

CHUTE INTERMEDIATE STORAGE SYSTEM AND METHOD OF CONVEYING REFUSE THEREOF

FIELD OF INVENTION

This invention relates to a system of allowing an intermediate storage in substantially vertical chute systems.

BACKGROUND OF THE INVENTION

Centralised chute systems for the conveyance of material within multi-storey buildings, or between a multiple of floors, are known in the art. An example of this would be the centralised refuse chute systems in multi-storey buildings, for the conveyance of refuse from a multiple of refuse hoppers, found on individual floors, to a centralised refuse storage room or bin, usually housed at the bottom of the chute.

Where centralised refuse chutes service particularly high-rise buildings, the amount of refuse inserted into the chutes, via the refuse hoppers, in a short period of time may be very large, and the amount of refuse gathering in the chute chambers frequently become high between the periodic emptying of the refuse from the chamber. This will lead to an eventual overflow of refuse gathering in bins or other equipment at the chute chamber.

Increasing the frequency of emptying may alleviate the problem of overflow at the chute chambers, but it may not be economically viable in the long term.

Another method of solving this problem is to create a larger refuse storage room or bin, to house the incoming refuse. Unfortunately, an increased storage room size will spoil the aesthetic appearance of the building, and the increased volume of stored refuse will create foul smells and may be a health risk. This is especially so should a proper air displacement and sanitisation system not be put in place. This may eventually degrade the value of the households or commercial units within the multi-storey building.

In prime or land scarce areas, having an increased refuse storage room size may not even be an option.

Additional problems exist where accumulated refuse at the bottom of the chute are compacted by the impact of objects falling from great heights. A dense slug of material may form, giving rise to collected refuse being embedded at the bottom of the refuse bins. This creates difficulty for a refuse collector when attempting to remove the refuse from the refuse bins. In extreme cases, temporary interruptions to the use of the refuse chute may even occur.

There have been attempts to address the problem relating to refuse waste management.

Provision of additional chutes

As detailed in US 3,887,053, this arrangement of refuse chutes involved two separate refuse chutes to be provided throughout the building. This system not only increases the overall costs of managing waste, the provision of an additional refuse chute also requires space. Thus, for example, in pre-existing building structures, the provision of an additional refuse chute will be even more problematic.

Controlling refuse discharge

This method adopts a system of an underground vacuum transport pipe for removing refuse from a centralised chute storage, to another location for eventual final disposal or further treatment. This system involves openable and closeable discharge valves to communicate between a centralised refuse chute, with the underground piping system. While this system allows a building developer to do away the need for a centralised storage room at the bottom of each building, the underground vacuum transport system requires an airtight seal to be maintained, which can prove to be a costly affair.

There is thus a need to provide an economic waste management system, which can even be retrofitted on existing refuse chutes so as to assure convenience of the people living or working within the building, and also to do away the need for a large chute chamber to allow better usage of floor space .

SUMMARY OF THE INVENTION

According to the invention, there is provided a material management system, to be incorporated within a substantially vertical chute system in a multi-storey building, including a substantially vertical chute for the conveyance of material from a hopper to a

subsequent storage container or room, at least one intermediate storage unit within said substantially vertical chute, said intermediate storage unit having a releasing means, a determination means to determine the amount of material within said at least one intermediate storage unit, said determination means coupled to a pre-set characteristic value, wherein the determination means is in communication with said releasing means to release the material stored within the intermediate storage unit, above a pre-determined characteristic value for the material, as determined by the determination means, to the bottom storage container or room.

Preferably, the releasing means is a sliding plate.

Still preferably, the releasing means is a punch-through mechanism to enact a vertical force on accumulated material within said intermediate storage unit to cause the accumulated material fall downwards.

Preferably, the punch-through mechanism includes a retractable claw.

Still preferably, the punch-through mechanism is housed within a removable cover.

In another preferred embodiment of the present invention, the releasing means further includes an ejector plate to enact a horizontal force on accumulated material in order to move the accumulated material to the chute opening within said intermediate storage unit.

In a preferred embodiment, the determination means is a detector to detect a pre-determined characteristic value of refuse within the intermediate storage unit.

Preferably, the characteristic value is a height of material within the intermediate storage unit.

Still preferably, the characteristic value is a weight of material within the intermediate storage unit.

In a preferred embodiment, the sensor is an infrared detector.

