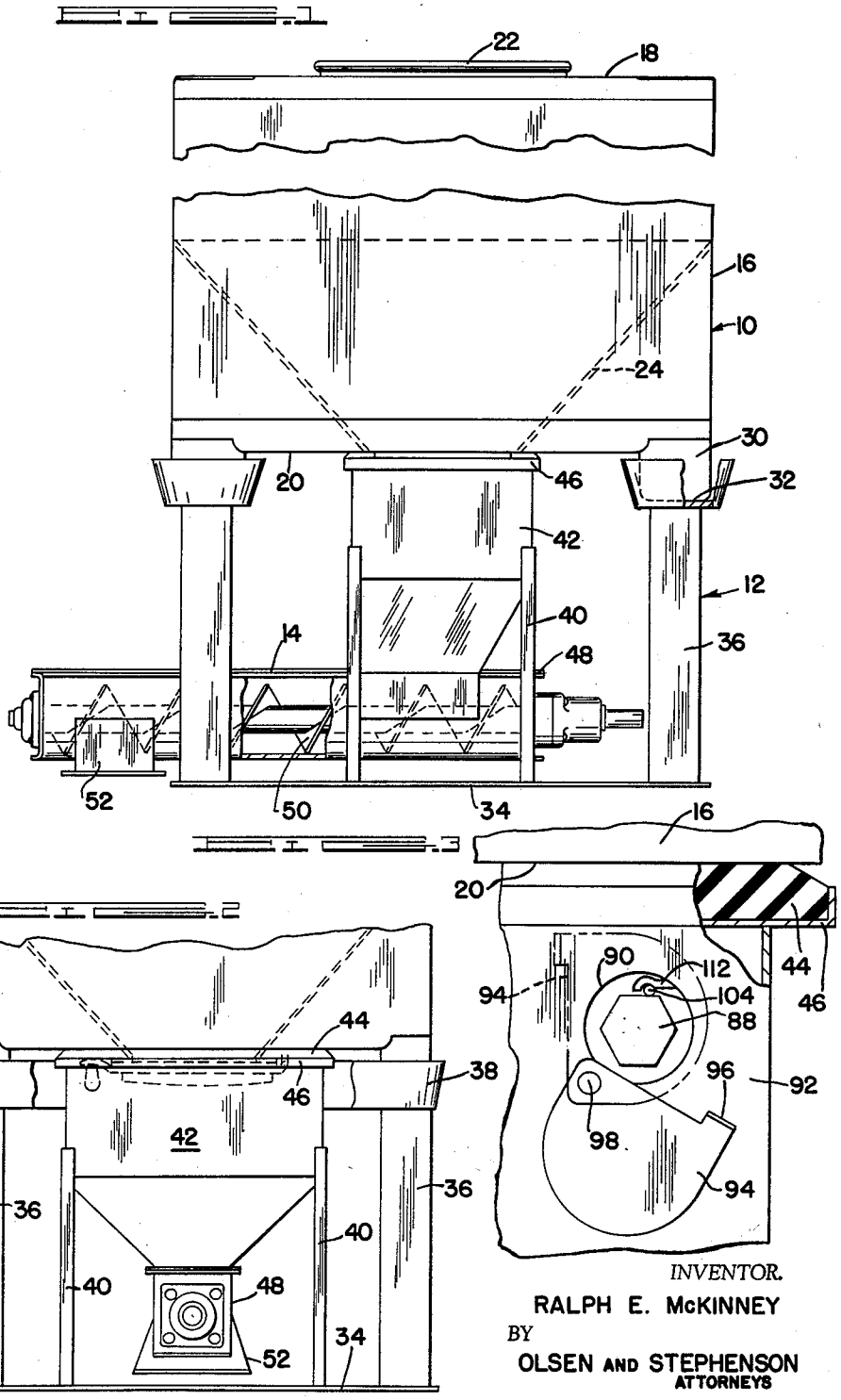
Sept. 17, 1963 R. E. McKINNEY 3,104,035

BIN CLOSURE ASSEMBLY

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INVENTOR.

