 7 to a labeling position adjacent to the labeling device 6 and to attach an identification label 60 on the object P. After that, the control device 4 may control the second object storage and extraction module 32 according to the object inbound command to move the object P with the identification label 60 to a weighing device 5 to measure the weight of the object P. Then, the control device 4 may control the second object storage and extraction module 32 according to the object inbound command to move the object P from the weighing device 5 to the object carrying platform 7, and the control device 4 may control the first object storage and extraction module 31 according to the object inbound command to move the object P from the object carrying platform 7 to the storage module 12 of the storage device 1. In addition, it should be noted that the object P in FIG. 6 and FIG. 7 is illustrated by a fine chain line to clearly present the statuses of the object P under which the object P is located respectively on the second object storage and extraction unit 325, the weighing device 5 and the object carrying platform 7.

As mentioned above, the labeling device 6 includes a label adhering unit 61

and a pressing column 62 that is arranged adjacent to the label adhering unit 61. The second object storage and extraction module 32 may move the object P to a position adjacent to the labeling device 6, so that the identification label 60 can be attached on the object P by the labeling device 6. Accordingly, when the control device 4 moves the object P from the object carrying platform 7 to the labeling position adjacent to the labeling device 6 according to the object inbound command, so as to attach the identification label 60 on the object P, the pressing column 62 may abut against the identification label 60 as the identification label 60 is adhered to the object P by the label adhering unit 61, so as to press the identification label 60 onto the object P.

Furthermore, the second object storage and extraction module 32 may further include a rotation unit 326 disposed on the third moving unit 324. The second object storage and extraction module 325 is disposed on the rotation unit 326 and indirectly disposed on the third moving unit 324, so that the rotation unit 326 may drive the second object storage and extraction module 325 to rotate around a rotational central axis A3. Accordingly, when the control device 4 moves the object P from the object carrying platform 7 to the position adjacent to the labeling device 6 according to the object inbound command to attach the identification label 60 on the object P, not only the pressing column 62 abuts against the identification label 60 as the identification label 60 attaches to the object P by the label adhering unit 61, but the rotation unit 326 may also drives the second object storage and extraction unit 325 to rotate around the rotational central axis A3, so that the identification label 60 is attached on the object P more firmly.

[Beneficial Effects of the Embodiment]

In conclusion, in the storage equipment U provided in the present disclosure, by virtue of “the storage device 1 including a rotating module 11 and a storage module 12 disposed on the rotating module 11” and “the rotating
5 module 11 driving the storage module 12 to rotate,” the object storage and extraction speed and the storage capacity for objects of the storage equipment U can be improved.

Further, in the present disclosure, by the arrangement of the object carrying platform 7 that is used in cooperation with the first object storage and extraction
10 module 31 and the second object storage and extraction module 32, the object carrying platform 7 can serve as a midway transfer position of object P, thereby increasing the storage and extraction speed of the storage equipment U for the object P.

The foregoing description of the exemplary embodiments of the disclosure
15 has been presented only for the purposes of illustration and description and is not intended to be exhaustive or to limit the disclosure to the precise forms disclosed. Many modifications and variations are possible in light of the above teaching.

The embodiments were chosen and described in order to explain the
20 principles of the disclosure and their practical application so as to enable others skilled in the art to utilize the disclosure and various embodiments and with various modifications as are suited to the particular use contemplated. Alternative embodiments will become apparent to those skilled in the art to which the present disclosure pertains without departing from its spirit and
25 scope.

CLAIMS

What is claimed is:

1. A storage equipment for storing and extracting an object, comprising:

5 a storage device for storing the object, including a rotating module and a storage module disposed on the rotating module, wherein the rotating module drives the storage module to rotate;

an object delivery platform arranged adjacent to the storage device;

an object storage and extraction device arranged adjacent to the storage device; and

10 a control device electrically connected to the storage device and the object storage and extraction device;

wherein, when the control device receives an object inbound command or an object outbound command, the control device controls the rotating module according to the object inbound command or the object outbound command to drive the storage module to rotate around a rotation central axis of the rotating module, so that the storage module rotates to a storage and extraction position;

