

SHELF ASSEMBLY AND CONTAINER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese application No. 201910502513.5 filed on June 11, 2019, entitled “Shelf Assembly and Container”, which is hereby incorporated by reference in its entirety.

FIELD OF TECHNOLOGY

[0002] The present application relates to the technical field of smart vending, in particular to a shelf assembly and a container.

BACKGROUND

[0003] An automatic vending container is a commercial transaction device capable of automatically selling corresponding goods without a salesperson. Due to its convenience in placement, absence of seller personnel during transactions, as well as no time and location restrictions, the automatic vending container is also known as a 24-hour mini-mart.

[0004] Currently, with regard to the commercially available gravity recognition vending containers with goods trays, sensors are mounted directly on the trays to recognize variations in gravity on the trays. Nevertheless, the recognition would be inaccurate when encountering subtle variations in gravity, which will lead to a large number of wrong customer orders and incorrect payments.

[0005] In addition, the disorderly placement of goods on trays is likely to cause the goods to tilt or lean on the box or other goods, resulting in inaccurate recognition of goods, which will also easily lead to wrong customer orders and incorrect payments.

SUMMARY

[0006] The present application is intended to solve at least one of the technical problems in the prior art or related art.

[0007] An objective of the present application is to provide a shelf assembly and a container so as to solve the problem of inaccurate recognition by automatic vending containers when encountering subtle variations in gravity, leading to wrong customer orders and incorrect payments.

[0008] In order to achieve the objective, the present application provides a shelf assembly, including:

[0009] a mount;

[0010] a gravity sensor having a fixed end fixed to the mount and a free end suspended in the air relative to the mount; and

[0011] a tray fixed to the free end.

[0012] In an embodiment, a first protrusion is provided on the mount, and the fixed end is fixed on the first protrusion.

[0013] In an embodiment, a groove is provided at an edge of the mount, the first protrusion is accommodated in the groove, and the gravity sensor is fixed in the groove.

[0014] In an embodiment, a limit mounting slot is provided on a side of the mount distal to the tray.

[0015] In an embodiment, the shelf assembly further includes a bearing plate provided with a second protrusion, the second protrusion being fixed to the free end, and the tray being fixed to the bearing plate.

[0016] In an embodiment, the number of the gravity sensors is two, the number of the bearing

plate is two, and the two gravity sensors and the two bearing plates are distributed on both sides of the mount in a center-symmetric manner.

[0017] In an embodiment, the tray includes a tray body and a partition plate, the partition plate is located on a side of the tray body distal to the mount, and the partition plate is movable and fixable along a width direction of the tray body.

[0018] In an embodiment, the tray further includes a pair of sliding rails extending along the width direction of the tray body, the sliding rails are fixed on the tray body, both ends of the partition plate are provided with sliders, and the sliders are slidable and fixable along the sliding rails.

[0019] In an embodiment, an anti-falling groove is provided on each sliding rail, and each slider includes a limit portion that enters an interior of the anti-falling groove from both ends of the sliding rail.

[0020] In an embodiment, both sides of the tray body along the width direction are provided with flangings, and the flangings block ends of the sliding rail.

[0021] In order to achieve the objective, the present application further provides a container including a container body and support columns located in the container body, and the container further includes the shelf assembly mentioned above, the shelf assembly being mounted on the support columns.

[0022] In an embodiment, the container further includes:

[0023] a camera component, mounted on a side of the mount distal to the tray, and configured to acquire image information of an interior of the container body;

[0024] a processor, configured to receive gravity data measured by the gravity sensor and the image information; and

[0025] a display module, connected to the processor, and configured to display a pick-up or replenishment status based on the image information and the gravity data.

[0026] In an embodiment, the container further includes:

[0027] a fan disposed on a top of an inner cavity of the container body; and

[0028] vent holes, provided on both the tray and the mount.

