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Storage

Abstract

A storage includes a first opening section, a second opening section, and a moving section. An article used in a board working machine configured to perform predetermined board work on a board is received or delivered through the first opening section. The second opening section is an opening section different from the first opening section, and when reception work or delivery work of the article is performed through the first opening section, an article different from the article can be received or delivered through the second opening section. The moving section moves the article to a predetermined storage section when the article is received through the first opening section or the second opening section and moves the article stored in the storage section to the first opening section or the second opening section when the article is delivered.

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Background/Summary

TECHNICAL FIELD

(1) The present specification discloses techniques related to a storage.

BACKGROUND ART

(2) In a manual baggage unloading device in an automatic warehouse described in Patent Literature 1, a manual unloading port is provided on a storage shelf. The manual baggage unloading device unloads a baggage toward a side opposite to a traveling path of a stacker crane through the manual

unloading port. A chute is provided at the manual unloading port. A baggage manually extracted from the storage shelf is guided obliquely downward in a slidable manner by the chute.

(3) An automatic warehouse facility described in Patent Literature 2 includes a picking cart. The picking cart includes a lifter and a chute. The chute is attached to the lifter, and a lower tip of the chute is provided toward a conveying conveyor.

PATENT LITERATURE

(4) Patent Literature 1: JP-A-H8-127403 Patent Literature 2: JP-UM-A-S61-44404

SUMMARY OF THE INVENTION

Brief Summary of the Invention

Technical Problem

(5) When an article is received in or delivered from a storage through one opening section, other articles cannot be received in or delivered from the storage until the reception or delivery of the article is completed. Therefore, there is a possibility that work efficiency of reception work or delivery work of the article in the storage is reduced.

(6) In view of such a circumstance, the present specification describes a storage capable of improving the work efficiency of the reception work or delivery work of articles.

Solution to Problem

(7) The present specification discloses a storage including a first opening section, a second opening section, and a moving section. An article used in a board working machine configured to perform predetermined board work on a board is received or delivered through the first opening section. The second opening section is an opening section different from the first opening section, and when reception work or delivery work of the article is performed through the first opening section, an article different from the article can be received or delivered through the second opening section. The moving section moves the article to a predetermined storage section when the article is received through the first opening section or the second opening section and moves the article stored in the storage section to the first opening section or the second opening section when the article is delivered.

Advantageous Effects Effect of the Invention

(8) According to the above storage, the storage includes a first opening section, a second opening section, and a moving section. As a result, the storage can perform reception work or delivery work of an article through the first opening section and reception work or delivery work of an article different from the article through the second opening section in parallel with each other, and thus, work efficiency of the reception work or the delivery work of the article is improved.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. 1 is a configuration diagram illustrating a configuration example of a board production facility.

(2) FIG. 2 is a plan view illustrating an example of a state in which an article is accommodated in an accommodation case in an arrival section.

(3) FIG. 3A is a front view illustrating an example of a storage.

(4) FIG. 3B is a plan view of the storage of FIG. 3A.

(5) FIG. 3C is a perspective view of the storage of FIG. 3A.

(6) FIG. 4 is a side view when the storage of FIG. 3C is viewed in an arrow IV direction.

(7) FIG. 5 is a block diagram illustrating an example of a control block of the storage.

(8) FIG. 6A is a flowchart illustrating an example of a control procedure in reception work of an article.

(9) FIG. 6B is a flowchart illustrating an example of a control procedure in delivery work of an

article.

(10) FIG. 7 is a perspective view illustrating an example of a first accommodation section.

DESCRIPTION OF EMBODIMENTS

1. Embodiment

(11) As illustrated in FIG. 1, storage **40** of the present embodiment is provided in board production facility **80**. board production facility **80** includes board working line **10L**, arrival section **20**, unmanned conveyance vehicle **30**, and storage **40**. Article **21** which has arrived at arrival section **20** is conveyed to storage **40** by unmanned conveyance vehicle **30**. Article **21** stored in storage **40** is conveyed to board working line **10L** by unmanned conveyance vehicle **30**.

(12) 1-1. Board Working Line **10L**

(13) In board working line **10L**, predetermined board work is performed on board **90**. The type and number of board working machines **10** constituting board working line **10L** are not limited. As illustrated in FIG. 1, board working line **10L** of the present embodiment includes multiple (five) board working machines **10** including printing machine **10a**, printing inspection machine **10b**, component mounter **10c**, reflow furnace **10d**, and appearance inspector **10e**, and board **90** is conveyed in this order by a board conveyance device.

(14) Printing machine **10a** prints solder at mounting positions of multiple components of board **90**. The solder printed on board **90** has a predetermined viscosity, and the solder functions as a bonding material for bonding board **90** and the component mounted on board **90**. As illustrated in FIG. 2, solder container **21d** accommodates solder. As solder container **21d**, for example, a bottomed tubular or tubular sealable container can be used.

(15) Printing inspection machine **10b** inspects a print state of the solder printed by printing machine **10a**. Component mounter **10c** mounts the multiple components to board **90** on which the solder is printed. Component mounter **10c** may be one or multiple component mounters. In a case where multiple component mounters **10c** are provided, multiple component mounter **10c** can be shared to mount the multiple components on board **90**.

