

BEVERAGE BOTTLE SORTING DEVICE

TECHNICAL FIELD

[0001] The invention relates to the field of beverage bottle recycling equipment, in particular to a beverage bottle sorting device.

BACKGROUND

[0002] Sorting mechanisms are widely used in reverse vending machines to sort beverage bottles (cans, plastic bottles, glass bottles, etc.) that are conveyed from a recognition chamber, before guiding the beverage bottles into different recycling bins, so as to achieve material classification of the beverage bottles. Some of the commonly used sorting mechanisms on the market currently have complex structures and long service lives, but are relatively high in costs. Some of them have simple structures and relatively low costs, but are instable and short in service lives. Therefore, a beverage bottle sorting device is provided to solve the above problems.

SUMMARY

[0003] The objective of the invention is to overcome the shortcomings of the prior art and provide a beverage bottle sorting device.

[0004] The objective of the invention is achieved through the following technical solution:

[0005] A beverage bottle sorting device includes a mounting plate, a motor is mounted on the mounting plate, a driving shaft is mounted at a power output end of the motor, a guide plate is fixedly mounted on the driving shaft, a rotation angle control assembly is provided between the guide plate and the mounting plate, and the rotation angle of the driving shaft is controlled by the rotation angle control assembly to control the rotation angle of the guide plate, so as to sort a beverage bottle entering the guide plate to an adapted recycling bin.

[0006] Preferably, the rotation angle control assembly includes a first sensor, a second sensor, and a third sensor fixedly mounted on the top of the mounting plate, a sensing plate is provided below the mounting plate, and the sensing plate can rotate with the guide plate; and the first sensor, the second sensor, and the third sensor are located on a rotation path of the

sensing plate and spaced apart uniformly.

[0007] Preferably, a bracket is fixedly mounted below the mounting plate, and a damper is provided on a side of the bracket.

[0008] Preferably, a recognition chamber is provided at an infeed port of the guide plate, a bottle feeding port is provided at the infeed port of the recognition chamber, the recognition chamber includes a chamber body, a conveyor belt is provided on the bottom of the chamber body, a detection camera is provided on the top of the chamber body, and the beverage bottle conveyed on the conveyor belt is recognized and classified via the image captured by the detection camera.

[0009] Preferably, the first sensor, the second sensor, and the third sensor are proximity sensors.

[0010] Preferably, an access door plate is provided on the guide plate.

[0011] Preferably, a first recycling bin and a second recycling bin are provided on two sides of the guide plate respectively.

[0012] Preferably, a compactor is provided at a discharge port of the first recycling bin and/or the second recycling bin.

[0013] Preferably, the damper is made of rubber.

[0014] The invention has the following advantages:

[0015] 1. The motor drives movement in the guide plate that is connected to the driving shaft, so as to sort pre-recognized classes of beverage bottles of different materials into corresponding recycling bins. The rotation angle control assembly controls the rotation angles and positions of both the driving shaft and the guide plate to prevent sorting failure or erroneous sorting of beverage bottles due to excessive or insufficient rotation of the guide plate.

[0016] 2. The detection camera provided on the top of the chamber body recognizes the beverage bottles on the conveyor belt based on their materials, which facilitates the motor to drive the driving shaft and the guide plate to rotate, so as to achieve automatic recognition and classification.

[0017] 3. The access door plate provided on the guide plate can prevent some user's misconducts to improve the safety of operation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a schematic diagram of a sorting structure of the invention.

[0019] FIG. 2 is a schematic diagram of a side view structure of the invention.

[0020] FIG. 3 is a schematic diagram of an overall structure of the invention.

[0021] FIG. 4 is a schematic diagram of an interior of a recognition chamber of the invention.

[0022] In the figures, 1. Mounting plate; 2. Motor; 3. Rotation angle control assembly; 31. First sensor; 32. Second sensor; 33. Third sensor; 34. Sensing plate; 4. Guide plate; 5. Access door plate; 6. Driving shaft; 7. Bracket; 8. Damper; 9. Recognition chamber; 91. Chamber body; 92. Detection camera; 93. Conveyor belt; 10. Bottle feeding port; 11. Compactor.

10 DETAILED DESCRIPTION

[0023] In order to make the objectives, technical solutions, and advantages of the embodiments of the invention clearer, the following will clearly and completely describe the technical solutions in the embodiments of the invention in conjunction with the accompanying drawings therein. Obviously, the described embodiments are some of the embodiments of the invention, not all of them. Generally, the components of the embodiments of the invention described and illustrated in the accompanying drawings can be arranged and designed in various different configurations.

[0024] Therefore, the following detailed descriptions of the embodiments of the invention provided in the accompanying drawings are not intended to limit the scope of the invention, but only to represent selected embodiments of the invention. Based on the embodiments of the invention, all other embodiments obtained by those of ordinary skill in the art without any creative effort fall within the scope of protection of the invention.