RALPH E. McKINNEY

BY

OLSEN AND STEPHENSON

ATTORNEYS

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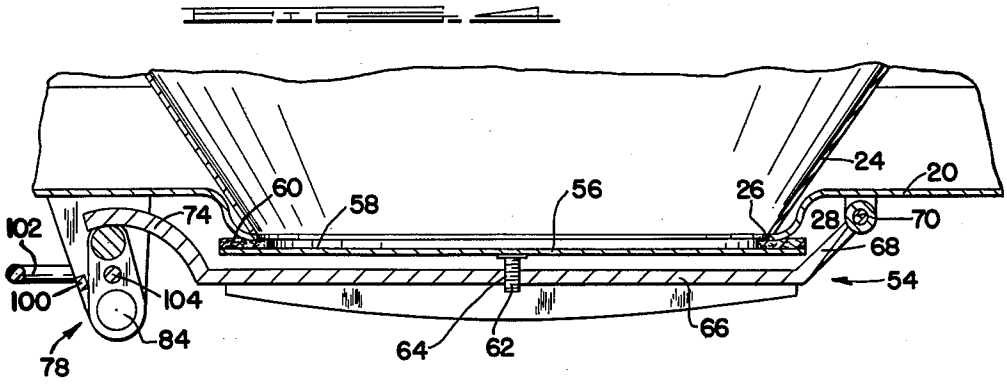


FIG. 5

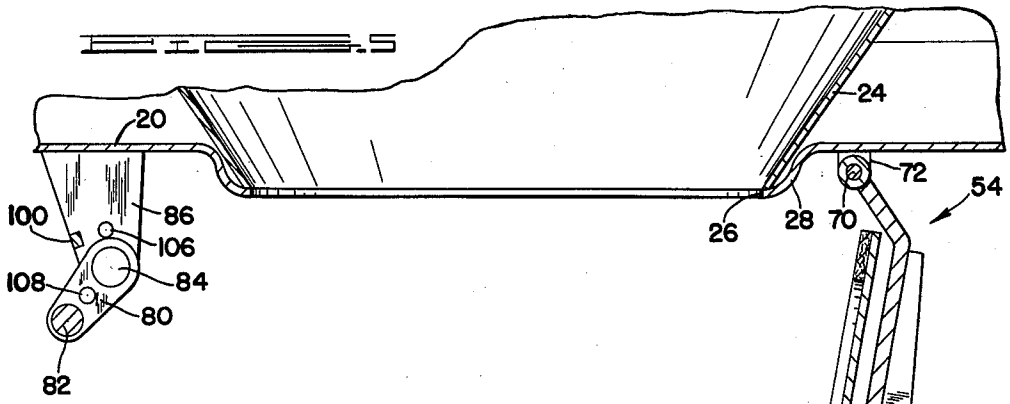
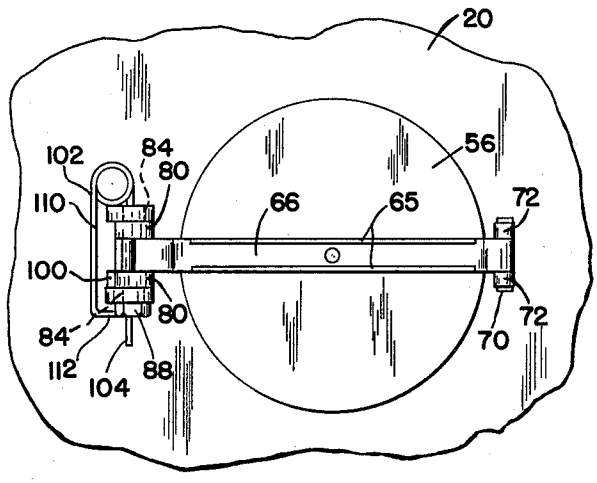
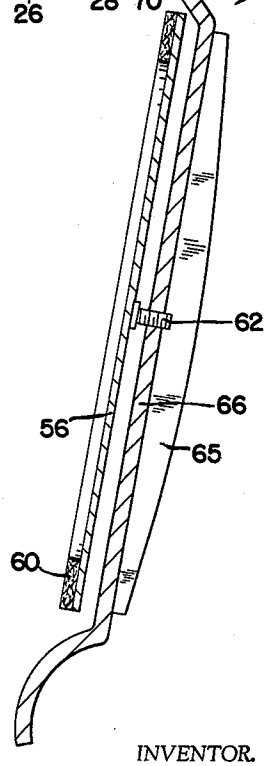