[0029] The technical solutions of the present application have the following beneficial effects:

in the shelf assembly of the present application, the fixed end of the gravity sensor is fixed with the mount, and the free end bears the weight of the tray, thus the leverage principle is utilized to greatly improve the recognition accuracy of microgravity variations. The weight of the whole tray act on the free end. When goods are placed on the tray, the free end is pushed downwards to a deformed status such that the gravity sensor may recognize that how much weight of the goods have been placed according to the deformation; when the goods are removed from the tray, the deformation caused by the placed goods will recover, and the gravity sensor may recognize that how much weight of the goods have been removed according to the rebounded deformation. A container equipped with the shelf assembly may greatly reduce the possibility of wrong customer order and avoid incorrect payment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] In order to more clearly illustrate technical solutions in the embodiments of the present application or the prior art, the drawings needed in the descriptions of the embodiments or the prior art will be briefly introduced below. The drawings in the following descriptions only show some embodiments of the present application, and other drawings can be obtained according to the drawings by those skilled in the art without any creative work.

[0031] FIG. 1 is a schematic side view of a shelf assembly according to an embodiment of the

present application;

[0032] FIG. 2 is a schematic isometric view of a shelf assembly from a perspective according to an embodiment of the present application;

[0033] FIG. 3 is a schematic isometric view of a shelf assembly from another perspective according to an embodiment of the present application;

[0034] FIG. 4 is a schematic isometric view of a mount from a perspective according to an embodiment of the present application;

[0035] FIG. 5 is a schematic isometric view of a mount from another perspective according to an embodiment of the present application;

[0036] FIG. 6 is a schematic front view of a bearing plate according to an embodiment of the present application;

[0037] FIG. 7 is a schematic top view of a bearing plate according to an embodiment of the present application;

[0038] FIG. 8 is a schematic side view of a bearing plate according to an embodiment of the present application;

[0039] FIG. 9 is a schematic isometric view of a tray according to an embodiment of the present application;

[0040] FIG. 10 is a schematic top view of a tray according to an embodiment of the present application;

[0041] FIG. 11 is a schematic side view of a tray according to an embodiment of the present application;

[0042] FIG. 12 is a partial enlarged schematic diagram of a part “T” in FIG. 11;

[0043] FIG. 13 is a schematic side view of a sliding rail according to an embodiment of the

present application;

[0044] FIG. 14 is a schematic isometric view of a slider according to an embodiment of the present application;

[0045] FIG. 15 is a schematic side view of a slider according to an embodiment of the present application;

[0046] FIG. 16 is a schematic top view of a slider according to an embodiment of the present application;

[0047] FIG. 17 is a schematic isometric view of a partition plate according to an embodiment of the present application;

[0048] FIG. 18 is a schematic isometric view of a tray body from a perspective according to an embodiment of the present application;

[0049] FIG. 19 is a schematic isometric view of a tray body from another perspective according to an embodiment of the present application;

[0050] FIG. 20 is a schematic isometric view of a gravity sensor according to an embodiment of the present application;

[0051] FIG. 21 is a perspective structural diagram of a container according to an embodiment of the present application;

[0052] FIG. 22 is a schematic isometric view of a container according to an embodiment of the present application;

[0053] FIG. 23 is a schematic diagram showing installation of a camera component according to an embodiment of the present application;

[0054] FIG. 24 is a schematic structural diagram of a camera component according to an embodiment of the present application; and

[0055] FIG. 25 is a schematic structural diagram of a lighting component according to an embodiment of the present application.

[0056] Reference Numerals:

1 mount	2 tray
201 tray body	202 sliding rail
203 slider	204 hook
205 limit portion	206 partition plate
3 gravity sensor	4 bearing plate
5 limit mounting slot	6 first protrusion
7 groove	8 second protrusion
9 through hole	10 mounting hole
11 flanging	12 positioning column
13 vent hole	14 processor
15 display module	16 camera component
17 lighting component	18 fan
19 support column	

DETAILED DESCRIPTION

[0057] Specific implementations of the present application will be described in further detail below in conjunction with accompanying drawings and embodiments. The following embodiments are used to illustrate the present application, but are not intended to limit the scope of the present application.