(16) Component mounter **10c** includes a component supplying device for supplying a component to be mounted on board **90**. For example, the component supplying device can supply components using feeder **21b** including reel **21a**, tray **21c**, or the like, as illustrated in FIG. 2. A component tape (carrier tape) for accommodating components is wound around reel **21a**. Reel **21a** is rotatably and detachably provided on feeder **21b**. A distal end portion of the component tape is drawn to a component take-out section provided on feeder **21b**, and thus, the components are sequentially supplied.

(17) For example, reel **21a** can supply a relatively compact component such as a chip component. Components are arranged in tray **21c**. For example, tray **21c** can supply relatively large components such as a Quad Flat Package (QFP) and a Ball Grid Array (BGA). Reflow furnace **10d** heats board **90** to which the multiple components are mounted by component mounter **10c**, melts the solder, and performs soldering. Appearance inspector **10e** inspects the mounting states or the like of the multiple components mounted by component mounter **10c**.

(18) In this manner, board working line **10L** can use multiple (five) board working machines **10** to sequentially convey board **90** and execute production process including inspection process to produce a board product. It should be noted that board working line **10L** may include, as required, board working machine **10** such as, for example, a function inspector, a buffer device, a board supplying device, a board flipping device, a shield mounting device, an adhesive application device, and an ultraviolet ray irradiation device.

(19) Multiple (five) board working machines **10** and management device **19** constituting board working line **10L** are provided so as to be capable of communicating with each other by a wired or wireless communication section. Management device **19** controls multiple (five) board working machines **10** constituting board working line **10L**, and monitors an operation situation of board working line **10L**. Management device **19** stores various control data for controlling multiple (five)

board working machines **10**. Management device **19** transmits control data to each of multiple (five) board working machines **10**. In addition, each of multiple (five) board working machines **10** transmits an operation situation and a production situation to management device **19**.

(20) 1-2. Arrival Section **20** and Unmanned Conveyance Vehicle **30**

(21) When article **21** arrives at arrival section **20**, a predetermined landing work is performed. Then, article **21** is accommodated in accommodation case **23**, mounted on unmanned conveyance vehicle **30**, and conveyed to storage **40**. After article **21** is stored in storage **40**, article **21** is supplied to board working line **10L** as required.

(22) As described above, board working line **10L** includes printing machine **10a** that prints solder at the mounting positions of multiple components of board **90**. In this case, for example, solder container **21d** accommodating the solder corresponds to article **21**. In addition, board working line **10L** includes component mounter **10c** for mounting components on board **90**. In this case, reel **21a** around which a component tape accommodating the component is wound corresponds to article **21**.

(23) Moreover, feeder **21b** on which reel **21a** is rotatably and detachably provided corresponds to article **21**. Further, tray **21c** on which the components are arranged corresponds to article **21**. A holding member for holding the component corresponds to article **21**. For example, the holding member includes a suction nozzle, a chuck, or the like. In addition, a holding member accommodating device (for example, a nozzle station) that accommodates the holding member corresponds to article **21**.

(24) Article **21** is provided with identification code **22**. Identification code **22** stores identification information for identifying article **21**. As identification code **22**, for example, a one-dimensional code, a two-dimensional code, a wireless tag, or the like can be used. When article **21** arrives at arrival section **20**, for example, an operator of arrival section **20** issues identification information using an article management device. In addition, the operator reads a barcode or the like provided on article **21** by a supplier (vendor) using a barcode reader or the like. Then, the operator can acquire article information of article **21** from a database in which article information related to article **21** is registered. The operator stores at least the identification information among the identification information and the article information in identification code **22** using the article management device.

(25) The operator of arrival section **20** attaches at least identification code **22** in which the identification information is stored to article **21**, and accommodates article **21** in accommodation case **23**. Accommodation case **23** may have any form as long as accommodation case **23** can accommodate at least one article **21**. Specific code **24** is provided in accommodation case **23**. Specific code **24** stores specific information for specifying accommodation case **23**. As specific code **24**, for example, a one-dimensional code, a two-dimensional code, a wireless tag, or the like can be used.

(26) When article **21** is accommodated in accommodation case **23**, the operator reads specific code **24** using a reader, and reads identification code **22** provided on article **21** using the reader. As a result, a correspondence between the specific information specifying accommodation case **23** accommodating article **21** and the identification information identifying article **21** is generated, and the correspondence is transmitted to and stored in a storage section of management device **19**.

(27) FIG. 2 illustrates an example of a state in which reel **21a**, which is article **21**, is accommodated in accommodation case **23**. In addition, FIG. 2 illustrates an example of a state in which feeder **21b**, which is article **21**, is accommodated in accommodation case **23**. Further, FIG. 2 illustrates an example of a state in which tray **21c**, which is article **21**, is accommodated (stacked) in accommodation case **23**. Tray **21c** is stored in a packaging bag, and identification code **22** is attached to a packaging bag of tray **21c**. In addition, FIG. 2 illustrates an example of a state in which solder container **21d**, which is article **21**, is accommodated in accommodation case **23**. It should be noted that FIG. 2 is a plan view schematically illustrating an example of the accommodation state of article **21**. In the present specification, a case where article **21** is reel **21a** is

mainly described as an example, but the same can be said for other articles **21**.