FIG. 6





INVENTOR.
RALPH E. McKINNEY
BY
OLSEN AND STEPHENSON
ATTORNEYS

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BIN CLOSURE ASSEMBLY

Ralph E. McKinney, Beatrice, Nebr., assignor to Hoover Ball and Bearing Company, Ann Arbor, Mich., a corporation of Michigan

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This invention relates generally to large gravity discharge bins or containers and more particularly to an improved discharge apparatus for bins of this type.

In some material handling systems a bottom discharge bin is desirable. In such systems the bin may discharge directly into a floor or other opening or it may be arranged to discharge into a screw or other type conveyor. In any case it is desirable to provide a closure for the bottom discharge opening which can be readily actuated to uncover the opening and a stand or mounting for the bin which provides access to the closure and sufficient clearance to allow full opening of the closure. Many prior bins of this type have, by virtue of the type of closures and bin mountings involved, required a cloth or similar discharge sleeve which is secured to the bin so that it extends downwardly from the discharge opening and when not in use is tucked in the bin inside the discharge opening closure. In a bin requiring such a sleeve it is necessary to reach into the bin to pull the sleeve out, and in the event the bin is filled with a caustic or other material dangerous to humans, such contact with the bin material is undesirable. It is an object of this invention to provide an improved closure assembly for bin openings which is readily released to discharge the bin contents, is effective to sealably close the bin opening, is maintained in a closed position by the force of the bin contents on the closure, and does not require a discharge sleeve.

Further objects, features and advantages of this invention will become apparent from a consideration of the following description, the appended claims, and the accompanying drawing in which:

FIGURE 1 is a side elevational view of a bottom discharge bin provided with the improved closure assembly of this invention and mounted on a stand for discharging into a screw conveyor;

FIGURE 2 is a fragmentary elevational view of one end of the apparatus shown in FIG. 1;

FIGURE 3 is an enlarged fragmentary elevational view of a portion of the opposite end of the apparatus shown in FIG. 1, with some parts broken away and other parts shown in section for the purpose of clarity;

FIGURE 4 is a fragmentary sectional view of the lower portion of the bin shown in FIG. 1, showing the bottom discharge opening in the bin and illustrating the closure assembly of this invention in a closed and locked position;

FIGURE 5 is a fragmentary vertical sectional view of the lower portion of the bin, illustrated similarly to FIG. 4, and showing the closure assembly in an open position; and

FIGURE 6 is a fragmentary bottom view of the bin showing the closure assembly in a closed and locked position.

With reference to the drawing, a bottom discharge bin **10** is illustrated in FIG. 1 mounted on a stand or frame **12** for feeding the contents of the bin into a screw conveyor **14**. The bin **10** consists of a body **16** which is generally rectangular in cross section and has a top wall **18** and a bottom wall **20**. A filling opening (not shown) is provided in the top wall **18** and is closed by a removable cover **22**. Adjacent its lower end, the body **16** is fitted with an interior hopper **24** which communicates at its lower end with an opening **26** in the bottom wall **20**. As best appears in FIG. 4, the bottom wall **20** is provided with a downwardly extending flange **28**, which is shown integral with the bottom wall **20** but which may be separately secured as by welding to the wall **20**, or formed as an extension of the hopper **24**, and the opening **26** is at the lower end of the flange **28**. The bin **10** is also provided with four downwardly extending supporting legs **30** which are located adjacent the corners of the bottom wall **20** and project downwardly so that their lower ends **32** are located below the discharge opening **26**.

