

[54] **BOTTOM DISCHARGE BIN AND DUST TIGHT UNLOADING STATION THEREFOR**

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[51] Int. Cl. .... **B67d 5/06**

[58] Field of Search ..... 222/185; 232/43.1; 274/71; 214/307

[56] **References Cited**

**UNITED STATES PATENTS**

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3,125,254	3/1964	Schoette .....	222/185
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3,343,725	9/1967	Cannon .....	222/129
3,138,297	6/1964	McKinney .....	222/185

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[57] **ABSTRACT**

A bottom discharge material storage and handling apparatus having a discharge station adapter and transportable bins. The bins are containers each having an opening in a top and two discharge doors mounted on an inverted V-shaped bottom. A cam locking assembly is associated with each of the discharge doors for locking the doors in a closed position. The discharge station adapter has upstanding walls attached to a base and contoured to receive the V-shaped bottom of a bin and to form a dust tight seal therebetween. The base has an opening formed therein and positioned below the discharge doors of the bin. A shaft is rotatably mounted between two opposed upstanding walls and has a closing cam fixedly attached thereto and positioned for simultaneously engaging and urging both doors to a closed position when the shaft is rotated.

**4 Claims, 5 Drawing Figures**

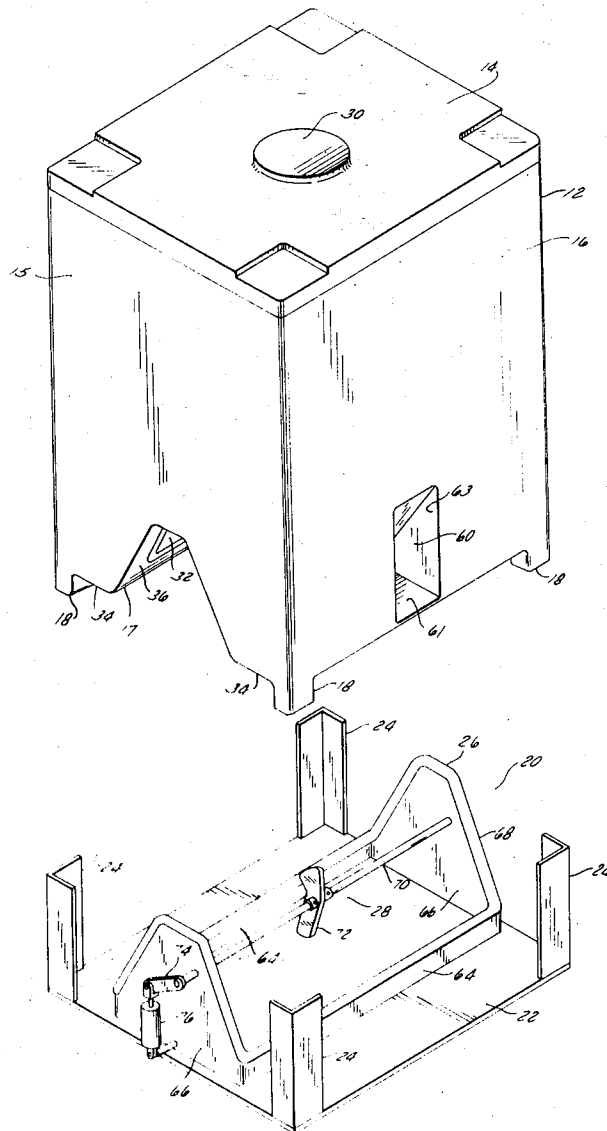
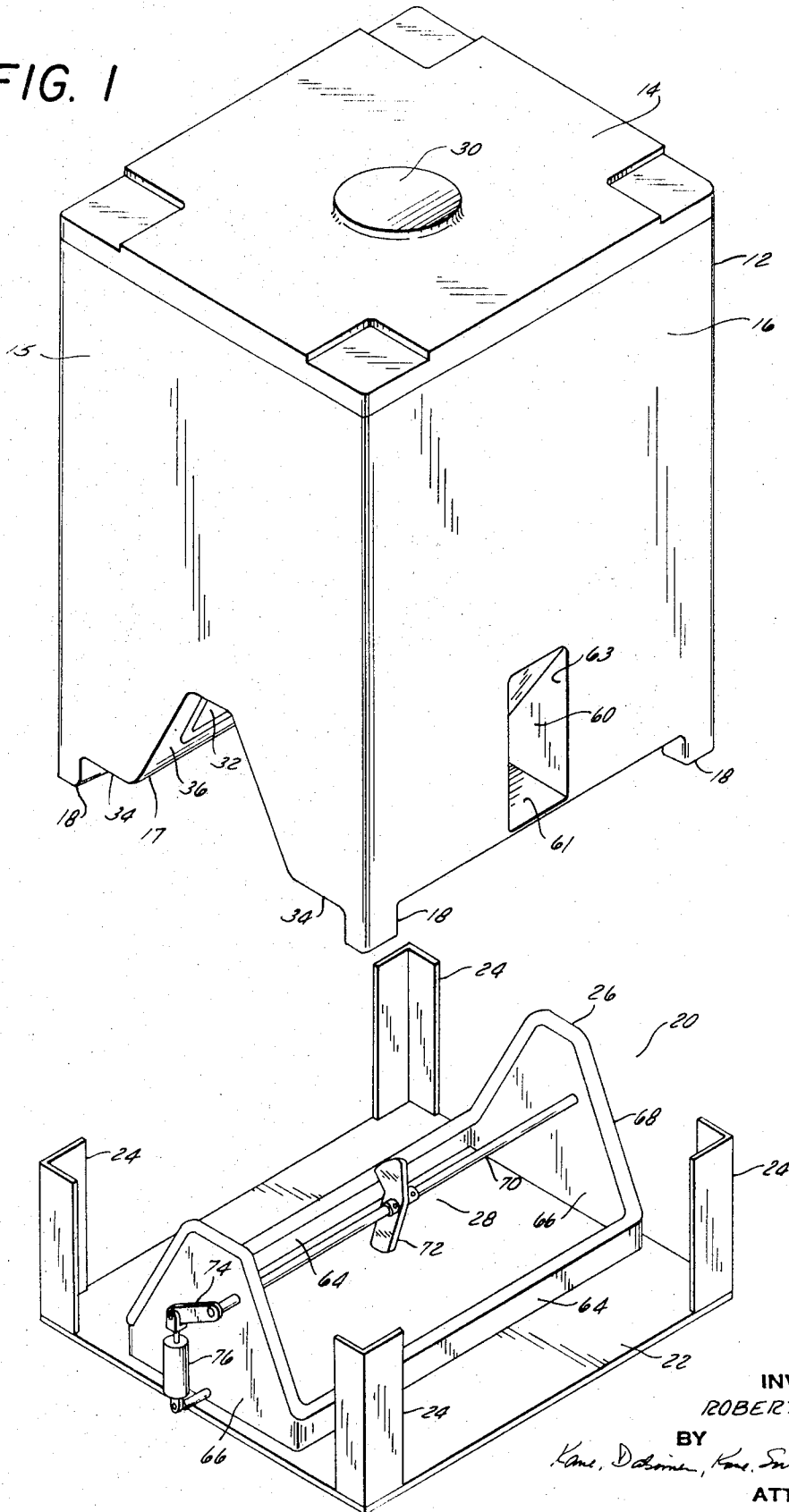


