

DESCRIPTION

TITLE OF THE INVENTION:

ARTICLE PROCESSING SYSTEM AND ARTICLE PROCESSING METHOD

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Field

[0001] The present invention relates to an article processing system and an article processing method.

Background

10 [0002] Examples of the invention for loading articles include the inventions disclosed in Patent Literatures 1 and 2. In the transfer facilities disclosed in Patent Literatures 1 and 2, sizes of cases of products to be loaded on a cage dolly are registered in advance. When
15 order data designating a product to be loaded onto the cage dolly and the number of the products to be loaded onto the cage dolly is input, the transfer facility sets a pattern of loading the product designated by the order data onto the cage dolly based on the size of the case of the
20 registered product. In addition, the transfer facility sets the cage dolly loading data defining the order of loading the cases and the coordinates of the cases onto the cage dolly for the set pattern, and loads the cases onto the cage dolly based on the set data.

25 Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Patent No. 3896981

Patent Literature 2: Japanese Patent No. 3969334

Summary

30 Technical Problem

[0004] Regarding the size of the case of the product, even when the products are the same, the size of the case may change due to a change in the size of the product. In

a case where the size of the case is changed and the size of the registered case is different from the size of the actual case, when the calculation of the loading is performed with the registered size, for example, in a case
5 where the case is smaller than the registered size, the gap between the cases is large, and the loading cannot be performed efficiently. In addition, for example, even when articles are stored in an automated warehouse before loading, the articles cannot be stored at a high density,
10 and cannot be efficiently stored.

[0005] The present invention has been made in view of the above, and an object thereof is to enable efficient loading or storage based on actual dimensions of an article to be palletized.

15 Solution to Problem

[0006] To solve the problem and achieve the object, an article processing system according to the present invention includes: a conveyor that conveys an article; a reading unit that reads a code which is printed on the
20 article conveyed by the conveyor and which identifies the article, from a first direction and a second direction intersecting the first direction; a label affixing unit that is provided at a position downstream of the reading unit in a conveyance direction, the label affixing unit
25 being configured to affix a label, on which the code read by the reading unit is printed, on a surface of the article facing in the second direction, when the reading unit has read the code from the first direction and has not read the code from the second direction; a measurement unit that is
30 provided at a position downstream of the label affixing unit in the conveyance direction and measures a dimension of the article; and a memory unit that memorizes the code and the dimension measured by the measurement unit in

association with each other.

[0007] Moreover, an article processing method according to the present invention includes: a reading step of
5 reading a code which is printed on an article conveyed by a conveyor for conveying the article and which identifies the article, from a first direction and a second direction intersecting the first direction; a labeling step of affixing, at a position downstream in the conveyance
10 direction of a position where the code is read in the reading step, a label on which the code read in the reading step is printed, on a surface of the article facing in the second direction, when the code is read at the position downstream of the conveyor in the conveyance direction in
15 the reading step and the code is not allowed to be read from the second direction; a measurement step of measuring a dimension of the article at a position downstream in the conveyance direction of the position where the code was read in the labeling step; and a memorizing step of
20 memorizing the code and the dimension measured in the measurement step in association with each other.

Brief Description of Drawings

[0008] FIG. 1 is a schematic diagram of an article processing system according to an embodiment.

25 FIG. 2 is a block diagram of a control device.

FIG. 3 is a flowchart illustrating a flow of processing executed by the control device.

FIG. 4 is a flowchart illustrating a flow of processing executed by the control device.

30 FIG. 5 is a flowchart illustrating a flow of processing executed by the control device.

Description of Embodiments

[0009] Hereinafter, embodiments of the present invention

will be described in detail with reference to the accompanying drawings. Note that the present invention is not limited by the embodiments described below. In addition, in the description of the drawings, the same or
5 corresponding elements are appropriately denoted by the same reference numerals. Furthermore, it should be noted that the drawings are schematic, and dimensional relationships and the like of the respective elements may be different from actual ones. In addition, an orthogonal
10 coordinate system of an X axis, a Y axis, and a Z axis is appropriately illustrated in the drawing, and a direction will be described with the orthogonal coordinate system. A direction in which the X component increases in the space indicated by the orthogonal coordinate system is referred
15 to as a +X direction, and a direction in which the X component decreases is referred to as a -X direction. Similarly, for the Y and Z components, a +Y direction, a -Y direction, a +Z direction, and a -Z direction are defined. For convenience of description, the +Z direction may be
20 referred to as upward, and the -Z direction may be referred to as downward.

