

Ingredient Delivery System and Control Method Thereof

Technical Field

This disclosure relates to the field of automation, and in particular to an ingredient delivery system and a method for controlling the same.

Background

The restaurant industry is a traditional labor-intensive industry. With the advancement of technology, more and more automated equipment has been introduced into the restaurant industry. This automated equipment can perform customer ordering, catering, delivery and other services in restaurants, thereby reducing the labor cost of the restaurant, and effectively reduces the labor intensity of employees in the catering industry and improves labor efficiency.

It should be noted that the above description of the background art is merely provided for clear and complete explanation of this disclosure and for easy understanding by those skilled in the art. And it should not be understood that the above technical solution is known to those skilled in the art as it is described in the background art of this disclosure.

Summary of the Disclosure

In the existing restaurant industry, foodstuff is usually stored in storage shelves after it arrives in restaurants. It was found by the inventors of this disclosure that in a case of many types of foodstuff or similar outer packaging of different foodstuff, how to take out the foodstuff from the storage shelves accurately and quickly has become an important issue to improve the distribution efficiency of foodstuff.

Embodiments of this disclosure provide an ingredient delivery system and a method for controlling the same, in which on the take-out side of the foodstuff storage portion, a movable tray is provided to take out the foodstuff in the slideways, and a first stopper member is provided at a front end of the slideways of the foodstuff storage portion, the first stopper member blocks respectively the foodstuff and

subsequent foodstuff, so that the foodstuff sequentially slides out from the front end of the slideways to the movable tray, so as to prevent multiple foodstuff from sliding into the movable tray disorderly, thereby improving accuracy and efficiency of the process of taking out the foodstuff.

According to a first aspect of the embodiments of this disclosure, there is provided an ingredient delivery system, including at least one delivery unit, each delivery unit including:

- a first storage portion configured to store foodstuff to be delivered,

- the first storage portion including:

- a frame having a front and a back that are disposed oppositely;

- slideways arranged within the frame and extending between the front and back of the frame, the number of the slideways being at least two, a position of an end of each slideway the back of the frame being higher than a position of an end of the slideway at the front of the frame, and the at least two slideways being distributed laterally and/or longitudinally within the frame;

- a movable tray located at a front side of the frame and capable of moving at least in a longitudinal direction, a front end of the movable tray being inclined downwards;
- and

- a first stopper member located at a front end of each slideway and having a front side stopper and a rear side stopper, and in an extending direction of the slideway, the front side stopper being closer to the front of the frame than the rear side stopper, the front side stopper blocking a front side of the foodstuff to be delivered, and the rear side stopper blocking a front of another foodstuff to be delivered at a rear side of the foodstuff to be delivered.

According to a second aspect of the embodiments of this disclosure, there is provided a method for controlling an ingredient delivery system, the method including:

- controlling a moving position of the movable tray; and

- controlling a front side stopper of a first stopper member of a target slideway to be open in a case where the movable tray moves to a front side of the target slideway.

An advantage of the embodiments of this disclosure exists in that on the take-out side of the foodstuff storage portion, a movable tray is provided to take out the foodstuff in the slideways, and a first stopper member is provided at a front end of the slideways of the foodstuff storage portion, the first stopper member blocks respectively the foodstuff and subsequent foodstuff, so that the foodstuff sequentially slides out from the front end of the slideways to the movable tray, so as to prevent multiple foodstuff from sliding into the movable tray disorderly, thereby improving accuracy and efficiency of the process of taking out the foodstuff.

With reference to the following description and drawings, the particular embodiments of this disclosure are disclosed in detail, and the principle of this disclosure and the manners of use are indicated. It should be understood that the scope of the embodiments of this disclosure is not limited thereto. The embodiments of this disclosure contain many alternations, modifications and equivalents within the spirits and scope of the terms of the appended claims.

Features that are described and/or illustrated with respect to one embodiment may be used in the same way or in a similar way in one or more other embodiments and/or in combination with or instead of the features of the other embodiments.

It should be emphasized that the term “comprises/comprising” or “includes/including” when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

Brief Description of the Drawings

Elements and features depicted in one drawing or embodiment of the disclosure may be combined with elements and features depicted in one or more additional drawings or embodiments. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views and may be used to designate like or similar parts in more than one embodiments.

The drawings are included to provide further understanding of this disclosure, which constitute a part of the specification and illustrate the preferred embodiments of

this disclosure, and are used for setting forth the principles of this disclosure together with the description. It is obvious that the accompanying drawings in the following description are some embodiments of this disclosure, and for those of ordinary skills in the art, other accompanying drawings may be obtained according to these accompanying drawings without making an inventive effort. In the drawings:

FIG. 1 is an exploded view of the delivery unit of the ingredient delivery system of Embodiment 1 of this disclosure;

FIG. 2 is a cross-sectional view of the first stopper member in a direction perpendicular to an extending direction of the slideways of Embodiment 1 of this disclosure;

FIG. 3 is a top view of the stopper member from the slideways of the embodiment of this disclosure;

FIG. 4 is a cross-sectional view of a lateral side of an overall first storage portion of Embodiment 1 of this disclosure;

FIG. 5 is a perspective view of the overall first storage portion of Embodiment 1 of this disclosure;

FIG. 6 is another perspective view of the overall first storage portion of Embodiment 1 of this disclosure;

FIG. 7 is a schematic diagram of a method for controlling the foodstuff to be delivered in the first storage portion from the frame to the output end tray of Embodiment 1 of this disclosure;

FIG. 8 is a schematic diagram of the ingredient delivery system including multiple delivery units of Embodiment 1 of this disclosure;

FIG. 9 is a schematic diagram of a displayed picture of the first display of Embodiment 1 of this disclosure;

FIG. 10 is a schematic diagram of a displayed picture of the second display of Embodiment 1 of this disclosure;

FIG. 11 is a schematic diagram of the back of the first storage portion of Embodiment 2 of this disclosure;

FIG. 12 is a schematic diagram of a displayed picture of the foodstuff

replenishment indicating device of Embodiment 2 of this disclosure; and

FIG. 13 is a schematic diagram of the method for controlling of Embodiment 3 of this disclosure.

Detailed Description of the Disclosure

These and further aspects and features of this disclosure will be apparent with reference to the following description and attached drawings. In the description and drawings, particular embodiments of the disclosure have been disclosed in detail as being indicative of some of the ways in which the principles of the disclosure may be employed, but it is understood that the disclosure is not limited correspondingly in scope. Rather, the disclosure includes all changes, modifications and equivalents coming within the spirit and terms of the appended claims.

In the embodiments of this disclosure, terms “first”, and “second”, etc., are used to differentiate different elements with respect to names, and do not indicate spatial arrangement or temporal orders of these elements, and these elements should not be limited by these terms. Terms “and/or” include any one and all combinations of one or more relevantly listed terms. Terms “contain”, “include” and “have” refer to existence of stated features, elements, components, or assemblies, but do not exclude existence or addition of one or more other features, elements, components, or assemblies.

In the embodiments of this disclosure, single forms “a”, and “the”, etc., include plural forms, and should be understood as “a kind of” or “a type of” in a broad sense, but should not defined as a meaning of “one”; and the term “the” should be understood as including both a single form and a plural form, except specified otherwise. Furthermore, the term “according to” should be understood as “at least partially according to”, the term “based on” should be understood as “at least partially based on”, except specified otherwise.

In the following description of the embodiments of this disclosure, for the convenience of description, a side of a first storage portion where foodstuff to be delivered is fed is referred to as “a back”, a side of the first storage portion where foodstuff to be delivered is taken out is referred to as “a front”, “the front” being

opposite to “the back”, and two sides of the first storage portion neighboring “the back” are referred to as “lateral sides”.

Embodiment 1

Embodiment 1 of this disclosure provides an ingredient delivery system.

FIG. 1 is an exploded view of the delivery unit of the ingredient delivery system of this embodiment. As shown in FIG. 1, the ingredient delivery system includes at least one delivery unit 10.

As shown in FIG. 1, in this embodiment, each delivery unit 10 may include a first storage portion 1. The first storage portion 1 may be used to store foodstuff to be delivered.