FIG. 1



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FIG. 5

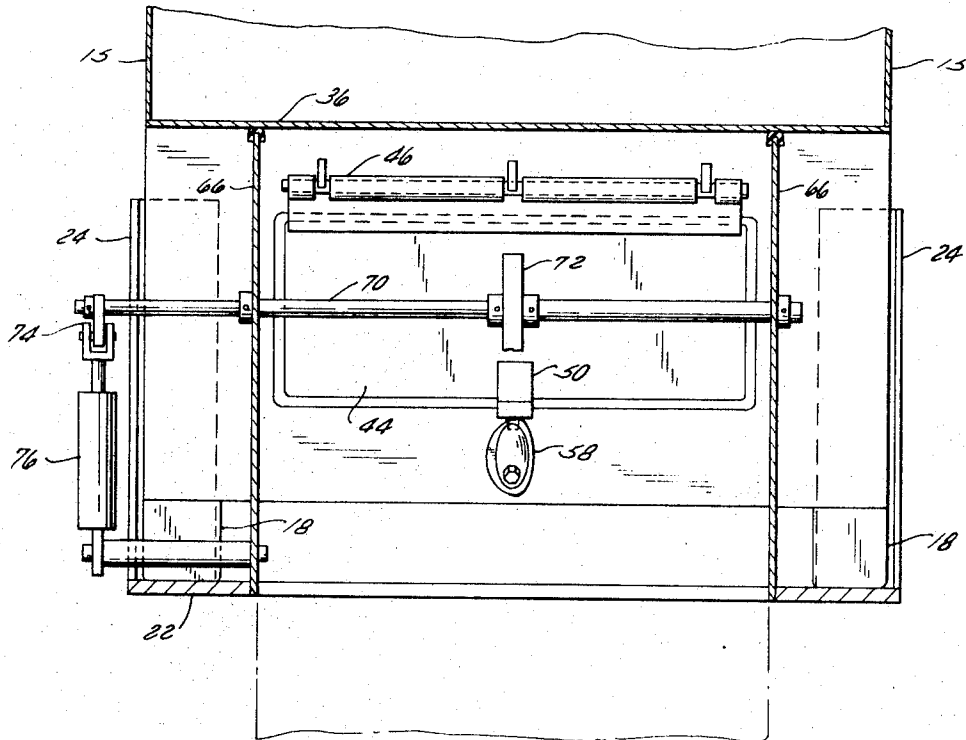
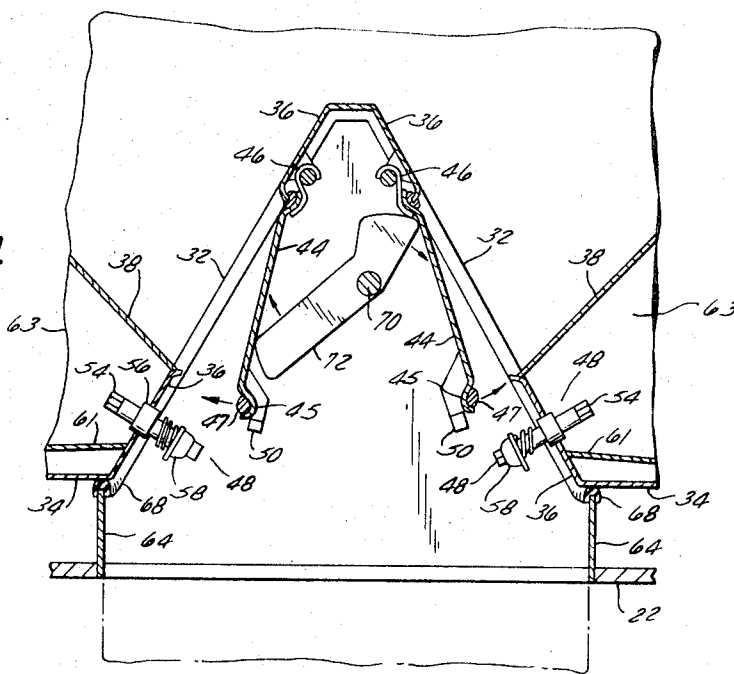


FIG. 4



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## BOTTOM DISCHARGE BIN AND DUST TIGHT UNLOADING STATION THEREFOR

### BACKGROUND OF THE INVENTION

#### 1. FIELD OF THE INVENTION

This invention relates to transport and storage containers for solid or semiliquid products having the ability to flow by gravity, and more particularly to a top-loading bottom discharge bin for storing and transporting this type of material.

#### 2. DESCRIPTION OF THE PRIOR ART

Heretofore, bottom discharge bins similar to the type disclosed in U.S. Pat. No. 3,343,725 were utilized to store and transport flowable materials. Two essential requirements for these bins were that they be dust tight and sanitary. Excessive dust could not be released into the atmosphere when the bin was discharged, and the material contained within the bin could not be contaminated. Thus, the bins had to be thoroughly cleaned each time they were to be used for a new material. The bins were essentially dust tight; however, efficient cleaning was hampered by the presence of door closing and locking hardware which interfered with access to the discharge doors and openings. Also, the assembly of the closing and locking hardware, at the time of fabrication, was a manual operation that required time consuming precise adjustments of the interconnecting linkage and hardware thus adding significantly to the cost of each bin and reducing the adaptability of the bins to modern, high output production line assembly.

