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Oh et al.(10) **Pub. No.: US 2012/0198790 A1**(43) **Pub. Date: Aug. 9, 2012**(54) **FOOD WASTE PACKAGING APPARATUS FOR
AN AUTOMATIC WASTE COLLECTION
SYSTEM**(76) Inventors: **Young-Khee Oh**, Anyang-si (KR);
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Il Lee**, Seoul (KR)(21) Appl. No.: **13/391,200**(22) PCT Filed: **Aug. 16, 2010**(86) PCT No.: **PCT/KR10/05382**§ 371 (c)(1),
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B65B 1/00 (2006.01)(52) **U.S. Cl.** **53/267**(57) **ABSTRACT**

The present invention relates to a food waste packaging apparatus for an automatic waste collection system, and more particularly, to a food waste packaging apparatus for an automatic waste collection system which automatically performs, when food waste is injected into a food waste inlet port, the processes of putting the food waste into a packaging bag, sealing the packaging bag, and discharging the packaging bag. The food waste packaging apparatus for an automatic waste collection system according to the present invention comprises:

a loading unit arranged below the food waste inlet port such that a plurality of packaging bags are laid in the horizontal direction and loaded into a layer on the loading unit; supply means for sucking the top packaging bag from among the packaging bags loaded on the loading unit, placing, by means of rotation, the sucked top packaging bag in the vertical direction below a hopper of the waste inlet port, and opening the upper portion of the packaging bag to ready the packaging bag for receiving food waste therein; sealing means arranged at the upper portion of the waiting packaging bag to heat seal the upper portion of the packaging bag when food waste is received in the packaging bag; and discharging means for supporting the bottom of the packaging bag and discharging, by means of rotation, the packaging bag to a storage chute arranged below the discharging means after the completion of the sealing of the packaging bag.