(28) The operator of arrival section **20** mounts accommodation case **23** in which article **21** is accommodated on unmanned conveyance vehicle **30**. Unmanned conveyance vehicle **30** is an automatic guided vehicle (AGV) without requiring driving operation by the operator. Unmanned conveyance vehicle **30** is not limited to the automatic guided vehicle as long as unmanned conveyance vehicle **30** can convey article **21** by self-driving. board working line **10L**, arrival section **20**, unmanned conveyance vehicle **30**, and storage **40** are provided so as to be capable of communicating with each other by a wired or wireless communication section. When article **21** is mounted on unmanned conveyance vehicle **30**, management device **19** transmits a conveyance command to unmanned conveyance vehicle **30**. The conveyance command includes a conveyance destination of article **21**. Management device **19** selects storage **40** in which article **21** can be stored and determines the conveyance destination. When unmanned conveyance vehicle **30** receives the conveyance command, unmanned conveyance vehicle **30** conveys article **21** to storage **40** designated as the conveyance destination.

(29) It should be noted that unmanned conveyance vehicle **30** can convey article **21** without using accommodation case **23**. In addition, the operator can convey article **21** without using unmanned conveyance vehicle **30**. Further, at least a portion of the work performed by the operator described above can be automated using a conveyance device (for example, belt conveyor or the like), an actuator (for example, a robot arm or the like), an article management device, or the like.

(30) 1-3. Storage **40**

(31) As long as storage **40** can store articles **21**, storage **40** may have any form. As illustrated in FIGS. 3A to 3C, for example, storage **40** of the present embodiment is formed in an octagonal prism shape. It should be noted that in FIG. 3C, an upper part of storage **40** is opened, and an inside of storage **40** is illustrated. Moreover, FIG. 4 is a schematic view of the inside of storage **40** when viewed from arrow IV direction illustrated in FIG. 3C, and mainly illustrates a positional relationship among first opening section **41a**, second opening section **41b**, a storage unit (in FIG. 4, first storage unit **42t1**), and the like.

(32) Storage **40** includes first opening section **41a**, second opening section **41b**, storage section **42**, control device **40a**, and moving device **40b**. Storage **40** may further include at least one of acquisition device **45**, chute section **46**, first accommodation section **47a**, and second accommodation section **47b**. As illustrated in FIG. 5, control device **40a** includes moving section **43** when viewed as a control block. Control device **40a** may further include permission section **44**. In addition, storage **40** may include work space **40c** and display device **40d**. As illustrated in FIGS. 3A-3C, 4, and 5, storage **40** of the present embodiment includes all of the components and devices described above.

(33) 1-3-1. Schematic Configuration of Storage **40**

(34) As illustrated in FIG. 3A, first opening section **41a** and second opening section **41b** are provided on a front face of storage **40**. Article **21** used in board working machine **10** for performing predetermined board work on board **90** is received or delivered through first opening section **41a**. First opening section **41a** is formed in a larger size than article **21** so that article **21** can be received or delivered. It should be noted that article **21** can be received or delivered through first opening section **41a** in a state where article **21** is accommodated in accommodation case **23**. In this case, first opening section **41a** is formed in a larger size than that of accommodation case **23** so that accommodation case **23** can be received or delivered. The above description can be similarly applied to second opening section **41b**.

(35) In the present embodiment, acquisition device **45** is provided only in first opening section **41a**. Acquisition device **45** acquires the identification information for identifying article **21** by reading identification code **22** provided on article **21**. As acquisition device **45**, a well-known reader (for example, a code reader that reads a one-dimensional code and a two-dimensional code, a wireless reader that performs wireless communication with a wireless tag, or the like) can be used. As

illustrated in FIG. 4, acquisition device 45 is disposed above work space 40c provided in the vicinity of first opening section 41a.

(36) Acquisition device 45 can acquire at least the identification information of the identification information and the article information by reading identification code 22 provided on article 21 when article 21 is received through first opening section 41a. It should be noted that acquisition device 45 can also acquire the specific information by reading specific code 24 provided in accommodation case 23 when accommodation case 23 accommodating article 21 is received through first opening section 41a. In this case, acquisition device 45 can acquire the identification information of article 21 accommodated in accommodation case 23 based on the correspondence between the specific information and the identification information.

(37) Second opening section 41b is an opening section different from first opening section 41a, and when reception work or delivery work of article 21 is performed through first opening section 41a, article 21 different from article 21 can be received or delivered through second opening section 41b. As illustrated in FIG. 4, storage 40 of the present embodiment includes work space 40c in which the reception work or delivery work of article 21 is performed through first opening section 41a, and chute section 46 in which the delivery work of article 21 can be performed through second opening section 41b. As a result, in storage 40 of the present embodiment, when the reception work or the delivery work of article 21 is performed through first opening section 41a, article 21 different from article 21 can be delivered through second opening section 41b.

(38) Chute section 46 causes article 21 carried out from storage section 42 by moving section 43 to slide toward second opening section 41b. As illustrated in FIG. 4, chute section 46 is inclined with respect to a horizontal plane. Accordingly, when article 21 is carried out to first upstream position 46a, article 21 slides through chute section 46 to second downstream position 46b. Article 21 which has slid on chute section 46 is delivered through second opening section 41b.