The supporting stand or frame **12** consists of a base **34** which is substantially horizontal and has four upstanding legs **36** mounted thereon and arranged in pairs. Each pair of legs **36** is connected at its upper end by an elongated trough or receptacle **38** which is of a length and width such that a pair of bin legs **30** can be supported therein. The stand **34** also includes four upright frame members **40** which are mounted on the base **34** and support an upright hopper **42** disposed between the legs **36**. The upper end of the hopper **42** is open and is bounded by a gasket or seal member **44** which is formed of a resilient yieldable material such as rubber and is supported in an angle shape rim **46** secured to the upper end of the hopper **42**. The lower end of the hopper **42** discharges into a horizontally extending tube **48** in which a screw **50** is rotatably mounted for conveying material from the discharge end of the hopper **42** to an outlet conduit **52** mounted on the tube **48**.

The stand **12** is constructed so that the seal member **44** is at a predetermined vertical position relative to the bin leg receiving receptacles **38**. As a result, when the bin **10** is lowered toward the stand **12**, the portion of the bottom wall **20** surrounding the recessed portion **28** first engages the seal member **44** and compresses it so that it is in tight sealing engagement with the bin bottom wall **20**. The bin legs **30** then contact and are supported on the receptacles **38** at a position such that the sealing engagement of the seal **44** with the bin bottom wall **20** is maintained.

The closure assembly, indicated generally at **54** (FIGS. 4 and 5), for the bin opening **26** includes a circular cover member **56** which is provided on its top surface **58** with an annular sealing gasket **60** which is of a diameter to engage the bottom wall portion **28** at a position surrounding the opening **26**. A threaded stud **62** is secured to the bottom side of the cover member **58** and extends downwardly therefrom at a position in substantially axial alignment with the bin opening **26** when the cover **56** is in a position closing the opening **26**. The stud **62** is supported in a threaded opening **64** in a cover retainer bar **66** which extends diametrically across the cover **56**, and is provided with reinforcing ribs **65**. The retainer bar **66** is formed at one end with an inclined end portion **68** which is connected by a shaft **70** to ears **72** which are secured to and project downwardly from the bin bottom wall **20** so that the retainer bar **66** is pivotally movable toward and away from the opening **26** about

the shaft 70. The bar 66 is also formed with an opposite end portion 74 which, in the position of the bar 66 shown in FIG. 4 is curved upwardly toward the bin bottom wall 20.

It can thus be seen that the cover member 56 is supported on the retainer bar 66 which is in turn pivotally supported at one end on the bin bottom wall 20 so that it is movable toward and away from the bin discharge opening 26 to either close the opening 26 (FIG. 4) or uncover the opening 26 (FIG. 5). In the position of the retainer bar 66 in which it holds the cover 56 in a position closing the opening 26, the cover 56 may be locked in its closed position by manipulation of a locking and release assembly 78 which coacts with the curved end portion 74 of the retainer bar 66. The assembly 78 includes a pair of horizontally spaced rocker arms 80 which are connected adjacent one of their ends by a locking pin 82. Adjacent their opposite ends, the rocker arms 80 are provided with stub shafts 84 which are rotatably supported in a pair of downwardly extending ears 86 secured to the bin bottom wall 20. One of the stub shafts 84 projects through an ear 86 and is provided with a hex-shape head 88 for a purpose to appear presently.

In the use of the closure assembly 54 assume that the bin 10 has been mounted on the stand 12 as previously described and as shown in FIG. 1 so that the closure assembly 54 and the locking and release assembly 78 project into the upper end of the hopper 42. The hopper seal 44 is thus in dust-tight engagement with the bin bottom wall 20 prior to any discharge of the bin contents. As a result the discharge station is maintained free of any of the dust which results from fines in the bin contents, when the bin contents are emptied into the hopper 42.

