

REFUSE CHUTE SYSTEM

Background of the Invention

Field of the Invention

5 The present invention relates to a refuse chute system installed in a building, for example, multifamily dwellings or the like.

Background Art

 One of examples of refuse chute systems is disclosed in Japanese Patent Application Laid Open Publication No. 9-202405, for example. This system includes a
10 chute, a conveyer, and a storage section. The chute extends vertically along a building and includes a plurality of refuse throw-in hoppers. The conveyer is installed below the chute for receiving refuse falling down through the chute and conveying it in the horizontal direction. The storage section is located at the discharge end of the conveyer for storing the refuse conveyed by the conveyer.

15 In the refuse chute system disclosed in the above publication, the conveyer intervenes between the chute and the storage section so that refuse falling down through the chute is stored to the storage section indirectly. In contrast, there is another refuse chute system in which a wheel bin (collector) is provided below the lower end opening of the chute without a conveyer. In this system, refuse falling down through the chute is
20 stored to the collector directly. When refuse in the collector is full, a collector operator conveys the collector to predetermined storage space, disposes of the refuse, and then, sets the thus emptied collector below the lower end opening of the chute.

 In the refuse chute system in which refuse is stored to the collector directly, however, the lower opening end of the chute has an area smaller than the upper end
25 opening of the collector, so that refuse is piled up in the collector like a mountain with the center thereof serving as a top. This makes wasted space at the upper four corners in the collector to lower the storage efficiency of the collector. As a result, the number of times

of collector conveyance increases to lower the operation efficiency.

Further, this requires an operator to, for example, flatten and level the refuse piled up like a mountain, which is undesirable in safety and hygienic aspects.

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Summary of the Invention

The present invention has been made in view of the foregoing and has its object of storing refuse automatically and evenly to a collector in a refuse chute system to improve the conveyance operation efficiency without degrading safety and hygienic aspects.

According to one aspect of the present invention, a refuse chute system includes: a
10 chute arranged vertically along a building and having at least one refuse throw-in hopper, through which refuse is thrown, at a predetermined point in the middle of a vertical course of the chute; and a collector which is set at a refuse storage point located below a lower end opening of the chute, which stores refuse falling down through the chute, and which is conveyed from the refuse storage point with refuse stored.

15 The above refuse chute system further includes refuse storing/discharging means mounted at a lower end of the chute for temporarily storing refuse falling down through the chute and including a storage section connected to the lower end opening of the chute and a discharge gate opening/closing an opening formed at the lower end of the storage section, wherein the discharge gate is opened when refuse stored in the storage section reaches a
20 predetermined amount to allow the refuse in the storage section to be discharged into the collector.

In the above arrangement, the refuse storing/discharging means is mounted at the lower end of the chute so that refuse falling through the chute is temporarily stored in the storage section thereof. When refuse stored in the storage section reaches the
25 predetermined amount, the discharge gate opens to allow the refuse in the storage section to be discharged at once into the collector. Accordingly, unlike the case where refuse is directly stored to the collector from the chute having a lower end opening of which area is

smaller than the upper end opening of the collector, the refuse is stored evenly in the collector. This eliminates the need of an operator to flatten refuse in the collector to improve the safety and hygienic aspects. This also improves the storage efficiency of the collector, thereby improving the conveyance operation efficiency.

5 The discharge gate may be provided above the lower end opening of the storage section and may have, for example, a double-doored structure including a pair of gate members pivotally supported at a pair of rotation axes symmetrical with respect to the center line of the storage section. With this structure, even when a large load is applied to the gate members by deposition of refuse in the storage section, the discharge gate can
10 open stably. The double-doored discharge gate also contemplates space saving in opening the discharge gate.

Preferably, a packing member is mounted at the discharge gate for water-packing the storage section.

In the case where the present refuse chute system is installed in a building, such as
15 multifamily dwellings or the like, wet refuse, such as kitchen refuse and the like will be thrown into the chute. Accordingly, when the storage section is water-packed, no water leaks from the storage section, which means hygienic. As well, trouble caused, for example, when an electric system part gets wet can be obviated, thereby securing the operation safety of the refuse chute system.

20 The storage section may have a sectional structure including an upper storage portion and a lower storage portion which are joined vertically with each other, wherein the upper storage portion includes at a lower peripheral end thereof a fitting portion fitted in an upper end opening of the lower storage portion.

For example, even when an interfering object, such as a beam or the like exists in
25 course of installation of the refuse storing/accommodating means to the refuse storage point, the storage section, which has the sectional structure, can be divided to be small for easy installation. This permits the storage section to be set in a comparatively small space

easily.

