April 26, 1966 R. W. SCHACKERMAN 3,248,142

BOTTOM DISCHARGE BIN LATCHING ASSEMBLY

Filed Dec. 9, 1963 2 Sheets-Sheet 1

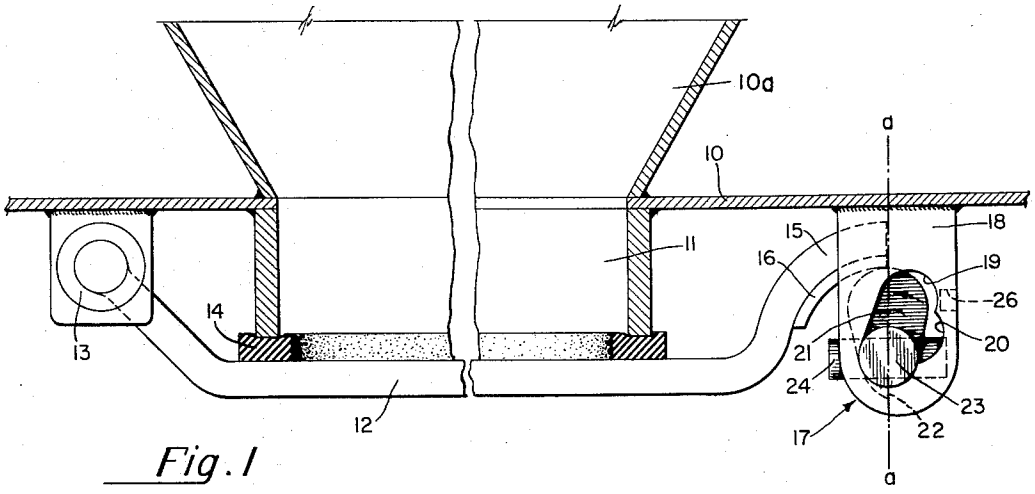


Fig. 1

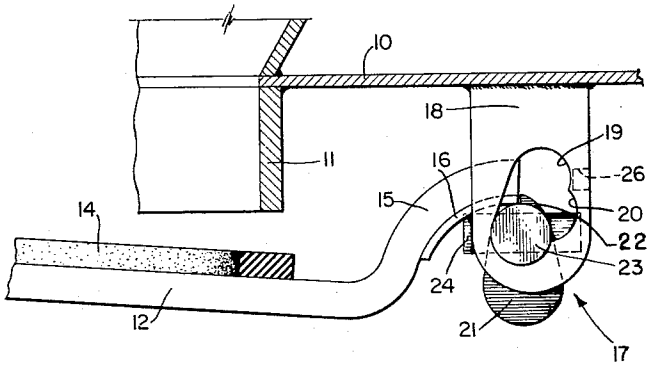


Fig. 2

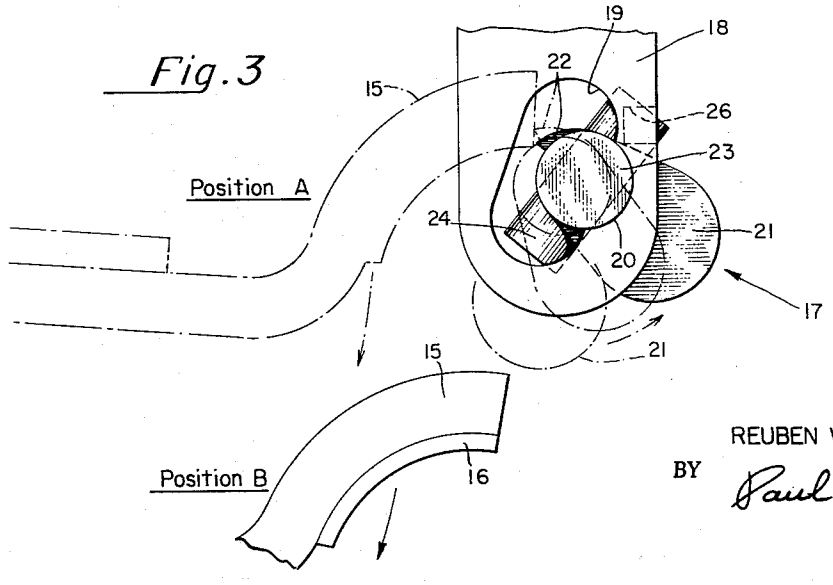


Fig. 3

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BOTTOM DISCHARGE BIN LATCHING ASSEMBLY