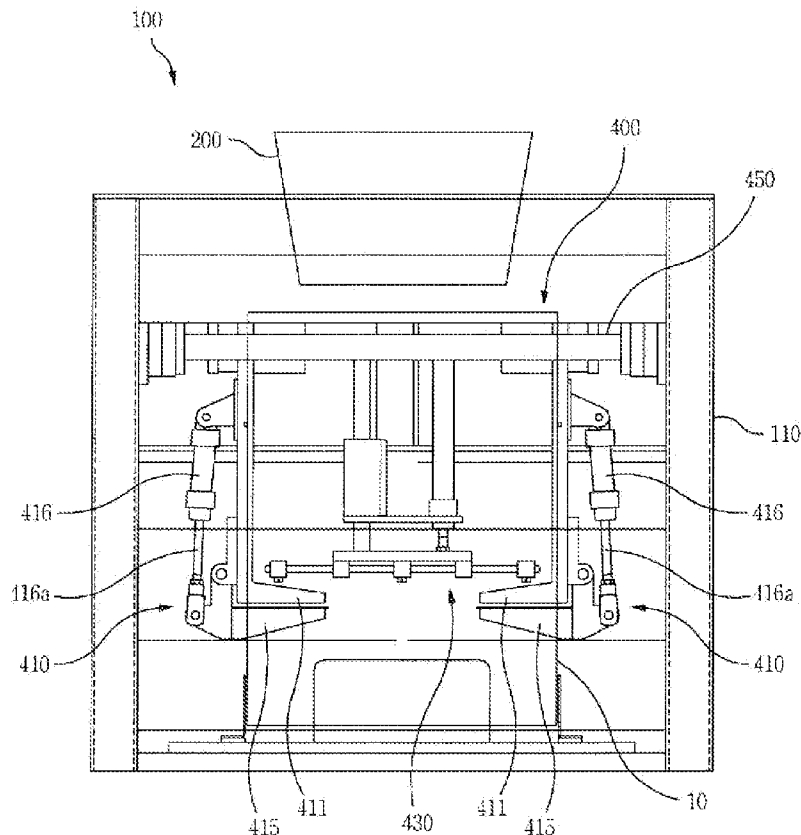


FIG. 1

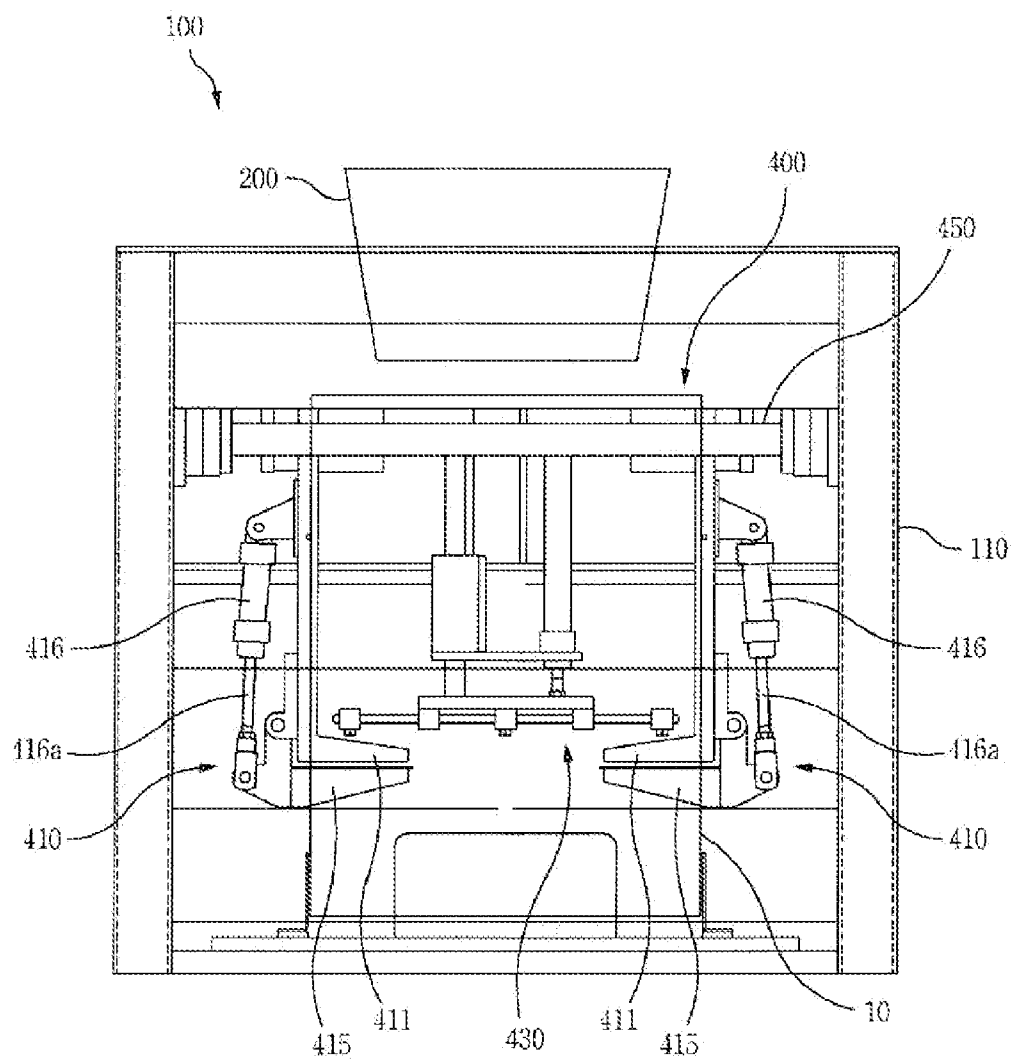


FIG. 2