FIG. 4 is a cross-sectional view of a lateral side of the overall first storage portion 1, FIG. 5 is a perspective view of the overall first storage portion 1, and FIG. 6 is another perspective view of the overall first storage portion 1.

As shown in FIG. 1, the first storage portion 1 includes: a frame 11, slideways 12, a movable tray 13 and a first stopper member 14.

As shown in FIG. 1, the frame 11 may be a cuboidal frame, each side of the cuboidal frame extending along X, or Y or Z direction. The X, Y and Z directions are perpendicular to each other.

In this embodiment, the Z direction is referred to as a longitudinal or height direction, the X direction is referred to as a fore-and-aft direction, and the Y direction is referred to as a lateral or left-right direction.

As shown in FIG. 1, the frame 11 includes a front 11F and a back 11B, the front 11F and the back 11B being arranged opposite to each other in the fore-and-aft direction.

As shown in FIG. 1, the slideways 12 are provided within the frame 11 and extend between the front 11F and the back 11B of the frame 11. The number of the slideways 12 is at least two, and the at least two slideways 12 are distributed laterally and/or longitudinally within the frame 11.

In this embodiment, the slideways 12 may be numbered. For example, a serial

number K_{ij} indicates that a slideway is: a slideway numbered i -th from the left to the right in the lateral direction and numbered j -th from the bottom to the top in the longitudinal direction. In each slideway, there may exist multiple storage positions, the multiple storage positions being distributed along an extension direction of the slideway, and the storage positions in the slideway may also be numbered. In this way, storage positions of the foodstuff to be delivered in the slideways in the first storage portion 1 may be determined according to the serial numbers of the slideways and the serial numbers of the storage positions in the slideways.

In this embodiment, the back of the frame 11 may have multiple first transverse spacers, each of the first transverse spacers extending laterally. The number of the first transverse spacers is at least two, and the at least two first transverse spacers may be distributed in the longitudinal direction and/or in the transverse direction. One end of the back of the slideway 12 is connected to one transverse spacer.

In this embodiment, as shown in FIG. 4, a position of each slideway 12 at an end 121 of the back of the frame 11 is higher than a position of the slideway 12 at an end 122 of the front of the frame 11, that is, each slideway 12 is arranged in an inclined manner relative to the horizontal direction. After the foodstuff to be delivered is put into an end of the back 121 of the slideway 12 from the back 11B of the frame 11, they may slide along the slideway 12 to the end 122. Such components as rollers or balls may be provided on the slideway 12 to facilitate the foodstuff to be delivered to slide.

In this embodiment, as shown in FIGs. 1 and 4, the movable tray 13 is located on the front side of the frame 11, and the front end of the movable tray 13 is inclined downwards. In this embodiment, the movable tray 13 is able to move at least in the longitudinal direction, for example, the movable tray 13 is able to be moved under the driving of a driving mechanism (not shown) in an up-down direction. In this embodiment, a size of the movable tray 13 in the lateral direction is the same as a size of the frame 11 in the lateral direction; however, this embodiment is not limited thereto. For example, the size of the movable tray 13 in the lateral direction may be smaller than the size of the frame 11 in the lateral direction, in which case the

movable tray 13 is able to move both in the longitudinal direction and in the transverse direction, so as to carry the foodstuff to be delivered that slides out from any slideway 12. In addition, in this embodiment, the movable tray 13 may include an angle adjustment mechanism (not shown) for adjusting an inclination angle, the angle adjustment mechanism being able to be controlled by a controller 15 to be described later, so as to adjust an inclination angle of a first extension slideway 131 with respect to the horizontal direction.

FIG. 2 is a cross-sectional view of the first stopper member 14 in a direction perpendicular to an extending direction of the slideways, and FIG. 3 is a top view of the stopper member 14 from the space above the slideways. In FIGs. 2 and 3, the foodstuff 200 to be delivered on the slideways 12 is shown.

In this embodiment, as shown in FIG. 1, the first stopper member 14 is located at a front end of each slideway 12. As shown in FIG. 3, the first stopper member 14 includes a front side stopper 141 and a rear side stopper 142. In the extending direction of the slideways (i.e. the X direction), the front side stopper 141 is closer to the front 11F of the frame 11 than the rear side stopper 142, and the front side stopper 141 blocks a front side of the foodstuff 200 to be delivered, and the rear side stopper 142 blocks a front of another foodstuff 200 to be delivered at a rear side of the foodstuff to be delivered.

In this embodiment, when the front side stopper 141 or the rear side stopper 142 is in an open state, the front of the foodstuff to be delivered at the front or rear side of the foodstuff 200 to be delivered is not blocked; and when the front side stopper 141 or the rear side stopper 142 is in a closed state, the front of the foodstuff to be delivered at the front or rear side of the foodstuff 200 to be delivered is blocked.

In this embodiment, when the rear side stopper 142 is in the open state, the foodstuff 200 to be delivered may slide along the slideway 12 into a space between the front side stopper 141 and the rear side stopper 142; and when the rear side stopper 142 is in the closed state, other foodstuff to be delivered behind the foodstuff 200 to be delivered is blocked by the rear side stopper 142 and may not slide along the slideway 12 into the space between the front side stopper 141 and the rear side

stopper 142. When the front side stopper 141 is in the closed state, the foodstuff 200 to be delivered is blocked by the front side stopper 141 and may not slide out from a front end (i.e. an end at the front) of the slideway 12; and when the front side stopper 141 is in the open state, the foodstuff 200 to be delivered may slide out of the slideway 12 from the front end (i.e. an end at the front) of the slideway 12.

According to this embodiment, the first stopper blocks the foodstuff to be delivered and another foodstuff to be delivered at the back side respectively, so that the foodstuff may slide out from the front end of the slideway to the movable tray in an orderly manner, thereby preventing multiple foodstuff from sliding into the movable tray disorderly, and improving accuracy and efficiency of the process of taking out the foodstuff. In this embodiment, the movable tray is arranged on the take-out side (that is, the front side) of the first storage portion to take out the foodstuff in the slideways, which may improve efficiency of taking out the foodstuff. In addition, compared with a structure in which a manipulator is arranged to grab foodstuff to be delivered from slideways, this embodiment adopts a structure in which the movable tray cooperates with the first stopper member to take out the foodstuff, which is simpler, and the cost may be lowered.

In some embodiments, as shown in FIG. 2, the foodstuff 200 to be delivered may have a packaging box, and the first stopper member 14 may abut an outer periphery of the packaging box, so as to block the foodstuff 200 to be delivered. A size and longitudinal installation position of the first stopper member 14 may vary with outer dimensions of the packaging box.

As shown in FIGs. 2 and 3, one slideway 12 may be provided with two first stopper members 14, the two first stopper members 14 being located on the left and right sides of the slideway 12 across the slideway 12. Hence, the two front side stopper members may clamp the foodstuff 200 to be delivered from the left and right sides of the slideway 12, thereby effectively blocking the foodstuff 200 to be delivered, and the two rear side stopper members may effectively block the foodstuff to be delivered at the back side of the foodstuff to be delivered from the left and right sides of the slideway 12. In addition, this embodiment may not be limited thereto, and

one slideway 12 may also be provided with only one first stopper member 14, for example, only one first stopper member 14 is provided at the left or right side. Furthermore, as shown in FIG. 2, in the longitudinal direction, the first stopper member 14 may block the foodstuff 200 to be delivered from a lower side of a largest lateral dimension portion 201 of the foodstuff 200 to be delivered.

As shown in FIG. 3, when the front side stopper 141 is in a closed state (such as the front side stopper 141 denoted by solid lines in FIG. 3), the front side stopper 141 enters a space above the slideway 12, thereby blocking the front side of the foodstuff to be delivered; and when the front side stopper 141 is in an open state (such as the front side stopper 141 denoted by dotted lines in FIG. 3), the front side stopper 141 retreats to a side of a space above the slideways 12, thereby avoiding blocking the foodstuff to be delivered.