#### SUMMARY OF THE INVENTION

The present invention contemplates bottom discharge bins that are readily adaptable to modern, high output production line assembly and a separate adapter that is attached to a discharge station for receiving the bins. The basic structure of the bins is similar to that provided by the prior art in that the bottom has a W-shaped cross section with two discharge doors attached to the inverted-V portion of the bottom cross section. The complicated and expensive door locking hardware of the prior art is replaced by two simple cam locks that are accessible from the sides of the bin and are actuated with a door opening key. The 'V' shaped openings in the sides of the bins and the removal of the interconnecting linkage and hardware from the 'V' shaped cross section of the bottoms provides a relatively, unobstructed open area across the bottom of the bin. This open area is readily accessible for inspection and cleaning both prior to the placing of the bins and after the removal of the bins from the adapter.

To facilitate a dust tight discharge, the adapter has upstanding walls contoured to fit the bottoms of the bins and to enclose the discharge door openings. The upstanding walls are suitably gasketed to provide a dust tight seal at the points of contact with the bin bottoms. The door closing hardware is associated with the adapter and includes a rotatable shaft extending between two opposed upstanding walls and positioned parallel to the discharge doors. A suitably shaped closing cam is attached to the shaft for simultaneously contacting the doors and swinging them into the closed position when the shaft is rotated.

The door closing hardware is greatly simplified in comparison with that of the prior art and only one

adapter is required to service a discharge station, thereby eliminating the need for door closing hardware on each bin that provides material to the station.

The main objective of this invention is to provide a bottom discharge bin that is readily adaptable to modern, high output production line assembly.

Another objective of this invention is to provide a bottom discharge bin that affords easy access for inspection and cleaning of both, the exposed surfaces that are in contact with the product at the time of discharge and, the interior of the container.

Another objective of the present invention is to provide a bottom discharge bin that is simpler and less expensive to fabricate than those heretofore provided.

The foregoing and other objectives and advantages of the invention will appear more fully after considering the detailed description which follows, taken together with the accompanying drawings in which one embodiment of the invention is illustrated by way of example. It is expressly understood, however, that the drawings are for illustrative purposes only and are not to be construed as defining the limits of the invention.

#### DESCRIPTION OF DRAWINGS

FIG. 1 is an assembly view of a bottom discharge material storage and handling apparatus constructed in accordance with the present invention;

FIG. 2 is a fragmentary vertical sectional view of a lower portion of the embodiment of the apparatus shown in FIG. 1, showing the discharge doors in a closed position;

FIG. 3 is a fragmentary vertical sectional view similar to that of FIG. 2 but shown with the discharge doors in the open position;

FIG. 4 is a fragmentary vertical sectional view similar to that of FIGS. 2 and 3 showing the engagement of the closing cam with the discharge doors to facilitate closing of the discharge doors; and

FIG. 5 is a fragmentary vertical sectional view of a portion of the bin taken along the line 5-5 of FIG. 2.

#### DESCRIPTION OF THE INVENTION

Referring to FIG. 1, there is shown a perspective view of the improved discharge bin apparatus of this invention including a container 12 which is generally rectangular in horizontal section having a top 14, two pair of parallel side walls 15 and 16 and a bottom shown generally at 17. Four supporting legs 18 are downwardly extended from the corners of container 12. Referring to FIGS. 2 and 3, bottom 17 has two horizontal walls 34 and two downwardly diverging walls 36 forming a section having an inverted V-shaped cross section. Two downwardly converging walls 38 are disposed between walls 16 and 36 and function as guide sheets for directing material stored in the container toward two discharge openings 32 formed in bottom walls 36. The container is loaded with material through an opening 30 in top 14 and is discharged through opening 32. In a modified embodiment, a vertical separator could be disposed between the top and the line of convergence of walls 36 to facilitate storage of two different materials. In such an embodiment, two separate openings would be required in the top.

Side walls 15 each have a V-shaped opening aligned with the V-shaped cross section formed by bottom

walls 36. The V-shaped opening provides for easy inspection and cleaning of the interior of the container and the exposed surfaces of the bottom walls.

When the bin is loaded, discharge openings 32 are closed by a pair of discharge doors 44. Doors 44 are attached to bottom walls 36 by hinge assemblies 46 which are mounted adjacent the upper edges of the discharge openings 32 so that each door can swing between a closed position as illustrated in FIG. 2 and an open position as illustrated in FIG. 3.

Doors 44 are formed with a groove 45 about the periphery thereof. A gasket 47 is detachably secured within each groove to provide dust and water tight seals between the doors and walls 36. The seals are detachable for sanitary reasons so that they may be cleaned to prevent contamination of the material.