[0025] As shown in the embodiments of FIGs. 1-4, a beverage bottle sorting device includes a mounting plate 1, a motor 2 is mounted on the mounting plate 1, a driving shaft 6 is mounted at a power output end of the motor 2, a guide plate 4 is fixedly mounted on the driving shaft 6, a rotation angle control assembly 3 is provided between the guide plate 4 and the mounting plate 1, and the rotation angle of the driving shaft 6 is controlled by the rotation angle control assembly 3 to control the rotation angle of the guide plate 4, so as to sort a beverage bottle entering the guide plate 4 to an adapted recycling bin.

[0026] With reference to FIG. 1, the motor 2 converts the power of horizontal rotation into the power of vertical rotation of the driving shaft 6, which can be achieved using a bevel

gear or other methods. Meanwhile, the motor 2 can be arranged vertically, that is, the driving shaft 6 is directly connected to the power output shaft of the motor 2, which does not require the bevel gear or other components and can be selectively implemented by those skilled in the art according to actual needs.

5 **[0027]** During use, the motor 2 starts to drive the driving shaft 6 to rotate, which then drives the guide plate 4 to rotate too, thereby classifying the beverage bottle transported to the guide plate 4 into the adapted recycling bin according to previously detected types to achieve sorting of beverage bottles. In the process of driving the guide plate 4 to rotate by the driving shaft 6, the rotation angles and positions of the driving shaft 6 and the guide plate 4 are
10 controlled by the rotation angle control assembly 3, to prevent the phenomenon that the classified beverage bottle cannot be sorted into the adapted recycling bin due to excessively large or small rotation.

[0028] With reference to FIG. 1, the rotation angle control assembly 3 includes a first sensor 31, a second sensor 32, and a third sensor 33 fixedly mounted on the top of the
15 mounting plate 1, a sensing plate 34 is provided below the mounting plate 1, and the sensing plate 34 can rotate with the guide plate 4; and the first sensor 31, the second sensor 32, and the third sensor 33 are located on a rotation path of the sensing plate 34 and spaced apart uniformly.

[0029] The rotation angle control assembly 3 may include a plurality of sensors,
20 which are selectively mounted according to the types of actually detected beverage bottles and the actual need. In this embodiment, three sensors are used.

[0030] The mounting plate 1 is sector-shaped. The first sensor 31, the second sensor 32, and the third sensor 33 are all mounted at an edge of the mounting plate 1. The sensing plate 34 is located on a connecting plate on the top of the guide plate 4. The three sensors are
25 located on the path of rotation of the sensing plate 34 together with the guide plate 4, so that the sensing plate 34 can be detected by the sensors, thereby detecting the rotation angles and distances of the sensing plate 34 and the guide plate 4.

[0031] A bracket 7 is fixedly mounted below the mounting plate 1, and a damper 8 is provided on a side of the bracket 7. The damper 8 is made of rubber, and the damper 8 may
30 alternatively be made of other materials that can absorb impact. The damper 8 buffers the

impact generated when the guide plate 4 rotates to prevent the guide plate from colliding with the bracket 7.

[0032] A recognition chamber 9 is provided at an infeed port of the guide plate 4, a bottle feeding port 10 is provided at the infeed port of the recognition chamber 9, the recognition chamber 9 includes a chamber body 91, a conveyor belt 93 is provided on the bottom of the chamber body 91, a detection camera 92 is provided on the top of the chamber body 91, and the beverage bottle conveyed on the conveyor belt 93 is recognized and classified via the image captured by the detection camera 92.

[0033] Electric, pneumatic, and hydraulic components such as the motor 2, the detection camera 92, and the conveyor belt 93 are all controlled by an adapted controller for coordinated work. A beverage bottle fed from the bottle feeding port 10 is thrown onto the conveyor belt 93, and the conveyor belt 93 conveys the beverage bottle thereon towards the guide plate 4. In the conveying process, the detection camera 92 recognizes whether the conveyed beverage bottle is metal or non-metal. In this embodiment, whether the beverage bottle is metal or plastic is recognized. When the metal or plastic beverage bottle is recognized, the controller controls the motor 2 to rotate clockwise or counterclockwise, thereby driving the guide plate 4 to guide and classify the pre-recognized beverage bottle into the appropriate recycling bin to achieve automatic recognition and sorting. Beverage bottles of other materials such as glass and paper can also be recognized only by adjusting the material types detected by the detection camera 92.

[0034] The first sensor 31, the second sensor 32, and the third sensor 33 are proximity sensors.

[0035] An access door plate 5 is provided on the guide plate 4. The access door plate 5 prevents some user's misconducts to improve the safety of operation.

