

BOX LUNCH VENDING MACHINE AND WORKING METHOD THEREOF

TECHNICAL FIELD

[0001] The present application relates to the field of vending machines, in particular to a box lunch vending machine and the working method thereof.

BACKGROUND

[0002] A box lunch vending machine generally includes a shelf for storing box lunch, wherein the shelf has a multi-layer structure and each layer is provided with a plurality of storage spaces. In the prior art, in order to conveniently take out the box lunch, a lifting platform is arranged in the box lunch vending machine, and the lifting platform can be operated to the designated lunch box placement block to take out the box lunch. However, this type of lifting platform has a large movement stroke and low efficiency when taking out the box lunch, and cannot meet the needs for many people's dining.

SUMMARY

[0003] Based on the above, it is necessary to provide a box lunch vending machine to solve the problem of low efficiency in taking out box lunch.

[0004] A box lunch vending machine, comprises:

[0005] a box body, wherein the box body comprises a plurality of exits;

[0006] a storage shelf arranged in the box body, wherein the storage shelf comprises a multi-layer supporting mechanism which is configured to place a box lunch;

[0007] a plurality of liquid-conducting grooves arranged in the box body and corresponding to the supporting mechanism one-to-one, wherein the liquid-conducting grooves each contains heat-conducting medium for heating the box lunch;

[0008] a lifting device configured to drive the storage shelf to rise and fall; when

the lifting device drives the storage shelf to lift down to the first position, each of the supporting mechanisms enters the corresponding liquid-conducting groove; when the lifting device drives the storage shelf lift up to the second position, each of the supporting mechanisms leaves the liquid-conducting grooves and is located at the same height as the corresponding exit.

[0009] The above box lunch vending machine comprises the supporting mechanism and the liquid-conducting groove arranged in one-to-one correspondence, driven by the lifting device, the storage shelf allows the box lunch placed on the supporting mechanism to be immersed into the heat-conducting medium of the liquid-conducting groove, so that the heat-conducting medium heats the box lunch. At the same time, the lifting device can drive the whole storage shelf to move in such a way that the box lunch stored in the multi-layer supporting mechanism on the storage shelf moves to the corresponding exit for centralized pick-and-place, effectively improving the pick-and-place efficiency of the box lunch and shortening the waiting time of users.

[0010] In one embodiment, the lifting device comprises the first fixing plate, a movable plate, the second fixing plate, a plurality of supporting poles, a screw rod and a driving assembly. The first fixing plate is disposed on the box body, the plurality of supporting poles are disposed on the first fixing plate, the movable plate is sleeved on the supporting pole, the second fixing plate is connected to one end of the supporting pole far from the first fixing plate. The screw rod is rotatably connected to the first fixing plate and the second fixing plate respectively, and is threadedly engaged with the movable plate. The driving assembly is configured to drive the screw rod to rotate so that the movable plate can rise and fall along the supporting pole. The movable plate is connected with a lifting rod, and the lifting rod is connected to the storage shelf.

[0011] In one embodiment, the lifting device further comprises a plurality of detecting components, wherein the detecting component comprises a sensor and a detecting strip. The detecting strip is disposed on the movable plate. The sensors are respectively disposed on the first fixing plate and the second fixing plate, and the

detecting strip can move with the movable plate and enter the detection area of the sensor.

[0012] In one embodiment, the sensor comprises oppositely disposed optical signal transmitter and an optical signal receiver. When the detection strip moves with the movable plate to the area between the optical signal transmitter and the optical signal receiver, the detecting strip can block the optical signal emitted by the optical signal transmitter.

[0013] In one embodiment, the first fixing plate and the box body are integrated.

[0014] In one embodiment, the lifting device further comprises a limiting block which is sleeved on the supporting pole and is connected to the first fixing plate, the second fixing plate or the movable plate for limiting the moving stroke of the movable plate.

[0015] In one embodiment, the driving assembly comprises the first gear, the second gear and a rotary motor, wherein the first gear and the second gear mesh with each other, the output of the rotary motor is connected to the first gear, and the second gear is coaxially disposed with the screw rod.

[0016] In one embodiment, the box lunch vending machine further comprises a liquid storage tank and a pump body, wherein the pump body is configured to inject the heat-conducting medium in the liquid storage tank into the liquid-conducting groove.