[0010] [Embodiment]

(Configuration of embodiment)

FIG. 1 is a schematic view of an article processing
25 system 1000 according to an embodiment of the present invention. The article processing system 1000 includes robots 1A and 1B, a pallet automatic warehouse 2, a three-dimensional automatic warehouse 3, a conveyor 41 to 46, code readers 5a to 5h, a sensor 6, a measurement device 7,
30 and an auto labeler 8. In addition, the article processing system 1000 includes a control device 100 that controls each unit of the article processing system 1000. The configuration of the control device 100 will be described

later. The article processing system 1000 is a system that stores a pallet P on which cases A are loaded in the pallet automatic warehouse 2, depalletizes the cases A loaded onto the pallet P stored in the pallet automatic warehouse 2 and
5 stores the cases A in the three-dimensional automatic warehouse 3, and palletizes a plurality of types of cases A stored in the three-dimensional automatic warehouse 3 on the pallet P and delivers the cases A.

[0011] The case A, which is an example of an article,
10 is, for example, a cardboard box storing a plurality of products to be sold in a store. The size of the case A varies depending on the stored product. In the case A illustrated in FIG. 1, a surface of the case A, the surface facing in the +X direction, a surface of the case A, the
15 surface facing in the -X direction, a surface of the case A, the surface facing in the +Y direction, and a surface of the case A, the surface facing in the -Y direction are side surfaces of the case A. A barcode (ITF symbol) for identifying a product name of a stored product is printed
20 on a side surface of the case A. The barcode may be printed on all of the four side surfaces of the case A, or the barcode may be printed only on the long side surface of the case A. The pallet P is a flat pallet on which the cases A are loaded. A plurality of cases A is loaded onto
25 the pallet P stored in the article processing system 1000. In the pallet P to be stored, the cases A loaded on one pallet P are the same cases A and store the same product. Therefore, the cases A in which different products are stored are loaded on another pallet P. A plurality of
30 cases A is loaded onto the pallet P removed from the article processing system 1000. A plurality of types of cases A having different sizes may be loaded onto the pallet P to be removed so that, for example, the case A1

storing a product a and the case A2 storing a product b are loaded. Note that, in the following description, when it is not necessary to distinguish the sizes of the cases, the case is referred to as a case A.

5 [0012] The conveyor 41 is a conveyor that conveys the pallet P on which a plurality of cases A to be stored in the three-dimensional automatic warehouse 3 is loaded. The conveyor 41 includes a conveyance mechanism that conveys the pallet P, and a drive unit such as a motor that drives
10 the conveyance mechanism. The conveyance mechanism is, for example, a conveyor such as a roller conveyor or a chain conveyor, but is not limited to these conveyors. The code reader 5a is installed near the conveyor 41. The code reader 5a is a device that reads a barcode printed on the
15 case A loaded onto the pallet P conveyed by the conveyor 41. The code reader 5a is installed in the width direction (Y axis direction) of the conveyor 41, reads a barcode printed on a side surface of the case A, the side surface facing in the width direction of the conveyor 41, and
20 outputs information indicating the read code to the control device 100.

[0013] The pallet automatic warehouse 2 is a warehouse that stores the pallet P on which the cases A are loaded. The pallet automatic warehouse 2 includes a plurality of
25 storage shelves installed at intervals, a stacker crane that travels in a work passage provided between the storage shelves, and a conveyor that conveys the pallet P. The pallet P conveyed by the conveyor 41 is conveyed to the vicinity of the storage shelf by a conveyor provided inside
30 the pallet automatic warehouse 2. A plurality of stages of storage shelves including a plurality of storage units for storing the pallets P on which the cases A are loaded in the left-right direction (X axis direction) is installed in

the vertical direction (Z axis direction). The stacker crane is controlled by the control device 100 to travel in the vicinity of the conveyor and the work passage, and stores the pallet P conveyed by the conveyor 41 in the storage unit. In addition, the stacker crane takes out the pallet P stored in the storage unit, and places the taken-out pallet P on a conveyor that conveys the taken-out pallet P to the conveyor 42.

