

REFUSE COLLECTION APPARATUS

FIELD OF INVENTION

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This invention relates to dealing with refuse. In particular, this invention relates to a portable apparatus for collecting refuse directly from refuse chute chambers and providing an initial treatment thereof.

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BACKGROUND

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A plethora of human activity creates a lot of environmental waste and unwanted products. These waste products are collected and disposed of regularly to maintain a clean and hygienic environment. These tasks of refuse collection and disposal often involve manual exertion. For example, in an existing refuse collection method used in apartment blocks, a two-man team empties a refuse chute into a larger container on a cart, which is then moved to a common collection centre for accumulation or compaction and further disposal. Due to limits on the size of the refuse collection container, the team has to make many trips between the apartment blocks and collection centre. These tasks are menial, and it is desirable to improve the current methods of refuse collection and their efficiencies. It is also desirable to reduce the number of human operators required.

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Some refuse is unpleasant to collect or handle, for example, kitchen waste that contains unwanted food or food scraps. Avoiding or reducing spillage of refuse or contamination from refuse during collection or disposal is also desired.

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SUMMARY OF THE INVENTION

According to an aspect of the invention, there is provided a refuse collection
5 apparatus including a driving mechanism for providing the driving means for the
refuse collection apparatus, a refuse holding bin for receiving refuse previously
contained in a chute bin, a refuse container loading mechanism for conveying
said refuse from said chute bin to said refuse holding bin, and a compaction
10 means for compressing said refuse conveyed, wherein said compaction means
is internally disposed of said refuse holding bin.

Preferably, the refuse container loading mechanism further includes an
engagement means to engage the chute bin, a lifting means for elevating said
chute bin and a tilting means to allow rotation of said chute bin so that refuse
15 previously contained in the chute bin will be discharged.

Still preferably, said engaging means includes two opposed gripping members to
provide a grip when engaging the chute bin.

20 In a preferred embodiment, the lifting means includes a lifting arm, said lifting
arm pivotally connected to a first mounting bracket on a surface, and a first
piston, engaged at one end to a mid section of the lifting arm, and the other end
pivotally engaged to a second mounting bracket at a spaced interval on said
surface, to the first mounting bracket.

25 Preferably, the surface where the first mounting bracket is provided is on a
wheeled base plate.

30 Preferably, when in use, the first piston extends and moves said lifting arm to
cause a rotation about the first mounting bracket.

Still preferably, said tilting means includes a second piston, a first end attached to a mid section of the opposed gripping members, and a second end to the lifting arm.

- 5 In a preferred embodiment, the first and second pistons are hydraulically driven.

Preferably, the first and second pistons are connected to a hydraulic pump by hydraulic lines.

- 10 In another preferred embodiment, the refuse container lifting mechanism further includes a sequence control device.

Preferably, the sequence control device controls the extension and retraction of said first and second pistons.

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Preferably when in use, the extension and retraction of said first and second pistons are timed such that the chute bin is in an upright position.

- 20 Still preferably, the rate of change in angle of the gripping members and the rate of change in angle of the lifting arm is substantially the same.

In a preferred embodiment, the apparatus further includes a frame to surround the refuse holding bin, thus providing a skeletal structure within which the refuse holding bin is housed.

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Preferably, the frame further includes biasing means, this biasing means is provided on opposed sides of an interior surface of the frame, so that when a refuse holding bin is placed within the frame, the position within the frame is maintained by virtue of the opposed biasing force of the biasing means.

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Preferably, the biasing means are springs.

In a further preferred embodiment, the frame further includes a closable cover, so that, when closed, the odour of the refuse within the refuse holding bin will be maintained within the refuse holding bin.

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In another preferred embodiment, the refuse holding bin further includes a sanitary system.

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Preferably, the sanitary system includes an air treatment hose in connection to an air maintenance unit, said air treatment hose removably connected to an interior of the refuse holding bin at one end, and at the other end, to the air maintenance unit.

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Still preferably, said air maintenance unit is a pump and a filter, wherein the pump draws air from the interior of the refuse holding bin and through the filter, to remove odour or contaminants from the drawn air, before the drawn air is introduced back to the environment.

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In a preferred embodiment, the air maintenance unit is driven by the driving mechanism, so that, when the driving mechanism is powered, the air maintenance unit is powered as well.