As shown in FIG. 3, when the rear side stopper 142 is in a closed state (such as the rear side stopper 142 denoted by dotted lines in FIG. 3), the rear side stopper 142 enters the space above the slideways, thereby blocking the foodstuff to be delivered at the rear side of the foodstuff 200 to be delivered; and when the rear side stopper 142 is in an open state (such as the rear side stopper 142 denoted by solid lines in FIG. 3), the rear side stopper 142 retreats to the side of the space above the slideways 12, thereby avoiding blocking the foodstuff to be delivered at the rear side of the foodstuff 200 to be delivered.

In this embodiment, as shown in FIG. 3, when the front side stopper 141 is in an open state, the rear side stopper 142 is in a closed state, hence, when the front side stopper 141 is opened to allow the foodstuff 200 to be delivered slides from the slideways 12, the rear side stopper 142 is in a closed state, thereby blocking sliding of other foodstuff to be delivered at the back side of the sliding foodstuff 200 to be delivered. Therefore, when the front side stopper 141 is opened, at most one piece foodstuff 200 to be delivered slides out, which may avoid multiple foodstuff 200 to be delivered from sliding out from the slideways 12, and control the foodstuff 200 to be delivered to slide out sequentially.

In this embodiment, as shown in FIG. 3, the first stopper member 14 may further

include a connection portion 143. The connection portion 143 may be connected between the front side stopper 141 and the rear side stopper 142. And the connection portion 143 may rotate around a shaft 144 extending longitudinally. As shown in FIGs. 2 and 3, the shaft 144 may be located at a lateral outer side of the slideways 12.

As to the front side stopper 141 and the rear side stopper 142 shown by the solid lines in FIG. 3, when the connection portion 143 rotates around the shaft 144 to a first position, the front side stopper 141 is in an open state, and the rear side stopper 142 is in a closed state, and at this moment, the foodstuff 200 to be delivered may enter along the slideways into an area between the front side stopper 141 and the rear side stopper 142, and the front side of the foodstuff 200 to be delivered is blocked by the front side stopper 141; and as to the front side stopper 141 and the rear side stopper 142 shown by the dotted lines in FIG. 3, when the connection portion 143 rotates around the shaft 144 to a second position, the front side stopper is in an open state, and the rear side stopper is in a closed state, and at this moment, the foodstuff 200 to be delivered may slide out of the slideways 12 from the front end of the slideways 12, and other foodstuff to be delivered at the rear side of the foodstuff 200 to be delivered is blocked by the rear side stopper 142, hence, it will not slide out of the slideways 12 from the front end of the slideways 12.

In this embodiment, as shown in FIGs. 1, 4, 5 and 6, the first storage portion 1 further includes a controller 15. The controller 15 may control a movement position of the movable tray 13, and control a front side stopper 141 of a first stopper member 14 of the target slideway 12 to be open in a case where the movable tray 13 moves to a front side of the target slideway 12. Hence, the foremost foodstuff 200 to be delivered on the target slideway 12 may slide out along the target slideway 12 and is carried by the movable tray 13.

As shown in FIG. 1, the movable tray 13 includes a first extension slideway 131. The first extension slideway 131 is laterally aligned with the slideway 12 in the frame 11, and an extension direction of the first extension slideway 131 is in parallel with that of the slideway 12, that is, both the first extension slideway 131 and the slideway 12 extend along the X direction. Thus, the foodstuff 200 to be delivered that slides out

from the slideway 12 may continue to slide on the first extension slideway 131 of the movable tray 13.

As shown in FIG. 4, a second stopper member 132 is provided at the front side of the first extension slideway 131. A retraction window (not shown) may be provided at the front side of the first extension slideway 131, and the second stopper member 132 may move in the longitudinal direction to protrude from the retraction window or retract to below the first extension slideway 131.

For example, when the second stopper member 132 is in a closed state, the second stopper member 132 moves upward from below the retraction window at the front end of the first extension slideway 131 and is exposed from a surface of the first extension slideway 131, thereby preventing the foodstuff to be delivered on the first extension slideway 131 from sliding forward; and when the second stopper member 132 is in an open state, the second stopper member 132 may move from the retraction window at the front side of the first extension slideway 131 downwards to below the first extension slideway 131 to release the blocking, so that the foodstuff to be delivered on the first extension slideway 131 may slide forward.

As shown in FIGs. 1, 4, 5 and 6, in this embodiment, the first storage portion 1 further includes a housing 16 and an output end tray 17. The housing 16 may accommodate the frame 11, the movable tray 13 and the first stopper member 14. The output end tray 17 may extend from an interior of the housing 16 to a front side of a window 161 in a front of the housing 16. For example, as shown in FIG. 4, an end 17A of the output end tray 17 is located within the housing 16, and the other end of the output end tray 17 is mounted on a tray rack 18 in front of the housing 16, and furthermore, the other end of the output end tray 17 may also not be mounted on the tray rack 18. The tray rack 18 may be used for placing trays for serving dishes. The window 161 may have, for example, a structure of shutter. Before the foodstuff to be delivered is sent out of the housing, the shutters are closed, during the process of delivering the foodstuff to be delivered out of the housing, the shutters are opened, and after the foodstuff to be delivered is sent out of the housing, the shutters are closed.

In this embodiment, when the movable tray 13 moves to a rear side of the output end tray 17, the controller 15 controls the second stopper member 132 of the first extension slideway 131 to be in an open state, hence, the foodstuff 200 to be delivered on the first extension slideway 131 of the movable tray 13 may slide onto the output end tray 17.

As shown in FIGs. 1 and 5, the output end tray 17 includes second extension slideways 171, the number of the second extension slideways 171 being equal to the number of the first extension slideways 131. The second extension slideways 171 are aligned with positions of corresponding first extension slideways 131 in the lateral direction, and the second extension slideways 171 are parallel to the first extension slideways 131, that is, the second extension slideways 171 and the first extension slideways 131 extend along the X direction.

As shown in FIG. 5, in this embodiment, a sensor 172 is provided at a front end of each second extension slideway 171. The sensor 172 is used to detect whether the foodstuff 200 to be delivered arrives on the second extension slideway 171 and whether the foodstuff 200 to be delivered is removed. Each sensor 172 may include, for example, a light-emitting end and a light-receiving end, the light-emitting end and the light-receiving end being located on two sides of a second extension slideway 171, and the light-emitting end and the light-receiving end being disposed opposite to each other. In addition, a front end of each first extension slideway 131 may also be provided with a sensor, the sensor being used to detect whether the foodstuff 200 to be delivered arrives on the first extension slideway 131 and whether the foodstuff 200 to be delivered slides out from the first extension slideway 131.

As shown in FIGs. 1, 4 and 5, the front end of the output end tray 17 is further provided with a blocking bar 173, the blocking bar 173 being used to block the foodstuff 200 to be delivered on the second extension slideway 171 from sliding forward.

In this embodiment, the foodstuff 200 to be delivered on the output end tray 17 may be manually removed by an operator and placed on a tray for serving dishes.