(39) Inclination angle $\theta 1$ of chute section 46 may be an angle at which at least article 21 can slide, and can be set in consideration of weight, shape, frictional resistance, and the like of article 21, for example. Inclination angle $\theta 1$ of chute section 46 can also be set in consideration of inclination angle $\theta 1$ of partition section 42b of storage section 42 to be described below. In addition, chute section 46 can cause accommodation case 23 in which article 21 is accommodated to slide toward second opening section 41b.

(40) As described above, in storage 40 of the present embodiment, acquisition device 45 is provided only in first opening section 41a. In addition, first opening section 41a is a reception/delivery opening through which article 21 can be received or delivered, and second opening section 41b is a delivery dedicated opening through which article 21 can be delivered. Therefore, acquisition device 45 is not required for second opening section 41b, and thus, second opening section 41b can be easily downsized as compared with first opening section 41a. In addition, as compared with work space 40c provided in first opening section 41a, it is easy to reduce the space of chute section 46 provided in second opening section 41b.

(41) Storage 40 of the present embodiment includes chute section 46. Article 21 which has slid on chute section 46 is delivered through second opening section 41b. Chute section 46 does not require a moving mechanism for primarily moving article 21, and, for example, it is easy to reduce the space as compared with a case where a conveyance device such as a belt conveyor is provided instead of chute section 46. In addition, in a case where the above-described conveyance device or chute section 46 is not provided, it is necessary for moving device 40b to be described below to convey article 21 to second opening section 41b through a gap between storage sections 42. Accordingly, the control of moving device 40b may be complicated. Since storage 40 of the present embodiment includes chute section 46, as long as moving device 40b carries out article 21 to first position 46a on an upstream side of chute section 46, moving device 40b may have any configuration, and thus, the control of moving device 40b can be simplified.

(42) As long as storage section 42 can store article 21, storage section 42 may have any form. For

example, in a case where article **21** is reel **21a**, as illustrated in FIG. 3C and FIG. 4, storage section **42** may include main body section **42a** and partition section **42b**. Main body section **42a** is formed in an U shape when viewed in a vertical direction (Z-axis direction). Partition section **42b** is provided so as to protrude upward at a predetermined angle with respect to main body section **42a**, and can store reel **21a**. An angle of partition section **42b** is set so as to suppress the detachment of reel **21a**.

(43) In addition, partition section **42b** of the present embodiment is provided in multiple pairs (15:30 in FIG. 4), and can accommodate multiple (15) reels **21a**. Each of the multiple pairs (15 pairs) of partition sections **42b** is provided with two partition sections **42b** separated from each other so as not to interfere with moving device **40b**. In FIGS. 3C and 4, for convenience of illustration, some members are assigned with reference symbols, and not all members are assigned with reference symbols.

(44) As illustrated in FIG. 3B and FIG. 3C, storage section **42** of the present embodiment is disposed in a circular shape in the vertical direction (the Z-axis direction). In addition, storage section **42** of the present embodiment includes first storage unit **42t1** and second storage unit **42t2**, and each of first storage unit **42t1** and second storage unit **42t2** is provided in multiple units along the vertical direction (the Z-axis direction). First storage unit **42t1** is formed wider than second storage unit **42t2**, and can store large-sized reel **21a** as compared with reel **21a** which can be stored in second storage unit **42t2**.

(45) As illustrated in FIG. 3C and FIG. 4, first storage units **42t1** are coupled in the vertical direction (the Z-axis direction) by coupling section **42j**. In addition, second storage units **42t2** are coupled in the vertical direction (the Z-axis direction) by coupling section **42j**. In addition, first storage units **42t1** adjacent to each other are coupled by coupling section **42j**, and second storage units **42t2** adjacent to each other are coupled by coupling section **42j**. In addition, first storage unit **42t1** and second storage unit **42t2** adjacent to each other are coupled by coupling section **42j**.

(46) The type, number, and disposition of the storage units can be appropriately changed. In addition, the shape and size (width, depth, and height) of the storage unit can be set according to article **21** to be stored, and storage section **42** can store article **21** other than reel **21a**. In addition, storage section **42** can store accommodation case **23** accommodating article **21**. In addition, article **21** or accommodation case **23** may be stored in any suitable storage unit, and in a case where board production facility **80** includes multiple storages **40**, article **21** or accommodation case **23** may be accommodated in any storage **40** as long as storage **40** includes a suitable storage unit.

(47) Control device **40a** includes a well-known computing device and a storage device, and constitutes a control circuit. Control device **40a** is provided so as to be capable of communicating with moving device **40b**, acquisition device **45**, and display device **40d**, and can control them. In addition, control device **40a** can store article information on article **21**, and can also notify management device **19** of the article information. For example, in a case where article **21** is reel **21a**, the article information may include a component type, the number of components (remaining number), a reel diameter, a type, a supplier (vendor), an expiration date, and the like in the component accommodated in reel **21a**.

(48) Moving device **40b** moves article **21** to predetermined storage section **42** when article **21** is received through first opening section **41a** or second opening section **41b**, and moves article **21** stored in storage section **42** to first opening section **41a** or second opening section **41b** when article **21** is delivered. Moving device **40b** of the present embodiment moves article **21** from work space **40c** provided in first opening section **41a** to predetermined storage section **42** when article **21** is received through first opening section **41a**. Moving device **40b** moves article **21** stored in storage section **42** to chute section **46** provided in second opening section **41b** when article **21** is delivered. It should be noted that moving device **40b** can move article **21** stored in storage section **42** to work space **40c** provided in first opening section **41a** when article **21** is delivered.