As described above, the storage section is preferably water-packed. When the fitting portion provided at the lower peripheral end of the upper storage portion is fitted in the upper end opening of the lower storage portion, the storage section is water-packed without providing a packing member or the like at the division part between the upper
5 storage portion and the lower storage portion.

The above refuse chute system may further includes an anti-scatter covering arranged between the refuse storing/discharging means and the collector for surrounding space between the lower end opening of the storage section and an upper end opening of
10 the collector when refuse is discharged into the collector from the storage section.

The anti-scatter covering surrounds the space between the lower end opening of the storage section and the upper end opening of the collector, so that refuse is stored to the collector thoroughly in discharging the refuse from the storage section into the collector. This prevents the refuse from scattering, which means hygienic.

15 The refuse chute system may further include: gate driving means for opening/closing the discharge gate; an operation switch; collector detection means for detecting a state that the collector is set at the refuse storage point; and control means for driving, upon receipt of both a detection signal from the collector detection means and an operation signal from the operation switch, the gate driving means to allow the discharge
20 gate to be opened.

This enables exchange between opening and closing of the discharge gate by the operation switch to eliminate the need of a collector operator to touch the refuse storing/discharging means storing refuse and the like, which is hygienic. Further, in the state where the collector is not set at the refuse storage point, the discharge gate cannot be
25 opened even if the operation switch is turned on, thereby preventing scattering of refuse being discharged from the storage section.

The above refuse chute system may further includes: an anti-scatter covering

arranged between the refuse storing/discharging means and the collector for surrounding space between the lower end opening of the storage section and an upper end opening of the collector when refuse is discharged into the collector from the storage section; a linking mechanism for vertically moving the anti-scatter covering between a retreat point and a use point by operation of a manual operation lever, the retreat point being a point where the anti-scatter covering is retreated upward to allow the collector to be positioned at the refuse storage point, and the use point being a point where the anti-scatter covering is moved downward for surrounding the space between the lower end opening of the storage section and the upper end opening of the collector; and covering detection means for detecting a state that the anti-scatter covering is set at the use point, wherein the control means drives, upon receipt of each of a detection signal from the collector detection means, a detection signal from the covering detection means, and an operation signal from the operation switch, the gate driving means to allow the discharge gate to be opened.

With this arrangement, the anti-scatter covering is moved manually between the use point and the retreat point. The linking mechanism undertakes this movement, which means less operation force needed for moving the anti-scatter covering.

Further, unless the operation lever is operated manually for positioning the anti-scatter covering at the use point, the discharge gate is not opened even by operation of the operation button, thereby preventing scattering of refuse being discharged from the storage section.

The above arrangement further improves the hygienic aspect under the state where the collector is set at the refuse storage point.

The above refuse chute system may further include: refuse amount detection means for detecting a state that refuse stored in the storage section reaches the predetermined amount; and informing means for performing information, wherein the control means operates, upon receipt of a detection signal from the refuse amount detection means, the informing means to inform an operator that the predetermined amount of refuse

is stored in the storage section.

The above arrangement can inform, when refuse stored in the storage section reaches the predetermined amount, a collector operator that refuse in the storage section should be discharged into the collector and the collector should be conveyed.

5 The above refuse chute system may further include: warning means mounted in the vicinity of the refuse throw-in hopper for warning, wherein the control means operates, upon receipt of a detection signal from the refuse amount detection means, the warning means to warn a user who is going to throw refuse into the chute that refuse throw-in is inhibited.

10 The above arrangement can warn, when the predetermined amount of refuse is stored in the storage section, a user who is going to throw refuse that refuse throw-in is inhibited.

Brief Description of the Drawings

15 FIG. 1 is a schematic overall view showing buildings to which a refuse chute system in accordance with an embodiment of the present invention is applied.

FIG. 2 is a back view of refuse storing/discharging means.

FIG. 3 is a left side view of the refuse storing/discharging means

FIG. 4 is a plan view of the refuse storing/discharging means.

20 FIG. 5 is an explanatory sectional view in an enlarged scale showing a sectional part of a storage section.

FIG. 6 is a front view in an enlarged scale of a discharge gate.

FIG. 7 is a sectional view in an enlarged scale of a packing member of the discharge gate.

25 FIG. 8 is a side view showing an operation of a linking mechanism.

FIG. 9 is a block diagram showing a configuration of a control system for the refuse chute system.

FIG. 10 is a flowchart depicting an operation of the refuse chute system.

Description of Preferred Embodiment of the Invention

An embodiment of the present invention will be described below with reference to
5 the accompanying drawings. It should be noted that the following preferred embodiment
is a mere example in essence and is not intended to limit the present invention, applicable
matters thereof, and use thereof.