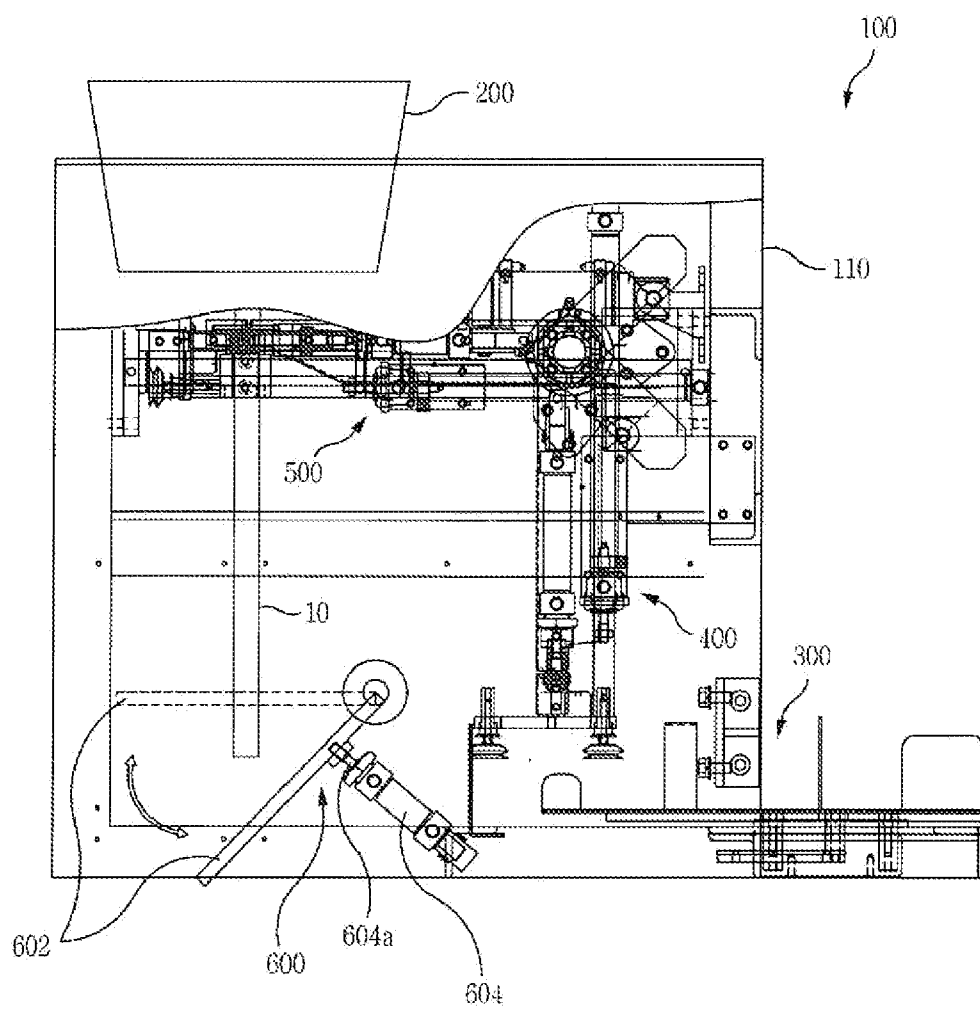


FIG. 3

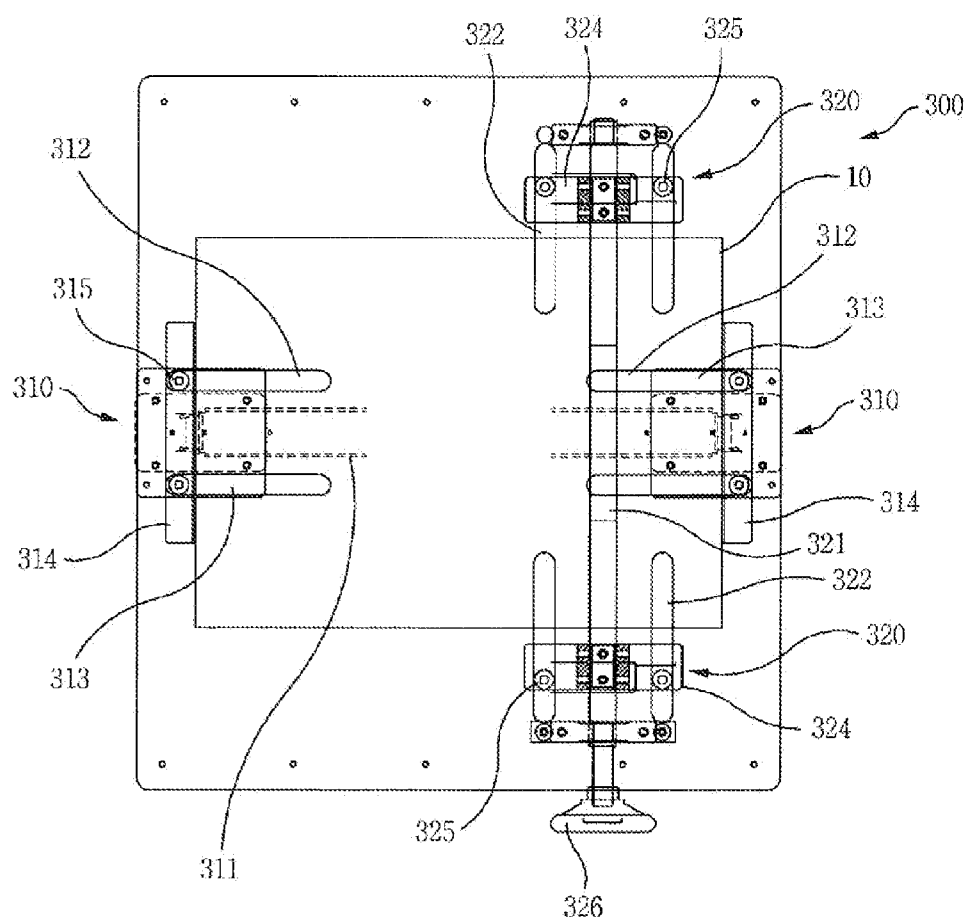


FIG. 4a

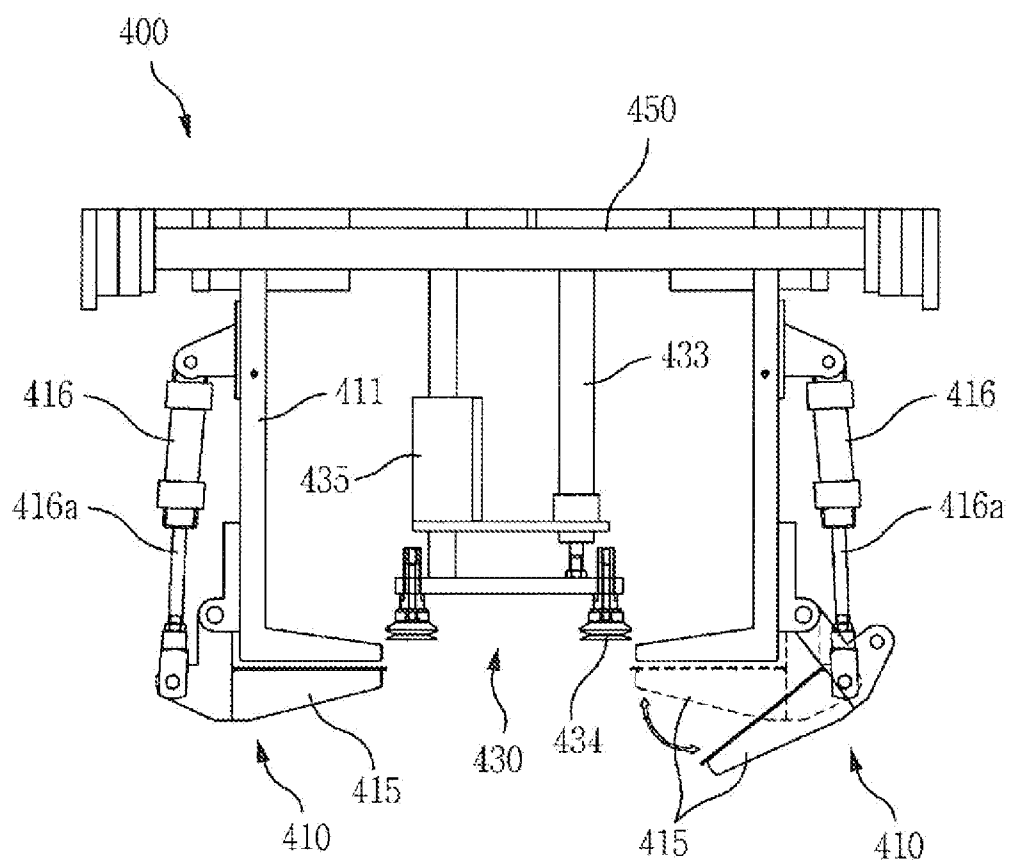