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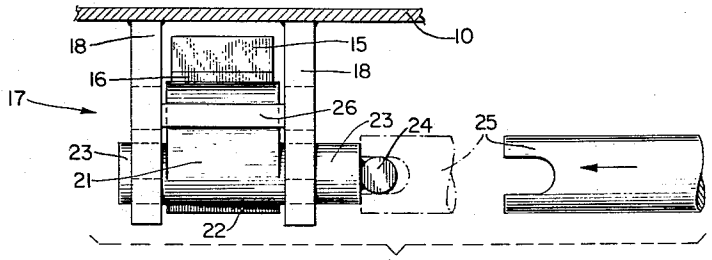


Fig. 4

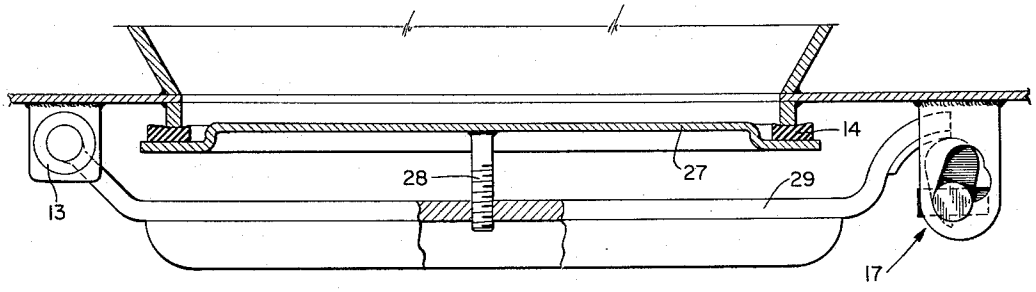


Fig. 5

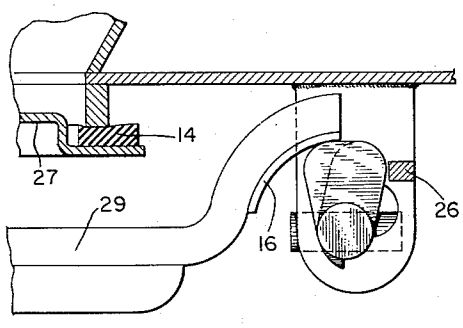


Fig. 6

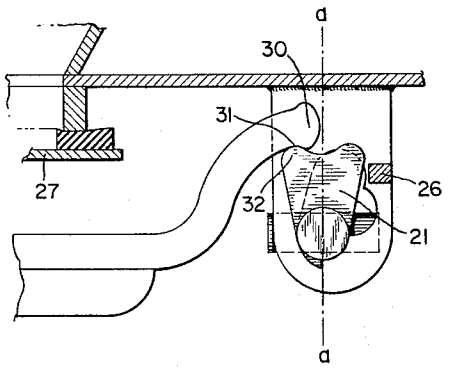


Fig. 7

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BOTTOM DISCHARGE BIN LATCHING ASSEMBLY

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4 Claims. (Cl. 292—238)

This invention relates generally to bottom discharge bins used for the storage and transport of bulk materials and deals particularly with an improved latch mechanism for the cover of the discharge opening of such bins.