FIG. 1 is a schematic view showing the entirety of a refuse chute system S in
accordance with the present invention, wherein the refuse chute system S is installed for
10 the building B1, B2, B3.

The refuse chute system S includes a chute 11 and a collector 21 in each building
B1, B2, B3. The chute 1 extends vertically along each building B1, B2, B3 through each
floor (not shown) of the buildings B1, B2, B3. The collector 21 (see FIG. 2) is arranged
below the lower end opening of the chute 11.

15 A plurality of refuse throw-in hoppers 12 through which refuse is thrown are formed
in the chute 11 correspondingly to the floors of the buildings B1, B2, B3. Refuse thrown
through each refuse throw-in hoper 12 falls down through the chute 11 and is then
discharged from the lower end opening of the chute 11.

The collector 21 is a box-shaped bottomed container with the upper part thereof
20 opened, as shown in FIG. 2 and FIG. 3. The collector 21 includes a handle 22 mounted at
the front face thereof and wheels 23 mounted at four corners of the lower face thereof so as
to be movable by a collector operator. A lid 24 for opening/closing the upper end
opening of the collector 21 is hinge-connected to the upper left end of the collector 21 so
as to close the upper end opening of the collector 21 during the time when the collector 21
25 is moved and the like (see the two-dot chain lines in FIG. 2). In contrast, during the time
when the collector 21 is set below the chute 11 (hereinafter referred to the position as a
refuse storage point of the collector 21), it is opened (see the solid lines in FIG.2).

In this refuse chute system S, the collector 21, which is empty, is set at the refuse storage point in advance so that refuse thrown through the refuse throw-in hoppers 12 and discharged from the lower end opening of the chute 11 is stored to the collector 21 finally, which will be described later in detail. When the collector 21 becomes full of refuse, a collector operator conveys the collector 21 to predetermined storage space 13 (see the broken arrow in FIG. 1) and deposits of the refuse. Then, the collector operator conveys again the thus emptied collector 21 to the refuse storage point (see the solid arrow in FIG. 1). In this way, refuse in each building B1, B2, B3 is collected.

In the present embodiment, the refuse chute system S further includes refuse storing/discharging means 3 mounted at the lower end of the chute 11 and an anti-scatter covering 4 provided between the refuse storing/discharging means 3 and the collector 21.

The refuse storing/discharging means 3 includes, as shown in FIG. 2 though to FIG. 4, a storage section 31 for temporarily storing refuse and a discharge gate 32 for opening/closing a lower end opening 34 of the storage section 31 and is supported by a frame 5 set below the chute 11. Hereinafter, the transverse direction in the paper of FIG. 2 is referred to as a transverse direction on the supposition that the left side and the right side of FIG. 2 are the left and the right, respectively. As well, the transverse direction in the paper of FIG. 3 is referred to as a vertical direction on the supposition that the left side and the right side of FIG. 3 are the rear and the front, respectively.

At the ground below the chute 11, namely, the ground serving as to the refuse storage point of the collector 21, a recess 14 where the collector is set is formed. The frame 5 includes four legs 51, container supporting portions 52, link supporting portions 53, and fore and aft reinforcing portions 54. The legs 51 are arranged at the front, the back, the right, and the left of the frames 5 with predetermined distances left so as to surround the recess 14. The container supporting portions 52 bridge the upper ends of adjacent two legs 51 in the fore and aft direction or the transverse direction. The link supporting portions 53 bridge in the fore and aft direction the vertical centers of pairs of two legs 51

arranged with a predetermined distance left in the fore and aft direction. The fore and aft reinforcing portions 54 bridge in the fore and aft direction the lower parts of the pairs of two legs 51 arranged with the predetermined distance left in the fore and aft direction. Though not shown, on the rear side of the frame 5, a transverse reinforcing portion bridges in the transverse direction the lower parts of the pair of two legs 51 with the predetermined distance left in the transverse direction while no reinforcing portion is provided on the front side at the lower parts of the pair of two legs 51 with the predetermined distance left in the transverse direction. This forms, between the two legs 51 paired in the transverse direction on the front side with the predetermined distance left, a conveyance port through which the collector 21 is conveyed to and from the refuse storage point.

The fore and aft reinforcing portions 54 include guides 56 in contact with the right or left side faces of the collector 21 for positioning the collector 21 in the transverse direction. An adjuster mechanism 57 is provided for adjusting the position in the transverse direction of the guides 56. With this arrangement, even if another collector 21 different in size (in the transverse width) is positioned at the refuse storage point, position adjustment by the guide 56 permits the collectors 21 to be positioned accurately at the refuse storage point, thereby leading to an increase in flexibility. The aforementioned recess 14 positions the collector 21 in the fore and aft direction. Specifically, when the wheels 23 arranged on the rear side of the collector 21 are in contact with the step of the recess 14, as shown in FIG. 3, the collector 21 is positioned in the fore and aft direction.