[0014] The conveyor 42 includes a conveyance mechanism that conveys the pallet P, and a drive unit such as a motor that drives the conveyance mechanism. The conveyor 42 conveys the pallet P taken out from the storage unit by the stacker crane in the pallet automatic warehouse 2 toward the robot 1A. The code reader 5b is installed near the conveyor 42. The code reader 5b is a device that reads a barcode printed on the case A loaded onto the pallet P conveyed by the conveyor 42. The code reader 5b is installed in the width direction (Y axis direction) of the conveyor 42, reads a barcode printed on a side surface of the case A, the side surface facing in the width direction of the conveyor 42, and outputs information indicating the read code to the control device 100.

[0015] The sensor 6 is installed above the downstream end portion of the conveyor 42 in the conveyance direction (+X direction). The sensor 6 includes a camera that captures an object on the conveyor 42. The sensor 6 photographs the case A loaded onto the pallet P on the conveyor 42 with a camera, and identifies the position of the case A and measures the length and width of the case A based on the image of the camera.

[0016] The robot 1A is a robot that performs depalletization of unloading the case A loaded onto the pallet P conveyed by the conveyor 42 from the pallet P.

The robot 1A is an articulated robot, and includes an articulated arm and a robot hand that holds the case A. The robot 1A is controlled by the control device 100, holds the case A loaded onto the pallet P with a robot hand, and
5 places the held case A on the conveyor 43.

[0017] The conveyor 43 is a conveyor that conveys the case A depalletized by the robot 1A to the measurement device 7. The conveyor 43 includes a conveyance mechanism that conveys the case A and a drive unit such as a motor
10 that drives the conveyance mechanism. In the vicinity of the conveyor 43, the code readers 5c to 5f and the auto labeler 8 are installed.

[0018] The code readers 5c and 5d, which are examples of reading units, are devices that read barcodes printed on
15 the case A conveyed by the conveyor 43. The code readers 5e and 5f are devices that read a barcode printed on the case A conveyed by the conveyor 43 or a barcode printed on a label affixed by the auto labeler 8. The code readers 5c, 5e, and 5f are installed in the width direction (Y axis
20 direction) of the conveyor 43, read a barcode on a side surface of the case A, the side surface facing in the width direction of the conveyor 43, and output information indicating the read code to the control device 100. The code reader 5d is installed above the conveyor 43, reads a
25 barcode printed on a side surface of the case A, the side surface facing in the conveyance direction (+X direction), and outputs a signal representing the read code to the control device 100. The auto labeler 8, which is an example of a label affixing unit, is a device that affixes
30 a label on which a barcode for identifying a product stored in the case A is printed to the case A being conveyed by the conveyor 43. The auto labeler 8 is installed in the width direction of the conveyor 43, and a label is affixed

to a side surface of the case A, the side surface facing in the width direction of the conveyor 43.

[0019] The measurement device 7, which is an example of a measurement unit, is installed at a position downstream
5 of the conveyor 43 in the conveyance direction, and automatically measures the length, width, and height of the case A conveyed by the conveyor 43 by, for example, a transmissive infrared beam method. The measurement device 7 conveys the case A to the conveyor 44 while measuring the
10 dimension of the case A. The measurement device 7 outputs information indicating the measured dimension to the control device 100. Note that the method of measuring the dimension of the case A in the measurement device 7 is not limited to the transmissive infrared beam method, and may
15 be, for example, a method of measuring the dimension from an image obtained by photographing the case A with a camera.

[0020] The conveyor 44 is a conveyor that conveys the case A conveyed from the measurement device 7 to the three-
20 dimensional automatic warehouse 3. The conveyor 44 includes a conveyance mechanism that conveys the case A and a drive unit such as a motor that drives the conveyance mechanism. The code reader 5g is installed near the conveyor 44. The code reader 5g is installed in the width
25 direction (Y axis direction) of the conveyor 44, reads a barcode on a side surface of the case A, the side surface facing in the width direction of the conveyor 44, and outputs information indicating the read code to the control device 100.

30 [0021] The three-dimensional automatic warehouse 3, which is an example of a storage unit, includes a plurality of storage shelves installed at intervals, a transfer machine that travels a work passage provided between the

storage shelves, a vertical conveyance lifter, and a conveyor. The case A conveyed by the conveyor 44 is conveyed to the vicinity of the storage shelf by a conveyor provided inside the three-dimensional automatic warehouse

5 3. A plurality of stages of storage shelves including a plurality of storage units for storing the case A in the left-right direction (X axis direction) is installed in the vertical direction (Z axis direction). The vertical conveyance lifter moves the case A conveyed by the conveyor
10 to a stage where the case A is stored in the storage shelf. The transfer machine is controlled by the control device 100 to travel in the vicinity of the vertical conveyance lifter and the work passage, and stores the case A conveyed by the vertical conveyance lifter in the storage unit.