[0017] In one embodiment, the box lunch vending machine further comprises a rotating device, wherein the rotating device comprises a transmission component and a motor, wherein the motor can drive the storage shelf to rotate through the transmission component.

[0018] A working method of the box lunch vending machine comprises the following steps:

[0019] at the first preset time point, heat-conducting medium is injected into the liquid-conducting groove;

[0020] the lifting device drives the storage shelf down to the first position, so that the box lunch placed on the storage shelf is immersed into the heat-conducting

medium of the liquid-conducting groove;

[0021] at the second preset time point, the lifting device drives the storage shelf up to the second position, so that the plurality of supporting mechanisms of the storage shelf leave the liquid-conducting groove and each of the supporting mechanisms is at the same height as the corresponding exit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a schematic structural diagram of a box lunch vending machine according to one embodiment.

[0023] FIG. 2 is a schematic structural diagram of a storage shelf in the box lunch vending machine shown in FIG. 1.

[0024] FIG. 3 is a schematic structural diagram of a lifting device in the box lunch vending machine shown in FIG. 1.

[0025] FIG. 4 is a schematic structural diagram of a rotating device in the box lunch vending machine shown in FIG. 1.

DESCRIPTION OF THE EMBODIMENTS

[0026] To facilitate the understanding of the present application, a more comprehensive description of the present application will be given below with reference to the relevant drawings. Preferred embodiments of the present application are given in the drawings. However, the present application can be implemented in numerous different manners and is not limited to the embodiments described herein. Rather, the purpose of providing these embodiments is to make the disclosure more fully understood.

[0027] It should be noted that when an element is referred to be “fixed” to another element, it can be directly arranged on the other element or intervening elements may also be present. When an element is considered to be “connected” to another element, it can be directly connected to the other element or intervening elements may be present simultaneously. The terms such as “internal”, “external”, “left” and “right” etc., used herein are merely for the purpose of illustration, and are not meant

to be the only embodiment.

[0028] Referring to FIG. 1 and FIG. 2, a box lunch vending machine 100 comprises a box body 10, a storage shelf 20, a plurality of liquid-conducting grooves 30 and a lifting device 40. The box body 10 comprises a plurality of exits 11. The storage shelf 20 is arranged in the box body 10, and the storage shelf 20 comprises a multi-layer supporting mechanism 21 which is used to place a box lunch 200. A plurality of liquid-conducting grooves 30 are arranged in the box body 10. The liquid-conducting grooves 30 one-to-one correspond to the supporting mechanisms 21 and contain heat-conducting medium for heating the box lunch 200. The lifting device 40 is configured to drive the storage shelf 20 to rise and fall, when the lifting device 40 drives the storage shelf 20 down to the first position, each of the supporting mechanisms 21 enters the corresponding liquid-conducting grooves 30, and when the lifting device 40 drives the storage shelf 20 up to the second position, each of the supporting mechanisms 21 leaves the liquid-conducting grooves 30 and is located at the same height as the corresponding exit 11.

[0029] The box lunch vending machine 100 comprises the supporting mechanism 21 and the liquid-conducting groove 30 which are arranged in a one-to-one way. Driven by the lifting device 40, the storage shelf 20 allows the box lunch 200 placed on the supporting mechanism 21 to be immersed into the heat-conducting medium of the liquid-conducting groove 30, so that the heat-conducting medium heats the box lunch 200. At the same time, the lifting device 40 can drive the whole storage shelf 20 to move, so that the box lunch 200 stored in the multi-layer supporting mechanism 21 on the storage shelf 20 moves to the corresponding exit 11 for centralized pick-and-place, effectively improving the pick-and-place efficiency of the box lunch 200 and shortening the waiting time of users.

[0030] It should be noted that when the storage shelf 20 is in the first position, the box lunch 200 stored in the supporting mechanism 21 is immersed into the heat-conducting medium of the liquid-conducting groove 30, and the heat-conducting medium can transfer heat to the box lunch 200 and heat it. When the storage shelf 20 is in the second position, the height of each supporting mechanism

21 is the same as the corresponding exit 11, so that the box lunch 200 can be taken out from exit 11.