The storage section 31 includes a front wall, a rear wall, and right and left side walls so as to form a substantially box shape of which volume is equal to or smaller than the volume of the collector 21. The storage section 31 is fixed to two container supporting portions 52 of the frame 5 by means of two pairs of supporting brackets 31a mounted at the vertical centers of the front and rear walls of the storage section 13.

At each of the upper end and the lower end of the storage section 31, an opening is formed. The upper end opening is closed by a lid 33. On the other hand, the lower end

opening 34, which is in a substantially arc shape in a front view (a back view) as shown in FIG. 2 and FIG. 6 and has an opening area almost equal to or smaller than the opening area of the upper end opening of the collector 21, is capable of being opened/closed by a discharge gate 32 that will be described later.

5 The storage section 31 is structured such that an upper storage portion 35 including a flange 35a at the lower end thereof and a lower storage portion 36 including a flange 36a at the upper end thereof are joined vertically with each other and the flanges 35a, 36a are fixed to each other by means of a fixing member (not shown, for example, a bolt, a nut, or the like). As shown in FIG. 5, at the lower peripheral end of the upper container part 35,
10 a fitting portion 35b protruding more downwardly than the flange 35a for being fitted into the upper end opening of the lower storage portion 36. Thus, the storage section 31 is in a sectional structure composed of the upper storage portion 35 and the lower storage portion 36. Accordingly, even if an interfering object, such as a beam or the like exists in course of conveyance of the refuse storing/discharging means to the set position, the storage
15 section 31 can be conveyed easily in a compacted state by dividing the upper storage portion 35 and the lower storage portion 36, so that the storage section 31 can be installed easily in comparatively small space. Further, provision of the fitting portion 35a at the upper storage portion 35 prevents water and the like from leaking from the storage section
20 31 even without providing a packing member or the like between the upper storage portion 35 and the lower storage portion 36.

Furthermore, a window 35c for maintenance is formed at each of the front and rear walls of the upper storage portion 35.

The storage section 31 temporarily stores refuse, as described above, and a refuse amount detection sensor 61 (not shown in FIG. 4) is mounted at each of the right and left
25 walls thereof for detecting a state that the predetermined amount of refuse is stored in the storage section 31. The refuse amount detection sensors 61 are preferably formed of microwave sensors, for example. The microwave sensors are free from influences of

moisture and the presence of dead space, and therefore, enables accurate detection of the state that the predetermined amount of refuse is stored in the storage section 31. Wherein, the refuse amount detection sensors 61 are not limited to the microwave sensors.

The discharge gate 32 in the present embodiment includes a pair of arc-shaped gate members 37 each extending between the front and rear walls of the storage section 31 in the fore and aft direction and each having a substantially arc shape in a front view so as to correspond to the substantially arc-shaped lower end opening 34 of the storage section 31.

At the front and rear ends of each arc-shaped gate members 37, pivotal supports 38 are mounted each of which has a substantially fan shape in a front view, as shown in FIGS. 2, 3, and 6. The pivotal center parts of the fan-shaped pivotal supports 38 are pivotally supported at the rotation axes X1, X2 through bearings. The rotation axes X1, X2 are set at the vertical centers of the front wall and the rear wall of the storage section 31 so as to be symmetrical with respect to the center line C in the transverse direction of the storage section 31. Thus, the pair of arc-shaped gate members 37 are rotatable along arcs having the centers at the rotation axes X1, X2 of the respective sides of the center line C.

The pair of arc-shaped gate members 37 are driven and rotated by gate driving means. In the present embodiment, the gate driving means is composed of a pair of motor cylinders 30 controlled by a controller 6 that will be described later. The gate driving means is not limited thereto and may be any of various actuators.

The motor cylinders 30 are fixed at the upper ends of the cylinder sections thereof to the right and left side walls of the upper storage portion 35 by means of brackets 35d while being fixed at the tip ends of the rods thereof to the central parts in the fore and aft direction of the arc-shape gate members 37, so as to be pivotal about the axes extending in the fore and aft direction. Thus, the arc-shaped gate members 37 are arced about the rotation axes X1, X2 as the centers in association with the piston motion of the motor cylinders 30. With this structure, the discharge gate 32 is exchangeable between a state indicated by the two-dot chain lines in FIG. 6 and a state indicated by the solid lines in FIG.