[0058] With respect to the description of the present application, it should be noted that the orientation or positional relationship indicated by the terms such as “center”, “longitudinal”,

“lateral”, “upper”, “lower”, “front”, “back”, “left”, “right”, “vertical”, “horizontal”, “top”, “bottom”, “inner” and “outer” is based on the orientation or positional relationship shown in the drawings, the purpose of which is only to facilitate describing the embodiments of present application and simplify the description, rather than to indicate or imply that the device or element referred to must have a specific orientation, be constructed and operated in a specific orientation, and therefore cannot be construed as a limitation of the present application. In addition, the terms “first”, “second”, “third” and the like are for descriptive purpose only, and cannot be understood as indicating or implying the relative importance.

[0059] With respect to the description of the present application, it should be noted that, unless otherwise clearly specified or defined, the terms “connect with” and “connect to” should be understood in a broad sense, for instance, it can be a fixed connection or a detachable connection, or an integral connection; it can be mechanically connected, or electrically connected; it can be directly connected or indirectly connected through an intermediary. For those of ordinary skill in the art, the specific meaning of the above terms in the present application can be understood according to the specific situations.

[0060] As shown in FIGS. 1 to 3, a shelf assembly according to an embodiment includes a mount 1, a gravity sensor 3 and a tray 2; the gravity sensor 3 includes a fixed end fixed to the mount 1 and a free end suspended in the air relative to the mount 1; the tray 2 is fixed on the free end.

[0061] In the shelf assembly, the fixed end of the gravity sensor 3 is fixed to the mount 1, and the free end bears the weight of the tray 2, thus the leverage principle is utilized to greatly improve the recognition accuracy of microgravity variations. The weight of the whole tray 2 acts on the free end. When goods are placed on the tray 2, the free end is pushed downwards to a

deformed status such that the gravity sensor 3 may recognize the weight of the goods according to the deformation; when goods are removed from the tray 2, the deformation caused by the placed goods will recover, and the gravity sensor 3 may recognize the weight of the removed goods according to the rebounded deformation. A container equipped with the shelf assembly may greatly reduce the possibility of wrong customer order and avoid incorrect payment.

[0062] As shown in FIG. 4, a first protrusion 6 is provided on the mount 1, and the fixed end is fixed on the first protrusion 6. By providing the first protrusion 6, it is guaranteed that the free end of the gravity sensor 3 is suspended in the air, thereby ensuring that the gravity sensor 3 is fixed on the mount 1 in a suspended status at an end.

[0063] In FIG. 4, the first protrusion 6 is cube-shaped. In this case, the first protrusion 6 and the gravity sensor 3 are in surface contact, thereby ensuring the structural strength of the first protrusion 6 and the gravity sensor 3. However, the structure of the first protrusion 6 is not limited by the drawings, and the first protrusion 6 may also adopt other structural forms.

[0064] In addition, in order to ensure that the free end of the gravity sensor 3 is suspended relative to the mount 1, a protrusion may also be provided at the fixed end of the gravity sensor 3 or a notch may be provided at a corresponding position on the mount 1.

[0065] In an embodiment, a groove 7 is provided at an edge of the mount 1, the first protrusion 6 is accommodated in the groove 7, and the gravity sensor 3 is fixed in the groove 7. By providing the groove 7, the positions of the first protrusion 6 and the gravity sensor 3 can be defined, and thus the mounting reliability of the gravity sensor 3 may be ensured. Moreover, due to the provision of the groove 7, not only the first protrusion 6 may be completely hidden in the groove 7, but also at least part of the gravity sensor 3 may be hidden in the groove 7, so as to ensure the aesthetics of the shelf assembly.

[0066] In FIG. 4, the grooves 7 are distributed along the edge of the mount 1, and when there are a plurality of gravity sensors 3, the plurality of gravity sensors 3 are disposed along the edge of the groove 7. In addition, two first protrusions 6 are respectively disposed at the lower left and upper right of the mount 1, and the two gravity sensors 3 can be fixed by the first protrusions 6 at the lower left and upper right, respectively.

[0067] As shown in FIG. 5, a limit mounting slot 5 is provided on a side of the mount 1 distal to the tray 2. The limit mounting slot 5 may facilitate the subsequent fixation of the mount 1 and even the shelf assembly to the support column 19. The number of the limit mounting slot 5 is four, and the four limit mounting slots 5 are distributed at the four corner positions of the rectangular mount 1. However, the structure of the mount 1 is not limited by FIG. 5, and the number of the limit mounting slots 5 is not limited by the embodiment.