In the storage and transport of bulk materials such as powders, pellets, granules, etc., it is frequently desirable to use a bin which is provided with a bottom discharge opening. In one type of such bin a slidable gate arrangement is used to permit discharge of the contents. However, opening a loaded bin having a sliding gate requires considerable force to overcome the friction involved. Furthermore, such gates are subject to freezing of the slide channel and therefore such arrangements are not entirely satisfactory. Alternatively, the discharge opening may be closed by a cover arrangement pivotally attached to the bottom of said bin so that the cover swings downwardly from a closed position to an open position to allow the contents of the bin to be discharged. With such cover arrangements used in the past, however, the cover, when released from its closed position by a latch mechanism, immediately opened completely and offered no control as to the rate of discharge of the bin contents.

It is an object of this invention to provide a bin having a bottom discharge opening whereby the cover may be unlatched to a first partial open position and subsequently further unlatched to a full open position, thereby permitting the operator of the bin an opportunity to control the initial rate of flow of the discharged material and to inspect the operation of the bin while in use to determined if the bin is properly seated over a receiver for its contents, and to observe the contents and operation of the bin at the point of use.

It is a further object of this invention to provide a latch mechanism for the bottom closure of a bottom discharge bin which may be operated readily and easily by rotary motion and at a distance from the opening of the bin by means of an actuating tool. Further objects, advantages, and features of the invention will be apparent by consideration of the following drawing, description, and claims which follow.

FIGURE 1 is a fragmentary sectional view of a bottom discharge bin showing the discharge portion of the bin with a hinged cover and the latching assembly of this invention holding the cover in a closed position.

FIGURE 2 is a fragmentary sectional view as in FIGURE 1, but showing the cover in a partially-opened position.

FIGURE 3 is a close-up side view of the closure assembly showing a partially opened position (Position A) and showing further the motion to completely release the cover (Position B).

FIGURE 4 is an end view of the latching assembly and also illustrates a section of a rotating tool and its engagement with shaft means of the latch.

FIGURE 5 is a sectional view similar to FIGURE 1 showing an embodiment of the invention in which a cover for the bottom bin is adjustably attached to a cover-retaining member which retaining member is engaged by the latch mechanism of the invention.

FIGURES 6 and 7 illustrate variations in the shape of the cam latch comprising a part of the latch mechanism.

Reference numeral **10** in FIGURES 1 and 2 indicates the bottom wall of a bottom discharge bin having an interior hopper **10***a* which communicates with a discharge

opening **11**. A cover **12** for the discharge opening is pivotally attached at **13** and is fitted with a resilient gasket **14**. An upwardly-curved cover extension **15** which may optionally have a wear plate **16** is shown held in a closed position by the latching mechanism **17**. The latching mechanism **17** comprises supporting means such as a pair of support brackets **18** (see FIGURE 4) spaced apart and extending vertically from a bottom portion of the bin. Each of said support brackets has an angled slot **19** with an offset notch or recess **20**, preferably arcuate as shown. The angular position of the slot is such that the bottom of the slot is closer to said cover pivoting means **13** than is the top of said slot. The offset notch or recess **20** is between the top and bottom at the slot and is on the side of the slot away from the cover-pivoting means **13** and will preferably be at about the center of said angled slot. Positioned between the support brackets **18** (as shown in FIGURE 4) is a cam **21** having as shown in the side view drawings, an essentially elliptical vertical cross section, said cam having an edge projection **22**. The edge projection **22** will preferably extend along the entire end of said cam as shown in FIGURE 4, but may comprise one or more teeth instead of a continuous edge. Shaft means **23** pivotally support cam **21** for movement about a substantially horizontal axis and said shaft means are carried by the angled slots of said brackets. At least one of said shaft means is provided with means to engage a tool to rotate the cam. Optionally, there may be provided near or adjacent the angled slot and mounted on the support brackets, stopping means **26** in order to prevent full rotation of said cam. In order to ensure that the cover extension **15** may clear the latching mechanism when swinging to the open position, it is preferable that it not extend beyond centerline *a—a* shown in FIGURE 1.

FIGURE 4 illustrates in more detail the tool for engagement with the cam shaft **23** for rotating the cam about its axis. In FIGURE 4 the engaging means is a T bar on the shaft which engages a slot of the tool **25**. However, it will be understood that other forms of tool engagement may be used as for example a square or hexagonal nut on the shaft **23** with a corresponding mating piece on the tool **25**.