15 When the case A is removed from the storage unit, the transfer machine takes out the case A stored in the storage unit, and conveys the case A taken out to the vertical conveyance lifter. The vertical conveyance lifter places the case A transported by the transfer machine on a
20 conveyor that transports the case A to the conveyor 45.

[0022] The conveyor 45 includes a conveyance mechanism that conveys the case A and a drive unit such as a motor that drives the conveyance mechanism. The conveyor 45 conveys the case A taken out from the storage unit by the
25 transfer machine in the three-dimensional automatic warehouse 3 toward the robot 1B. The code reader 5h is installed near the conveyor 45. The code reader 5h is installed in the width direction (Y axis direction) of the conveyor 45, reads a barcode on a side surface of the case
30 A, the side surface facing in the width direction of the conveyor 45, and outputs information indicating the read code to the control device 100.

[0023] The robot 1B is a robot that performs

palletization of loading the cases A conveyed by the conveyor 45 onto the pallet P. The robot 1B is an articulated robot, and includes an articulated arm and a robot hand that holds a case A that is a cardboard box.

5 The robot 1B is controlled by the control device 100, holds the case A conveyed by the conveyor 45 with a robot hand, and places the held case A on the pallet P.

[0024] The conveyor 46 is a conveyor that conveys the pallet P on which the cases A are palletized by the robot
10 1B. The conveyor 46 includes a conveyance mechanism that conveys the pallet P, and a drive unit such as a motor that drives the conveyance mechanism. The pallet P conveyed by the conveyor 46 is loaded on a truck by, for example, a forklift and shipped.

15 [0025] FIG. 2 is a block diagram of a control device 100 that controls the article processing system 1000. The control device 100 is a computer device, and includes an arithmetic processing unit 101, a main memory unit 102, an auxiliary memory unit 103, and an interface 104.

20 [0026] The interface 104 outputs signals for controlling the pallet automatic warehouse 2, the three-dimensional automatic warehouse 3, the robots 1A and 1B, and drive units 41a to 46a, and acquires information output from the code readers 5a to 5h, the sensor 6, and the measurement
25 device 7. The drive units 41a to 46a include motors or the like that drive the conveyance mechanism of the conveyor 41 to 46. The drive units 41a, 42a, and 46a controlled by the control device 100 drive the conveyance mechanism, so that the pallet P is conveyed by the conveyors 41, 42, and 46.
30 In addition, the drive units 43a to 45a controlled by the control device 100 drive the conveyance mechanism, so that the case A is conveyed by the conveyors 43 to 45.

[0027] The main memory unit 102 is, for example, a

random access memory (RAM), and includes a volatile memory. The main memory unit 102 serves as a work space when the arithmetic processing unit 101 performs arithmetic processing, and stores a result of the arithmetic processing of the arithmetic processing unit 101 and the like. The auxiliary memory unit 103 includes a read only memory (ROM) and an auxiliary storage device such as a nonvolatile memory. The ROM of the auxiliary memory unit 103, which is an example of the memory unit, stores a program executed by the arithmetic processing unit 101 to perform arithmetic processing. The nonvolatile memory of the auxiliary memory unit 103 stores data used by the arithmetic processing unit 101 to perform arithmetic processing.

[0028] The arithmetic processing unit 101 is, for example, a central processing unit (CPU), reads a program from the auxiliary memory unit 103, and executes the program with the main memory unit 102 as a work space. The functions of the arithmetic processing unit 101 are implemented by the arithmetic processing unit 101 reading and executing a program, and in the present embodiment, a calculation unit 101a and a loading unit 101b are implemented.

[0029] The calculation unit 101a, which is an example of a calculation unit, performs mixture loading simulation of the plurality of types of cases A onto the pallet P using the dimension of the case A memorized in the auxiliary memory unit 103. The loading unit 101b controls the three-dimensional automatic warehouse 3, the conveyor 45, and the robot 1B so that the cases A are loaded onto the pallet P based on the result of the mixture loading simulation performed by the calculation unit 101a.