In the supported position of the bin 10 on the stand 12, the stub shafts 84 and the hex-shape head 88 on one of the stub shafts 84 are axially aligned with an opening 90 (FIG. 3) formed in one side wall 92 of the hopper 42. The opening 90 is normally closed by a cover plate 94 which is pivotally connected to the hopper side wall 92 by a rivet 98 and is provided at one corner with an outwardly extending tab 96 to facilitate manual manipulation of the plate 84. In order to release the locking and release assembly 78, a tool (not shown) is inserted through the opening 90 into gripping engagement with the hex head 88 on one of the stub shafts 84. The hex head 88 is then rotated in a direction to rotate the rocker arms 80 in a clockwise direction as shown in FIG. 4 to a position in which the locking pin 82 is out of the path of travel of the retainer bar end portion 74 when the bar 66 swings downwardly, in response to the force of the material in the bin 10 on the cover 56. The closure assembly 54 then swings downwardly to a position within the hopper 42 to a position, such as is shown in FIG. 5, in which it does not obstruct the flow of material from the bin 10 through the opening 26 and through the hopper 42 to the screw conveyor tube 48. It is to be understood that while the hopper 42 has been shown as communicating with a screw conveyor, it may, if desired, merely communicate with a floor opening or other conveyor and the screw conveyor 50 is shown for illustrative purposes only.

When the bin 10 is empty, it is lifted off the stand 12 and the closure assembly 54 is manually moved from its position shown in FIG. 5 to a closed position in which the gasket 60 engages the bin bottom wall. The bar end portion 74 is shaped so that in a retaining position of the bar 66 the under surface of the portion 74 is located approximately on the arc traveled by the locking pin 82 when it is swung upwardly about the stub shafts 84. In the initial closed position of the assembly 54 the under surface of the bar end portion 76 is preferably located slightly below the arc traveled by the locking pin 82 when it is moved to its locking position shown in FIG. 4. As a result, when the arms 80 are

rotated in a counterclockwise direction toward the position shown in FIG. 4, the locking pin 82 rides upwardly on the retainer bar end portion 74 so as to exert an upwardly directed force on the retainer bar 66 which is in turn transmitted to the cover 56 as an upwardly directed force located substantially at the axis of the opening 26, to thereby urge the seal 60 into pressure tight engagement with the bin bottom wall 20. If desired, the under surface of the retainer bar end portion 74 may be provided with a coating or pad of a low friction material to facilitate travel of the locking pin 82 thereon.

The application of a force to the cover member 56 which is substantially axially aligned with the opening 26 provides for a tight sealing engagement of the gasket 60 with the bottom wall portion 28 entirely around the opening 26 so that there is no tendency of the cover 56 to tilt or bend relative to the opening 26. The desired pressure engagement of the seal member 60 with the wall portion 28 is obtained by rotating the cover 56 and the stud 62 relative to the retainer bar 66 prior to closing movement of the assembly 54.

The arms 80 are rotated to a stop position in which one of the arms 80 engages a lateral projection 100 on one of the ears 86. The projection 100 is positioned such that when the arm 80 is in engagement with it, the vertical plane of the axis of the stub shafts 84 is located between the vertical plane of the axis of the locking pin 82 and the retainer bar pivot shaft 70. As a result, when the bin 10 is refilled, the weight of the material therein on the cover member 56 acts to urge the locking pin 82 in a direction opposite to the direction in which it must be moved to release the reainer bar 66 and in a direction holding an arm against the projection 100. Consequently, the locking and release assembly 78 cannot be accidentally moved to a release position wihtout first overcoming the force of the material in the bin 10 on the locking pin 82.