In a still further preferred embodiment, the system further includes an air-displacement

pipe to allow a displacement of air within the chute.

Preferably, the air-displacement pipe extends to an outlet of the chute.

Still preferably, the outlet is at the top of the building.

In yet another preferred embodiment, the intermediate storage unit further includes a breakfall mechanism to prevent direct impact of material discharged on to the release mechanism

Preferably, the breakfall mechanism is hingedly connected to a side of the chute to allow a rotational movement when material is impacted on said breakfall mechanism.

Still preferably, the breakfall mechanism further includes a cushioning layer.

In a preferred embodiment, the releasing means can be activated manually.

In yet another preferred embodiment, the intermediate storage unit further includes a cleaning system.

Preferably, the cleaning system is a flushing system to flush liquid wastes towards the bottom of the chute.

Still preferably, a base plate of the intermediate storage unit is inclined.

According to another aspect of the invention, there is provided an intermediate storage unit, adapted to be used in any one of the preceding claims including a releasing means, a determination means to determine the amount of material within said at least one intermediate storage unit, said determination means coupled to a pre-set characteristic value, wherein the determination means is in communication with said releasing means to discharge material stored within the intermediate storage unit, above a pre-determined characteristic value for the refuse, as determined by the determination means, to a subsequent intermediate storage unit.

Preferably, the subsequent intermediate storage container or room is a bottom storage container or room.

Preferably, the intermediate storage unit further includes a fire-proof mechanism.

Still preferably, the fire-proof mechanism includes a heat activated fire represser.

Still preferably, the fire-proof mechanism includes a smoke activated fire represser.

According to yet another aspect of the invention, there is provided a releasing means, adapted to be used in any one of the preceding claims wherein said ejector plate and punch through mechanism include linear actuators motivated by any one or a combination of rotary, electronic, hydraulic, pneumatic or chain driven motivation sources.

According to still another aspect of the invention, there is provided a method of conveying material within a chute system in a multi-storey building, whereby the material within each intermediate storage unit is released in tandem.

According to another aspect of the invention, there is provided a method of conveying material within a chute system in a multi-storey building including the steps of turning on an activation button, said activation button in communication with said intermediate storage unit, opening up the sliding plates, activating the release mechanism, sensing the intermediate storage unit is clear using a sensing means, and closing the sliding plates.

Preferably, the method is programmed into a programmable logic controller.

Still preferably, the activation button activates the programmable logic controller.

Preferably, the sensing means is a sensor.

Preferably, the release mechanism is a punch-through mechanism.

Still preferably, the release mechanism further includes an ejector plate.

According to yet another aspect of the invention, there is provided a method of preventing an overload of an intermediate storage unit including the steps of determining an overload situation in a first intermediate storage unit in comparison with a pre-set

characteristic value, establishing a second intermediate storage unit below for an overload situation in comparison with a pre-set characteristic value, discharging material from a first intermediate storage unit to a second intermediate storage unit when said second intermediate storage unit is not in an overload condition.

Preferably, the method is programmed into a programmable logic controller.

Still preferably, the determination means is a sensor.

In a preferred embodiment, the determination means will sense a next intermediate storage unit below for an overload situation when said first and second intermediate storage units are in an overload situation.

Preferably, the overload situation is a pre-set characteristic value.

Still preferably, the pre-set characteristic value is a level of material within said intermediate storage unit.

Preferably, the pre-set characteristic value can be programmed into a programmable logic controller.

In yet another aspect of the invention, there is provided a method of managing material within a chute system wherein an alert occurs through an alert means when the sensor malfunctions.

Preferably, the alert means is a visual indicator or sound emitting device.

Still preferably, the alert means is a light emitting diode.

In a preferred embodiment, the method of managing material within a chute system further includes the steps of turning on an activation button, said activation button in communication with said intermediate storage unit, opening up the sliding plates, activating the release mechanism, sensing the intermediate storage unit is clear using a determination means, and closing the sliding plates.

Preferably, the release mechanism is a punch-through mechanism.

Still preferably, the release mechanism further includes an ejector plate.

DRAWINGS

Embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a comparison between the current centralised refuse chute system of the art, and the material management system of the present invention.

Figure 2 shows the side elevation view of the intermediate storage unit of the present invention.

Figure 3 shows the side elevation of the punch-through mechanism, in use.