(49) As illustrated in FIG. 3B, moving device **40b** of the present embodiment is provided inside

storage unit (first storage units **42t1** and second storage units **42t2**) when viewed in the vertical direction (the Z-axis direction). As long as moving device **40b** can move article **21**, and moving device **40b** may have any form. For example, a robot arm (an articulated robot), a lifting and lowering slide mechanism, and the like can be used for moving device **40b**. For example, in a case where article **21** is reel **21a**, as illustrated in FIG. 3C, moving device **40b** may include lifting and lowering section **40b1** and gripping section **40b2**.

(50) Raising/lowering section **40b1** can rotate around an axial line along the vertical direction (Z-axis direction), and can lift or lower gripping section **40b2** along the vertical direction (Z-axis direction). Gripping section **40b2** can move forward or rearward at the same angle as inclination angle $\theta 1$ of work space **40c** illustrated in FIG. 4. In addition, gripping section **40b2** can move forward or rearward at the same angle as inclination angle $\theta 1$ of partition section **42b** of storage section **42**. In addition, gripping section **40b2** can move forward or rearward at the same angle as inclination angle $\theta 1$ of chute section **46**.

(51) As described above, in storage **40** of the present embodiment, inclination angle $\theta 1$ of work space **40c** provided in first opening section **41a** coincides with inclination angle $\theta 1$ of partition section **42b** of storage section **42**. Accordingly, storage **40** of the present embodiment can perform an unloading operation at the time of reception when reel **21a** is unloaded from work space **40c** and a storage operation at the time of reception when unloaded reel **21a** is stored in storage section **42** by lifting and lowering operations, a rotation operation, a forward movement operation, and a rearward movement operation of moving device **40b**.

(52) In storage **40** of the present embodiment, inclination angle $\theta 1$ of chute section **46** coincides with inclination angle $\theta 1$ of partition section **42b** of storage section **42**. Accordingly, storage **40** of the present embodiment can perform an unloading operation at the time of delivery when reel **21a** is unloaded from the storage unit and a sending operation at the time of deliver at when unloaded reel **21a** is sent out to chute section **46** by the lifting and lowering operations, the rotating operation, the forward movement operation, and the rearward movement operation of the moving device **40b**.

(53) As illustrated in FIG. 3A, storage **40** includes display device **40d**. Display device **40d** can use a well-known display device, and displays various data so as to be visually recognizable by the operator. For example, display device **40d** displays the article information on article **21** stored in storage section **42** in accordance with an operation of the operator. It should be noted that display device **40d** of the present embodiment is configured by a touch panel, and display device **40d** also serves as an input device for receiving various operations by the operator.

(54) For example, the operator can designate desired article **21** to be delivered from storage **40** using a touch panel (display device **40d** functioning as an input device). In this case, control device **40a** uses moving device **40b** to move and deliver designated article **21** to work space **40c** provided in first opening section **41a** or chute section **46** provided in second opening section **41b**.

(55) In addition, control device **40a** can store positional information, reception/delivery information, and storage information of article **21** in storage section **42**. The positional information indicates a storage location of article **21**. The reception/delivery information indicates the date and time of receipt and date and time of delivery of article **21**. For example, the storage information includes information such as an ambient temperature of storage section **42**, a humidity of storage section **42**, and the like. Control device **40a** stores the positional information and the reception date and time of article **21** when article **21** is stored. Control device **40a** stores storage information during storage of article **21**. Control device **40a** stores the delivery date and time of article **21** when article **21** is delivered.

(56) 1-3-2. Example of Control of Reception and Delivery of Article **21**

(57) As illustrated in FIG. 5, control device **40a** includes moving section **43** and permission section **44** when viewed as control blocks. Control device **40a** executes a control program according to flowcharts illustrated in FIGS. 6A and 6B. FIG. 6A illustrates an example of a control procedure in

the reception work of article **21**, and FIG. **6B** illustrates an example of a control procedure in the delivery work of article **21**.

(58) Moving section **43** moves article **21** to predetermined storage section **42** when article **21** is received through first opening section **41a** or second opening section **41b**, and moves article **21** stored in storage section **42** to first opening section **41a** or second opening section **41b** when article **21** is delivered. Moving section **43** of the present embodiment moves article **21** to predetermined storage section **42** when article **21** is received through first opening section **41a**, and moves article **21** stored in storage section **42** to second opening section **41b** when article **21** is delivered. Moving section **43** can move article **21** by driving and controlling above-described moving device **40b**.

(59) Permission section **44** permits the operator to perform the reception work of article **21** through first opening section **41a**. In a mode in which storage **40** includes permission section **44**, moving section **43** performs the delivery work of article **21** different from article **21** through second opening section **41b** in parallel with the reception work by the operator through first opening section **41a** when the reception work of article **21** by the operator is permitted by permission section **44**.

(60) Specifically, permission section **44** prohibits the operator from performing the reception work of article **21** through first opening section **41a**, for example, when moving device **40b** is performing or is scheduled to perform the work in work space **40c**. Conversely, permission section **44** permits the operator to perform the reception work of article **21** through first opening section **41a** when moving device **40b** is not performing the work in work space **40c** and is not scheduled to perform the work.