FIG. 7 is a schematic diagram of a method for controlling the foodstuff 200 to be

delivered in the first storage portion 1 from the frame 11 to the output end tray 17. As shown in FIG. 7, the method for controlling includes:

operation 701: the controller 15 determines slideways 12 in the frame 11 on which the foodstuff 200 to be delivered needs to be taken out, that is, determines a total number and serial numbers of the target slideways 12, and determines a first target slideway 12;

operation 702: the controller 15 controls the movable tray 13 to move longitudinally and/or laterally to reach a front side of the target slideway 12;

operation 703: the controller 15 controls the front side stopper 141 of the first stopper member 14 of the target slideway 12 to be in an open state and the rear side stopper 142 of the first stopper member 14 to be in a closed state at the same time, hence, the foodstuff 200 to be delivered slides along the target slideway 12 to a corresponding first extension slideway 131 of the movable tray 13, and other foodstuff 200 to be delivered at the back side of the foodstuff 200 to be delivered is blocked by the rear side stopper 142 and does not slide out of the target slideway;

operation 704: the controller 15 determines whether it is needed to move the tray to another position to take out the foodstuff 200 to be delivered, if yes, enters into operation 705, and if no, enters into operation 706;

operation 705: the controller 15 determines a next target slideway 12, and enters into operation 702;

operation 706: the controller 15 controls the movable tray 13 to move to the rear side of the output end tray 17, that is, the front end of the movable tray 13 and the rear end of the output end tray 17 are in consistence with respect to heights; and furthermore, the controller 15 may control the first extension slideway 131 of the movable tray 13 to perform a tilting operation, so that the first extension slideway 131 and the second extension slideway 171 are located on the same straight line; for example, the controller 15 controls the aforementioned angle adjustment mechanism to adjust an inclination angle of the first extension slideway 131;

operation 706a: the window 161 is opened, such as the structure of shutter is opened;

operation 707: the controller 16 controls the second stopper member 132 of the first extension slideway 131 of the movable tray 13 to be in an open state; hence, the foodstuff 200 to be delivered slides along the first extension slideway 131 to a corresponding second extension slideway 171 of the output end tray 17, and the foodstuff 200 to be delivered passes through the window 161 at the front side of the housing 16 and stay on the second extension slideway 171 behind the blocking bar 173;

operation 707a: the window 161 is closed, for example, such as the structure of shutter is closed; and

operation 708: the sensor 172 on the second extension slideway 171 detects that the foodstuff 200 to be delivered on the second extension slideway 171 is removed, and feeds back a detection result to the controller 15.

According to the first storage portion 1 of this embodiment, the foodstuff may sequentially slide out of the front end of the slideways to the movable tray, and by controlling the movable tray, the first stopper member and the second stopper member, the foodstuff to be delivered may be sequentially taken out to the output end tray through the slideways and the movable tray, so that removal efficiency and accuracy of the foodstuff to be delivered are high.

As shown in FIGs. 1, 4, 5 and 6, in this embodiment, some components 19 of a temperature control device may be provided at an upper part of the housing 16, and other components of the temperature control device (not shown) may be provided within the housing 16, wherein the temperature control device may control the temperature inside the housing 16, for example, the temperature control device may perform cooling or heating processing.

As shown in FIGs. 1 and 6, doors 162 may be provided at the back of the housing 16, the number of the doors 162 may be one or at least two. For example, FIG. 6 shows two doors 162 distributed in an up-down direction. When the foodstuff to be delivered put into the slideway 12 of the frame 11 needs to be redirected, the doors 162 are opened, and an operator or manipulator may put the foodstuff 200 to be delivered into a corresponding slideway 12.

In addition, it should be noted that in this embodiment, as shown in FIGs. 1, 4, 5 and 6, the first storage portion 1 of the ingredient delivery system includes a housing 16. However, this embodiment is not limited thereto, and the first storage portion 1 may not include a housing, in which case the first storage portion 1 may be provided in, for example, a refrigerator, and the temperature of the foodstuff 200 to be delivered in the first storage portion 1 is maintained by a temperature conditioning system in the refrigerator.

In this embodiment, the ingredient delivery system 100 may include at least one delivery unit 10. FIG. 8 is a schematic diagram of the ingredient delivery system including multiple delivery units 10. As shown in FIG. 8, the ingredient delivery system 100 includes four delivery units 10. In addition, the ingredient delivery system 100 includes a first display 20 and a first output control switch 30.

FIG. 9 is a schematic diagram of a displayed picture of the first display 20. As shown in FIG. 9, the displayed picture 20A of the first display 20 may display a correspondence relationship between the foodstuff 200 to be delivered in the current order and the first storage portion 1.

For example, the display picture 20A of FIG. 9 may include a first display area 21, which displays a serial number 211 of the first storage portion 1 where the foodstuff 200 to be delivered needs to be taken out in the current order. If the foodstuff 200 to be delivered needs to be taken out from at least two first storage portions 1, the at least two first storage portions 1 are arranged in a descending order or ascending order of serial numbers, and adjacent first storage portions 1 are connected by arrows according to their serial numbers; in addition, in the first display area 21, a quantity 212 of the foodstuff 200 to be delivered that needs to be taken out from each first storage portion 1 are also displayed. Furthermore, the displayed picture 20A may also include a second display area 22, which may display a type of a foodstuff to be taken out that should be placed in a tray in the current order, a serial number of the first storage portion 1 where the foodstuff is located, a serial number of a position of the foodstuff on the tray.

In this embodiment, as shown in FIG. 8, the first output control switch 30 is used

to control whether to allow the first display 20 to display information on a next order. For example, when the operator presses the first output control switch 30, the first display 20 displays the information on the next order; otherwise, the first display 20 always displays the information on the current order.

As shown in FIG. 8, each delivery unit 10 may further include: a second display 101 and a second output control switch 102. The second display 101 and the second output control switch 102 may be arranged on the housing 16; however, this embodiment is not limited thereto, and the second display 101 and the second output control switch 102 may also be arranged at other positions.

FIG. 10 is a schematic diagram of a displayed picture of the second display 101. As shown in FIG. 10, the displayed picture 101A of the second display 101 displays a type of the foodstuff 200 to be delivered in the current order, a serial number of the first storage portion 1 where the foodstuff 200 to be delivered is located, a serial number of the second extension slideway 171, and a placement position of the foodstuff 200 to be delivered in the tray.

For example, the displayed picture 101A includes a first display area 1011, which is divided into several sub-areas 10111, positions of the sub-areas 10111 in the first display area 1011 corresponding to placement positions of the foodstuff 200 to be delivered in the tray denoted by the sub-areas. As shown in FIG. 10, each sub-area 10111 displays a type of the foodstuff 200 to be delivered denoted by the sub-area (such as literally displaying a name of the type), a serial number of the first storage portion 1 where the foodstuff 200 to be delivered is located, a serial number of the second extension slideway 171, and a placement position of the foodstuff 200 to be delivered in the tray. And the sub-area 10111 may further display information on a customer to which the foodstuff 200 to be delivered corresponds, such as a serial number of a table of the customer.

In this embodiment, the second display 101 may highlight a type of the foodstuff to be delivered in the current order outputted by the first storage portion 1 of the delivery unit 10 of the second display 101. For example, in FIG. 10, the second display 101 and a first storage portion 1 numbered “#2” are contained in the same

delivery unit 10, hence, in the sub-area 10111 of the first display area 1011, the second display 101 highlights the following: a type of the foodstuff to be delivered outputted by the first storage portion 1 numbered “#2”, a serial number of the foodstuff to be delivered on the second extension slideway 171, a placement location of the foodstuff 200 to be delivered in the tray and information on a customer to which the foodstuff 200 to be delivered corresponds, etc. A form of the highlight is, for example, lengthening a length of the sub-area 10111, and/or changing a font displayed in the sub-area 10111, and/or changing a background color of the sub-area 10111, and/or displaying a picture of the foodstuff 200 to be delivered in the sub-area 10111, etc.

In this embodiment, as shown in FIG. 10, the displayed picture 101A of the second display 101 may further include a second display area 1012. The second display area 1012 displays a serial number of a next first storage portion 1 for outputting the foodstuff 200 to be delivered in the current order. For example, as shown in FIG. 10, the second display 101 and the first storage portion 1 numbered “#2” are included in the same delivery unit 10, and the second display area 1012 displays “Go to ‘#4’ first storage portion”, thereby instructing the operator to go to the first storage portion 1 numbered “#4” to take out the foodstuff 200 to be delivered.

In addition, the displayed picture 101A may further include a third display area 1013, which may display the same information as the second display area 22 of the displayed picture 20A.

In this embodiment, as shown in FIG. 8, the second output control switch 102 is used to control whether to allow the second display 101 to display information on the next order. For example, when the operator presses the second output control switch 102, it means that the operator’s action of taking out the foodstuff 200 to be delivered in the current delivery unit 10 has been completed, and the second display 101 is allowed to display information on the next order; otherwise, the second display 101 always displays information on the current order.