Figure 4 shows the side elevation of the ejector plate.

Figure 5 shows the flow chart of material conveyance within the chute system of the present invention.

Figure 6 shows the flow chart in an overloading situation of the invention.

Figure 7 shows the flow chart in a sensor malfunction situation.

DETAILED DESCRIPTION OF THE 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 the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill of the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and features have been described in detail as not to

unnecessarily obscure aspects of the present invention.

The description sets forth, in particular, the invention in use within a refuse chute system, but it is envisioned that this system can similarly be used in any conveying system for the conveyance of material including but not limited to refuse.

Figure 1 shows the side elevation of a refuse chute system 1000, where the intermediate storage unit 2000 is integrated. The intermediate storage unit 2000, is shown in a unit within the refuse chute system 1000, but can be adopted in a plurality of intermediate storage units, preferably in equally spaced intervals throughout the refuse chute system 1000. It should be understood that each intermediate storage unit 2000 can be described the same way, and reference and detailed explanations directed towards an intermediate storage unit 2000 will apply to other subsequent intermediate storage units.

Figure 2 shows an enlarged view of an intermediate storage unit 2000. The intermediate storage unit 2000 is a sectioned unit within the refuse chute system 1000. The determination means 2100 is shown in its preferred embodiment as a sensor 2110, positioned within the intermediate storage unit 2000, where the sensor 2110 is a level sensor 2111, to detect the level of refuse accumulated within the intermediate storage unit 2000. This level sensor 2111 is operatively connected to the release mechanism 2200, to release the refuse within the intermediate storage unit 2000 when a predetermined characteristic value of refuse is detected. It is to be understood that this disclosure does not limit the type of sensor to a level sensor, and includes weight sensors, especially where the refuse or material to be conveyed are homogenous products. Any type of sensor capable of sensing the continued presence of refuse within the intermediate storage unit 2000 may be employed by the present invention, as long as the sensor does not interfere with the normal operation of the refuse chute system 1000. The means of activating the sensors is by no way to be limited, and examples include mechanical, optical and ultrasonic sensors.

As shown in Figure 2, when the predetermined characteristic value is detected by the sensor 2110, shown in the preferred embodiment as a level sensor 2111, a signal is sent to the release mechanism 2200. The release mechanism 2200 includes a punch-through mechanism 2210, an ejector plate 2220 and a sliding plate 2230. The sliding plate 2230 slides open, allowing the accumulated refuse to leave the intermediate storage unit 2000 therethrough. To ensure a complete discharge and to ensure there is no blockage of the

accumulated material, the ejector plate 2220 provides a horizontal force towards the opening of the sliding plate 2230, whereas the punch-through mechanism provides a vertical force. The punch through mechanism 2210 extends by way of an extendible claw 2211, to push the refuse through the opening of the sliding plate 2230. This extendible claw 2211 will then retract towards its housing which is encased in a protection cover 2213. Thus, the extendible claw 2211 expands on a downward motion and retracts with a minimal upward pulling force due to the angle of the retracted claw. Thus it can be seen that the retracted claw will not be obstructing the material accumulating at the opening at the base plate even when the sliding plate is closed. It is also seen in a preferred embodiment, that the base plate of the intermediate storage unit 2000 is inclined. In an inclined configuration, it is envisioned that the ejector plate 2220 may not be required, to allow the refuse to exit the intermediate storage unit 2000 as the refuse will move towards the opening of each sliding plate 2230 by virtue of gravitational forces.

The level of inclination of the sliding plate 2230 is a balance between the rate of discharge of the refuse within the intermediate storage unit 2000, and the effective volume for refuse storage of the intermediate storage unit 2000. Thus, for a sharp incline for the base plate of the intermediate storage unit 2000, it can be seen that an ejector plate 2220 will not be needed to clear the refuse within the intermediate storage unit 2000, and the rate of discharge of refuse within the intermediate storage unit 2000 is seen to increase as compared to a base plate with a gradual incline. To further enhance the release of the material within the intermediate storage unit 2000, the sliding plate 2230 can further be controlled by means of reciprocation opening and closing movement.

It is also advantageous that the base plate of the intermediate storage unit 2000 is inclined as liquids that may be disposed within the intermediate storage unit will also be allowed to flow through the chute opening below each sliding plate by virtue of gravitational forces.