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In another preferred embodiment, the air maintenance unit is driven by a power source other than the driving mechanism, so that when the driving is not activated, the air maintenance unit can still be powered.

Preferably, said sanitary system further includes a disinfectant dispenser at an interior of said refuse holding bin.

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Still preferably, said sanitary system further includes a drain line extending from an interior to an exterior of the refuse holding bin, and a drain pan.

In yet another preferred embodiment, the compaction means is a retractable arm and a panel, said panel driven by, and transverse to the retractable arm.

- 5 Preferably, the panel further includes at least one pressure sensor to detect the pressure sensed by the panel when the panel is being retracted by the retractable arm.

Still preferably, the pressure sensor is in communication with the retractable arm.

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Still preferably, the pressure sensor further includes a comparator.

- Preferably, the comparator compares the pressure sensed by the panel and a predetermined pressure, such that, above a pre-determined pressure, the retractable arm will not retract further, and thus, the panel, and the retractable arm will not have to endure undue stress, which may lead to premature failure of the system

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In a preferred embodiment, said refuse container loading mechanism and said refuse holding bin is mounted on at least one wheeled base plate.

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DESCRIPTION OF FIGURES

- In order that the invention might be more fully understood, embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

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Figure 1 shows a preferred embodiment of the present invention.

- 30 Figure 2 shows a preferred embodiment of the present invention when in use.

Figure 3 shows a preferred embodiment of the refuse container loading mechanism when depositing refuse into the refuse holding bin.

Figure 4 shows the compaction means in a preferred embodiment.

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DETAILED DESCRIPTION OF INVENTION

Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims. Furthermore, in the following detailed description of embodiments of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present embodiment.

Figure 1 shows the preferred embodiment of a refuse collection apparatus 100 of the present invention. This apparatus 100 has a driving mechanism 10, shown in Figure 1 as a cart 11. The refuse collection apparatus 100 further includes a refuse holding bin 20, a refuse container loading mechanism 30 and a compaction means 40 (seen in Figure 4) internally disposed within the refuse holding bin 20. The refuse holding bin 20 and the refuse container loading mechanism 30 may be united with the cart 11 by virtue of a series of base plates with wheels, forming wheeled base plates 12 and corresponding anchor point and hook arrangements 13, or the refuse collection apparatus 100 may be fitted with one wheeled base plate 12, with an anchor point and hook arrangement 13 to the cart 11, so that the refuse collection apparatus 100, is mobile.

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The refuse holding bin 20 and the refuse container loading mechanism 30 may be mounted on individual wheeled base plates 12, or they may be mounted on a

single wheeled base plate. Further, the wheeled base plate 12 may easily be substituted by incorporating wheels onto the base of the refuse holding bin 20 and refuse container loading mechanism 30, respectively.

- 5 The preferred embodiment of Figure 1 shows the refuse holding bin 20 and the refuse container loading mechanism 30 on a single wheeled base plate 12. The portion of the wheeled base plate 12 corresponding to the refuse holding bin 20 may further include a frame 110 surrounding the refuse holding bin 20. This frame 110, preferably in the form of a rectangular cage frame 111, is preferably
- 10 integral with the portion of the wheeled base plate 12. The frame 110 forms a support for a cover 21, mounted across the top of the frame 110. The refuse holding bin 20 and the refuse container loading mechanism 30 may be mounted on individual wheeled base plates 12 so that maintenance of each individual component, or the replacement of each individual component will be more
- 15 convenient thus, when a particular component needs to be serviced or replaced, a user will only need to remove the affected component. By hooking on a replacement component, the whole apparatus 100 can be used and as such, the downtime for the apparatus 100 will be minimized.
- 20 The frame 110 may further include biasing means 120, provided on the inner surface of the frame 110, to maintain a position of the refuse holding bin 20 within the wheel based plate 12. In the preferred embodiment of Figure 1, the biasing means 120 are provided on opposed ends of the frame 110.
- 25 In use, the refuse container loading mechanism 30 collects a chute bin 80 containing refuse (not shown in the figure) elevates this bin 80 to a pre-determined height to allow deposition of this refuse into a refuse holding bin 20. The refuse holding bin 20 further includes a cover 21, which pivots to an open position, uncovering the refuse holding bin 20, when refuse is to be deposited.
- 30 Thus, it is to be appreciated that when the refuse holding bin 20 is full, it can be easily removed from the frame 110, and a new refuse holding bin 20 can be

inserted. This cover 21 is maintained in a closed position otherwise, to minimise the propagation of foul smells usually associated with the presence of refuse. As an illustration, Figure 1 shows the refuse holding bin 20 in a closed position, and in Figure 2, an open position when refuse is to be deposited therein.