(61) First front door **41a1** illustrated in FIG. **5** is provided between first opening section **41a** and work space **40c**. When the reception work of article **21** by the operator through first opening section **41a** is prohibited by permission section **44**, first front door **41a1** is closed, and thus, interference between the operator and moving device **40b** is suppressed. Second front door **41b1** illustrated in FIG. **5** is provided between second opening section **41b** and chute section **46**. Second front door **41b1** can be opened when article **21** can be delivered from second opening section **41b**.

(62) The operator designates desired article **21** to be delivered from storage **40** using a touch panel (display device **40d** functioning as an input device). In the present embodiment, the operator designates reel **21a** that is article **21**. In addition, the operator uses the touch panel to instruct the opening operation of first front door **41a1**. Control device **40a** performs the opening operation of first front door **41a1** when the reception work of article **21** by the operator is permitted by permission section **44** (Step **S11** illustrated in FIG. **6A**).

(63) The operator receives article **21** at a predetermined position in work space **40c** through first opening section **41a** (Step **S12**). When the reception work of article **21** is completed, the operator uses the touch panel to instruct the closing operation of first front door **41a1**. As a result, control device **40a** performs the closing operation of first front door **41a1** (Step **S13**). The work from the time when the operator instructs the opening operation of first front door **41a1** to the time when the operator instructs the closing operation of first front door **41a1** corresponds to the reception work of article **21** by the operator through first opening section **41a** (Steps **S11** to **S13**).

(64) When the reception work of article **21** described above is performed, moving section **43** performs the delivery work of article **21** different from article **21** through second opening section **41b** in parallel with the reception work by the operator through first opening section **41a** (Steps **S21** to **S25** illustrated in FIG. **6B**). First, moving section **43** moves gripping section **40b2** to storage section **42** in which article **21** to be delivered is stored (Step **S21**). Specifically, lifting and lowering section **40b1** rotates as necessary to lift or lower gripping section **40b2** along the vertical direction (the Z-axis direction) so that gripping section **40b2** reaches reel **21a** stored at a desired storage location (pair of partition sections **42b**) when gripping section **40b2** moves forward.

(65) Next, gripping section **40b2** moves forward to grip reel **21a** stored in the storage location (the pair of partition sections **42b**), and moves rearward in a state where reel **21a** is gripped (Step **S22**).

After the unloading operation at the time of delivery described above, moving section **43** moves gripping section **40b2** to chute section **46** (Step S23). Specifically, lifting and lowering section **40b1** rotates as required to lift or lower gripping section **40b2** along the vertical direction (the Z-axis direction) so that reel **21a** gripped by gripping section **40b2** reaches first position **46a** of chute section **46** when gripping section **40b2** moves forward.

(66) Next, gripping section **40b2** moves forward to move reel **21a** to first position **46a** of chute section **46**, the gripping of reel **21a** is released, and gripping section **40b2** moves rearward (Step S24). As a result of the above-described sending operation at the time of delivery, reel **21a**, which is article **21**, slides along chute section **46** and reaches second opening section **41b**. When article **21** can be delivered from second opening section **41b**, control device **40a** guides the fact that article **21** can be delivered using the touch panel, and the opening operation of second front door **41b1** is enabled (Step S25).

(67) When article **21** can be delivered from the second opening section **41b** and the closing operation of first front door **41a1** is completed (processes illustrated in Steps S13 and S25 are completed), moving section **43** moves gripping section **40b2** to work space **40c** (Step S14). Specifically, lifting and lowering section **40b1** lifts or lowers gripping section **40b2** along the vertical direction (the Z-axis direction) so that gripping section **40b2** reaches reel **21a** received in work space **40c** when gripping section **40b2** moves forward. Next, gripping section **40b2** moves forward to grip reel **21a**, and moves rearward in a state where reel **21a** is gripped (Step S15).

(68) After the above-described unloading operation at the time of reception, moving section **43** moves gripping section **40b2** to storage section **42** in which article **21** is stored (Step S16). Specifically, lifting and lowering section **40b1** rotates as necessary to lift or lower gripping section **40b2** along the vertical direction (the Z-axis direction) so that gripping section **40b2** reaches a predetermined storage location (pair of partition sections **42b** of first storage unit **42t1** or second storage unit **42t2**) when gripping section **40b2** moves forward. Next, gripping section **40b2** moves forward to insert reel **21a** into the storage location (pair of partition sections **42b**), the gripping of reel **21a** is released, gripping section **40b2** moves rearward (Step S17). As a result of the storage operation at the time of reception described above, reel **21a** which is article **21** is stored in storage section **42**.

(69) As described above, in the present embodiment, when the reception work of article **21** by the operator is permitted by permission section **44**, moving section **43** performs the delivery work of article **21** different from article **21** through second opening section **41b** in parallel with the reception work by the operator through first opening section **41a**. Accordingly, in storage **40**, it is possible to shorten a time required for the reception work and the delivery work of article **21** as compared with, for example, a case where the delivery work of article **21** different from article **21** is performed after the reception work by the operator through first opening section **41a** is completed.