A cam locking assembly 48 is mounted on each of the bottom walls 36 and are arranged to engage contact members 50 positioned along the bottom edges of doors 44 for retaining the doors in a closed position. The cam locking assemblies comprise shaft members 54 rotatably mounted in bottom walls 36 by a bearing 56. An oval-shaped cam member 58 is mounted off-center on shaft 54 so that at one angular shaft position it is engaged with contact member 50 and at another angular shaft position it is disengaged from contact member 50. One end of shaft 54 is suitably formed to engage a door opening key 52 so that cam member 58 may be turned by the key. A pair of openings 60 are formed in side walls 16 to provide access to the cam locking assemblies. Floor members 61 and side members 63 are provided to enclose the bottoms and sides of access opening 60 to form an easily cleaned dust tight, water tight opening in side walls 16.

A discharge station adapter shown generally at 20 in FIG. 1 has a base plate 22 with upstanding angle brackets 24 affixed to each corner. The brackets 24 are positioned to receive legs 18 of bin 12 and are provided to guide bin 12 into the proper position on plate 22. Base plate 22 has a rectangular shaped opening 62 formed therein and positioned to be beneath openings 32 of bin 12 when the bin is placed in adapter 20. Two upstanding wall members 64 are formed on base plate 22 adjacent opposite edges of opening 62 and have a height sufficient to engage horizontal walls 34 of bottom 17 when bin 12 is positioned on base plate 22. Two upstanding wall members 66 are formed on base plate 22 adjacent opposite ends of opening 62 and have a height contoured to engage walls 36 of bin 12. A compression-type flexible, sanitary gasket 68 is attached to the uppermost edges of the upstanding wall members 64 and 66 for forming a dust tight seal between the upstanding wall members and the bottom 17 of bin 12.

A shaft 70 is rotatably mounted between wall members 66 and is positioned parallel to walls 36 of bin 12. A solenoid 76 is connected to shaft 70 by means of a crank arm 74. Solenoid 76 functions to rotate shaft 70 when the solenoid is actuated by circuit means not shown in the drawings. A manual crank mechanism or a pneumatic or hydraulic cylinder may also be used instead of solenoid 76.

A cam 72 is attached to shaft 70 and is suitable shaped so as not to engage doors 44 when they are in the open position as shown in FIG. 3 and to simultaneously engage doors 44 and swing them to the closed

position as the shaft is turned. Once the doors are driven to the closed position, cam locking assembly 48 is utilized to securely hold the doors closed and shaft 70 is rotated to the normal open position. It can thus be seen that bin 12 may be readily loaded through top opening 30 when the doors 44 are closed, as shown in FIG. 2, and secured by the cam lock assembly.

In use, adapter 20 is fixed to a top-loading discharge station, and bin 12 is placed on top of the adapter so that legs 18 rest on base plate 22. Generally the bin will be positioned by a fork-lift truck. Angle brackets 24 guide bin 12 in place on the adapter 20 and assure proper positioning above opening 62. To discharge the bin, the door opening key 52 is used to disengage the cam lock assemblies 48 by rotating shafts 54 and causing cam members 58 to disengage contacts 50, thereby allowing doors 44 to swing open to a downward position as shown in FIG. 3 under the weight of the materials stored in the bin. After the bin is empty, shaft 70 is rotated by the solenoid 76 causing cam 72 to simultaneously engage the doors 44, as shown in FIG. 4. The cam drives both of the doors into the closed position at which time the operator inserts the key 52 through the access openings 60 to engage shaft 54 and to turn the shaft 180° to lock the doors in the closed position.

The cam locking assembly could be operated automatically by the use of a solenoid and crank associated with each of shafts 54 in a manner similar to that in which shaft 70 is rotated. In such an automated device, a lift truck operator could move, place, discharge and remove a bottom discharge bin from an adapter and the corresponding discharge hopper without either the bin or the operator leaving the lift truck. Such a device would utilize a switch or switches activated by the operator from his position on the lift truck.