[0030] (Operation example of embodiment)

Next, an operation example of the article processing system 1000 will be described. In the following description, an operation example when the pallet P on which the case A is loaded is stored in the pallet automatic warehouse 2, an operation example when the case A loaded onto the pallet P stored in the pallet automatic warehouse 2 is depalletized and stored in the three-dimensional automatic warehouse 3, and an operation example when the case A stored in the three-dimensional automatic warehouse 3 is palletized on the pallet P will be described.

[0031] FIG. 3 is a flowchart illustrating a flow of processing executed by the control device 100 when the pallet P onto which the case A is loaded is stored in the pallet automatic warehouse 2. The pallet P onto which the cases A are loaded is conveyed to the article processing system 1000 by a truck from a factory that manufactures products, for example, and is carried by a forklift from the truck and placed on the conveyor 41.

[0032] The control device 100 controls the drive unit 41a to convey the pallet P onto which the cases A are loaded to the pallet automatic warehouse 2 by the conveyor 41 (step S1). The code reader 5a reads a barcode printed on the case A loaded onto the pallet P conveyed by the conveyor 41 to output information indicating the read barcode to the control device 100.

[0033] The control device 100 acquires the information output from the code reader 5a, and causes the auxiliary memory unit 103 to memorize, as pallet storage data, the product name identified by the code indicated by the acquired information and the position of the storage unit of the pallet automatic warehouse 2 storing the pallet P onto which the case A is loaded in association with each

other (step S2).

[0034] When the pallet P reaches the pallet automatic warehouse 2, the control device 100 controls the conveyor and the stacker crane of the pallet automatic warehouse 2 so that the pallet P is stored at the position of the storage unit memorized in the auxiliary memory unit 103, and stores the pallet P in the storage unit of the pallet automatic warehouse 2 (step S3).

[0035] FIG. 4 is a flowchart illustrating a flow of processing executed by the control device 100 when the case A loaded onto the pallet P stored in the pallet automatic warehouse 2 is depalletized and stored in the three-dimensional automatic warehouse 3. When instructed to store the product name stored in the pallet automatic warehouse 2 in the three-dimensional automatic warehouse 3, the control device 100 refers to the pallet storage data and acquires the position of the storage unit associated with the instructed product name. The control device 100 designates the acquired position of the storage unit, controls the stacker crane of the pallet automatic warehouse 2, and conveys the pallet P stored in the designated storage unit to the conveyor 42 (step S11).

[0036] The code reader 5b reads a barcode printed on the case A loaded onto the pallet P conveyed by the conveyor 42, and outputs information indicating the read barcode to the control device 100. The sensor 6 measures the length and width of the case A loaded on the conveyed pallet P, and outputs information indicating the measured dimensions to the control device 100. The control device 100 acquires the information output from the code reader 5b and the information output from the sensor 6 (step S12).

[0037] The control device 100 determines whether the product name identified by the information acquired from

the code reader 5b is a product name instructed to be stored in the three-dimensional automatic warehouse 3 (step S13). When the product name identified by the information acquired from the code reader 5b is not the product name instructed to store the product in the three-dimensional automatic warehouse 3 (No in step S13), the control device 100 controls the drive unit 42a to stop the conveyor 42 since the pallet P onto which the case A storing the product different from the product having the instructed product name is loaded is conveyed (step S14). The pallet P placed on the stopped conveyor 42 is returned to the pallet automatic warehouse 2.

[0038] When the product name identified by the information acquired from the code reader 5b is the product name instructed to store the product in the three-dimensional automatic warehouse 3 (Yes in step S13), the control device 100 controls the robot 1 so that the case A loaded onto the pallet P is placed on the conveyor 43 in a predetermined direction based on the dimensional information acquired from the sensor 6 (step S15). Here, the predetermined direction is a direction in which the long side surface of the case A faces in the width direction of the conveyor 43 and the short side surface faces in the conveyance direction in plan view.

[0039] The control device 100 controls the drive unit 43a to convey the case A placed by the robot 1 toward the measurement device 7 (step S16). When a barcode is printed on a side surface of the case A, the side surface facing in the width direction of the conveyor 43, the code reader 5c reads the printed barcode to output information indicating the read code to the control device 100. When a barcode is printed on a side surface of the case A, the side surface facing in the conveyance direction of the conveyor 43, the

code reader 5d reads the printed barcode to output information indicating the read code to the control device 100. The control device 100 acquires the information output from the code readers 5c and 5d (step S17).