Further, with a cleaning system in the form of a flushing system, cleaning liquid can be dispensed from the top of the chute, and be allowed to drain down towards the refuse storage room, and hence cleaning the chute system 1000.

A breakfall mechanism 2300 is hingedly connected to a side of the intermediate storage unit 2000, positioned advantageously to prevent a direct impact on the punch-through mechanism 2210, which will in turn break the fall of the falling refuse so that the

compaction of refuse within the chute 1000 will be minimized.

Further, the release mechanism 2200 can be activated by a timing mechanism, not seen in the figures. The programmed timings will coincide with a refuse discharge vehicle to allow the refuse accumulated within individual intermediate storage units to discharge towards the chute chamber or bin, and finally into the refuse collecting vehicle.

In a preferred embodiment, a master control, also in the form of switches, is provided, preferably at the bottom of the refuse chute. This master control switch, will allow the timing mechanism to activate individual release mechanisms 2200 for refuse discharge within the chute 1000.

As seen in Figure 2, an air-displacement channel 2400, which runs from the bottom side opening of the hopper to the top of the intermediate storage unit 2000 is created within the intermediate storage unit 2000. This forms a bypass to the bottleneck created by the intermediate storage unit 2000. The air displacement channel could also be branched off to a direct outlet, preferably at the top end of the multi-storey building. This prevents a potential build up of foul smells within the refuse chute, thus creating a more pleasant environment to users.

Figure 3 shows a close up elevation view of the punch-through mechanism 2210, where the extendible claw 2211 is seen in an extended position. The individual claws 2214 are hinged on the central spine 2215 to provide a preferably limited extension from the vertical axis to between 60° to 90°. A pneumatic actuator 2216 provides the reciprocating movement of the extendible claw 2211.

The punch-through mechanism 2210 is preferably housed within a protection cover 2213, to provide a protective guard against falling refuse. Further, a breakfall plate 2300 is hingedly positioned above the protection cover 2213. A cushioning layer 2310 allows the impact from falling material to be reduced. It also reduces noise generated due to the impact of the falling material on the breakfall plate 2300. Further noise reduction could be effected by means of lining the breakfall plate with resilient material.

Figure 4 shows a detailed view of the ejector mechanism 2220, where the ejection is mechanised by a pneumatic cylinder 2221, pushing out the ejector plate 2222. In a preferred embodiment, a refuse guiding plate 2500 is positioned atop the ejector to allow

fallen refuse to collect by the ejector plate 2222.

It is understood that the release mechanism 2200 can also be activated manually, whereby a refuse collector can, by depressing a control switch, not shown in the figures, allow the release mechanism 2200 to be activated. This is preferred in a scenario where the sensors 2110 are undergoing maintenance, or where the sensors 2110 are faulty. The control switch is preferably placed at the bottom of the chute, so that a refuse collector can easily activate this switch when required.

Figure 5 shows a flow chart of the method of discharging material. Once the control button is activated, a pre-set programme, preferably using a programmable logic controller, is activated. In this programme, the release mechanism at all intermediate storage units 2000 is allowed to work in tandem. This simultaneous release keeps the collection time minimum. The release mechanism consists of the sliding plate, the punch-through mechanism and the ejector plates, as previously described. As previously explained, for an intermediate storage unit with an inclined base, the release mechanism need not include the ejector plates, as, by virtue of the inclined base, the refuse will gather at the opening of the sliding mechanism and does not require a horizontal force to be enacted on the refuse.

Once the intermediate storage unit is clear, as determined by the determination means, which, in a preferred embodiment is an infra red detector, the release mechanism 2200 will then stop activation. It is to be understood that this method of discharging will continue should the intermediate storage unit not be clear, as determined by the determination means, as previously explained.

In this preferred method to prevent the overloading of refuse within an intermediate storage unit 2000 below, the refuse can be discharged to a subsequent intermediate storage unit 2000, thus providing an automatic means of levelling the amount of refuse within each individual intermediate storage unit 2000. Thus, it can be seen that the refuse load of the multi-storey building can be advantageously re-distributed, for as many intermediate storage units there are within the refuse chute, thus lessening the requirement for a large refuse storage room or bin at the bottom of the multi-storey building, thus optimising storage space and design volume of intermediate storage unit as seen in the flow chart of Figure 6.