Operation of the latch device is quite simple and easily carried out at a distance from the latch itself by means of the actuating tool. To open the cover from a closed position, the cam is rotated as shown by the arrow in FIGURE 1 allowing the cover **12** to drop and rest on the end of the cam which has been turned about 180°. In this manner there is obtained a partially-opened position as shown in FIGURE 2. This partially-opened position is further illustrated by the broken lines shown in Position A of FIGURE 3. It may be seen that further rotation of the cam in the same direction, as shown by the arrows, engages the projection **22** with the cover extension **15**. The rotation of the cam forces the projection **22** against the end of cover extension **15**, which with continued rotational force applied causes the shafts **23** to move into the off-set position by occupying recess **20**. When this occurs, the cover falls, clearing the latch mechanism as shown in Position B and thereby achieving a fully-opened position. Upon removal of the rotating tool from engagement with the cam shaft, the cam may be allowed to fall by gravity from the off-set notch to the bottom of the angular slot. Thus, the offset notch is preferably arcuated to aid this falling movement of the cam.

To close the cover of the bottom discharge bin, the procedure is simply reversed. The cover is raised and as it approaches the latch mechanism it contacts the cam. With further raising, the cover extension pushes the cam shafts into the off-set and thereby is able to

proceed upward clear of the cam which then drops by gravity into the lower portion of the angled slot. The cover extension above the cam may now rest on the cam to assume a partially-open position as shown in FIGURE 2. Engagement of the tool with the actuating means on the shaft then permits rotation of the cam in a manner opposite to the arrow shown in FIGURE 1 and FIGURE 3 so that the cam engages the cover extension and raises it to the closed position.

It will be understood that various changes and modifications may be made to various features of the device. In FIGURE 5 for example, there is illustrated a bottom portion of a bin in which the cover **27** for the discharge opening is adjustably mounted by means of a threaded bolt **28** to a cover-retaining bar **29** which is pivotally attached at **13** to the bottom of the bin and which is engaged by the latching mechanism as previously illustrated. An advantage of this embodiment is that it permits adjustment of the cover upon the resilient gasket **14** and thereby enables a tight closure to be maintained even though dimensional changes due to wear might occur.

In FIGURES 6 and 7 there are illustrated cams for the latching mechanism which differ in shape from the cam shown in the previous drawings. In FIGURE 6 the cam has a flat top which is useful to provide a greater contact surface between the cam and the wear plate **15**. In FIGURE 7 there is illustrated a lobed cam which enables a more positive seating arrangement to be obtained. In this embodiment of the invention the extension of the cover or cover-retaining bar has a nub **30** at its end and adjacent said nub seating means such as a depression into which the lobe **32** of the cam **21** seats. It is preferable that the nub **30** not extend beyond the center line *a—a* in order for the cover extension to easily clear the cam in the full release position (i.e. with the cam shafts in the offset notch). It will be understood further that the cam, the cover extension or retaining bar, and the various other parts of the latching mechanism may be modified in numerous ways without departing from the spirit and scope of the invention.

I claim:

1. In a bin having a bottom discharge opening the improvement which comprises, in combination, a cover for said bottom discharge opening and a cam latching mechanism therefor;

said cover

having means pivotally attaching it to a bottom portion of said bin to swing downwardly from a closed position to an open position, and having an upwardly curved extension on a side opposite said pivoting means;

said latching mechanism comprising:

A. supporting means extending vertically from a bottom portion of said bin, said supporting means having an angled slot with an offset notch between the bottom and top of said slot, the angular position of said slot being such that the bottom of said slot is closer to said cover pivoting means than is the top of said slot, said offset being on the side of said slot away from said cover pivoting means,

B. a cam having an edge projection extending at one end,

C. shaft means pivotally supporting said cam for pivotal movement about a substantially horizontal axis, said shaft means being carried by said slot in said supporting means, said shaft means being capable of engagement with a tool to rotate said cam about its axis,

whereby,

said upwardly-curved extension of said cover in its closed position rests on an end of said cam and when unlatching said cover by rotating said cam, said cover drops and said curved extension

rests on the opposite end of said cam to achieve a partially open position, and whereby further rotation of said cam in the same direction, forces said projection against said cover extension and moves said supporting cam shaft means into said offset notch allowing said cover to fall clear of said latch mechanism to a fully open position.