6. The state indicated by the two-dot chain lines in FIG. 6 is such that the pair of arc-shaped gate members 37 are in contact at the side faces thereof (hereinafter referred to them as contact faces 37a) with each other on the transverse center line C of the storage section 31 to close the lower end opening 34 of the storage section 31 (see FIG. 2). The state indicated by the solid lines in FIG. 6 is such that the contact faces 37a of the arc-shaped gate members 37 are positioned in the vicinity of the right and left walls of the storage section 31 to open the lower end opening 34 thereof.

At a contact face 37a of the left arc-shaped gate member 37 out of the pair of arc-shaped gate members 37, a packing member 39 is mounted, as shown in FIG. 7, so that the storage section 31 is water-packed. This structure prevents water from leaking from the storage section 31 storing wet refuse, such as kitchen refuse and the like and is therefore preferable especially in a refuse chute system for multifamily dwellings.

In the present embodiment, specifically, the packing member 39 includes a fixed member 39a fixed to the contact face 37a of the left arc-shaped gate member 37, a packing body 39b continuing from the fixed member 39a and having a substantially cylindrical hollowed shape, and a plurality of protrusions 39c (three in FIG. 7, for example) protruding from the surface of the packing body 39b. With this structure, an excellent water-packing characteristic is obtained. The material of the packing member 39 is not limited but may be natural rubber, synthetic rubber of EPDM or the like, for example. Alternatively, the packing member 39 may be made of urethane resin. In this case, high packing ability is obtained, which is favorable.

As shown in FIG. 2 through to FIG. 4, the lid 33 is connected to the lower end opening of the chute 11, and a circular through hole 33a is formed in the lid 33 so as to pass therethrough vertically. The chute 11 and the storage section 31 communicate with each other through the through hole 33a.

Furthermore, the lid 33 includes a throw-in gate 7 for opening/closing the through hole 33a. The throw-in gate 7 includes a pair of plate gate members 71, a support portion

72, bearings 73, a bole screw 74, sliders 75, and an opening/closing motor 76. The pair of plate gate members 71 are arranged on the respective sides of the center line in the fore and aft direction of the through hole 33a. The support portion 72 supports the left sides of the plate gate members 71 and guides the plate gate members 71 to allow them to slide in the fore and aft direction. The bole screw 74 is supported on the right side of the plate gate members 71 by the bearings 73 and extends inside the lid 33 in the fore and aft direction. The sliders 75 are fixed to the right parts of the plate gate members 71 and are screw-engaged with the bole screw 74. The opening/closing motor 76 is mounted at the front end of the bole screw 74 and is controlled by a controller 6 that will be described later to allow the bole screw 74 to rotate about its center axis.

The bole screw 74 includes, as shown in FIG. 4, a front side portion F and a rear side portion R which are symmetrical with respect to the center thereof corresponding to the center line in the fore and aft direction of the through hole 33a and are threaded in directions reverse to each other. When the bole screw 74 is rotated by driving the opening/closing motor 76, sliders 75 screw-engaged with the front side portion F of the bole screw 74 and sliders 75 screw-engaged with the rear side portion R thereof are moved in directions reverse to each other. The throw-in gate 7 is exchangeable between a closed state (see FIG. 4) and an opened state (FIG. 3). The closed state is such that the side faces of the pair of plate gate members 71 are in contact with each other along the center line of the through hole 33a to close the through hole 33a while the opened state is such that the side faces of the pair of plate gate members 71 are located in the vicinity of the front or rear peripheries of the through hole 33a to open the through hole 33a. With the throw-in gate 7 in a double-doored structure including the pair of plate gate members 71, space saving in opening the throw-in gate 7 is contemplated.

When the sliders 75 are made of a soft material relative to the material of the bole screw 74, notches of both of them may not be formed to eliminate the need for lubricant oil. This is effective in a refuse chute system which may invite adhesion of the sliders 75 and

the bole screw 74 to each other caused due to mixture of dirt or dust with the lubricant oil. As one example, the bole screw 74 may be made of stainless steel in view of corrosion resistance while the sliders 75, 75 may be made of brass.

Since the lower end opening 34 of the storage section 31 is opened/closed by the
5 discharge gate 32, the throw-in gate 7 may be omitted.

The anti-scatter covering 4 includes a main body 41 covering the lower end of the storage section 31 and tapered as it goes downward and rubber bellows 42 suspended from the lower end of the main body 41 and extending downward.

The anti-scatter covering 4 is supported by the frame 5 through a pair of linking
10 mechanisms 8 (not shown in FIG. 4) arranged on the right and left sides thereof so as to be movable vertically by the linking mechanisms 8.