[0031] In some embodiments, the controller of the box lunch vending machine 100 heats the box lunch 200 at a preset time point. When heating the box lunch 200, firstly the heat-conducting medium is injected to the liquid-conducting groove 30, then the lifting device 40 drives the storage shelf 20 down to the right position, and the box lunch 200 is immersed into the heat-conducting medium. After a period of time, the box lunch 200 is heated up. The lifting device 40 drives the storage shelf 20 to rise. At the same time, the box lunch 200 placed on the supporting mechanism 21 is at the same height as the corresponding exit 11, so that the box lunch 200 placed on the supporting mechanism 21 is pushed out from the exit 11.

[0032] The box lunch vending machine 100 further comprises a liquid storage tank (not shown in the figure) and a pump body which is configured to inject the heat-conducting medium in the liquid storage tank into the liquid-conducting groove 30, wherein the liquid storage tank is disposed at the bottom of the box body 10. Each of the liquid-conducting grooves 30 is connected with a liquid inlet pipe and a liquid outlet pipe, the heat-conducting medium is lifted to a certain height by the pump body, and then the heat-conducting medium flows into each of the liquid-conducting grooves 30 by the liquid inlet pipe. The other end of the liquid outlet pipe is connected to the liquid storage tank. After the heating is completed, the heat-conducting medium flows into the liquid storage tank by the liquid outlet pipe, to achieve the recycling of the heat-conducting medium.

[0033] It should be noted that the liquid outlet pipe is equipped with a solenoid valve, which communicatively connects to the controller. After the box lunch 200 is heated for a certain period of time, the controller controls the solenoid valve to open and the heat-conducting medium flows into the liquid storage tank by the liquid outlet pipe.

[0034] Referring to FIG 3, the lifting device 40 comprises the first fixing plate 41, a movable plate 42, the second fixing plate 43, a plurality of supporting poles 44, a screw rod 45 and a driving assembly 46. The first fixing plate 41 is disposed on the

box body 10, the plurality of supporting poles 44 are disposed on the first fixing plate 41, the movable plate 42 is sleeved on the supporting pole 44, the second fixing plate 43 is connected to one end of the supporting pole 44 far from the first fixing plate 41. The screw rod 45 is rotatably connected to the first fixing plate 41 and the second fixing plate 43 respectively, and is threadedly engaged with the movable plate 42. The driving assembly 46 is configured to drive the screw rod 45 to rotate so that the movable plate 42 can rise and fall along the supporting pole 44. The movable plate 42 is connected with a lifting rod 47, and the lifting rod 47 is connected to the storage shelf 20.

[0035] Specifically, the driving assembly 46 drives the screw rod 45 to rotate. Since the screw rod 45 and the movable plate 42 are thread-fitted, the screw rod 45 can drive the movable plate 42 to rise and fall. The storage shelf 20 is connected to the movable plate 42 through the lifting rod 47. When the movable plate 42 rises or falls, the storage shelf 20 rises or falls accordingly. The supporting pole 44 is configured to fix the relative positions of the first fixing plate 41 and the second fixing plate 43, and to guide the movable plate 42. It should be understood that the number of the supporting poles 44 is four, and the four supporting poles 44 are symmetrically disposed on the first fixing plate 41 and the second fixing plate 43.

[0036] The driving assembly 46 comprises the first gear 461, the second gear 462 and a rotary motor 463. The first gear 461 and the second gear 462 mesh with each other. The output of the rotary motor 463 is connected to the first gear 461, and the second gear 462 is coaxially disposed with the screw rod 45. The rotary motor 463 is a reduction motor that can be decelerated when the movable plate 42 approaches the ascending or falling position, so as to prevent a sudden stop and a large vibration.

[0037] In one embodiment, the lifting device 40 further comprises a detecting a component 48, wherein the detecting component comprises a sensor 481 and a detecting strip 482. The detecting strip 482 is disposed on the movable plate 42. The detecting strip 482 can move with the movable plate 42 and enter the detection area of the sensor 481, so as to determine whether the movable plate 42 is in place. The first fixing plate 41 and the second fixing plate 43 are both equipped with the sensor

481. The sensor 481 is communicatively connected with the controller, when the sensor 481 detects an in-place signal of the rising or falling of the movable plate 42, the in-position signal is transmitted to the controller, then the controller sends the driving assembly 46 a stop signal, accordingly the moving state of the movable plate 42 can be monitored in real time and the movable plate 42 can be prevented from exceeding the maximum range of motion, which will result in collision between the storage shelf 20 and other parts in the box body 10.