5 [0040] For example, when a barcode is printed only on the long side surface of the case A and the long side surface of the case A faces in the width direction of the conveyor 43, the control device 100 acquires information indicating a code from the code reader 5c. On the other
10 hand, when the barcode is printed only on the long side surface of the case A and the long side surface of the case A faces in the conveyance direction of the conveyor 43, the code reader 5c cannot read the printed barcode, and thus the control device 100 does not acquire the information
15 indicating the code from the code reader 5c. When the barcode is printed only on the long side surface of the case A and the long side surface of the case A faces in the conveyance direction of the conveyor 43, the control device 100 acquires information indicating the code from the code
20 reader 5d. On the other hand, when the barcode is printed only on the long side surface of the case A and the long side surface of the case A faces in the width direction of the conveyor 43, the code reader 5d cannot read the printed barcode, and thus the control device 100 does not acquire
25 information indicating the code from the code reader 5d.

[0041] The barcode may be printed only on the long side surface and not on the short side surface of the four side surfaces of the case A. In this case, by placing the case A on the conveyor 43 in a predetermined direction, the
30 barcode can be read from the width direction of the conveyor at a position downstream of the placement position in the conveyance direction. However, when the case A in which the barcode is printed only on the long side surface

is placed on the conveyor 43 by the robot 1A, for example, when the case A has a shape close to a square in plan view, the side surface on which the barcode is printed is erroneously placed in the conveyance direction, and the barcode may not be read by the code reader installed in the width direction of the conveyor. In such a case, when the code reader is installed above the conveyor so that the barcode printed on the side surface facing in the conveyance direction can be read at each place where the barcode is required to be read, the number of code readers to be installed increases, and the system is complicated.

[0042] Therefore, in the present embodiment, even when the side surface, of the case A, on which the barcode is printed faces in the conveyance direction, the barcode of the case A can be read without installing the code reader above the conveyor. Specifically, the control device 100 determines whether information indicating the read code has been acquired from the code reader 5c installed in the width direction of the conveyor (step S18). When the control device 100 acquires the information indicating the code from the code reader 5d (No in step S18), the control device 100 controls the auto labeler 8 to affix the label on which the barcode indicated by the information acquired from the code reader 5d is printed on a side surface of the case A, the side surface facing in the width direction of the conveyor 43 (step S19).

[0043] As a result, since the barcode is attached to the side surface facing in the width direction of the conveyor, the barcode can be read only by the code readers 5e to 5h installed in the width direction of the conveyor without installing the code reader above the conveyor at a position downstream of the auto labeler 8 in the conveyance direction. When the information indicating the code is

acquired from the code reader 5c (Yes in step S18), the control device 100 does not perform the process of affixing the label by the auto labeler 8.

[0044] In the case A conveyed from the position of the auto labeler 8, the printed barcode is read by the code reader 5e. The control device 100 determines whether there is a barcode on a side surface of the case A, the side surface facing in the width direction of the conveyor (step S20). When the control device 100 cannot acquire information from the code reader 5e, the control device 100 determines that there is no barcode on a side surface of the case A, the side surface facing in the width direction of the conveyor (No in step S20). In this case, the control device 100 stops the drive unit 43a to stop the conveyor 43 (step S21). For example, the operator places the case A so that the side surface on which the barcode is located faces in the width direction of the conveyor.

[0045] When acquiring the information from the code reader 5e, the control device 100 determines that the barcode is present on a side surface of the case A, the side surface facing in the width direction of the conveyor (Yes in step S20). In this case, the control device 100 controls the drive unit 43a to convey the case A to the measurement device 7 (step S22). The code reader 5f reads a barcode printed on the case A conveyed by the conveyor 43, and outputs information indicating the read barcode to the control device 100. The measurement device 7 measures the dimension of the case A conveyed from the conveyor 43, and outputs information indicating the measured dimension of the case A to the control device 100.

[0046] The control device 100 acquires the information output from the code reader 5f and the information output from the measurement device 7 (step S23). Next, the

control device 100 causes the auxiliary memory unit 103 to memorize the product name identified by the information output from the code reader 5f and the dimension measured by the measurement device 7 in association with each other
5 as dimension data (step S24). As a result, accurate dimension of the case A can be acquired.