Each linking mechanism 8 includes, as shown in FIG. 3 and FIG. 8, first and second links 81, 82 pivotally connected at the central parts thereof to each other and extending in the fore and aft direction. Further, the rear end of the first link 81 is
15 pivotally connected to the rear part of the associated link support portion 53 of the frame 5 while a roller 81a is mounted at the front end thereof so as to be in contact with the lower face of a contact part 43 formed at the front part of the side face of the main body 41 of the anti-scatter covering 4. On the other hand, the rear end of the second link 82 is pivotally connected to the rear part of the side face of the main body 41 while a roller 82a is
20 mounted at the front end thereof so as to be in contact with the upper face of a contact part 58 formed at the front part of the associated link support portion 53 of the frame 5. A pushing member 59 fixed to the associated link support portion 53 pushes the roller 82a downward to allow the roller 82a to be movable only in the fore and aft direction.

Each linking mechanism 8 further includes an operation lever 83 to be operated by
25 a collector operator which includes a bent part bent at the base end part. The bent part is pivotally connected to the associated link support portion 53 of the frame 5 and includes a bent end part to which a connection link 84 is connected pivotally. The connection link

84 is pivotally connected to a part of the first link 81 which is located between the part pivotally connected to the second link 82 and the roller 81a. The tip end of the operation lever 83 protrudes frontward farther than the frame 5. The front ends of the right and left operation levers 83 of the linking mechanisms 8 are connected to each other by means of a handle 85 (see FIG. 4) to be gripped by a collector operator.

In the state where the operation levers 83 are kept substantially horizontal, as shown by the solid lines in FIG. 8, the anti-scatter covering 4 is positioned upward by the linking mechanisms 8 (see the two-dot chain lines in FIG. 8 and FIG. 3), so that the lower end of the bellows 42 is positioned above the collector 21 (at a retreat position of the anti-scatter covering 4). On the other hand, when the operation levers 83 are rotated upward, the bent end parts of the operation levers 83 are moved rearward, as shown by the dash-dot lines in FIG. 8, to pull down the front ends of the first links 81 and to move downward the rear ends of the second links 82 pivotally connected to the first links 81. This allows the anti-scatter covering 4 to move downward (see the dash-dot lines in FIG. 8). In this state, the lower end of the bellows 42 is positioned within the upper end opening of the collector 21 (at a use position of the anti-scatter covering 4) so that the anti-scatter covering 4 surrounds the space between the lower end opening 34 of the storage section 31 and the upper end opening of the collector 21. Hence, as will be described later, when refuse in the storage section 31 is discharged into the collector 21 with the discharge gate 32 opened, the refuse is stored to the collector 21 thoroughly with refuse prevented from scattering.

Description will be given next with reference to FIG. 9 and FIG. 10 to a control system for the present refuse chute system S. In the drawings, reference numeral 6 denotes the controller for controlling in total the refuse chute system S to which detection signals are input from a collector sensor 62, a covering sensor 63, a discharge gate sensor 64, a throw-in gate sensor 65, and the refuse amount detection sensors 61. The collector sensor 62 is formed of, for example, a lighting tube fixed to the frame 5 for detecting a

state that the collector 21 is set at the refuse storage position. The covering sensor 63 is formed, for example, of a limit switch mounted at one of the linking mechanisms 8 for detecting a state that the anti-scatter covering 4 is set at the use position. The discharge gate sensor 64 is formed of, for example, a limit switch incorporated in one of the motor
5 cylinders 30 for detecting opening/closing of the discharge gate 32. The throw-in gate sensor 65 is formed of, for example, a limit switch for detecting opening/closing of the throw-in gate 7. The refuse amount detection sensors 61 detect a state that refuse stored in the storage section 31 reaches the predetermined amount. As well, though not shown, an operation signal from an operation switch 66, which is mounted at a predetermined
10 position so as to be operated by a collector operator, is input to the controller 6.

To the controller 6, there are connected a caution lamp 67 mounted in the vicinity of each refuse throw-in hopper 12, a rotating lamp 68 and a buzzer 69 mounted in the vicinity of the point where the refuse storing/discharging means 3 is set, the opening/closing motor 76 for opening/closing the throw-in gate 7, and the motor cylinders
15 30 for opening/closing the discharge gate 32. The controller 6 outputs a drive signal to each of them.

An operation of the refuse chute system S will be described next with reference to FIG. 9 and FIG. 10. Usually, the throw-in gate 7 is opened while the discharge gate 32 is closed (see P1 in FIG. 10). In this state, refuse thrown through the refuse throw-in hoppers
20 12 falls down through the chute 11 and is then stored into the storage section 31. When refuse sorted in the storage section 31 is full, the refuse amount detection sensor 61 detects this state and outputs the detection signal to the controller 6.