[0038] The lifting device 40 further comprises a limiting block 49 which is sleeved on the supporting pole 44 and is connected to the first fixing plate 41, the second fixing plate 43 or the movable plate 42. When the movable plate 42 rises or falls, the limiting block 49 is clamped between the first fixing plate 41 and the movable plate 42 (or between the second fixing plate 43 and the movable plate 42), which can limit the movable plate 42 and prevent the movable plate 42 from exceeding the maximum lifting stroke when the detecting component 48 fails.

[0039] The sensor 481 comprises oppositely disposed optical signal transmitter and optical signal receiver. The detecting strip 482 can block the optical signal emitted by the optical signal transmitter. The area between the optical signal transmitter and the optical signal receiver is the detection area. When the detecting strip 482 enters the detection area, the optical signal emitted by the optical signal transmitter is blocked, and the optical receiver cannot receive the optical signal. At this time, the sensor 481 obtains the in-position signal of the movable plate 42.

[0040] It should be noted that the sensor 481 can also be a contact sensor or a potentiometer.

[0041] In one embodiment, the first fixing plate 41 and the box body 10 are integrated. In other words, the first fixing plate 41 is a part of the box body 10, so that one end of the supporting pole 44 can be directly disposed on the box body 10.

[0042] The whole box body 10 has a cuboid structure and is equipped with a box door. In the preparation stage, the box door is opened and the box lunch 200 is put into the supporting mechanism 21 on the storage shelf 20. It should be understood that a supporting frame is arranged in the box body 10 and the storage shelf 20 is

arranged on the supporting frame. The lifting device 40 is disposed at the top of the box body 10. Referring to FIG 2, there is a rotating shaft 22 arranged in the middle of the storage shelf 20, and the lifting rod 47 is fixedly connected with the rotating shaft 22.

[0043] Referring to FIG 4, the box lunch vending machine 100 further comprises a rotating device 50, wherein the rotating device 50 comprises a transmission component 51 and a motor 52. The motor 52 can drive the storage shelf 20 to rotate through the transmission component 51. In order to increase the capacity of the box lunch vending machine 100, each of the supporting mechanisms 21 comprises a plurality of storage bits 211 arranged circumferentially, and each box lunch 200 can be placed in a storage bit 211. The storage shelf 20 is driven to rotate by the rotating device 50, so that the storage bit 211 moves to the position opposite to the exit 11 to conveniently take out the box lunch 200 from the exit 11. In particular, the transmission component 51 may be a gear meshing structure or a belt transmission structure, and the motor 52 drives the lifting rod 47 to rotate through the transmission component 51.

[0044] Further, the transmission component 51 and the motor 52 are both arranged on the movable plate 42. There is an escape opening on the first fixing plate 41. The lifting rod 47 passes through the escape opening and is connected to the transmission component 51.

[0045] The working method of the box lunch vending machine 100 comprises the following steps:

[0046] S100: at the first preset time point, heat-conducting medium is injected into the liquid-conducting groove 30;

[0047] The first preset time point is a certain time point before the meal, for example, the first preset time point is set at 11:00. The heat-conducting medium may be hot water or other high specific heat liquid.

[0048] S200: the lifting device 40 drives the storage shelf 20 down to the first position, so that the box lunch 200 placed on the storage shelf 20 is immersed into the heat-conducting medium of the liquid-conducting groove 30.

[0049] S300: at the second preset time point, the lifting device 40 drives the storage shelf 20 up to the second position, so that several supporting mechanisms 21 of the storage shelf 20 leave the liquid-conducting groove 30, and each of the supporting mechanisms 21 is at the same height as the corresponding exit 11.

[0050] The second preset time point is the starting time point of the meal peak, for example, setting the second preset time point to 11:25, the controller sends an instruction to the driving component, then the driving component starts to work so that the storage shelf 20 leaves the liquid-conducting groove 30 and rises to the second position. Each of supporting mechanisms 21 of the storage shelf 20 reaches the corresponding height of the exit 11, so that box lunch 200 can be easily taken out from the exit 11.

[0051] It should be noted that when the box lunch vending machine 100 is in the initial state, there is no heat-conducting medium in the liquid-conducting groove 30. The refrigeration module of the box lunch vending machine 100 works to ensure that the box lunch 200 is kept at a low temperature to prevent food deterioration. Before the first preset time point, such as 10:30, the refrigeration module stops working, so that the box lunch 200 gradually returns to room temperature.