[0047] The control device 100 controls the drive unit 44a, and conveys the case A whose dimension has been measured by the measurement device 7 to the three-
10 dimensional automatic warehouse 3 by the conveyor 44 (step S25). The code reader 5g reads a barcode printed on a side surface of the case A, the side surface facing in the width direction of the conveyor 44, and outputs information indicating the read barcode to the control device 100. The
15 control device 100 acquires the information output from the code reader 5g, and causes the auxiliary memory unit 103 to memorize the product name identified by the code indicated by the acquired information and the position of the storage unit of the three-dimensional automatic warehouse 3 storing
20 the case A storing the product in association with each other as case storage data (step S26).

[0048] When the case A reaches the three-dimensional automatic warehouse 3, the control device 100 controls the conveyor and the transfer machine of the three-dimensional
25 automatic warehouse 3 so that the case A is stored at the position of the storage unit indicated by the case storage data memorized in the auxiliary memory unit 103 to store the case A in the storage unit of the three-dimensional automatic warehouse 3 (step S27).

30 [0049] FIG. 5 is a flowchart illustrating a flow of processing executed by the control device 100 when the case A is palletized on the pallet P by the robot 1B. In a case where palletization of a plurality of types of cases A

having different sizes stored in the three-dimensional automatic warehouse 3 is instructed, the control device 100 (calculation unit 101a) performs mixture loading simulation of the plurality of types of cases A. Specifically, when
5 acquiring the delivery data including the name of the product to be delivered and the delivery number of cases A storing the product having the product name, the control device 100 acquires the dimension of the case A associated with the product name for each product name included in the
10 delivery data from the dimension data memorized in the auxiliary memory unit 103 (step S51). For example, when the product a and the product b are loaded onto the pallet P, the control device 100 acquires the dimension of the case A1 and the dimension of the case A2. The control
15 device 100 performs the calculation of the mixture loading simulation of the cases A storing the product name included in the delivery data using the acquired dimension, and determines the loading position and orientation of the case A onto the pallet P (step S52). Here, since the acquired
20 dimension is an accurate dimension measured by the measurement device 7, efficient loading calculation can be performed.

[0050] Next, the control device 100 (loading unit 101b) controls the transfer machine of the three-dimensional
25 automatic warehouse 3 based on the result of the mixture loading simulation, and conveys the cases A having the product name designated by the delivery data to the conveyor 45 in the order of loading onto the pallet P (step S53). The control device 100 controls the drive unit 45a
30 to convey the case A to the robot 1B by the conveyor 45 (step S54). The code reader 5h reads a barcode printed on a side surface of the case A conveyed by the conveyor 45, the side surface facing in the width direction of the

conveyor 45, and outputs information indicating the read code to the control device 100.

[0051] The control device 100 acquires the information output from the code reader 5h (step S55), and determines
5 whether the product name identified by the code indicated by the acquired information is the product to be palletized on the pallet P with reference to the delivery data (step S56). When the product name identified by the code indicated by the acquired information is not included in
10 the delivery data (No in step S56), the control device 100 stops the drive unit 45a and stops the conveyor 45 (step S58). In this case, for example, the operator removes the case A from the conveyor 45.

[0052] When the product name identified by the code
15 indicated by the acquired information is included in the delivery data (Yes in step S56), the control device 100 (loading unit 101b) controls the robot 1B to load the case A onto the pallet P placed on the conveyor 46 based on the position and orientation calculated by the mixture loading
20 simulation (step S57). Next, the control device 100 determines whether all the plurality of cases A to be loaded on one pallet have been loaded based on the information acquired from the code reader 5h (step S59). For the case A loaded onto the pallet P by the robot 1B,
25 when the product name identified by the code indicated by the acquired information is not a product name to be loaded last onto the pallet P (No in step S59), the control device 100 returns the flow of processing to step S54. For the case A loaded onto the pallet P by the robot 1B, when the
30 product name identified by the code indicated by the acquired information is a product name to be loaded last onto the pallet P (Yes in step S59), the control device 100 ends the process of FIG. 5.