(70) As illustrated in FIG. 4, storage **40** of the present embodiment includes first accommodation section **47a** capable of temporarily accommodating multiple articles **21** to be received through first opening section **41a**. As long as first accommodation section **47a** temporarily can accommodate multiple articles **21**, first accommodation section **47a** may have any form. FIG. 7 illustrates an example of first accommodation section **47a**. Similar to storage section **42**, first accommodation section **47a** includes main body section **47a1**, and partition sections **47a2** which are provided so as to protrude upward at a predetermined angle with respect to main body section **47a1** to accommodate reel **21a**.

(71) Partition section **47a2** of the present embodiment is provided in multiple pairs (15:30 in FIG. 7), and can accommodate multiple (15) reels **21a**. Each of the multiple pairs (15 pairs) of partition sections **47a2** is provided with two partition sections **47a2** separated from each other so as not to interfere with moving device **40b**. In FIG. 7, for convenience of illustration, some members are assigned with reference symbols, and not all members are assigned with reference symbols. In

addition, it is preferable that inclination angle $\theta 1$ of partition section **47a2** of first accommodation section **47a** coincides with inclination angle $\theta 1$ of partition section **42b** of storage section **42**. As a result, storage **40** can obtain the same effect as the case where inclination angle $\theta 1$ of chute section **46** coincides with inclination angle $\theta 1$ of partition section **42b** of storage section **42**.

(72) In a mode in which storage **40** includes first accommodation section **47a**, moving section **43** can deliver article **21** that need to be delivered through second opening section **41b** when it is necessary to deliver article **21** stored in storage section **42** during the reception work of multiple articles **21** through first opening section **41a**. Specifically, moving section **43** temporarily accommodates multiple articles **21** to be received through first opening section **41a** in first accommodation section **47a**, so that, for example, articles **21** accommodated in first accommodation section **47a** can be stored in storage section **42** using, for example, an idling time of storage **40**.

(73) In addition, when it is necessary to deliver article **21** stored in storage section **42** during the reception work of multiple articles **21** through first opening section **41a**, moving section **43** delivers article **21** that needs to be delivered through second opening section **41b**. At this time, moving section **43** can perform the reception work of article **21** by the operator through first opening section **41a** and the delivery work of article **21** through second opening section **41b** in parallel with each other in the same manner as described above.

(74) In addition, when it is necessary to deliver article **21** stored in storage section **42** during the reception work of multiple articles **21** through first opening section **41a**, moving section **43** may preferentially perform the delivery work of article **21** requiring the delivery with respect to the reception work of article **21** through first opening section **41a**. For example, moving section **43** can perform the delivery work of multiple articles **21** through second opening section **41b** while the reception work of one article **21** is performed through first opening section **41a**. In addition, when it is necessary to deliver article **21** stored in storage section **42**, moving section **43** can stop the reception work of article **21**, and can perform the delivery work of article **21** using both or one of first opening section **41a** and second opening section **41b**. In any of the above cases, moving section **43** can move article **21** by driving and controlling above-described moving device **40b**.

(75) As illustrated in FIG. 4, storage **40** of the present embodiment includes second accommodation section **47b** capable of temporarily accommodating multiple articles **21** to be delivered through second opening section **41b**. As long as second accommodation section **47b** can temporarily accommodate multiple articles **21**, second accommodation section **47b** may have any form. For example, a tray can be used as second accommodation section **47b**. The tray can sequentially stack articles **21** moved to second opening section **41b**.

(76) In a mode in which storage **40** includes second accommodation section **47b**, moving section **43** can move multiple articles **21** required for board working machine **10** to second accommodation section **47b** based on a production plan of a board product, and can deliver multiple articles **21** accommodated in second accommodation section **47b** through second opening section **41b**. For example, the production plan of the board product is stored in management device **19**. Based on the production plan of the board product, management device **19** indicates article **21** (multiple articles **21** for which board working machine **10** is required) to be delivered to storage **40**. Moving section **43** drives and controls above-described moving device **40b** to move indicated article **21**. As a result, storage **40** can collectively deliver multiple articles **21** required in the production plan.

(77) 1-4. Other

(78) In the above embodiment, article **21** is mainly described as an example of reel **21a**. However, for example, article **21** may be feeder **21b**, tray **21c**, solder container **21d**, the holding member, the holding member accommodation device described above, or the like. Storage **40** can include a storage unit conforming to article **21**, and can include a moving device conforming to article **21**. In addition, moving device of storage **40** can store accommodation case **23** in which article **21** is accommodated in the storage unit for each accommodation case **23**.

(79) Storage **40** can also deliver article **21** different from article **21** through second opening section **41b** when the delivery work of article **21** is performed through first opening section **41a**.

Specifically, when gripping section **40b2** carries out reel **21a** to be delivered through first opening section **41a** to work space **40c**, the rear door provided between work space **40c** and moving device **40b** is closed. Then, control device **40a** performs the opening operation of first front door **41a1**, and thus, the operator can perform the delivery work of reel **21a** through first opening section **41a**.

(80) When reel **21a** to be delivered through first opening section **41a** is carried out to work space **40c**, gripping section **40b2** moves to storage section **42** in order to acquire reel **21a** to be delivered through second opening section **41b**. Then, gripping section **40b2** acquires reel **21a** delivered through second opening section **41b** from storage section **42**, and carries out reel **21a** to first position **46a** of chute section **46**. Carried-out reel **21a** slides along chute section **46** and reaches second opening section **41b**.