As seen in Figure 6, an overload situation is detected by a sensor. It is understood that the overload situation is a value in determination of the storage space within each intermediate storage unit. In an example, an overload situation is 70% of the storage space within the intermediate storage unit, and once this situation is reached, the sensor will respond with an overload situation, and will automatically activate the programmable logic controller to activate the steps in relation to an overload situation. The programme within the programmable logic controller is such that, once an overload situation is detected in an intermediate storage unit, denoted as the n^{th} unit for ease of reference, the system first establishes if the n^{th} unit is the last intermediate storage unit. Should the n^{th} unit be the last intermediate storage unit, an alert means will be activated to alert for maintenance or a refuse collector, to clear the refuse accumulated within the chute 1000. Should the n^{th} intermediate storage unit not be the last intermediate storage unit, then the next subsequent intermediate storage unit, or the $(n+1)^{\text{th}}$ unit, is checked for an overload situation. Should this next subsequent intermediate storage unit not be in an overload situation, i.e. within a safety level, then the refuse of the n^{th} intermediate storage unit will be discharged to this subsequent, or $(n+1)^{\text{th}}$ intermediate storage unit. However, should the scenario be such that the $(n+1)^{\text{th}}$ intermediate storage unit also be in an overload situation, a $(n+2)^{\text{th}}$ intermediate storage unit is detected for an overload situation. In the situation where the $(n+2)^{\text{th}}$ intermediate storage unit is not in an overload situation, the $(n+1)^{\text{th}}$ intermediate storage unit will discharge to the $(n+2)^{\text{th}}$ intermediate storage unit, and the n^{th} intermediate storage unit will discharge to the $(n+2)^{\text{th}}$ intermediate storage unit. This process is repeated till an intermediate storage unit 2000 is detected within a safety level. Thus, the refuse within each intermediate storage unit is distributed, and the chute system as a whole, will be able to maximise the storage of the total designed volume of the system by distribution the material, wherever possible.

However, should the intermediate storage unit detected in an overload situation be of the last intermediate storage unit 2000, then an alert will be generated for maintenance, or a refuse collector, to clear the refuse accumulated within the chute 1000.

In a sensor malfunction situation, the method of managing the waste within the chute system can be seen in the flowchart of Figure 7. The logic is preferably programmed into a programmable logic controller. Once a sensor malfunction scenario is detected, an alert will be generated. This alert is preferably visual, and be a light emitting diode, but it may also be an audio or wireless signal to a remote location, preferably a control station, where a refuse collector will be alerted during collection. In parallel, the lowest

intermediate storage unit with a sensor malfunction will be identified. The subsequent intermediate storage unit will then be activated in a 'collection mode', as described earlier and illustrated in Figure 5. For the intermediate storage units above or prior the intermediate storage unit detected with a malfunction sensor, the sensor malfunction mode will be activated, as illustrated in Figure 7. In this mode, the releasing means are activated. As previously explained, the releasing means comprise at least a sliding plate and a punch through mechanism. Ejector plates are preferably included only where the level of inclination of the base plate of the intermediate storage unit is not great, and would require a horizontal force to be enacted on the accumulated refuse within the intermediate storage unit, to exit via the sliding plate.

The highest operating intermediate storage unit stops activation of the release mechanism after a pre-determined time, which, in a preferred example, is 5 minutes. This pre-determined time can be determined by a user, for example the building manager or estate manager, and can be changed to suit the needs of the chute system by manipulating a timing mechanism. This timing mechanism can be programmed into the programmable logic controller.

CLAIMS

1. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building, including
 - a substantially vertical chute for the conveyance of material from a hopper to a bottom storage container or room;
 - at least one intermediate storage unit within said substantially vertical chute, said intermediate storage unit having a releasing means;
 - a determination means to determine the amount of material within said at least one intermediate storage unit, said determination means coupled to a pre-set characteristic value;
 - wherein the determination means is in communication with said releasing means to discharge refuse stored within the intermediate storage unit, above a pre-determined characteristic value for the refuse, as determined by the determination means, to the bottom storage container or room.
2. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 1, wherein the releasing means is a sliding plate.
3. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to any one of the preceding claims wherein the releasing means further includes a punch-through mechanism to enact a vertical force on accumulated refuse within said intermediate storage unit.
4. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to any one of the preceding claims, wherein the releasing means still further includes an ejector plate to enact a horizontal force on accumulated refuse within said intermediate storage unit.
5. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 3 wherein the punch-through mechanism includes a retractable claw.
6. A material management system, to be incorporated within a substantially vertical

chute system in a multi-storey building according to claim 5 wherein the punch-through mechanism is encased within a removable cover.

7. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building claim 1, wherein the determination means is a sensor to detect a pre-determined characteristic value of material within the intermediate storage unit.
8. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 7 wherein the characteristic value is a height of material within the intermediate storage unit.
9. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 7 wherein the sensor is an infrared detector.
10. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 1 wherein the system further includes an air-displacement pipe to allow a displacement of air to bypass the intermediate storage unit within the chute.
11. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 10 wherein the air-displacement pipe further extends to an outlet of the chute.
12. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 11 wherein the outlet is at the top of the building.
13. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to any one of the preceding claims wherein the intermediate storage unit further includes a breakfall mechanism to prevent direct impact of material discharge on to the release mechanism
14. A material management system, to be incorporated within a substantially vertical

chute system in a multi-storey building according to claim 13 wherein the breakfall mechanism is hingedly connected to a side of the refuse chute to allow a rotational movement when refuse is impacted on said breakfall mechanism.

15. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 14 wherein the breakfall mechanism further includes a cushioning layer.
16. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to any one of claims 1 to 16 wherein the releasing means can be activated manually.
17. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 1 wherein the intermediate storage unit further includes a cleaning system.
18. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 17 wherein the cleaning system is a flushing system to flush liquid waste towards the bottom of the chute.
19. A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building according to claim 1 wherein a base plate of the intermediate storage unit is inclined.
20. An intermediate storage unit, adapted to be used in any one of the preceding claims including a releasing means;
a determination means to determine the amount of material within said at least one intermediate storage unit, said determination means coupled to a pre-set characteristic value;
wherein the determination means is in communication with said releasing means to discharge material stored within the intermediate storage unit, above a pre-determined characteristic value for the material, as determined by the determination means, to a subsequent intermediate storage unit.
21. An intermediate storage unit, adapted to be used in any one of the preceding claims wherein the subsequent intermediate storage unit can be a bottom storage

container or room.

22. An intermediate storage unit according to claim 21, wherein the unit further includes a fire-proof mechanism.
23. An intermediate storage unit according to claim 22 wherein the fire-proof mechanism includes a heat activated fire represser.
24. An intermediate storage unit according to claim 23 wherein the fire-proof mechanism includes a smoke activated fire represser.
25. A releasing means, adapted to be used in any one of the preceding claims wherein said ejector plate and punch through mechanism include linear actuators motivated by any one or a combination of electronic, hydraulic, pneumatic or chain driven motivation sources.
26. A method of discharging refuse within a refuse chute system in a multi-storey building, as described in the preceding claims, whereby the refuse is released in tandem.

CHUTE INTERMEDIATE STORAGE SYSTEM AND METHOD OF CONVEYING REFUSE THEREOF

ABSTRACT

A material management system, to be incorporated within a substantially vertical chute system in a multi-storey building, including a substantially vertical chute for the conveyance of material from a hopper to a bottom storage container or room, at least one intermediate storage unit within said substantially vertical chute, said intermediate storage unit having a releasing means, a determination means to determine the amount of material within said at least one intermediate storage unit, said determination means coupled to a pre-set characteristic value, wherein the determination means is in communication with said releasing means to discharge refuse stored within the intermediate storage unit, above a pre-determined characteristic value for the refuse, as determined by the determination means, to the bottom storage container or room.

An intermediate storage unit, adapted to be used in any one of the preceding claims including a releasing means, a determination means to determine the amount of material within said at least one intermediate storage unit, said determination means coupled to a pre-set characteristic value, wherein the determination means is in communication with said releasing means to discharge material stored within the intermediate storage unit, above a pre-determined characteristic value for the material, as determined by the determination means, to a subsequent intermediate storage unit.

A method of discharging refuse within a refuse chute system in a multi-storey building whereby the refuse is released in tandem.

A method of preventing an overload of an intermediate storage unit including the steps of determining an overload situation in a first intermediate storage unit in comparison with a pre-set characteristic value, establishing a second intermediate storage unit for an overload situation in comparison with a pre-set characteristic value, discharging material from a first intermediate storage unit to a second intermediate storage unit when said second intermediate storage unit is not in an overload condition.

FIGURE 2A