[0053] According to the present embodiment, even when the case A of which the barcode is printed only on the long side surface is placed on the conveyor with the long side surface facing in the conveyance direction, since the
5 barcode is attached to the surface facing in the width direction of the conveyor by the auto labeler 8, it is not necessary to install the code reader above the conveyor at a position downstream in the conveyance direction. In addition, in the present embodiment, the product name
10 identified by the code acquired by the code reader 5f and the accurate dimension of the case A measured by the measurement device 7 are stored in association with each other as dimension data, and the mixture loading simulation is performed based on the accurate dimension data.
15 Therefore, it is possible to efficiently load the case A onto the pallet P based on the actual dimension of the case A. That is, in the present invention, since the actual dimension of the article is measured and memorized in association with the article, it is possible to perform
20 loading or calculation of storage in a warehouse based on the stored actual dimensions.

[0054] [Modifications]

Although the embodiments of the present invention have been described above, the present invention is not limited
25 to the above-described embodiments, and can be implemented in various other forms. For example, the present invention may be implemented by modifying the above-described embodiments as follows. Note that the above-described embodiments and the following modifications may be
30 combined. The present invention also includes configurations obtained by appropriately combining the components of the above-described embodiments and modifications. Further, further effects and modifications

can be easily derived by those skilled in the art.
Therefore, a wider aspect of the present invention is not
limited to the above embodiments and modifications, and
various modifications can be made.

5 [0055] In the present invention, when the case A is
stored in the three-dimensional automatic warehouse 3,
efficient arrangement in the storage unit may be calculated
based on the dimension measured by the measurement device
7, and the case A may be disposed and stored based on the
10 calculated arrangement.

Reference Signs List

[0056] 1A, 1B ROBOT
2 PALLET AUTOMATIC WAREHOUSE
3 THREE-DIMENSIONAL AUTOMATIC WAREHOUSE
15 5a to 5h CODE READER
6 SENSOR
7 MEASUREMENT DEVICE
8 AUTO LABELER
41 to 46 CONVEYOR
20 41a to 46a DRIVE UNIT
100 CONTROL DEVICE
101 ARITHMETIC PROCESSING UNIT
102 MAIN MEMORY UNIT
103 AUXILIARY MEMORY UNIT
25 104 INTERFACE
1000 ARTICLE PROCESSING SYSTEM

CLAIMS

[Claim 1] An article processing system comprising:

a conveyor that conveys an article;

5 a reading unit that reads a code which is printed on the article conveyed by the conveyor and which identifies the article, from a first direction and a second direction intersecting the first direction;

a label affixing unit that is provided at a position downstream of the reading unit in a conveyance direction,
10 the label affixing unit being configured to affix a label, on which the code read by the reading unit is printed, on a surface of the article facing in the second direction, when the reading unit has read the code from the first direction and has not read the code from the second direction;

15 a measurement unit that is provided at a position downstream of the label affixing unit in the conveyance direction and measures a dimension of the article; and

a memory unit that memorizes the code and the dimension measured by the measurement unit in association
20 with each other.

[Claim 2] The article processing system according to claim 1, further comprising:

a storage unit that stores the article whose dimension
25 has been measured by the measurement unit;

a calculation unit that calculates loading of a plurality of articles stored in the storage unit onto a pallet using a dimension memorized in the memory unit; and

a loading unit that loads the articles stored in the
30 storage unit onto the pallet based on a result of calculation by the calculation unit.

[Claim 3] The article processing system according to claim

2, wherein

the calculation unit calculates an arrangement of an article stored in the storage unit by using a dimension memorized in the memory unit, and

5 the storage unit stores the article based on a result of calculation by the calculation unit.

[Claim 4] The article processing system according to claim 1, further comprising:

10 a detection unit that detects the code printed on a surface of the article facing in the second direction or the code printed on the label affixed to the surface of the article facing in the second direction, at a position downstream of the label affixing unit in a conveyance
15 direction.

[Claim 5] An article processing method comprising:

a reading step of reading a code which is printed on an article conveyed by a conveyor for conveying the article
20 and which identifies the article, from a first direction and a second direction intersecting the first direction;

a labeling step of affixing, at a position downstream in the conveyance direction of a position where the code is read in the reading step, a label on which the code read in
25 the reading step is printed, on a surface of the article facing in the second direction, when the code is read at the position downstream of the conveyor in the conveyance direction in the reading step and the code is not allowed to be read from the second direction;

30 a measurement step of measuring a dimension of the article at a position downstream in the conveyance direction of the position where the code was read in the labeling step; and

a memorizing step of memorizing the code and the dimension measured in the measurement step in association with each other.