Upon receipt of the detection signal from the refuse amount detection sensor 61, the controller 6 allows the caution lamp 67 to light up to inform a user going to throw
25 refuse that refuse throw-in is inhibited while allowing lighting of the rotating lamp 68 and operation of the buzzer 69 to inform a collector operator that the predetermined amount of refuse is stored in the storage section 31. Further, the controller 6 drives the

opening/closing motor 76 for closing the throw-in gate 7 so that the pair of plate gate members 71 are moved as described above to close the throw-in gate 7.

Under the state that the collector 21 is set at the refuse storage point, a collector operator rotates the operation levers 83 upward to move the anti-scatter covering 4 downward, so that the anti-scatter covering 4 is positioned at the use position. When the anti-scatter covering 4 is positioned at the use position, the covering sensor 63 outputs the detection signal to the controller 6. As well, since the collector 21 has been set at the refuse storage point, the collector sensor 62 outputs the detection signal to the controller 6 (see P2 in FIG. 10).

When the collector operator turns on the operation switch 66 in this state, the operation switch 66 outputs the operation signal to the controller 6.

Upon receipt of the operation signal, the controller 6 judges whether or not the detection signals from the collector sensor 62 and the covering sensor 63 have been received. If the detection signals from the collector sensor 62 and the covering sensor 63 have not been received, the controller 6 outputs no drive signal to the motor cylinders 30. Accordingly, the discharge gate 32 is not opened unless the collector 21 is set at the refuse storage point and/or the anti-scatter covering 4 is set at the use point.

In contrast, when the detection signals from the collector sensor 62 and the covering sensor 63 have been received, the controller 6 outputs the drive signal to the motor cylinders 30. This allows the pair of arc-shape gate members 37 to rotate, as described above, to open the lower end opening 34 of the storage section 31. As a result, refuse stored in the storage section 31 is discharged at once into the collector 21 (see P3 in FIG. 10).

After the refuse in the storage section 31 has been discharged into the collector 21, the refuse amount detection sensor 61 outputs a non-detection signal to the controller 6. Upon receipt thereof, the controller 6 outputs the drive signal to the motor cylinders 30 to cause the discharge gate 32 to be closed. At the same time or after a predetermined time

period elapses therefrom, the controller 6 outputs the drive signal also to the opening/closing motor 76 to cause the throw-in gate 7 to be opened (see P4 in FIG. 10).

After the refuse has been stored to the collector 21, the operation levers 83 are rotated downward to position the anti-scatter covering 4 at the retreat point. In this state,
5 the collector operator conveys the collector 21 storing the refuse from the refuse storage point to the storage space 13, as described above, and then positions the thus emptied collector 21 again at the refuse storage point (see P5 in FIG. 10).

Herein, the operation levers 83 are operated to position the anti-scatter covering 4 at the use point when refuse stored in the storage section 31 reaches the predetermined
10 amount, namely, when the rotating lamp 68 and the buzzer 69 are operated. Alternatively, the operation levers 83 may be operated to position the anti-scatter covering 4 at the use point in advance when the emptied collector 21 is positioned at the refuse storage point.

As described above, in the refuse chute system S in accordance with the present embodiment, the refuse storing/discharging means 3 is arranged between the chute 11 and
15 the collector 21. Accordingly, refuse falling down through the chute 11 is not directly thrown into the collector 21, but is stored once in the storage section 31. Then, only when refuse stored in the storage section 31 reaches the predetermined amount (the amount substantially equal to the volume of the collector 21), the refuse in the storage section 31 is discharged into the collector 21 at once.

20 In the case where refuse falling down through the chute 11 is thrown into the collector 21 directly and intermittently, refuse is piled up like a mountain in the collector 21 because the opening of the chute 11 has an area smaller than that of the collector 21. This lowers the storage efficiency of the collector 21 and requires flattening of the mountain-like refuse by hand.

25 In contrast, in the refuse chute system S in accordance with the present embodiment, the predetermined amount of refuse once stored in the storage section 31 is discharged at once into the collector 21 from the lower end opening 34 of the storage

section 31 having a comparatively large diameter. This permits the refuse to be stored to the collector 21 evenly, thereby leading to an increase in storage efficiency of the collector 21 and eliminating the need to flatten the refuse by hand. As a result, the operation efficiency is improved as well as the safety and hygienic aspects are improved.

5 Provision of the anti-scatter covering 4 between the storage section 31 and the collector 21 prevents scattering of refuse being discharged into the collector 21 from the storage section 31, so that the refuse is stored to the collector 21 thoroughly. This further improves the safety and hygienic aspects.