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In another embodiment, the refuse collection apparatus 100 includes a means to transport further refuse holding bins 20, so that the apparatus 100 as a whole can accommodate more refuse. A particular means would include incorporating a further wheeled base plate 12, to transport refuse holding bins 20, or to have a
10 bigger wheeled base plate 12, to house at least 2 refuse holding bins 20, on the same wheeled base plate 12.

Thus, when a refuse holding bin 20 is full, it can be substituted with another bin, already on the apparatus 100. A cover is preferably provided for a filled refuse
15 holding bin 20, to prevent odours from emanating from it.

To further minimise the odours from emanating from the refuse holding bin 20, the refuse collection apparatus 100 is further equipped with a sanitary system 50. This sanitary system 50 may consist of an air treatment hose 51 removably
20 connected to an air maintenance unit 52 at one end, and connected to an interior of the refuse holding bin 20 on the other. To allow a connection to the interior, the cover 21 is made with a bore hole with internal screw threads to allow the air treatment hose 51 to be screwably engaged to the cover, and exposed to the interior of the refuse holding bin 20. The air maintenance unit 52 may be an air
25 filtration unit 53, or a scrubber system 55, or both. To effectively remove odours, the air filtration unit 53 may be incorporated with activated carbon filters 54, or any other filter, which enables the removal of odours to be obtained effectively.

The air filtration unit 53 also serves to remove contaminants from the drawn air,
30 and as a result, only filtered air is introduced back to the environment.

In an embodiment, the air filtration unit 53 is powered by the driving mechanism 10.

However, it is also envisioned that the air filtration unit 53 is powered by a separate power source, so that when the driving mechanism 10 is not activated, the air filtration unit 53 can still be independently powered.

The sanitary system 50 may further include disinfectant dispensers 56, in the form of a nozzled spray bottle, to provide a preliminary treatment to the refuse. The disinfectant dispensers 56 may be positioned at an interior of the refuse holding bin 20, or the bottle may be positioned at an exterior of the refuse holding bin 20, with an orifice to allow a nozzle of the disinfectant spray therethrough. The dispenser 56 may be mechanically connected to the cover 21, so that the mechanical motion of closing the cover 21, activates the dispenser 56 as well. Thus, the dispenser will dispense preferably when the cover 21, is closed. The dispenser 56 can also be dispensed by timing means, so that it will dispense after a predetermined period of time, or further, it can be activated by a user depressing a button connected to the dispenser, allowing the dispenser to dispense the disinfectant into the interior of the refuse holding bin 20.

To remove liquid wastes that may be present in the refuse, the refuse holding bin 20 may include drain lines 57 within the interior, to allow liquid wastes to be conveyed to an exterior of the refuse holding bin 20, and preferably channelled into a drain pan 58, not seen in the figures. This drain pan 58 can be enclosed, such that the odours will not diffuse into the environment.

The sanitary system 50 may be one or all of the features of above or in a combination of any of the features above without departing from the spirit of the invention.

Figure 2 shows the refuse collection apparatus 100 when in a use position. The refuse container loading mechanism 30 is shown in an extended position, and subsequent retracted positions in dashed lines. The refuse container loading mechanism 30 consists of 'U' shaped lifting arms 61 in a pivotal connection at a first mounting bracket 62 on a base plate 12 at one end. At a distal end, the engagement means 70 is conveyed. The lifting means 60 moves in a rotary motion, with the aid of an actuating mechanism 63, in the form of a first piston 64, which may be pneumatically or hydraulically driven. This first piston 64 is rotatably engaged to a second mounting bracket 65. Thus in a timed extension of the first piston 64 together with the rotation of the first piston 64 about the second mounting bracket 65, the lifting arm 61 can be made to rotate to a transverse position the extended position to the final retracted position. The lifting arm 61 can be provided with a bumper 66 so that, in the retracted position, the lifting arm 61 can be made to rest on the base plate 66, without damage to the surface of the lifting arm 61 or the wheeled base plate 12. To provide a larger clearance between the lifting arm 61 and the wheeled base plate 12, a corresponding bumper 66 may be fitted on the surface of the wheeled base plate 12 to be in contact with the bumper 66 of the lifting arm 61 when in a retracted position.