(81) As described above, storage **40** can perform the delivery work of article **21** by the operator through first opening section **41a** and the delivery work of article **21** different from article **21** through second opening section **41b** in parallel with each other. In this case, permission section **44** permits the delivery work of article **21** by the operator through first opening section **41a**. When the delivery work of article **21** by the operator is permitted by permission section **44**, moving section **43** performs the delivery work of article **21** different from article **21** through second opening section **41b** in parallel with the delivery work by the operator through first opening section **41a**.

(82) In addition, storage **40** can receive article **21** different from article **21** through second opening section **41b** when the reception work or delivery work of article **21** is performed through first opening section **41a**. In this case, storage **40** can include a second chute section instead of chute section **46**. The second chute section causes article **21** received through second opening section **41b** to slide toward a predetermined position. The predetermined position can be set to a position at which gripping section **40b2** can grip article **21** which has slid on the second chute section. It should be noted that in a case where the positioning of article **21** which has slid on the second chute section is difficult, storage **40** may include a positioning device for positioning article **21** at a predetermined position. In addition, storage **40** may include a conveyance device which conveys article **21** received through second opening section **41b** to a predetermined position instead of the second chute section.

(83) In addition, when article **21** is received through second opening section **41b**, it is necessary to provide acquisition device **45** in second opening section **41b**. For example, in a case where it is difficult to provide acquisition device **45** in second opening section **41b** due to convenience of the installation space or the like, for example, a wireless tag or the like may be used as identification code **22**. A wireless reader (acquisition device **45**) for performing wireless communication with a wireless tag may be provided at a position separated from second opening section **41b**.

2. Example of Effects of Embodiment

(84) According to storage **40**, first opening section **41a**, second opening section **41b**, and moving section **43** are provided. As a result, storage **40** can perform the reception work or the delivery work of article **21** through first opening section **41a** and the reception work or the delivery work of article **21** different from article **21** through second opening section **41b** in parallel with each other, and thus, the work efficiency of the reception work or the delivery work of article **21** is improved.

REFERENCE SIGNS LIST

(85) **10**: board working machine, **10c**: component mounter, **21**: article, **21a**: reel, **22**: identification code, **40**: storage, **41a**: first opening section, **41b**: second opening section, **42**: storage section, **42a**: main body section, **42b**: partition section, **43**: moving section, **44**: permission section, **45**: acquisition device, **46**: chute section, **47a**: first accommodation section, **47b**: second accommodation section, **90**: board, **θ1**: inclination angle

Claims

1. A storage comprising: a first opening section through which an article used in board working machine configured to perform predetermined board work on a board is received or delivered, the first opening section being disposed on a front face of the storage, and the first opening section being a reception/delivery opening through which the article is received or delivered; a second opening section which is different from the first opening section and through which an article different from the article is delivered when reception work or delivery work of the article is performed through the first opening section, the second opening section being disposed below the first opening section on the front face of the storage, the second opening section being smaller than the first opening section, and the second opening section being a delivery dedicated opening through which the article is delivered; a moving section configured to move the article to a predetermined storage section when the article is received through the first opening section or the second opening section and move the article stored in the storage section to the first opening section or the second opening section when the article is delivered; an acquisition device configured to read an identification code provided in the article to acquire identification information for identifying the article is provided only in the first opening section; a work space in which the reception work or the delivery work of the article is performed through the first opening section; a chute section along which the article carried out from the storage section slides toward the second opening section by the moving section; a first front door provided between the first opening section and the work space; a second front door provided between the second opening section and the chute section; and a control device configured to prohibit an operator from performing the reception work of the article through the first opening section when the moving device is performing or is scheduled to perform the work in work space, and configured to permit the operator to perform the reception work of the article through first opening section when the moving device is not performing the work in work space and is not scheduled to perform the work, wherein the first front door is closed when the control device prohibits the operator from performing the reception work of the article through the first opening section, and the second front door may be opened when the article is delivered from the second opening section.
2. The storage according to claim 1, further comprising: a permission section configured to permit the reception work of the article by an operator through the first opening section, wherein the moving section performs the delivery work of the article different from the article through the second opening section in parallel with the reception work by the operator through the first opening section when the reception work of the article by the operator is permitted by the permission section.
3. The storage according to claim 1, wherein the board working machine is a component mounter configured to mount a component on the board, the article is a reel around which a component tape configured to accommodate the component is wound, the storage section includes a main body section and a partition section provided so as to project upward at a predetermined angle with respect to the main body section to store the reel, and an inclination angle of the chute section coincides with an inclination angle of the partition section of the storage section.
4. The storage according to claim 1, further comprising: a first accommodation section configured to temporarily accommodate multiple articles to be received through the first opening section.
5. The storage according to claim 4, wherein the moving section delivers article that needs to be delivered through second opening section when it is necessary to deliver the article stored in the storage section during the reception work of the multiple articles through the first opening section.
6. The storage according to claim 1, further comprising: a second accommodation section configured to temporarily accommodate multiple articles to be delivered through the second opening section.

7. The storage according to claim 6, wherein the moving section moves the multiple articles required for the board working machine to the second accommodation section based on a production plan of a board product and delivers the multiple articles accommodated in the second accommodation section through second opening section.