Moreover, the discharge gate 32 of the storage section 31 is in a double-doored
10 structure including the pair of arc-shaped gate members 37 arching about the rotation axes X1, X2. Accordingly, even in the state where much amount of refuse is deposited in the storage section 31 to apply a load to either the arc-shaped gate members 37, the opening operation can be performed securely and stably. Rotation of the pair of arc-shaped gate members 37 achieves space saving in opening the discharge gate 32.

15 As described above, the interlocking function is employed in which: the discharge gate 32 is not opened even by ON-operation of the operation switch 66 unless the collector 21 is set at the refuse storage point and/or the anti-scatter covering 4 is set at the use point; while the discharge gate 32 is opened only when the collector 21 is set at the refuse storage point and the anti-scatter covering 4 is set at the use point. This definitely prevents
20 scattering of refuse being thrown into the collector 21. This arrangement is much effective for definitely securing the safety and hygienic aspects especially in the present refuse chute system in which the collector 21 is conveyed manually and the anti-scatter covering 4 is moved in the vertical direction manually.

According to the present invention, the anti-scatter covering 4 in the above
25 embodiment may not be moved in the vertical direction manually. For example, the anti-scattering covering 4 may be moved in the vertical direction in association with the opening/closing operation of the discharge gate 32 by providing an actuator controlled by

the controller 6. In addition, the collector 21 may be positioned at and/or be conveyed from the refuse storage point even non-manually, namely, automatically in association with the opening/closing operation of the discharge gate 32.

WHAT IS CLAIMED IS:

1. A refuse chute system comprising:

a chute arranged vertically along a building and having at least one refuse throw-in hoper, through which refuse is thrown, at a predetermined point in the middle of a vertical
5 course of the chute;

a collector which is set at a refuse storage point located below a lower end opening of the chute, which stores refuse falling down through the chute, and which is conveyed from the refuse storage point with refuse stored;

refuse storing/discharging means mounted at a lower end of the chute for
10 temporarily storing refuse falling down through the chute and including a storage section communicating with the lower end opening of the chute and a discharge gate opening/closing an opening formed at the lower end of the storage section,

wherein the discharge gate is opened when refuse stored in the storage section reaches a predetermined amount to allow the refuse in the storage section to be discharged
15 into the collector.

2. The refuse chute system of Claim 1, further comprising:

a packing member mounted at the discharge gate for water-packing the storage section.
20

3. The refuse chute system of Claim 1 or 2,

wherein the storage section has a sectional structure including an upper storage portion and a lower storage portion which are overlaid vertically with each other, and

the upper storage portion includes at a lower peripheral end thereof a fitting
25 portion fitted in an upper end opening of the lower storage portion.

4. The refuse chute system of Claim 1, further comprising:

an anti-scatter covering arranged between the refuse storing/discharging means and the collector for surrounding space between the lower end opening of the storage section and an upper end opening of the collector when refuse is discharged into the collector from the storage section.

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5. The refuse chute system of Claim 1, further comprising:

gate driving means for opening/closing the discharge gate;

an operation switch;

collector detection means for detecting a state that the collector is set at the refuse

10 storage point; and

control means for driving, upon receipt of both a detection signal from the collector detection means and an operation signal from the operation switch, the gate driving means to allow the discharge gate to be opened.

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6. The refuse chute system of Claim 5, further comprising:

an anti-scatter covering arranged between the refuse storing/discharging means and the collector for surrounding space between the lower end opening of the storage section and an upper end opening of the collector when refuse is discharged into the collector from the storage section;

20

a linking mechanism for vertically moving the anti-scatter covering between a retreat point and a use point by operation of a manual operation lever, the retreat point being a point where the anti-scatter covering is retreated upward to allow the collector to be positioned at the refuse storage point, and the use point being a point where the anti-scatter covering is moved downward for surrounding the space between the lower end

25 opening of the storage section and the upper end opening of the collector; and

covering detection means for detecting a state that the anti-scatter covering is set at the use point,

wherein the control means drives, upon receipt of each of a detection signal from the collector detection means, a detection signal from the covering detection means, and an operation signal from the operation switch, the gate driving means to allow the discharge gate to be opened.

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7. The refuse chute system of Claim 5, further comprising:

refuse amount detection means for detecting a state that refuse stored in the storage section reaches the predetermined amount; and

informing means for performing information,

10

wherein the control means operates, upon receipt of a detection signal from the refuse amount detection means, the informing means to inform an operator that the predetermined amount of refuse is stored in the storage section.

8. The refuse chute system of Claim 7, further comprising:

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warning means mounted in the vicinity of the refuse throw-in hoper for warning,

wherein the control means operates, upon receipt of a detection signal from the refuse amount detection means, the warning means to warn a user who is going to throw refuse into the chute that refuse throw-in is inhibited.