FIG. 4b

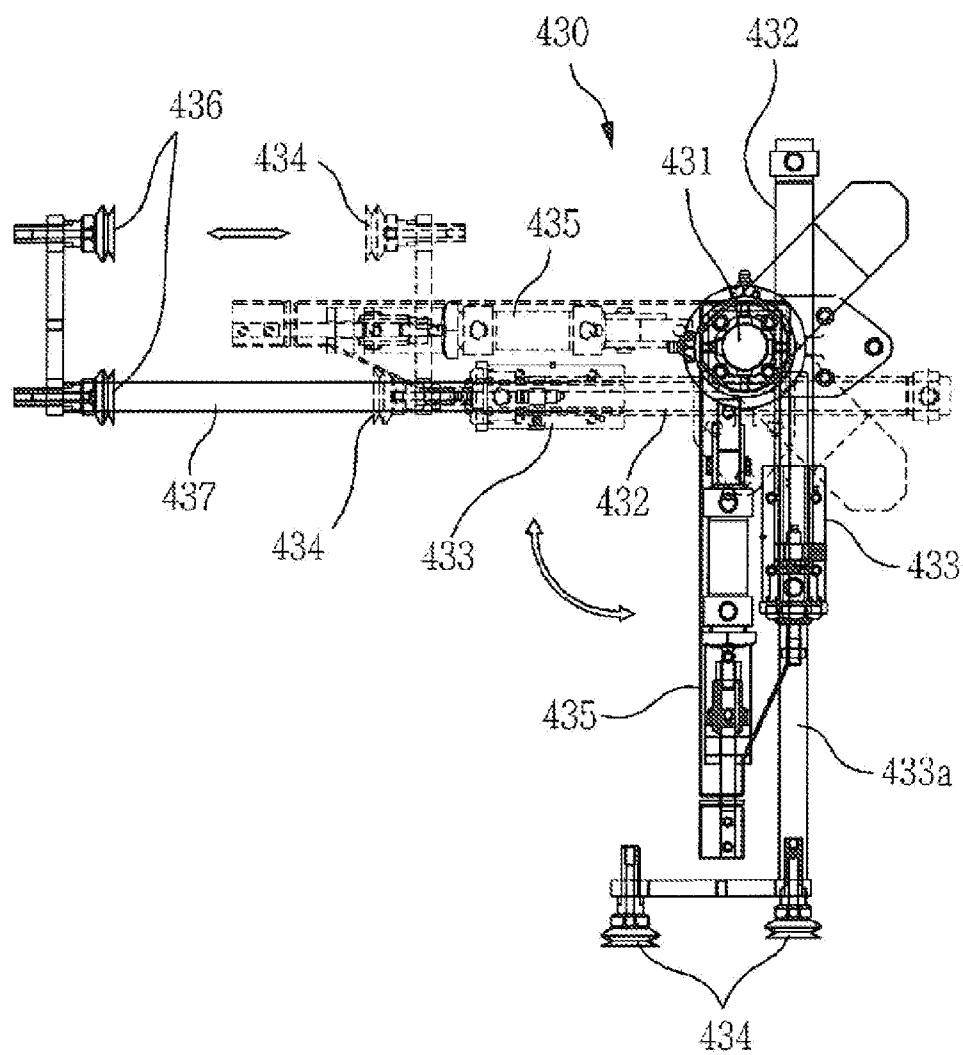
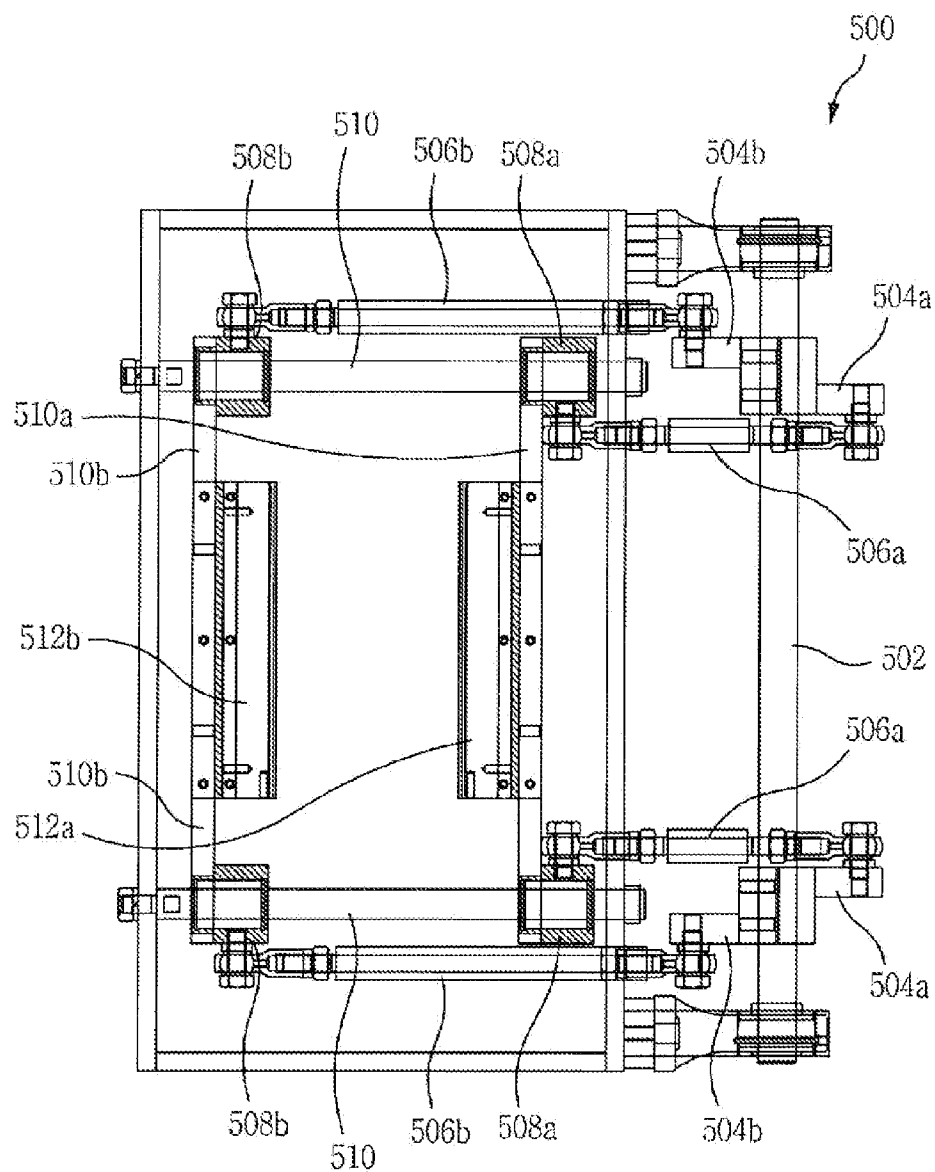