[0068] In an embodiment, as shown in FIG. 1, the shelf assembly further includes a bearing plate 4 provided thereon with a second protrusion 8 in conjunction with FIGS. 6 to 8. The second protrusion 8 of the bearing plate 4 is fixed to the free end, and the tray 2 is fixed to the bearing plate 4. By providing the bearing plate 4, the gravity of the tray 2 may be transferred to the bearing plate 4, and then transferred to the gravity sensor 3 through the bearing plate 4, thereby improving the sensitivity of the gravity sensor 3 to the variations of gravity on the tray 2.

[0069] In addition, as shown in FIG. 7, through holes 9 are provided at both ends of the second protrusion 8. The through holes 9 are provided to fit with the positioning columns 12 at the bottom of the tray 2, so that the tray 2 is fixed to the bearing plate 4 and gravity is transferred to the free end through the bearing plate 4.

[0070] An end of the bearing plate 4 is fixed to the free end by the second protrusion 8 while the other end is suspended in the air relative to the gravity sensor 3. Therefore, the lever principle

is utilized to enable the bearing plate 4 to transfer the gravity variations on the tray 2 to the gravity sensor 3.

[0071] According to an embodiment, in addition to the bearing plate 4, the gravity sensor 3 and the mount 1 are also provided with through holes 9 at the corresponding positions, through which the bearing plate 4 and the gravity sensor 3, as well as the gravity sensor 3 and the mount 1, may be connected to each other by means of fasteners. Alternatively, the through holes 9 may be replaced with blind holes or other forms of holes, as long as the connection requirements between the components can be met.

[0072] According to an embodiment, the bearing plate 4 is elongated and extends along the length of the groove 7 in FIG. 4. By this kind of bearing plate 4, the gravity variations on the entire tray 2 may be converted into gravity variations on the bearing plate 4, and finally into gravity variations at the free end.

[0073] According to an embodiment, the number of the gravity sensors 3 is two, the number of the bearing plates 4 is two, and the two gravity sensors 3 are distributed on both sides of the mount 1 in a center-symmetric manner and the two bearing plates 4 are distributed on both sides of the mount 1 in a center-symmetric manner. In the case that the mount 1 has the structure in FIG. 4, namely rectangular frame-shaped grooves 7 are formed on the mount 1, two gravity sensors 3 are respectively distributed on the grooves 7 on the left and right. The gravity sensor 3 on the left has a fixed end at the bottom and a free end at the top, while the gravity sensor 3 on the right has a fixed end at the top and a free end at the bottom. A bearing plate 4 is mounted on each of the two gravity sensors 3 respectively, and is mounted on the free end of the gravity sensor 3 along the extending direction of the length of the groove 7. In this case, the gravity variations on the entire tray 2 may be transferred to the gravity sensors 3 through the bearing

plate 4, and the bearing plate 4 and gravity sensors 3 on both sides may help to ensure the reliability of carrying the tray 2 and the goods on the tray 2.

[0074] As shown in FIGS. 9 to 12, the tray 2 includes a tray body 201 and a partition plate 206, the partition plate 206 is located on a side of the tray body 201 distal to the mount 1, and the partition plate 206 is movable and fixable along a width direction of the tray body 201. The width direction of the tray body 201 is the lateral direction in FIGS. 9 and 10.

[0075] By disposing the partition plate 206, the storage space above the tray 2 may be flexibly divided to avoid disorderly placement of goods, as well as the situation that goods are inclined or leaning on the box or other goods, so as to ensure the accuracy of goods recognition during the pick-and-place process, and reduce the occurrence of wrong customer order payments. As an illustration, when larger-sized cans need to be placed, the partition plate 206 may be moved to make the current column of goods storage space larger in size, so as to meet the storage requirements for the cans. When smaller-sized bottles of mineral water need to be placed, the partition plate 206 may be moved to make the current column of goods storage space smaller in size.