In this embodiment, the information on the foodstuff 200 to be delivered corresponding to the order may be displayed on the displayed picture 20A of the first

display 20. The operator takes out the tray from a tray storage place, and under the guidance of the displayed picture 20A, goes to a first “first storage portion 1” indicated by the displayed picture 20A (e.g. the first storage portion numbered “#2” shown in FIG. 9). Before going to the first “first storage portion 1”, the first output control switch 30 is pressed; after the operator reaches the first “first storage portion 1” (such as the first storage portion numbered “#2” shown in FIG. 9), under the guidance of the displayed picture 101A of FIG. 10, it takes out from the second extension slideway 171 corresponding to the serial number of the second extension slideway 171 (such as the No. 1 slideway and the No. 2 slideway shown in FIG. 10) highlighted by the displayed picture 101A; then, under the guidance of the displayed picture 101A corresponding to the first “first storage portion 1”, the operator goes to a next “first storage portion 1” guided by the displayed picture 101A (such as going to the first storage portion numbered “#4 according to “Go to ‘#4’ first storage portion 1” shown in FIG. 10), and before going to the next “first storage portion 1”, the second output control switch 102 is pressed; and the operator arrives at the first storage portion 1, and performs the same operations as those performed after arriving at the first “first storage portion 1”.

In addition, after the foodstuff 200 to be delivered in the order is taken out, the operator may move the tray containing the foodstuff 200 to be delivered to an output console, and an information reading device of the output console may again acknowledge the foodstuff to be delivered 200 on the tray, and after the acknowledgement is completed, the operator’s personal identification information may be inputted into the output console (for example, the information reading device may read a bracelet of the operator that stores the personal identification information, etc.), and then the output console prints out information on the foodstuff to be delivered on the tray and the information on the operator, and the operator may send the tray away and distribute the foodstuff 200 to be delivered to a corresponding customer.

In this embodiment, by setting the first display 20 and the second display 101, the information on the foodstuff 200 to be delivered in the order may be clearly indicated

to the operator, so that the operator may quickly take out the foodstuff 200 to be delivered from each delivery unit.

In this embodiment, as shown in FIG. 8, the number of delivery units 10 may be one or at least two, for example, four delivery units are shown in FIG. 8. In a case where these exist multiple delivery units 10, the delivery efficiency of the foodstuff 200 to be delivered may be greatly improved.

The ingredient delivery system 100 in this embodiment may be used for foodstuff delivery. However, this embodiment is not limited thereto, that is, the ingredient delivery system 100 may also be used in other industries for delivery of other types of objects to be delivered.

In addition, in Embodiment 1, a structure of the back of the first storage portion 1 is not particularly limited, and a method for feeding the foodstuff to be delivered into the first storage portion 1 is also not particularly limited. For example, the foodstuff to be delivered may be fed into the first storage portion 1 from an end at the back of the slideways manually or by grasping by a manipulator.

Embodiment 2

In Embodiment 2, an embodiment of a structure of the back of the first storage portion 11 shall be described.

FIG. 11 is a schematic diagram of the back of the first storage portion of Embodiment 2. The back of the first storage portion 11 may include a reading device 111.

As shown in FIG. 11, the reading device 111 reads the information on the foodstuff 200 to be delivered. For example, an information carrying unit for carrying the information on the foodstuff 200 to be delivered is provided on an outer package of the foodstuff 200 to be delivered. The information carrying unit may be a two-dimensional code (QR code), a barcode, or a radio frequency identification (RFID) chip, etc. The reading device 111 has an information reading function corresponding to the information carrying unit, such as a two-dimensional code reader, or a barcode reader, or a radio frequency identification (RFID) chip reader, and the

like. The reading device 111 may be mounted on the frame 11, for example, in a case where the rear of the frame 11 is provided with the doors 162 of the housing 16 (as shown in FIG. 6), the doors 162 may not cover the reading device 111, or, the reading device 111 may also be installed at other positions.

In this embodiment, the information on the foodstuff 200 to be delivered may include: a type of the foodstuff 200 to be delivered. In addition, the information on the foodstuff 200 to be delivered may include: a production date and/or a shelf life of the foodstuff 200 to be delivered.

As shown in FIG. 11, first indicator lights 112 may be provided at the back of the frame 11. The number of the first indicator lights 112 is the same as the number of the slideways 12, and positions of the first indicator lights 112 correspond to positions of the slideways 12. For example, a first indicator light 112 is located above a corresponding slideway 12, and a shape of the first indicator light 112 is a downward arrow, thereby indicating the corresponding slideway 12; for another example, the first indicator light 112 may be located below the corresponding slideway 12, and a shape of the first indicator light 112 is an upward arrow, thereby indicating the corresponding slideway 12.

As shown in FIG. 11, there may exist multiple first lateral spacers 119 at the back of the frame 11, each of which extending laterally. The number of the first lateral spacers 119 is at least two, and the at least two first lateral spacers 119 may be distributed in the longitudinal direction and/or in the transverse direction. One end of the back of the slideway 12 is connected to the transverse spacers 119. The first indicator light 112 may be arranged on a first lateral spacer 119. For example, the first indicator light 112 may be embedded inside the first transverse spacer 119, and a back of the first lateral spacer 119 has a light-transmitting window, so that light emitted by the first indicator light 112 may be observed from the back of the frame; for another example, the first indicator light 112 may be disposed on an outer periphery of the first lateral spacer 119, and the like.

As shown in FIG. 11, the controller 15 is connected to the first indicator light 112 and the reading device 111, and the controller 15 controls a lighting mode of the first

indicator light 112 according to the information on the foodstuff 200 to be delivered read by the reading device 111.

According to this embodiment, in the case where the reading device 111 reads the information on the foodstuff 200 to be delivered, the first indicator 112 may be lit in a manner corresponding to the information read by the reading device 111, hence, in a process of storing the foodstuff 200 to be delivered in the first storage portion 1, a possibility of erroneous storage may be lowered.

In this embodiment, as shown in FIG. 11, the first storage portion 1 may further include sensors 113 arranged inside the frame 11 and used to detect whether there exists an object that is fed into the slideway 12 from the end of the back of slideway 12. For example, the sensors 113 may include a light emitting portion and a light receiving portion arranged separately. The light emitting portion and the light receiving portion are arranged opposite to each other, and when there exists an object therebetween, the object will be detected. The number of the sensors 113 may be multiple, and the sensors may detect whether objects are fed into the slideways 12.

In this embodiment, as shown in FIG. 11, the first storage portion 1 may further include a first control switch 114. The first control switch 114 may be disposed at the frame 11. In addition, the embodiment may not be limited thereto, and the first control switch 114 may also be disposed at other positions.

The first control switch 114 may be in communication with the reading device 111 and control the reading device 111 to be in a first state or a second state. In the first state, the reading device 111 may read the information on the foodstuff 200 to be delivered, for example, a function of the reading device 111 to read the information on the foodstuff 200 to be delivered is activated. In the second state, the reading device 111 stops reading the information on the foodstuff 200 to be delivered, for example, the function of the reading device 111 to read the information on the foodstuff 200 to be delivered is disabled.

In this embodiment, when the reading device 111 is in the second state, if the first control switch 114 is pressed, the reading device 111 may be switched to the first state; and when the reading device 111 is in the first state, if the first control switch 114 is

pressed, the reading device 111 may be switched to the second state.

In this embodiment, when the first control switch 114 controls the reading device 111 to be in the first state, the reading device 111 may read the information on the foodstuff 200 to be delivered, and the controller 15 may control the first indicator light 112 to perform the following lighting modes.

A first lighting mode:

if the controller 15 determines that the slideway 12 corresponding to the foodstuff 200 to be delivered is a slideway in the first storage portion 1 according to the information on the foodstuff 200 to be delivered read by the reading device 111, the controller 15 makes the first indicator light 112 corresponding to the determined slideway to be turned on in a first mode, and the first mode is, for example, that the first indicator light 112 flashes at an interval of 1.0 seconds, thereby prompting the operator to feed the foodstuff 200 to be delivered into the slideway to which the flashing first indicator light 112 corresponds.