FIG. 5



FOOD WASTE PACKAGING APPARATUS FOR AN AUTOMATIC WASTE COLLECTION SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to a food waste packaging apparatus for an automatic waste collection system, and more particularly, to a food waste packaging apparatus for an automatic waste collection system, which automatically performs the processes of putting food waste into a packaging bag, sealing the packaging bag, and discharging the packaging bag when the food waste is injected into a food waste inlet port.

BACKGROUND ART

[0002] An automatic waste collection system is a facility to transport waste, which is sucked together with air by suction force of an air blower, to a waste collection site through transport pipeline. Differently from a collection method of collecting household or office wastes by manpower and vehicles, when wastes are injected into a waste inlet port of a waste bin installed indoors or outdoors, such an automatic waste collection system performs the processes of transporting the wastes to a central collection facility together with air flowing at high speed (ranging 70 km/h to 90 km/h) inside a transport pipeline by means of control of a central control system, directly injecting the wastes into an incineration plant according to kinds of the wastes or automatically loading on a container, and transporting to a waste disposal site.

[0003] Such an automatic waste collection system is expected to create a pleasant residential environment by solving problems of bad smells and sanitary matters, to solve pollution and safety matters of waste collection vehicles, to enhance city life through an eco-friendly image, to prevent unnecessary waste of resources and energies, to reduce operation and management costs of residents through the unmanned system, to make local governments financially healthy because manpower resources to collect wastes and vehicles to transport the wastes are unnecessary, and to provide sanitary effects by preventing damages by bad smells, leachat, animals due to accumulation of wastes a certain period of time.

[0004] Therefore, most of apartments, hospitals, large-scaled restaurants, high-rise buildings, airports, and others constructed recently are equipped with automatic waste collection systems.

[0005] Such an automatic waste collection system includes: a collection site for collecting and treating wastes; a plurality of waste bins installed at various places on the ground to allow persons to put wastes; and a transport pipeline buried underground to guide the wastes introduced through the plural waste bins to the collection site in a lump.

[0006] Each of the waste bins includes: a storage chute that is to temporarily store the wastes put into the waste bin and is communicatively connected to the transport pipeline arranged below the storage chute; and an inlet port that is mounted at the top of the waste bin and spaced apart from the storage chute at a predetermined interval.

[0007] The upper portion of the inlet port is exposed to the ground, and a main body of the inlet port is buried underground and communicatively connected to the storage chute buried under the main body of the inlet port at the predetermined interval from the main body.

[0008] In the meantime, the separate garbage collection legally obligated is an invaluable system to reduce the volume of waste, to effectively use resources by recycling waste resources, and to reduce environmental pollution.

[0009] Accordingly, the waste inlet port and the storage chute are separated to separately collect general wastes from food waste, but the transport pipeline for transporting the wastes by suction is just one.

[0010] So, food waste and general waste are transported together through the transport pipeline. Typically, food waste put in standard garbage bags is transported together with general waste, and because the waste in the transport pipeline is transported at high speed of about 25 m/s to 2 km~3 km, the standard garbage bags containing food waste (the standard garbage bags are not durable because they are made of biodegradable resin) may burst while flying at the high speed.

[0011] Particularly, in the case of a curved transport pipeline, the standard garbage bags containing food waste are bumped and burst at points where curvature is changed, and hence, the food waste is stained around the points and makes there mess, there is onerousness that persons have to put the food waste into the standard garbage bags and tie up and seal the upper portions of the bags so that the food waste does not leak out, and the food waste is stained on the hands during the above processes.

[0012] Transport pipelines are respectively buried underground to separately transport the food waste and general waste, but in this instance, there is a problem in that respectively burying the transport pipelines underground is costly.

DISCLOSURE

Technical Problem

[0013] Accordingly, the present invention has been made in an effort to solve the above-mentioned problems occurring in the prior arts, and it is an object of the present invention to provide a food waste packaging apparatus for an automatic waste collection system, which automatically carries out the processes of putting food waste into a packaging bag disposed inside an inlet port when the food waste is injected into the inlet port, sealing the packaging bag, and discharging the packaging bag to a storage chute located below the inlet port, thereby providing convenience and preventing the food waste from being stained on the hands because there is no need that someone directly puts food waste into the garbage bag and seal the upper portion of the bag not to leak, and preventing the packaging bag from bursting and the food waste from being stained on the inner wall of a transport pipeline while the packaging bag is moved through the transport pipeline because the food waste is moved in a state where it is put in the durable packaging bag. Technical Solution

[0014] To achieve the above objects, the present invention provides a food waste packaging apparatus for an automatic waste collection system including: a loading unit arranged below the waste inlet port in such a fashion that a plurality of packaging bags are laid in the horizontal direction and vertically loaded on the loading unit; supply means for sucking the top packaging bag out of the packaging bags loaded on the loading unit, placing the sucked top packaging bag below a hopper of the waste inlet port in the vertical direction by rotation, and opening the upper portion of the packaging bag to make the packaging bag ready to receive the food waste therein; sealing means arranged at the upper portion of the waiting packaging bag to seal the upper portion of the pack-

aging bag by heat when the food waste is received in the packaging bag; and discharging means for supporting the bottom of the packaging bag and discharging the packaging bag to a storage chute arranged below the discharging means by means of rotation after the completion of the sealing of the packaging bag.