The intricate parts and lever arrangements required for door closing and door locking, with each individual bin of the prior art, have been eliminated. Each bin is now equipped only with a pair of simple cam locking devices for securing the doors. The function of closing the doors is now incorporated in the design and construction of the adapter. The elimination of the extensive interconnecting linkage and miscellaneous hardware installed in the door area of the prior art provides a bin having an unobstructed area to allow inspection and cleaning with little or no difficulty. Access for inspection and cleaning is further enhanced by the existence of the V-shaped opening formed in side wall 15 of the bin. The adapter 20 does have a limited amount of hardware and requires an insignificant amount of manual assembly; however, this is far less than that required by the bins of the prior art. The cost of an operating installation is greatly reduced in that only one adapter is required to service several bins, whereas in the prior art the adapter and its associated hardware was required for each individual bin. Thus, the present invention provides a bottom discharge material storage and handling apparatus that is readily adaptable to modern, high output production line assembly and one that is less expensive than those theretofore provided. The V-shaped openings provide for easy inspection and cleaning of the interior of the bin and the exposed exterior surfaces of the bin bottom.

What is claimed is:

1. An apparatus for storing, transporting and discharging flowable materials into a top loading discharge station, comprising:

a hollow upright body including, a top having at least one opening for receiving the material, sides, and a bottom having at least one opening for discharging the material;

door means hingedly attached to the bottom for closing said bottom opening;

a cam locking means for locking said door in a closed position and for releasing said door when rotated;

a discharge station adapter for attachment to the discharge station for receiving the hollow body and having upstanding walls contoured to engage the bottom of the hollow body and to form a dust tight seal between the discharge station and the bottom of the hollow body;

a shaft positioned parallel to the door means and rotatably mounted between two opposed upstanding walls of the discharge station adapter;

a cam member fixedly attached to said shaft and positioned to engage the door means when the shaft is rotated; and

means for rotating said shaft, whereby the cam member engages the doors and drives the doors into the closed position.

2. In combination with a bin, for transporting and storing bulk flowable materials, of the type having an upright hollow body having side walls, a substantially rectangular floor and depending legs disposed substantially at the corners of said floor, said floor having a central opening of substantially rectangular shape, a bottom wall section of a substantially inverted V shape disposed above said opening, a pair of horizontally spaced discharge openings in said bottom wall section extending substantially the full length of said section in a horizontal direction, a pair of door members hinged at their upper end on said wall section above said discharge openings for movement between positions opening and closing said discharge openings, each door member in the closed position thereof being positioned so that the weight of bulk material of said bin urges said door member towards its open position, inclined internal walls in said bin on transversely opposite sides of said bottom wall section for directing material in said bin toward said discharge openings, the improvement comprising:

a pair of shafts rotatably mounted in the bottom wall section, one shaft below each discharge opening, said shafts being accessible through openings formed in the side walls; and

a cam fixedly attached to each shaft for engaging and locking said door members when the shafts are in a first position and for disengaging and releasing said door members when rotated to a second position, whereby the weight of the material in the body

pushes the doors open and the material flows out of the hollow body.

3. A bottom discharge bin apparatus for transporting and storing bulk flowable material and for discharging said material into a discharge station, said bin apparatus comprising:

a hollow upright body including, side walls, a substantially rectangular floor having a central opening of substantially rectangular shape, a top, depending legs disposed substantially at the corners of said floor, and a bottom wall section of substantially inverted V-shape disposed above said opening, said bottom wall section having a pair of rectangular discharge openings extending substantially the full length of the floor;

a pair of door members hingedly attached to the bottom wall section adjacent the uppermost sides of said discharge openings for movement between positions for opening and closing said discharge openings, each door member being positioned when closed so that the weight of the material urges said door member towards its open position; inclined internal walls in said hollow body extending between the side walls and the lower edges of the discharge openings for directing material in said hollow body towards said discharge openings;

a pair of shafts rotatably mounted in the bottom wall section, one shaft below each discharge opening, said shafts being accessible through openings formed in the side walls; and

latch means fixedly attached to each shaft for engaging and locking said door means when the shaft is in a first position and for disengaging and releasing said door means when rotated to a second position, whereby the weight of the material in the body pushes the door open and the material flows out of the hollow body.

4. A bottom discharge bin apparatus as described in claim 3, additionally comprising:

a discharge station adapter for attachment to the discharge station for receiving the bottom of the hollow body, said discharge station adapter having a base with an opening positioned beneath the bottom wall section;

upstanding wall members attached to the base for engaging and forming a seal between the discharge station and the bottom of the hollow body;

a shaft rotatably mounted between two opposed upstanding wall members, said shaft being positioned parallel to the bottom wall section;

a cam fixedly attached to said shaft and suitably shaped to engage the doors when the shaft is rotated; and

means for rotating said shaft, whereby the cam engages the doors and drives the doors to the closed position.

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