The controller 15 may store a correspondence relationship between the slideway 112 and the type of the foodstuff 200 to be delivered (such as slideways where baby Chinese cabbages are stored, and slideways where tofu is stored, etc.), thus, in a case where the information on the foodstuff 200 to be delivered is read by the reading device 111, the controller 15 may determine which slideway 12 the foodstuff 200 to be delivered should be fed into according to the read information and the correspondence relationship.

In addition, when the sensor 113 detects that the foodstuff 200 to be delivered is fed into the slideway 12 to which the flashing first indicator light 112 corresponds, the first indicator light 112 is turned off.

Second lighting mode:

If the sensor 113 detects that the foodstuff 200 to be delivered is actually put into a slideway different from the slideway determined by the controller 15, at least the first indicator light 112 corresponding to the slideway where the foodstuff 200 to be delivered is actually put is lit in a second mode. The second mode may be that, for example, the first indicator light 112 flashes at a shorter cycle than the first mode, the

cycle being, for example, 0.5 second. In a specific implementation, centered on the first indicator light 112 corresponding to the slideway into which the foodstuff 200 to be delivered is actually placed, a first predetermined number of first indicator lights 112 in the horizontal direction and a second predetermined number of first indicator lights 112 in the vertical direction are lit in the second mode, that is, the first indicator lights 112 distributed in a cross shape centered on the first indicator light 112 corresponding to the slideway into which the foodstuff 200 to be delivered is actually placed are lit up in the second mode, the first predetermined number of first indicator lights 112 being, for example, a horizontal row of first indicator lights 112, and the second predetermined number of first indicator lights 112 being, for example, a vertical column of first indicator lights 112.

In addition, when the controller 15 controls the first indicator lights 112 to be lit up in the second mode, if the reading device 15 reads information on new foodstuff 200 to be delivered, or the first control switch 114 is triggered to control the reading device 111 to be in a second state, the controller 15 makes the first indicator lights 112 lit in the second mode to be turned off.

A third lighting mode:

When the controller 15 determines that foodstuff 200 to be delivered may no longer be placed in all slideways corresponding to the foodstuff 200 to be delivered according to the information on the foodstuff 200 to be delivered read by the reading device 111, that is, the foodstuff 200 to be delivered is fully loaded in the first storage portion 1, the controller 15 makes the first indicator lights 112 of all the slideways 12 corresponding to the foodstuff 200 to be delivered to be lit in the third mode, the third mode being, for example, keeping the first indicator lights 112 lighting.

For example, the reading device 111 reads that the information on the foodstuff 200 to be delivered is baby Chinese cabbages, and the slideways 12 for storing the baby Chinese cabbages in the first storage portion 1 is full of baby Chinese cabbages, in which case the controller 15 controls the first indicator lights 112 corresponding to all the slideways 12 for storing baby Chinese cabbages in the first storage portion 1 to keep lighting.

In a case where the sensor 113 does not detect that foodstuff 200 to be delivered is put into any slideway 12, if the reading device 111 reads information on next foodstuff 200 to be delivered, or the first control switch 114 is pressed (i.e. the reading device 111 enters into the first state), the controller 15 makes the first indicator lights 112 lit in the third mode to be turned off.

A fourth lighting mode:

When the controller 15 determines that there exists no slideway corresponding to the foodstuff 200 to be delivered in the first storage portion 1 according to the information on the foodstuff 200 to be delivered read by the reading device 111, the controller 15 makes first indicator lights 112 of a third predetermined number of slideways 12 to be lit in a fourth mode. The first indicator lights 112 of the third predetermined number of slideways 12 are, for example, all first indicator lights in the first storage portion 1, and the fourth lighting mode is, for example, keeping the first indicator lights 112 lighting.

For example, the information on the foodstuff 200 to be delivered read by the reading device 111 is baby Chinese cabbages, and there exists no slideway 12 for storing baby Chinese cabbages in the first storage portion 1, in which case the controller 15 controls all first indicator lights 112 in the first storage portion 1 to keep lighting.

In a case where the sensor 113 does not detect that the foodstuff 200 to be delivered is put into any slideway 12, if the reading device 111 reads information on the next foodstuff 200 to be delivered, or the first control switch 114 is pressed (i.e. the reading device 111 enters into the second state), the controller 15 controls the first indicator lights 112 lit in the fourth mode to be turned off.

In this embodiment, when the first control switch 114 controls the reading device 111 to be in the second state, the function of the reading device 111 to read the information on the foodstuff 200 to be delivered is prohibited, in which case if the sensor 113 of any slideway of the first storage portion is blocked (for example, an object enters the slideway, or an object stays at the entrance of the slideway), the controller 15 controls a fourth predetermined number of first indicator lights 112 in

the first storage portion 1 to be lit in the fifth mode. The fourth predetermined number of first indicator lights 112 may be all the first indicator lights 112 or another number of first indicator lights 112 in the first storage portion 1, and the fifth lighting mode is that, for example, the first indicator lights 112 flash at a cycle of 0.5 second.

In addition, when the object blocking the sensor 113 is removed, the controller 15 makes the first indicator lights 112 lit in the fifth mode to be turned off.

After the controller 15 determines the slideway 12 corresponding to the foodstuff 200 to be delivered according to the information on the foodstuff 200 to be delivered read by the reading device 111 and during a period before the reading device 111 reads the information on the next foodstuff 200 to be delivered, position information on a first slideway 12 where it is detected that the foodstuff 200 to be delivered is put into is stored in association with the information on the foodstuff 200 to be delivered read by the reading device 111. In addition, the controller 15 stores position information on a slideway 12 where it is subsequently detected that the foodstuff 200 to be delivered is put into in association with information on unknown foodstuff to be delivered. The position information on the slideway 12 includes a serial number of the slideway 12 and a serial number of a storage position in the slideway 12, and the information on unknown foodstuff to be delivered means that information on the foodstuff to be delivered 200 is not clear, and the foodstuff is unable to be delivered to customers.

For example, the reading device 111 reads information on N -th foodstuff 200 to be delivered as “baby Chinese cabbages; produced at 12:00 on January 1; shelf life is 1 day”, and determines that a slideway 12 numbered K32 is a slideway corresponding to the N -th foodstuff 200 to be delivered, before information on $(N+1)$ -th foodstuff 200 to be delivered is read, if a sensor 113 to which the slideway 12 numbered K32 corresponds first detects that foodstuff 200 to be delivered is fed into the slideway 12 numbered K32, the controller 15 stores the information on N -th foodstuff 200 to be delivered corresponding to position information on the slideway 12 numbered K32; wherein the position information on the slideway 12 numbered K32 includes a serial number K32 of the slideway 12 and an M -th storage position in the slideway 12;

thereafter, before the information on the $(N+1)$ -th foodstuff 200 to be delivered is read, if a sensor 113 to which a slideway 12 numbered K34 corresponds detects that foodstuff 200 to be delivered is fed into the slideway 12 numbered K34, the controller 15 stores the information on the unknown foodstuff 200 to be delivered corresponding to position information on the slideway 12 numbered K34.

In this embodiment, as shown in FIG. 11, the first storage portion 1 further includes a state indicator 115. The state indicator 115 is connected to the controller 15, and is used to indicate that: it is forbidden to put the foodstuff 200 to be delivered into the slideway 12 of the first storage portion 1, or, after a waiting time has elapsed, the foodstuff 200 to be delivered is allowed to be put into the slideway 12 of the first storage portion 1.

As shown in FIG. 11, the state indicator 115 may include: a second indicator light 1151, a third indicator light 1152, a fourth indicator light 1153 and a fifth indicator light 1154.

The controller 15 controls the second indicator light 1151 to be lit up when the controller 15 determines that the foodstuff 200 to be delivered has passed the shelf life according to the information on the foodstuff to be delivered 200 read by the reading device 111. When the reading device 111 is unable to correctly read the information on the foodstuff 200 to be delivered (for example, the two-dimensional code or RFID chip of the packaging box of the foodstuff 200 to be delivered is damaged, etc.), the controller 15 controls the third indicator light 1152 to be lit up. When the controller 15 is unable to correctly identify the information on the foodstuff 200 to be delivered read by the reading device 111 (for example, although the reading device 111 may read the information in the two-dimensional code or RFID chip of the packaging box of the foodstuff 200 to be delivered, the controller 15 is unable to identify or process the information), the controller 15 controls the fourth indicator light 1153 to be lit up. And when a failure occurs in the sensor 113 in the first storage portion 1 or a triggering time exceeds a predetermined time, the controller 15 controls the fifth indicator light 1154 to be lit up.