[0076] According to an embodiment, as shown in FIG. 13, the tray 2 includes a pair of sliding rails 202 extending along the width direction of the tray body 201. Both ends of the partition plate 206 are provided with sliders 203, and the sliders 203 are slidable and fixable along the sliding rails 202. The structure of the slider 203 is shown in FIGS. 14 to 16. Through the cooperation of the sliders 203 and the sliding rails 202, the partition plate 206 is movable or fixed along the width direction of the tray 2. The cooperation between the sliding rails 202 and the sliders 203 is shown in FIG. 12. Certainly, in addition to the form of cooperation between the sliding rails 202 and the sliders 203, the tray 2 and the partition plate 206 may also be movably

matched by means of a ball screw pair, a chain sprocket, and other methods disclosed in the prior art.

[0077] In FIG. 13, an anti-falling groove is formed on the sliding rail 202, and the slider 203 includes a limit portion 205 that enters an interior of the anti-falling groove from both ends of the sliding rail 202. By providing the anti-falling sliding groove, the slider 203 may be prevented from falling from the sliding rail 202. The anti-falling groove may have T-shaped, L-shaped or U-shaped cross sections, such that the limit portion 205 with the corresponding structure may move along the anti-falling groove after entering therein through both ends of the sliding rail 202. As an illustration, when the anti-falling groove has a T-shaped cross section, the corresponding limit portion 205 of the slider 203 may be a bolt head of a T-shaped bolt.

[0078] As shown in FIG. 16, the slider 203 includes a hook 204. In addition, mounting holes 10 are formed at both ends of the partition plate 206, as illustrated in FIG. 17. In such a way, the hook 204 of the slider 203 may be clamped at the mounting hole 10 of the partition plate 206 to detachably connect the slider 203 and the partition plate 206. It should be noted that when the partition plate 206 and the slider 203 are connected by means of the structure shown in the figures, the partition plate 206 may be effortlessly disassembled for cleaning at any time. The slider 203 and the partition plate 206 may also be connected by welding, bonding, threading, or other specific connection forms not yet limited.

[0079] As shown in FIGS. 18 and 19, both ends of the tray body 201 along the width direction thereof are provided with flangings 11, namely flangings 11 are provided on left and right ends of the tray body 201. After the sliding rails 202 are mounted, the flangings 11 block the ends of the sliding rails 202, and after the partition plate 206 is mounted on the sliding rails 202 through the sliders 203, the flangings 11 may prevent the partition plate 206 from falling off relative to

the tray body 201.

[0080] According to an embodiment, the structure of the gravity sensor 3 are as shown in FIG. 20. The left free end on the left of the gravity sensor 3 is provided with a through hole 9 used to connect with the bearing plate 4, the fixed end on the right of the gravity sensor 3 is provided with a through hole 9 used to connect with the mount 1, and a lightening hole is provided between the free end and the fixed end. However, FIG. 20 cannot be considered as a limitation of the structure of the gravity sensor 3 of the present application.

[0081] According to an embodiment, a container is provided, including a container body and support columns 19 located in the container body, further including the above-mentioned shelf assembly, the shelf assembly being mounted on the support columns 19, as shown in FIGS. 21 and 22. The container has a reasonable structure and reliable assembly.

[0082] As shown in FIG. 21, the support column 19 is provided with mounting holes distributed along a length direction thereof. The mounting holes are matched with fasteners, which may be fixed into the mounting holes. The limit mounting slots 5 of the mount 1 match with the fasteners to achieve the matching between the shelf assembly and the support column 19. The position of the shelf assembly may be adjusted by adjusting the position of the fasteners on the support column 19.

[0083] According to an embodiment, the container further includes a camera component 16, a processor 14 and a display module 15. The camera component 16 is mounted on a side of the mount 1 distal to the tray 2, and configured to acquire image information of an interior of the container body, as shown in FIG. 23. Specifically, the mounting holes 10 for the camera component 16 may be provided on the mount 1, and the structure of the camera component 16 is as illustrated in FIG. 24. For monitoring the image information of the goods on the tray 2 of the

uppermost layer, the camera component 16 needs to be mounted on the top of the container body. The processor 14 is configured to receive gravity data measured by the gravity sensor 3 and the image information, as well as process the acquired data to determine which goods are currently being picked or placed and their quantities. The display module 15 is connected to the processor 14, and is configured to display a pick-up or replenishment status based on the image information and the gravity data. For this container, all the information about gravity variations on the tray 2 in the shelf assembly will be effectively received and passed to the processor 14 for processing, which greatly improves the accuracy of goods recognition. In addition, customer order information may be displayed in real time on this container, which greatly improves customer experience and shopping comfort.