15 wherein, when the control device receives the object inbound command or the object outbound command, the control device controls the object storage and extraction device according to the object inbound command or the object outbound command to move the object from the object delivery platform to the storage device or from the storage device to the object delivery platform;

20 wherein the storage module includes a first base body and a second base body that are disposed on the rotating module, a plurality of carrier

plates disposed between the first base body and the second base body, and a plurality of storage elements disposed on each of the carrier plates and sequentially arranged along a length direction of each of the carrier plates, and wherein the carrier plates, the first base body, and a second base body
5 define an air flow space;

wherein the carrier plates are spaced apart from each other, two adjacent ones of the carrier plates define an air flow gap therebetween, and wherein the first base body has an airflow hole that is in spatial communication with the air flow gaps by the air flow space, and when the
10 rotating module drives the storage module, the spaced apart configuration of the carrier plates permits air to flow between the airflow hole and the air flow gaps.

2. The storage equipment according to claim 1, further comprising a weighing
15 device and a labeling device, wherein the weighing device and the labeling device both are arranged adjacent to the storage device, the control device is electrically connected to the weighing device and the labeling device, so as to receive a weight information of the object measured by the weighing device, and to control the labeling device to attach an identification label
20 on the object.

3. The storage equipment according to claim 2, further comprising an object carrying platform which is arranged adjacent to the storage device, wherein the object storage and extraction device includes a first object storage and
25 extraction module and a second object storage and extraction module;

wherein, when the control device receives the object inbound command, the control device controls the first object storage and extraction module to move the object from the object delivery platform to the object carrying platform according to the object inbound command; the control device
5 controls the second object storage and extraction module to move the object from the object carrying platform to a labeling position which is adjacent to the labeling device according to the object inbound command to attach the identification label on the object; the control device controls the second object storage and extraction module to move the object with the
10 identification label to the weighing device according to the object inbound command to measure the weight of the object; the control device controls the second object storage and extraction module to move the object from the weighing device to the object carrying platform according to the object inbound command; and the control device controls the first object storage
15 and extraction module to move the object from the object carrying platform to the storage module of the storage device according to the object inbound command.

4. The storage equipment according to claim 3, wherein the first object storage
20 and extraction module includes a robotic arm, a first object storage and extraction unit disposed on the robotic arm, and an image recognition unit disposed on the robotic arm; wherein the second object storage and extraction module includes a base, a first moving unit disposed on the base, a second moving unit disposed on the first moving unit, a third moving unit
25 disposed on the second moving unit, and a second object storage and extraction unit disposed on the third moving unit; the first moving unit

moves relative to the base along a first movement direction, the second moving unit moves relative to the base along a second movement direction, the third moving unit moves relative to the base along a third movement direction, and the first movement direction, the second movement direction, and the third movement direction are perpendicular to one another.

5 5. The storage equipment according to claim 4, wherein the second object storage and extraction module further includes a rotation unit disposed on the third moving unit, the second object storage and extraction module is disposed on the rotation unit and indirectly disposed on the third moving unit, so that the rotation unit drives the second object storage and extraction module to rotate around a rotational central axis.

10 6. The storage equipment according to claim 2, wherein the labeling device includes a label adhering unit and a pressing column that is arranged adjacent to the label adhering unit; wherein, when the control device moves the object from the object carrying platform to a labeling position which is adjacent to the labeling device so as to attach the identification label on the object according to the object inbound command, the pressing column abuts against the identification label as the identification label is adhered to the object by the label adhering unit, so as to press the identification label onto the object.

25 7. The storage equipment according to claim 1, wherein each of the storage elements includes a fixed part and a storage socket connected to the fixed

part, the storage socket has a central axis, and the central axis and the rotation center axis of the rotating module form a predetermined angle therebetween ranging from 20° to 60°.

- 5 8. The storage equipment according to claim 1, wherein the carrier plates surround the rotation center axis.
9. The storage equipment according to claim 1, wherein the first base body includes a plurality of first slots, the second base body includes a plurality
10 of second slots, one end of each of the carrier plates is disposed in the corresponding one of the first slots, and another end of each of the carrier plates is disposed in the corresponding one of the second slots.