In addition, as shown in FIG. 11, the first storage portion 1 may further include a

first door indicator light 19a and a second door indicator light 19b, both the first door indicator light 19a and the second door indicator light 19b being connected to the controller 15 (such as a sub-controller). In a case where the door 162 includes a first door and a second door (as shown in FIG. 6, for example, the first door is located at an upper side, and the second door is located at a lower side), the first door indicator light 19a may indicate that: according to the information on the foodstuff 200 to be delivered read by the reading device 111, the slideway 12 corresponding to the foodstuff 200 to be delivered is located in a slideway 12 in front of the first door. And the second door indicator light 19b may indicate that: according to the information on the foodstuff 200 to be delivered read by the reading device 111, the slideway 12 corresponding to the foodstuff 200 to be delivered is located in a slideway 12 in front of the second door.

As shown in FIG. 11, the first door indicator light 19a and the second door indicator light 19b may be provided on the state indicator 115; however, this embodiment is not limited thereto, and the first door indicator light 19a and the second door indicator light 19a and 19b may also be provided at other positions on the frame 11 that are not blocked by the first door and the second door.

As shown in FIG. 11, the first storage portion 1 may further include a shielding door 19d, which may be provided on the frame 11 and at the back side of each slideway 12. The shielding door 19d may be opened and closed, for example, the shielding door 19d may be a sliding door that slides laterally. The shielding door 19d may be shielded by the door 162 of the above housing. When the foodstuff 200 to be delivered needs to be put into the slideway 12, the shielding door 19d to which the slideway 12 corresponds is opened, and shielding doors 19a of other slideways 12 may be kept closed, so that temperatures of the environments of the other slideways 12 may be kept.

As shown in FIG. 8, the ingredient delivery system 100 may further include a foodstuff replenishment indicating device 40. The foodstuff replenishment indicating device 40 is, for example, a tablet computer. The foodstuff replenishment indicating device 40 may be in communication with a central controller. The foodstuff

replenishment indicating device 40 may include a display screen 40A (not shown in FIG. 8), which may switch storage of the foodstuff 200 to be delivered in the first storage portions 1 in the ingredient delivery system 100.

FIG. 12 is a schematic diagram of a displayed picture of the display screen 40A. As shown in FIG. 12, the displayed picture of the display screen 40A may include a first display area 41, the first display area 41 displaying a list of the foodstuff 200 to be delivered stored in the first storage portions 1, a sub-display area to which each foodstuff 200 to be delivered corresponds displaying a serial number and type of the foodstuff 200 to be delivered. In addition, the first display area 41 may also display a quantity (not shown) of the foodstuff 200 to be delivered in the first storage portion 1 that needs to be replenished; the larger the quantity of the foodstuff 200 to be delivered that needs to be replenished, the smaller its corresponding serial number. A display mode of the sub-display area corresponding to each foodstuff 200 to be delivered corresponds to the quantity of the foodstuff 200 to be delivered that needs to be replenished. Different display modes may refer to different display colors and/or different fonts, and the like. Thus, the different display modes may intuitively indicate quantities of various foodstuffs 200 to be delivered. The quantity of the foodstuff 200 to be delivered that needs to be replenished may be obtained through calculation in the following manner: a predetermined quantity of the foodstuff 200 to be delivered subtracted by quantity of the foodstuff 200 to be delivered remained in the first storage portion 1, and a result of subtraction is the quantity of the foodstuff 200 to be delivered that needs to be replenished.

For example, as shown in (A) of FIG. 12, when No. 1 first storage portion is selected, various foodstuffs 200 to be delivered in the first storage portion 1 are displayed in the first display area 21 in a form of a list, for a sub-display area of foodstuff to be delivered 200 with a quantity needing to be replenished less than a first threshold, it displays with a first color, such as green; for a sub-display area of foodstuff to be delivered 200 with a quantity needing to be replenished greater than or equal to the first threshold, it displays with a second color, such as yellow; and for a sub-display area of foodstuff to be delivered 200 with a quantity needing to be

replenished greater than a second threshold, it displays with a third color, such as red.

In addition, in the first display area 21, such information as serial numbers, types, and quantities needing to be replenished, of foodstuffs 200 to be delivered in all the first storage portions 1 of the ingredient delivery system 100 may also be displayed.

In this embodiment, as shown in (B) of FIG. 12, the displayed picture of the display screen 40A of the foodstuff replenishing indicating device 40 may further include a second display area 42. The second display area 42 may display information on foodstuff to be delivered to which the information on the foodstuff to be delivered 200 read by the reading device 111 corresponds. In addition, a display mode of the second display area 42 may also be related to the quantity of the foodstuff 200 to be delivered that needs to be replenished. For example, in the No. 1 first storage portion, a serial number of foodstuff named 2 is #1, and a sub-display area of the foodstuff is red, that is, it indicates that the foodstuff named 2 needs to be replenished into the No. 1 first storage portion; when the reading device 111 of the No. 1 first storage portion reads the information on the foodstuff 200 to be delivered named 2, the foodstuff to be delivered named 2 is transferred from the first display area to the second display area 42 for display, and foodstuff remained in the first display area 41 are ordered and displayed again according to the quantity that needs to be replenished; when the central controller 15 determines that the quantity of the foodstuff 200 to be delivered named 2 put into the No.1 first storage portion increases gradually, the quantity of the foodstuff 200 to be delivered that needs to be replenished decreases gradually, and the second display area 42 in the first storage portion may turn yellow; and when the quantity of the quantity of the foodstuff to be delivered named 2 continues to increase, the second display area 42 may turn green.

According to this embodiment, when the foodstuff to be delivered is stored in the first storage portion, a possibility of erroneous storage may be reduced; and furthermore, the quantity of foodstuffs in the first storage portion may be notified in time, and the operator may be reminded to replenish foodstuff as soon as possible.

Embodiment 3

Embodiment 3 provides a method for controlling an ingredient delivery system,

which is used to control the ingredient delivery system of Embodiment 1 or Embodiment 2.

FIG. 13 is a schematic diagram of the method for controlling of this embodiment. As shown in FIG. 13, the method includes the following steps:

operation 1301: controlling a moving position of a movable tray; and

operation 1302: controlling a front side stopper 141 of a first stopper member 14 of a target slideway 12 to be open in a case where the movable tray 13 moves to a front side of a target slideway 12.

For detailed description of steps 1301 and 1302, reference may be made to the description of the functions of the controller 15 in Embodiment 1, which shall not be described herein any further.

The method for controlling may further include:

operation 1303: controlling a lighting mode of a first indicator light by the controller according to information on the foodstuff to be delivered read by a reading device.

For detailed description of step 1303, reference may be made to the description of the functions of the controller 15 in Embodiment 2, which shall not be described herein any further.

According to this embodiment, the efficiency may be improved when the foodstuff to be delivered is taken out from the ingredient delivery system; and furthermore, when the foodstuff to be delivered is stored in the first storage portion, a possibility of erroneous storage may be lowered.

The controller described with reference to the embodiments of this disclosure may be directly embodied as hardware, software modules executed by a processor, or a combination thereof. Such hardware module, for example, may be carried out by firming the soft modules by using a field programmable gate array (FPGA).

The soft modules may be located in an RAM, a flash memory, an ROM, an EPROM, and EEPROM, a register, a hard disc, a floppy disc, a CD-ROM, or any memory medium in other forms known in the art. A memory medium may be coupled to a processor, so that the processor may be able to read information from the memory

medium, and write information into the memory medium; or the memory medium may be a component of the processor. The processor and the memory medium may be located in an ASIC. The soft modules may be stored in a memory of a mobile terminal, and may also be stored in a memory card of a pluggable mobile terminal. For example, if equipment (such as a mobile terminal) employs a MEGA-SIM card of a relatively large capacity or a flash memory device of a large capacity, the soft modules may be stored in the MEGA-SIM card or the flash memory device of a large capacity.