As a further precaution against accidental movement of the assembly 78 to release the closure assembly 54, a safety pin 102 may be installed on the assembly 78 as shown in FIGS. 4, 5 and 6. The safety pin 102 includes a first straight wire portion 104 which is extended through aligned openings 106 in the ears 86 and openings 108 in the arms 80 when the arms 80 are in their locking positions shown in FIG. 4. The safety pin 102 includes a second wire portion 110 which terminates in a laterally extending hook section 112 (FIG. 3) which is engaged with the straight portion 104. When the safety pin 102 is used, it is removed prior to mounting of the bin 10 on the stand 12 for the purpose of discharging the bin contents into the hopper 42.

From the above description it is seen that this invention provides a bottom discharge bin 10 with a closure assembly 54 which is maintained in a closed position by the force of the bin contents on the closure assembly. Furthermore, the closure release assembly 78 is constructed so that the closure assembly 54 may be readily released after it is mounted on the stand 12 in dust-tight engagement with the hopper 42 which is constructed to provide access, through the opening 90, to the release assembly 78. As a result, no contact of personnel with the bin contents is required during emptying of the bin contents into the bin hopper 42. Another advantage of the release assembly 78 is its adaptability to remote automatic actuation. If desired an actuating air cylinder can be mounted on the hopper wall 92 adjacent the opening 90 and a suitable linkage can be extended between either of the stub shafts 84 and the air cylinder, so that on operation of the air cylinder the shafts 84 are rotated in a clockwise direction as viewed in FIG. 4.

It will be understood that the bin closure assembly which is herein disclosed and described is presented for purposes of explanation and illustration and is not intended to indicate limits of the invention, the scope of which is defined by the following claims.

What is claimed is:

1. In a bin having a bottom wall and a circular discharge opening in said bottom wall, a closure assembly for said opening comprising a cover member engaged with the outer side of said bottom wall at a position surrounding said opening, a cover retaining bar having a pair of ends one of which is pivotally connected to said bottom wall at one side of said opening, said bar extending substantially diametrically across said cover member at a position therebelow and having an opposite end portion thereof curved upwardly toward said bottom wall, upwardly extending means on said bar engageable with said cover at a position substantially axially aligned with said opening, a locking and release assembly for said retaining bar comprising a pair of horizontally spaced actuating arms, shaft means pivotally mounting said arms on said bottom wall for pivotal movement about a substantially horizontal axis disposed below said bottom wall, a locking pin connected to and extending between said arms at a position engageable with said bar end portion on pivotal movement of said arms in one direction for urging said bar in the direction of said cover member, stop means on said bottom wall engageable with said locking and release assembly so as to limit pivotal movement of said arms in said one direction to a position in which the axis of said pin is above said shaft means and the axis of said shaft means is in a vertical plane between the vertical plane of said pin axis and said one end of the retainer bar so that a downwardly directed force on said cover urges said locking and release assembly in a direction against said stop means, and means on said shaft means adapting said shaft means for rotation in an opposite direction to a position in which said locking and release assembly is to one side of said cover and retaining bar on pivotal movement thereof away from said discharge opening.

2. In a bin having a bottom wall and a circular discharge opening in said bottom wall, a closure assembly for said opening comprising a cover member engaged with the outer side of said bottom wall at a position surrounding said opening, a cover retaining bar having a pair of ends one of which is pivotally connected to said bottom wall at one side of said opening, said bar extending substantially diametrically across said cover member at a position therebelow and having an opposite end portion thereof curved upwardly toward said bottom wall, upwardly extending means on said bar engageable with the outer side of said cover, a locking and release assembly for said retaining bar comprising a pair of horizontally spaced actuating arms, shaft means pivotally mounting said arms on said bottom wall for pivotal movement about a substantially horizontal axis disposed below said bottom wall, a locking pin connected to and extending between said arms so that said locking pin is movable along an arc extended about the axis of said shaft means, said curved end portion of the retainer bar being shaped so that it is positioned to extend substantially along said arc in the closed position of said closure assembly, and stop means on said bottom wall engageable with said locking and release assembly so as to limit pivotal movement of said arms in said one direction to a position in which the axis of said pin is above said shaft means and the axis of said shaft means is in a vertical plane between the vertical plane of said pin axis and said one end of the retainer bar so that a downwardly directed force on said cover urges said locking and release assembly in a direction against said stop means, said shaft means being rotatable in an opposite direction to move said locking pin out of engagement with said retainer bar to release said closure assembly for opening movement.