[0036] A first recycling bin and a second recycling bin are provided on two sides of the guide plate 4 respectively. Beverage bottles of different materials are collected through the first recycling bin and the second recycling bin.

[0037] A plurality of recycling bins can be selectively configured according to the types of materials of beverage bottles to be sorted, and the positions of the recycling bins can also be adjusted according to actual needs. In this embodiment, two recycling bins are used to

recycle metal beverage bottles and plastic beverage bottles.

[0038] A compactor 11 is provided at a discharge port of the first recycling bin and/or the second recycling bin to crush and compact the beverage bottles of different materials. Some fragments may be produced in the crushing and compaction process, and the fragments
5 are blocked by the access door plate 5 from splashing out to harm workers.

[0039] A working process of the invention is as follows: It is assumed that the first recycling bin collects metal beverage bottles (specifically cans), the second recycling bin collects non-metal beverage bottles (specifically plastic beverage bottles), the sensor near the first recycling bin is the third sensor 33, and the sensor near the second recycling bin is the
10 first sensor 31. During use, a beverage bottle is fed from the bottle feeding port 10 and conveyed on the conveyor belt 93, and the detection camera 92 above recognizes whether the conveyed beverage bottle is plastic or metal. When the metal beverage bottle is recognized, the motor 2 is controlled to drive the driving shaft 6 and the guide plate 4 to rotate towards the first recycling bin, the sensing plate 34 rotates from the second sensor 32 (initial position)
15 to the third sensor 33, then the metal beverage bottle is guided into the first recycling bin, and after sorting, the motor 2 drives the driving shaft 6 and the guide plate 4 to return to the initial position, namely, the position of the second sensor 32. When a plastic beverage bottle is recognized, the motor 2 drives the driving shaft 6 and the guide plate 4 to rotate towards the second recycling bin, the sensing plate rotates from the second sensor 32 to the first sensor 31,
20 the plastic beverage bottle is guided into the second recycling bin, and after sorting, the components also return to the initial position, namely, the position of the second sensor 32.

[0040] Although the invention is described in detail with reference to the aforementioned embodiments, those skilled in the art can still modify the technical solutions described in the aforementioned embodiments, or make equivalent substitutions for some of
25 the technical features therein. Any modifications, equivalent substitutions, improvements, etc. made within the spirit and principles of the invention should be included in the scope of protection of the invention.

WHAT IS CLAIMED IS:

1. A beverage bottle sorting device, comprising a mounting plate (1), wherein a motor (2) is mounted on the mounting plate (1), a driving shaft (6) is mounted at a power output end of the motor (2), a guide plate (4) is fixedly mounted on the driving shaft (6), a rotation angle control assembly (3) is provided between the guide plate (4) and the mounting plate (1), and wherein through controlling the rotation angle of the driving shaft (6) by the rotation angle control assembly (3), the rotation angle of the guide plate (4) is controlled for sorting a beverage bottle entering the guide plate (4) to a corresponding recycling bin.

2. The beverage bottle sorting device according to claim 1, wherein the rotation angle control assembly (3) comprises a first sensor (31), a second sensor (32), and a third sensor (33) fixedly mounted on the top of the mounting plate (1), a sensing plate (34) is provided below the mounting plate (1), and the sensing plate (34) is arranged to rotate with the guide plate (4); and the first sensor (31), the second sensor (32), and the third sensor (33) are located on a rotation path of the sensing plate (34) and spaced apart uniformly.

3. The beverage bottle sorting device according to claim 1, wherein a bracket (7) is fixedly mounted below the mounting plate (1), and a damper (8) is provided on a side of the bracket (7).

4. The beverage bottle sorting device according to claim 1, wherein a recognition chamber (9) is provided at an infeed port of the guide plate (4), a bottle feeding port (10) is provided at the infeed port of the recognition chamber (9), the recognition chamber (9) comprises a chamber body (91), a conveyor belt (93) is provided on the bottom of the chamber body (91), a detection camera (92) is provided on the top of the chamber body (91) for recognizing and classifying a beverage bottle that is conveyed on the conveyor belt (93) .

5. The beverage bottle sorting device according to claim 2, wherein the first sensor (31), the second sensor (32), and the third sensor (33) are proximity sensors.

6. The beverage bottle sorting device according to claim 1, wherein an access door plate (5) is provided on the guide plate (4).

5 7. The beverage bottle sorting device according to claim 1, wherein a first recycling bin and a second recycling bin are provided on two sides of the guide plate (4) respectively.

8. The beverage bottle sorting device according to claim 7, wherein a compactor (11) is provided at a discharge port of the first recycling bin and/or the second recycling bin.

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9. The beverage bottle sorting device according to claim 3, wherein the damper (8) is made of rubber.