The engagement means 70 includes 2 opposed gripping members 71, pivotally connected to a distal end 73 of the lifting arm 61. To control the pivotal rotation about the point 73, a second piston 94 is engaged from a midsection 72 of the gripping members 71 to a point 75 on the lifting arm 61. This point 75 can be varied along the length of the lifting arm 61 and depends only on the length of the cylinder and rod of the second piston 94.

When the refuse collection apparatus 100 is in use, an operator drives the cart 11 to a location close to where the chute bin 80 is held. Once the cart 11 is parked, the operator will then activate the refuse container loading mechanism 30. The cover 21 made integral with the frame 110 will be caused to open. Once activated, the lifting arm 61 moves, by virtue of the movement of the first piston

64 from a retracted position to an extended position where the lifting arm 61 is seen in an inverted 'U' structure. The engagement means 70 in the form of the opposed gripping members 71 will come together to retain the chute bin 80. The gripping members can be corrugated to provide better frictional resistance and to prevent slippage of the chute bin 80. When returning to the retracted position, the first piston 64 will extend, causing an anti-clockwise movement about the first mounting bracket 62 as seen in Figure 2. At an intermediate stage, the second piston 94 will allow an extension so that, the chute bin 80 will be maintained in a substantially upright position till the lifting arm 61 is returned to its retracted position.

Figure 3 shows the lifting arm 61 in its retracted position with the second piston 94 fully extended. To remove refuse from the chute bin 80 and deposit into the refuse holding bin 20, the second piston 94 is caused to retract and the gripping members 71 rotate about the pivotal point 73 to cause a tipping motion, and the refuse will be caused to tip out and into the refuse holding bin 20. Once the refuse is removed from the chute bin 80, the second piston 94 then reverses the process to return the chute bin 80 to the ground.

The activation of the refuse container loading mechanism 30 can be by a single button, or it may be a series of buttons to activate the various components of the refuse container loading mechanism 30. Further, the sequence of the pistons can be derived from any timing arrangement in the form of a sequence control device known in the art. The timing arrangement is made, such that the chute bin 80 will be maintained in an upright position as the lifting arm 61 rotates about the first mounting bracket 62. Thus, as an illustration, the timing is such that the rate of change in angle of the gripping members in relation to the distal end of the lifting arm is the same as the rate of change in angle of the lifting arm in relation to the base plate 12. The pistons are shown to be hydraulically driven, with hydraulic lines 91 driven by a hydraulic pump 90. In an embodiment, the hydraulic pump 90 is driven by the driving mechanism 10.

Once the refuse is contained within the refuse holding bin 20, the cover 21 is closed. As seen in Figure 4, the compaction means 40, in the form of a retractable half frame 41 extending across the depth of the refuse holding bin 20 will then retract, thereby to compact the refuse contained therein. The
5 compaction means 40 can also be a panel supported by retractable arms. Further the compaction means 40 can be fit with pressure sensors in communication with the retractable arms and the panel and to a comparator programmed with a pre-determined pressure value, such that above a
10 predetermined pressure value, the compaction means 40 will cease to retract further, thereby preventing undue stress on the compaction means 40.

CLAIMS

1. A refuse collection apparatus including

5 a driving mechanism for providing the driving means for the refuse collection apparatus;

a refuse holding bin for receiving refuse previously contained in a chute bin;

10 a refuse container loading mechanism for conveying said refuse from said chute bin to said refuse holding bin; and

a compaction means for compressing said refuse received in said refuse holding bin;

wherein said compaction means is internally disposed of said refuse holding bin.

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2. A refuse collection apparatus according to claim 1 wherein said refuse container loading mechanism further includes an engagement means to engage the chute bin; a lifting means for elevating said chute bin; and a tilting means to allow rotation of said chute bin so that refuse previously contained in the chute
20 bin will be discharged into the refuse holding bin.

3. A refuse collection apparatus according to claim 2 wherein said engaging means includes two opposed gripping members to provide a grip when engaging the chute bin.