[0084] Certainly, in order to accurately recognize the picked or placed goods, the camera component 16 may also be replaced with a RFID identifier, or both the camera component 16 and the RFID identifier are disposed.

[0085] According to an embodiment, as shown in FIG. 21, the container further includes a fan 18. The fan 18 is disposed on a top of an inner cavity of the container body, and both the tray 2 and the mount 1 are provided with vent holes 13. By providing the fan 18 and the vent holes 13, it is guaranteed that the airflow circulates inside the container body, thereby ensuring a favorable storage environment of the goods. The structure of the vent hole 13 may be as shown in FIGS. 3, 4, 5, 10, 18, 19, and 23.

[0086] As shown in FIG. 25, the container further includes a lighting component 17 located above each shelf assembly, so as to ensure that the goods above each shelf assembly are clearly visible for the camera component 16 to capture sharper images inside the container body.

[0087] The above-mentioned processor 14 may be a terminal service module, the display

module 15 may be a liquid crystal display, the camera component 16 may be a camera, and the lighting component 17 may be an LED lamp.

[0088] The embodiments above are only used to describe the present application, and are not limited thereto. Although the present application is described in detail with reference to the embodiments, it should be understood by those of ordinary skill in the art that various combinations, modifications or equivalent substitutions of the technical solutions of the present application do not depart from the scope of the technical solutions of the present application, and thus should be covered by the scope of the claims of the present application.

Claims:

1. A shelf assembly, comprising:

a mount;

a gravity sensor including a fixed end fixed to the mount and a free end suspended in the air relative to the mount; and

a tray fixed to the free end.
2. The shelf assembly of claim 1, wherein a first protrusion is provided on the mount, and the fixed end is fixed on the first protrusion.
3. The shelf assembly of claim 2, wherein a groove is provided at an edge of the mount, the first protrusion is accommodated in the groove, and the gravity sensor is fixed in the groove.
4. The shelf assembly of claim 1, wherein a limit mounting slot is provided on a side of the mount distal to the tray.
5. The shelf assembly of any one of claims 1 to 4, further comprising a bearing plate provided with a second protrusion, the second protrusion being fixed to the free end, and the tray being fixed to the bearing plate.
6. The shelf assembly of claim 5, wherein the number of the gravity sensor is two, the number of the bearing plate is two, and the two gravity sensors are distributed on both sides of the mount in a center-symmetric manner and the two bearing plates are distributed on both sides of the mount in a center-symmetric manner.
7. The shelf assembly of any one of claims 1 to 4, wherein the tray comprises a tray body and a partition plate, the partition plate is located on a side of the tray body distal to the mount, and the partition plate is movable and fixable along a width direction of the tray body.
8. The shelf assembly of claim 7, wherein the tray further comprises a pair of sliding rails

extending along the width direction of the tray body, the sliding rails are fixed on the tray body, both ends of the partition plate are provided with sliders, and the sliders are slidable and fixable along the sliding rails.

9. The shelf assembly of claim 8, wherein an anti-falling groove is provided on each sliding rail, and each slider comprises a limit portion that enters an interior of the anti-falling groove from both ends of the sliding rail.

10. The shelf assembly of claim 9, wherein both sides of the tray body along the width direction are provided with flangings, and the flangings block ends of the sliding rail.

11. A container, comprising a container body and support columns located in the container body, wherein the container further comprises the shelf assembly of any one of claims 1 to 10, the shelf assembly being mounted on the support columns.

12. The container of claim 11, further comprising:

a camera component, mounted on a side of the mount distal to the tray, and configured to acquire image information of an interior of the container body;

a processor, configured to receive gravity data measured by the gravity sensor and the image information; and

a display module, connected to the processor, and configured to display a pick-up or replenishment status based on the image information and the gravity data.

13. The container of claim 11, further comprising:

a fan disposed on a top of an inner cavity of the container body; and

vent holes, provided on both the tray and the mount.