[0052] The technical features of the above-mentioned embodiments may be arbitrarily combined. For the sake of brevity, all possible combinations of the technical features in the above-mentioned embodiments are not described. However, as long as there is no contradiction in the combination of these technical features, it should be considered as the scope of the specification.

[0053] The above-mentioned embodiments merely illustrate several embodiments of the present application, which are described in more detail, but should not be construed as limiting the scope of the present application. It should be noted that for those skilled in the art, several modifications and improvements may be made without departing from the spirit and scope of the application. Therefore, the scope of the protection of the present application should be subject to the appended claims.

Claims

1. A box lunch vending machine comprising:

a box body comprising a plurality of exits;

a storage shelf arranged in the box body, wherein the storage shelf comprises a multi-layer supporting mechanism and each supporting mechanism comprises a plurality of storage units for placing box lunch;

a plurality of liquid-conducting grooves arranged in the box body, wherein the liquid-conducting groove one-to-one corresponds to the supporting mechanism and contains heat-conducting medium for heating the box lunch;

a lifting device, wherein the lifting device is configured to drive the storage shelf to rise and fall, when the lifting device drives the storage shelf down to the first position, each supporting mechanism enters the corresponding liquid-conducting groove; when the lifting device drives the storage shelf up to the second position, each supporting mechanisms leaves the liquid-conducting groove and is located at the same height as the corresponding exit.

2. The box lunch vending machine of claim 1, wherein the lifting device comprises a first fixing plate, a movable plate, a second fixing plate, a plurality of supporting poles, a screw rod and a driving assembly, the first fixing plate is disposed on the box body, the plurality of supporting poles are disposed on the first fixing plate, the movable plate is sleeved on the supporting pole, the second fixing plate is connected to one end of the supporting pole far from the first fixing plate, the screw rod is rotatably connected to the first fixing plate and the second fixing plate respectively and is threadedly engaged with the movable plate, the driving assembly is configured to drive the screw rod to rotate so that the movable plate can rise and fall along the supporting pole, the movable plate is connected with a lifting rod and the lifting rod is connected to the storage shelf.

3. The box lunch vending machine of claim 2, wherein the lifting device further

comprises a plurality of detecting components, each of the detecting components comprises a sensor and a detecting strip, the detecting strip is disposed on the movable plate, the sensor is respectively disposed on the first fixing plate and the second fixing plate, the detecting strip is capable of moving with the movable plate and enter the detection area of the sensor.

4. The box lunch vending machine of claim 3, wherein the sensor comprises oppositely disposed optical signal transmitter and optical signal receiver, when the detection strip moves with the movable plate to the area between the optical signal transmitter and the optical signal receiver, the detecting strip blocks the optical signal emitted by the optical signal transmitter.

5. The box lunch vending machine of claim 2, wherein the first fixing plate and the box body are integrated.

6. The box lunch vending machine of claim 2, wherein the lifting device further comprises a limiting block, the limiting block is sleeved on the supporting pole and is connected to the first fixing plate, the second fixing plate or the movable plate for limiting the moving stroke of the movable plate.

7. The box lunch vending machine of claim 2, wherein the driving assembly comprises a first gear, a second gear and a rotary motor, the first gear and the second gear mesh with each other, the output of the rotary motor is connected to the first gear, the second gear is coaxially disposed with the screw rod.

8. The box lunch vending machine of claim 1, wherein the box lunch vending machine further comprises a liquid storage tank and a pump body, the pump body is configured to inject the heat-conducting medium in the liquid storage tank into the liquid-conducting groove.

9. The box lunch vending machine of claim 1, wherein the box lunch vending machine further comprises a rotating device, the rotating device comprises a transmission component and a motor, the motor drives the storage shelf to rotate through the transmission component.

10. A working method of the box lunch vending machine of any one of claims 1 to 9, which comprises the following steps:

at a first preset time point, heat-conducting medium is injected into the liquid-conducting groove;

the lifting device drives the storage shelf down to a first position, so that the box lunch placed on the storage shelf is immersed into the heat-conducting medium of the liquid-conducting groove;

at a second preset time point, the lifting device drives the storage shelf up to a second position, so that the supporting mechanisms of the storage shelf leave the liquid-conducting groove and each of the supporting mechanisms is located at the same height as the corresponding exit.