3. In a bin having a bottom wall and a circular discharge opening in said bottom wall, a closure assembly for said opening comprising a cover member engaged with the outer side of said bottom wall at a position surrounding said opening, a cover retaining bar having a pair of ends one of which is pivotally connected to said bottom wall at one side of said opening, said bar extending substantially diametrically across said cover member at a position therebelow and having an opposite end portion thereof curved upwardly toward said bottom wall, upwardly extending means on said bar engageable with the outer side of said cover, a locking and release assembly for said retaining bar comprising a pair of horizontally spaced actuating arms, a pair of downwardly extending ears on said bottom wall positioned adjacent said arms, shaft means on said ears pivotally supporting said arms for pivotal movement about a substantially horizontal axis disposed below said bottom wall, a locking pin connected to and extending between said arms at a position engageable with said bar end portion on pivotal movement of said arms in one direction for urging said bar in the direction of said cover member, stop means on at least one of said ears engageable with said locking and release assembly so as to limit pivotal movement of said arms in said one direction to a position in which the axis of said pin is above said shaft means and the axis of said shaft means is in a vertical plane between the vertical plane of said pin axis and said one end of the retainer bar so that a downwardly directed force on said cover urges said locking and release assembly in a direction against said stop means, and safety pin means removably extended through said ears and said arms to prevent accidental movement of said arms in an opposite direction.

4. In a bin having a bottom wall and a circular discharge opening in said bottom wall, a closure assembly for said opening comprising a cover engaged with the outer side of said bottom wall at a position surrounding said opening, means on said cover extending substantially diametrically from one edge thereof and pivotally connected to said bottom wall at one side of said opening, means on said cover extending from a substantially diametrically opposite edge thereof at a position therebelow having an end portion curved upwardly toward said bottom wall, a locking and release assembly for said cover comprising a pair of horizontally spaced actuating arms, shaft means pivotally mounting said arms on said bottom wall for pivotal movement about a substantially horizontal axis disposed below said bottom wall, a locking pin connected to and extending between said arms so that said locking pin is movable along an arc extended about the axis of said shaft means, said curved end portion of said means on said cover being shaped so that it is positioned to extend substantially along said arc in the closed position of said closure assembly, and stop means on said bottom wall engageable with said locking and release assembly so as to limit pivotal movement of said arms in said one direction to a position in which the axis of said pin is above said shaft means and the axis of said shaft means is in a vertical plane between the vertical plane of said pin axis and said pivotal connection of said cover to the bin bottom wall so that a downwardly directed force on said cover urges said locking and release assembly in a direction against said stop means, said shaft means being rotatable in an opposite direction to move said locking pin out of engagement with said curved end portion to release said closure assembly for opening movement.

5. In a bin having bottom legs and a substantially centrally disposed bottom opening, a closure assembly for said opening pivotally mounted on the bottom of said bin at a position to one side of said opening, a closure locking and release assembly pivotally mounted on the bottom of said bin on the opposite side of said opening, an actuating shaft for rotating said locking and release assembly, coacting means on said closure assembly and said locking and release assembly providing for the application of a force on said closure assembly in a direction urging said closure assembly against said bottom

wall to close said opening in response to rotation of said actuating shaft in one direction, stop means on said bottom wall engageable with said locking and release assembly for limiting rotation of said actuating shaft in said one direction, said locking and release assembly being positioned when engaged with said stop means such that any forces applied thereto by said closure assembly maintains said locking and release assembly in engagement with said stop means, said closure assembly and said locking and release assembly being disposed entirely above the lower ends of said legs in a position of said closure assembly closing said opening, and said locking and release assembly being positioned so that it is movable out of engagement with and into a clearance relation with said closure assembly on rotation of said actuating shaft in an opposite direction.

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