Advantageous Effects

[0015] According to the present invention, the food waste packaging apparatus can provide convenience and prevent the food waste from being stained on the hands because there is no need that someone directly puts food waste into the garbage bag and seal the upper portion of the bag not to leak, and also prevent the packaging bag from bursting and the food waste from being stained on the inner wall of a transport pipeline while the packaging bag is moved through the transport pipeline because the food waste is moved in a state where it is put in the durable packaging bag.

DESCRIPTION OF DRAWINGS

[0016] FIG. 1 is a schematic front view of a structure of a food waste packaging apparatus according to the present invention.

[0017] FIG. 2 is a schematic side view of the structure of FIG. 1.

[0018] FIG. 3 is a plan view of a loading unit for packaging bags of FIG. 1.

[0019] FIGS. 4a and 4b are a front view and a side view of packaging bag supply means of FIGS. 1 and 2.

[0020] FIG. 5 is a plan view of sealing means of FIG. 2.

<Explanation of essential reference numerals in drawings>	
10: packaging bag	100: waste packaging apparatus
200: hopper	300: loading unit
400: supply means	500: sealing means
600: discharging means	

MODE FOR INVENTION

[0021] Reference will be now made in detail to a bicycle tire 1 of the present invention with reference to the attached drawings.

[0022] FIG. 1 is a schematic front view of a structure of a food waste packaging apparatus according to the present invention, and FIG. 2 is a schematic side view of the structure of FIG. 1. As shown in the drawings, the food waste packaging apparatus 100 includes a hopper 200, a loading unit 300, supply means 400, sealing means 500, and discharging means 600.

[0023] The hopper 200 for guiding a person to put food waste into an open packaging bag 10 is disposed at an upper portion of the front of an inlet port body 110.

[0024] The loading unit 300 for loading the packaging bags 10 is disposed below the rear of the inlet port body 110, and a plurality of packaging bags 10 are vertically loaded in a state where they are laid in the horizontal direction.

[0025] As shown in FIG. 3, the loading unit 300 includes height controlling means 310 and width controlling means 320 for controlling height and width of the loading unit 300 according to the standards of height and width of the packaging bags 10 (here, the height means a height in a state where

the packaging bags are upright, and the width means a width in a state where the packaging bags are flattened).

[0026] The height controlling means 310 are mounted oppositely against each other in the height direction of the packaging bags 10 (in drawings, in a lateral direction). Each of the height controlling means 310 includes: a conveying shaft 311 traversing along the height direction of the packaging bags 10; a guide 312 of a predetermined length arranged side by side with the conveying shaft 311 near end portions of the conveying shaft 311; a control main body 313 conveyed along the conveying shaft 311 and the guide 312; a support projection 314 protrudingly formed at an upper portion of the control main body 313 for supporting outer faces of the upper and lower portions of the loaded packaging bags 10; and stoppers 315 for fixing the control main body 313 not to move when a position of the control main body 313 is determined.

[0027] The width control means 320 are mounted oppositely against each other in the width direction of the packaging bags 10, and each of the width controlling means 320 includes: a rotary shaft 321 traversing along the width direction of the packaging bags 10; a guide 322 of a predetermined length arranged side by side with the rotary shaft 321 near end portions of the rotary shaft 321; a support projection 324 conveyed along the rotary shaft 321 and the guide 322 and supporting the width of the loaded packaging bags 10 from the outside; and stoppers 325 for fixing the support projection 324 not to move when a position of the support projection 324 is determined.

[0028] Moreover, one of the width control means 320 has a handle 326 joined to an end of the rotary shaft 321 for rotating the rotary shaft 321 to thereby make the support projections, which are opposed to each other, distance from each other and closer to each other.

[0029] Continuously, in FIGS. 1 and 2, the supply means 400, which is operated to suck the top packaging bag out of the packaging bags 10 loaded on the loading unit 300, place the sucked top packaging bag below the hopper 200 in the vertical direction by rotation, and open the upper portion of the packaging bag 10 is located above the loading unit 300.

[0030] As shown in FIGS. 1, 2 and 4a and 4b, the supply means 400 includes grip means 410 and suction means 430 that are shaft-mounted to the rotary shaft 450 to thereby be rotated together with the rotary shaft 450.

[0031] When the suction means 430 is rotated, the grip means 410 for gripping the packaging bags are opposed to each other at right and left sides of the suction means 430 when they are viewed from the front, and each of the grip means 410 includes: a fixed gripper 411 that is shaft-mounted to the rotary shaft 450 and is bent in the form of the Alphabet "L"; and a rotary gripper 415 rotatably joined to the lower portion of the outer face of the fixed gripper 411 for holding the packaging bag 10 together with the fixed gripper 411.

[0032] In this instance, the packaging bag 10 is interposed between the bent bottom face of fixed gripper 411 and the upper face of the rotary gripper 415, and the grip means 410 hold the packaging bag 10 when the rotary shaft 450 is rotated.

[0033] The rotary gripper 415 is joined to a piston rod 416a of a cylinder 416 rotatably joined to the upper portion of the outer face of the fixed gripper 411 and is rotated by means of expansion and contraction of the piston rod 416a.

[0034] The suction means 430 includes: a rotary body 431 shaft-mounted to the rotary shaft 450; a mounting rod 432

mounted at the rotary body 431; a cylinder 433 joined to the mounting rod 432; and a suction plate 434 joined to a piston rod 433a of the cylinder 433.

[0035] The suction plate 434 is connected to an air line (not shown) to thereby suck the packaging bag 10 by means of suction of air and release the sucked packaging bag 10 by means of discharge of air.