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4. A refuse collection apparatus according to any one of the claims 2 or 3, wherein the lifting means includes a lifting arm, said lifting arm pivotally connected to a first mounting bracket on a surface, and a first piston, engaged at one end to a mid section of the lifting arm, and the
30 other end pivotally engaged to a second mounting bracket at a spaced interval along said surface to the first mounting bracket.

5. A refuse collection apparatus according to claim 4 wherein said surface is provided on a wheeled base plate.

6. A refuse collection apparatus according to claim 4, where in use, the first
5 piston extends and moves said lifting arm to cause a rotation about the first mounting bracket.

7. A refuse collection apparatus according to any one of claims 2 or 4
10 wherein said tilting means includes a second piston, a first end attached to a mid section of the opposed gripping members, and a second end to the lifting arm.

8. A refuse collection apparatus according to any one of the preceding
15 claims wherein the first and second pistons are hydraulically driven to drive the pistons.

9. A refuse collection apparatus according to claim 8 wherein said first and
second pistons are connected to a hydraulic pump by hydraulic lines.

10. A refuse collection apparatus according to any one of the claims 2 to 9
20 wherein the refuse container lifting mechanism further includes a sequence control device.

11. A refuse collection apparatus according to claim 10 wherein the sequence
25 control device controls the extension and retraction of said first and second pistons.

12. A refuse collection apparatus according to any one of the preceding
30 claims where in use, the extension and retraction of said first and second pistons are timed such that the chute bin is in an upright position.

13. A refuse collection apparatus according to claim 11 wherein the rate of change in angle of the gripping members and the rate of change in angle of the lifting arm is substantially the same.

5 14. A refuse collection apparatus according to claim 1, wherein said apparatus further includes a frame to surround the refuse holding bin.

15. A refuse collection apparatus according to any one of claims 5 or 14, wherein said frame is made integral with the wheeled base plate.

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16. A refuse collection apparatus according to any one of claims 14 or 15, wherein said frame further includes biasing means.

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17. A refuse collection apparatus according to claim 16 wherein said biasing means are provided on opposed sides of the frame to maintain a position of the refuse holding bin.

18. A refuse collection apparatus according to any one of claims 14 to 17, wherein said frame further includes a closable cover.

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19. A refuse collection apparatus according to claim 1 wherein the refuse holding bin further includes a sanitary system.

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20. A refuse collection apparatus according to claim 19 wherein the sanitary system includes an air treatment hose in connection to an air maintenance unit, said air treatment hose removably connected to an interior of the refuse holding bin at one end, and to the air maintenance unit at the other end.

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21. A refuse collection apparatus according to claim 20, wherein said air maintenance unit is a pump and a filter, wherein the pump draws air from the

interior of the refuse holding bin and through the filter to remove odour from the drawn air.

22. A refuse collection apparatus according to claim 21, wherein the air
5 maintenance unit is driven by the driving mechanism.

23. A refuse collection apparatus according to claim 21, wherein the air
maintenance unit is driven by a separate power source.

24. A refuse collection apparatus according to any one of claims 1 or 19
10 wherein said sanitary system further includes a disinfectant dispenser at an
interior of said refuse holding bin.

25. A refuse collection apparatus according to any one of claims 1 or 19
wherein said sanitary system further includes a drain line extending from an
15 interior to an exterior of the refuse holding bin, and a drain pan.

26. A refuse collection apparatus according to claim 1 wherein the compaction
means is a retractable arm and a panel, said panel, driven by, and transverse to
the retractable arm.
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27. A refuse collection apparatus according to claim 26, wherein the panel
further includes at least one pressure sensor.

28. A refuse collection apparatus according to any one of claims 26 to 27,
25 wherein the pressure sensor is in communication with the retractable arm.

29. A refuse collection apparatus according to any one of claims 26 to 28,
wherein the pressure sensor further includes a comparator.

30. A refuse collection apparatus according to any one of claims 26 to 29
30 wherein the comparator compares the pressure to a predetermined pressure,

such that, above a pre-determined pressure, the retractable arm will not retract further.

31. A refuse collection apparatus according to any one of the preceding
5 claims wherein said refuse container loading mechanism and said refuse holding
bin is mounted on at least one wheeled base plate.