The controller described in the embodiments may be realized as a universal processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic devices, discrete gate or transistor logic devices, discrete hardware component or any appropriate combinations thereof carrying out the functions described in this disclosure, or may also be realized as a combination of computing equipment, such as a combination of a DSP and a microprocessor, multiple processors, one or more microprocessors in communication combination with a DSP, or any other such configuration.

This disclosure is described above with reference to particular embodiments. However, it should be understood by those skilled in the art that such a description is illustrative only, and not intended to limit the protection scope of the present disclosure. Various variants and modifications may be made by those skilled in the art according to the spirits and principle of the present disclosure, and such variants and modifications fall within the scope of the present disclosure.

CLAIMS

1. An ingredient delivery system, comprising at least one delivery unit, characterized in that each delivery unit comprises:

a first storage portion configured to store foodstuff to be delivered,

the first storage portion comprising:

a frame having a front and a back that are disposed oppositely;

slideways arranged within the frame and extending between the front and back of the frame, the number of the slideways being at least two, a position of an end of each slideway at the back of the frame being higher than a position of an end of the slideway at the front of the frame, and the at least two slideways being distributed laterally and/or longitudinally within the frame;

a movable tray located at a front side of the frame and capable of moving at least in a longitudinal direction, a front end of the movable tray being inclined downwards; and

a first stopper member located at a front end of each slideway and having a front side stopper and a rear side stopper, and in an extending direction of the slideway, the front side stopper being closer to the front of the frame than the rear side stopper, the front side stopper blocking a front side of the foodstuff to be delivered, and the rear side stopper blocking a front of another foodstuff to be delivered at a rear side of the foodstuff to be delivered.

2. The ingredient delivery system according to claim 1, wherein,

when the front side stopper is in an open state, the rear side stopper is in a closed state.

3. The ingredient delivery system according to claim 2, wherein,

when the front side stopper is in a closed state or an open state, the front side stopper enters a space above the slideways or retreats to a side of a space above the slideways,

and when the rear side stopper is in a closed state or an open state, the rear side stopper enters the space above the slideways or retreats to the side of the space above

the slideways.

4. The ingredient delivery system according to claim 2, wherein,
the first stopper member further comprises a connection portion connected between the front side stopper and the rear side stopper,

wherein the connection portion rotates around a shaft extending longitudinally, and when the front side stopper is in an open state, the rear side stopper is in a closed state, and when the front side stopper is in a closed state, the rear side stopper is in an open state.

5. The ingredient delivery system according to claim 2, wherein,
the first storage portion further comprises:
a controller configured to control movement of the movable tray, and control a front side stopper of the first stopper member of a target slideway to be open in a case where the movable tray moves to a front side of the target slideway.

6. The ingredient delivery system according to claim 5, wherein,
the movable tray comprises a first extension slideway laterally aligned with the slideway, the first extension slideway being parallel with the slideway,
and a second stopper member is provided at a front side of the first extension slideway.

7. The ingredient delivery system according to claim 6, wherein,
the first storage portion further comprises:
a housing accommodating the frame, the movable tray and the first stopper member; and

an output end tray extending from an interior of the housing to a front side of a window in a front of the housing,

and when the movable tray moves to a rear side of the output end tray, the controller controls the second stopper member of the first extension slideway to be in an open state.

8. The ingredient delivery system according to claim 7, wherein,
the second stopper member moves in the longitudinal direction,
when the second stopper member is in the open state, the second stopper member

moves downwards from a retraction window at the front side of the first extension slideway to below the first extension slideway,

and when the second stopper member is in the closed state, the second stopper member moves upwards from below the retraction window at the front side of the first extension slideway and is exposed from a surface of the first extension slideway.

9. The ingredient delivery system according to claim 7, wherein,

the output end tray comprises a second extension slideway laterally aligned with the first extension slideway, the second extension slideway extending in a fore-and-aft direction,

and the second extension slideway is provided with a sensor, the sensor detecting whether the foodstuff to be delivered stays on the second extension slideway and whether the foodstuff to be delivered on the second extension slideway is removed.

10. The ingredient delivery system according to claim 7, wherein the ingredient delivery system further comprises:

a first display configured to display a correspondence relationship between foodstuff to be delivered in a current order and the first storage portion; and

a first output control switch configured to control whether to allow the first display to display information on a next order.

11. The ingredient delivery system according to claim 10, wherein the delivery unit further comprises:

a second display configured to display a type of the foodstuff to be delivered in the current order, a serial number of the first storage portion where the foodstuff to be delivered is located, a serial number of the second extension slideway and a location of the foodstuff to be delivered in the tray; and

a second output control switch configured to control whether to allow the second display to display the information on the next order.

12. The ingredient delivery system according to claim 11, wherein,

the second display highlights the following: a type of the foodstuff to be delivered in the current order outputted by the first storage portion of the delivery unit, a serial number of the foodstuff to be delivered on the second extension slideway and a

placement location of the foodstuff to be delivered in a tray.

13. The ingredient delivery system according to claim 11, wherein,
the second display further displays a serial number of a next first storage portion for outputting the foodstuff to be delivered in the current order.

14. The ingredient delivery system according to claim 1, wherein,
the delivery unit further comprises:
a reading device configured to read information on the foodstuff to be delivered;
and

first indicator lights disposed on the back of the frame, the number of the first indicator lights being identical to the number of the slideways, and locations of the first indicator lights corresponding to locations of the slideways,

and the controller is connected to the first indicator lights and is in communication with the reading device, and the controller controls a lighting mode of the first indicator lights according to the information on the foodstuff to be delivered read by the reading device.

15. The ingredient delivery system according to claim 1, wherein,
the first storage portion further comprises:
a second indicator light, when the controller determines that a shelf life of the foodstuff to be delivered has expired according to the information on the foodstuff to be delivered read by the reading device, the controller controls the second indicator light to light up; and/or

a third indicator light, when the reading device is unable to correctly read the information on the foodstuff to be delivered, the controller controls the third indicator light to light up; and/or

a fourth indicator light, when the controller determines that the information on the foodstuff to be delivered read by the reading device is unable to match information in a database, the controller controls the fourth indicator light to light up; and/or

a fifth indicator light, when a sensor provided in the slideway in the first storage portion fails or a time when the sensor is triggered exceeds a predetermined time, the controller controls the fifth indicator light to light up.

16. The ingredient delivery system according to claim 1, wherein,
the ingredient delivery system further comprises:

a foodstuff replenishment indicating device in communication with the controller,
a first display area of the foodstuff replenishment indicating device displaying a quantity of foodstuff to be delivered in each first storage portion that needs to be replenished, wherein a display mode of a sub-display area corresponding to the foodstuff to be delivered corresponds to the quantity of the foodstuff to be delivered that needs to be replenished.

17. A method for controlling an ingredient delivery system, wherein the ingredient delivery system comprises at least one delivery unit, characterized in that each delivery unit comprises:

a first storage portion configured to store foodstuff to be delivered,
the first storage portion comprising:

a frame having a front and a back that are disposed oppositely;

slideways arranged within the frame and extending between the front and back of the frame, the number of the slideways being at least two, a position of an end of each slideway at the back of the frame being higher than a position of an end of the slideway at the front of the frame, and the at least two slideways being distributed laterally and/or longitudinally within the frame;

a movable tray located at a front side of the frame and capable of moving at least in a longitudinal direction, a front end of the movable tray being inclined downwards;
and

a first stopper member located at a front end of each slideway and having a front side stopper and a rear side stopper, and in an extending direction of the slideway, the front side stopper being closer to the front of the frame than the rear side stopper, the front side stopper blocking a front side of the foodstuff to be delivered, and the rear side stopper blocking a front of another foodstuff to be delivered at a rear side of the foodstuff to be delivered,

and the control method comprises:

controlling a moving position of the movable tray; and

controlling a front side stopper of a first stopper member of a target slideway to be open in a case where the movable tray moves to a front side of the target slideway.