[0036] Furthermore, a weight shaft 435 is located at one side of the mounting rod 432 in such a way as to be side by side with the mounting rod 432, and includes a sensor (not shown) to balance weight and sense a rotational angle by being joined to the rotary body 431.

[0037] Additionally, in the case that the mounting rod 432 is rotated at an angle of ninety degrees to keep horizontality, another suction plate 436 is joined to another piston rod 437 at the side where the suction plate 436 is opposed to the suction plate 434, and in this instance, it is preferable that the suction plate 436 and the piston rod 437 are not joined straight but joined face to face so that the size of the inlet port body 110 is not big.

[0038] The suction plate 436 is also connected to the air line to suck the packaging bag 10 or release the sucked packaging bag 10.

[0039] In the supply means 400, in a state where the mounting rod 432 is positioned vertically and the piston rod 433a is projected such that the suction plate 434 is located directly above the packaging bags 10 loaded on the loading unit 300, when the suction plate 434 sucks the top packaging bag 10 by means of suction of air, the piston rod 433a performs expansion and contraction to lift up the packaging bag 10.

[0040] In this instance, while the piston rod 416a joined to the rotary gripper 415 performs expansion and contraction, the rotary gripper 415 downwardly rotates, so that the bent bottom face of the fixed gripper 411 is exposed to the outside.

[0041] The packaging bag 10 lifted by the expansion and contraction of the piston rod 433a in the sucked state is caught to the bent bottom face of the fixed gripper 411, and at the same time, the contracted piston rod 416a is projected, so that the rotary gripper 415 is upwardly rotated and holds the packaging bag 10 below the fixed gripper 411.

[0042] As described above, in the state where the packaging bag 10 is sucked by the suction means 430 and held by the grip means 410, when the rotary shaft 450 is rotated at an angle of ninety degrees and the mounting rod 432 becomes in a horizontal state, the packaging bag 10 laid in the horizontal direction stands vertically.

[0043] In the above state, when the piston rod 437 joined to the suction plate 436 performs expansion and contraction (if necessary, when the piston rod 433a is projected, in this instance, the rotary gripper 415 is rotated not to hold the packaging bag 10) and the suction plates 434 and 436 become closer to each other, the suction plate 436 sucks the upper portion of the standing packaging bag 10 by means of suction of air, so that both sides of the upper portion of the packaging bag 10 are in a sucked condition by means of the suction plates 434 and 436.

[0044] As described above, in the state where both sides of the upper portion of the packaging bag 10 are in the sucked condition by means of the suction plates 434 and 436, when the piston rod 437 joined to the suction plate 436 is projected (if necessary, the piston rod 433a of the cylinder 433 is contracted), the suction plates 434 and 436 distance from each

other, and the upper portion of the packaging bag 10 is opened, so that someone can put food waste into the packaging bag 10.

[0045] In this instance, the lower portion of the packaging bag 10 is supported by a discharge plate 602 of the discharging means 600.

[0046] As described above, after the food waste is put into the inlet port and contained in the packaging bag 10, the suction plates 434 and 436 are closer to each other such that the upper portion of the packaging bag 10 closes up. After that, the upper portion of the packaging bag 10 is sealed by means of the sealing means 500 arranged above the packaging bag 10, and then, the sealed packaging bag 10 is discharged to a storage chute located below the packaging bag 10 when the discharge plate 602 of the discharging means 600 is rotated downwardly.

[0047] Moreover, the supply means 400 is operated on the contrary to the above to thereby be located at the original position.

[0048] Continuously, in FIGS. 1 and 2, the sealing means 500 is disposed above the packaging bag 10 in a waiting state of the packaging bag 10, and seals the packaging bag 10 when food waste is put into the packaging bag 10.

[0049] As shown in FIG. 5, the sealing means 500 includes: a rotary shaft 502 rotating at a predetermined angle; cantilevers 504a and 504b protrudingly mounted at the rotary shaft 502 in the opposite direction to each other; links 506a and 506b respectively joined to the cantilevers 504a and 504b; bearings 508a and 508b respectively joined to the links 506a and 506b; and slide shafts 510 that move in a state where the bearings 508a and 508b are shaft-mounted, the slide shafts 510 being mounted oppositely at the front and rear of the sealing means 500 when viewed in the drawings.

[0050] Connectors 510a and 510b are respectively joined to the opposed bearings 508a and 508b, and respectively include sealers 512a and 512b for sealing both sides of the upper portion of the packaging bag 10 by heat.

[0051] When the rotary shafts 502 are rotated at the predetermined angle by means of the structure of the sealing means 500, the cantilevers 504a and 504b are rotated to ascend or descend in the opposite direction to each other according to the rotational direction of the rotary shafts 502, such that the links 506a and 506b joined to the cantilevers 504a and 504b and the bearings 508a and 508b joined to the links are moved in a direction that they distance from each other or in a direction that they become closer to each other, and thereby, the sealers 512a and 512b are also moved to distance from each other or become closer to each other.

[0052] In order to seal the upper portion of the packaging bag 10, the sealers 512a and 512b become closer to each other to be in contact with the packaging bag 10, and in this instance, seals the upper portion of the packaging bag 10 by heat. In addition, after sealing, the rotary shafts 502 are rotated in the opposite direction to each other at a predetermined angle, such that the sealers 512a and 512b distance from each other to be located at the original position.

[0053] Continuously, in FIG. 2, the discharging means 600 is disposed below the front of the inlet port body 100, and includes the discharge plate 602, which has an end rotatably joined, and a cylinder 604 for rotating the discharge plate 602.

[0054] The discharge plate 602 normally supports the packaging bag 10 while keeping horizontality, but, when sealing of the packaging bag 10 is finished, is downwardly rotated by expansion or contraction of the piston rod 604a of the cylin-

der 604 to discharge the packaging bag 10 to the storage chute located below the discharging means 600.

[0055] The supply means 400, the sealing means 500, and the discharging means 600 are controlled by means of program of a controller (not shown) to be operated in time series by interworking. The supply means 400 vertically locates the packaging bag 10, which is horizontally loaded on the loading unit 300, below the hopper 200 in such a way that the packaging bag 10 is opened so that someone can put food waste therein. After the food waste is put into the packaging bag 10, the sealing means 500 is operated to seal the upper portion of the packaging bag 10, and in this instance, the supply means 400 is in a standby status at the original position. After sealing, the packaging bag 10 is discharged downwardly by the discharging means 600, and then, the supply means 400 is operated again so that the packaging bag 10 is in the waiting state till someone puts food waste therein.

[0056] As described above, when food waste is put into the waste inlet port, the food waste packaging apparatus according to the present invention automatically carries out a series of processes of putting the food waste into the packaging bag 10, sealing the packaging bag 10, and discharging the packaging bag 10. Accordingly, because there is no need that someone directly puts food waste into the garbage bag and seal the upper portion of the bag not to leak, the food waste packaging apparatus provides convenience and food waste is not stained on the hands.

[0057] While the present invention has been particularly shown and described with reference to exemplary embodiment thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

1. A food waste packaging apparatus for an automatic waste collection system, wherein the food waste packaging apparatus automatically carries out a series of processes of putting food waste into a packaging bag, sealing the packaging bag and discharging the packaging bag to a storage chute located below a waste inlet port when the food waste is put into the waste inlet port.

2. The food waste packaging apparatus for the automatic waste collection system according to claim 1, comprising:

a loading unit arranged below the waste inlet port in such a fashion that a plurality of packaging bags are laid in the horizontal direction and vertically loaded on the loading unit;

supply means for sucking the top packaging bag out of the packaging bags loaded on the loading unit, placing the sucked top packaging bag below a hopper of the waste inlet port in the vertical direction by rotation, and opening the upper portion of the packaging bag to make the packaging bag ready to receive the food waste therein; sealing means arranged at the upper portion of the waiting packaging bag to seal the upper portion of the packaging bag by heat when the food waste is received in the packaging bag; and

discharging means for supporting the bottom of the packaging bag and discharging the packaging bag to a storage chute arranged below the discharging means by means of rotation after the completion of the sealing of the packaging bag.

3. The food waste packaging apparatus according to claim 2, wherein the loading unit comprises height controlling means and width controlling means for controlling height and

width of the loading unit according to the standards of height and width of the packaging bags to thereby support the loaded packaging bag from the outside.

4. The food waste packaging apparatus according to claim 3, wherein the height controlling means are mounted oppositely against each other in the height direction of the packaging bags, and each of the height controlling means comprises: a conveying shaft traversing along the height direction of the packaging bags; a guide arranged side by side with the conveying shaft near end portions of the conveying shaft; a control main body conveyed along the conveying shaft and the guide; a support projection protrudingly formed at an upper portion of the control main body for supporting outer faces of the upper and lower portions of the loaded packaging bags; and stoppers for fixing the control main body not to move when a position of the control main body is determined.

5. The food waste packaging apparatus according to claim 3, wherein the width control means are mounted oppositely against each other in the width direction of the packaging bags, and each of the width controlling means comprises: a first rotary shaft traversing along the width direction of the packaging bags; a guide arranged side by side with the first rotary shaft near end portions of the first rotary shaft;

a support projection conveyed along the first rotary shaft and the guide and supporting the width of the loaded packaging bags from the outside; and stoppers for fixing the support projection not to move when a position of the support projection is determined.

6. The food waste packaging apparatus according to claim 5, wherein one of the width control means has a handle joined to an end of the first rotary shaft for rotating the first rotary shaft to thereby make the support projections, which are opposed to each other, distance from each other and closer to each other.

7. The food waste packaging apparatus according to claim 2, wherein the supply means comprises grip means and suction means that are shaft-mounted to a second rotary shaft, and

wherein the grip means for holding the packaging bag when the suction means is rotated are opposed to each other at both sides of the suction means, and each of the grip means comprises: a fixed gripper that is shaft-mounted to the rotary shaft and is bent in the form of the Alphabet "L"; and a rotary gripper rotatably joined to the lower portion of the outer face of the fixed gripper for holding the packaging bag together with the fixed gripper.

8. The food waste packaging apparatus according to claim 7, wherein the suction means comprises: a rotary body shaft-mounted to the second rotary shaft; a mounting rod mounted at the rotary body; a cylinder joined to the mounting rod;

and a first suction plate joined to a piston rod of the cylinder and connected to an air line; and a second suction plate opposed to the first suction plate and connected to an air line when the mounting rod is rotated at an angle of ninety degrees to keep horizontality.

9. The food waste packaging apparatus according to claim 8, wherein the second suction plate is joined face to face with another piston rod and moves horizontally.

10. The food waste packaging apparatus according to claim 8, wherein a weight shaft for balancing weight is joined to the second rotary shaft and located side by side with the mounting rod.

11. The food waste packaging apparatus according to claim **2**, wherein the sealing means comprises:

a third rotary shaft rotating at a predetermined angle; cantilevers protrudingly mounted at the third rotary shaft in the opposite direction to each other; links respectively joined to the cantilevers; bearings respectively joined to the links; and slide shafts that move in a state where the bearings are shaft-mounted, the slide shafts being opposed to each other, and

wherein connectors are respectively joined to the opposed bearings, and respectively comprise sealers for sealing both sides of the upper portion of the packaging bag by heat.

12. The food waste packaging apparatus according to claim **9**, wherein a weight shaft for balancing weight is joined to the second rotary shaft and located side by side with the mounting rod.

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