2. In a bin having a bottom discharge opening, the improvement which comprises, in combination, a cover for said bottom discharge opening and a cam latching mechanism therefor;

said cover

having means pivotally attaching it to a bottom portion of said bin to swing downwardly from a closed position to an open position, and having an upwardly curved extension on a side opposite said pivoting means;

said latching mechanism comprising:

A. a pair of support brackets spaced apart and extending vertically from a bottom portion of said bin, each of said brackets having an angled slot with an arcuated center offset notch, the angular position of said slot being such that the bottom of said slot is closer to said cover pivoting means than is the top of said slot, said offset being on the side of said slot away from said cover pivoting means,

B. a cam having an essentially elliptical vertical cross-section positioned between said support brackets, said cam having an edge projection extending at one end,

C. shaft means pivotally supporting said cam for pivotal movement about a substantially horizontal axis, said shaft means being carried by said slots in said brackets, means on said shaft means to engage a tool to rotate said cam about its axis, and cam stopping means attached to said support bracket at a point above said offset notch to prevent full rotation of said cam;

whereby,

said upwardly curved extension of said cover in its closed position rests on an end of said cam and when unlatching said cover by rotating said cam about 180° away from said cam stopping means, said cover drops and said extension rests on the opposite end of said cam to achieve a partially open position, and whereby further rotation of said cam in the same direction, engages said projection with said cover extension and moves said supporting cam shaft means into said arcuated offset notches allowing said cover to fall clear of said latching mechanism to a fully open position; and whereby in closing said discharge opening said cover extension contacts said cam and moves said cam shafts into said arcuated offset notches to permit clearance of said cover extension as is moves to a position above said cam, said cam shaft means thereafter returning by gravity to the bottom of said slots, thereby permitting said cover extension to rest on one end of said cam and thereby holding said cover in a partially closed position until said cam is rotated further to raise said cover to a fully closed position.

3. In a bin having a bottom discharge opening, the improvement which comprises, in combination, a cover

for said bottom discharge opening and a cam latching mechanism therefor;

said cover

having means pivotally attaching it to a bottom portion of said bin to swing downwardly from a closed position to an open position, and having an upwardly curved extension on a side opposite said pivoting means, said curved extension having seating means adjacent its end;

said latching mechanism comprising:

A. a pair of support brackets spaced apart and extending vertically from a bottom portion of said bin, each of said brackets having an angled slot with an arcuated center offset notch, the angular position of said slot being such that the bottom of said slot is closer to said cover pivoting means than is the top of said slot, said offset notch being on the side of said slot away from said cover pivoting means,

B. a lobed cam having an essentially elliptical vertical cross-section positioned between said support brackets, said cam having an edge projection extending at one end,

C. shaft means pivotally supporting said cam for pivotal movement about a substantially horizontal axis, said shaft means being carried by said slots in said brackets, at least one of said shaft means capable of engaging a tool to rotate said cam about its axis, cam-stopping means attached to said support bracket at a point above said offset notch to prevent full rotation of said cam;

whereby,

said seating means of said upwardly curved extension rests on said cam lobe in a closed cover position and when unlatching said cover by rotating said cam about 180° away from said stop, said cover drops and said extension then rests on the opposite end of said cam to achieve a partially open position, and whereby further rotation of said cam in the same direction, engages said cam projection with the end of said extension and moves said supporting cam shaft means into said arcuated offset notches allowing said cover to fall clear of said latching mechanism to a fully open position; and whereby in closing said discharge opening said cover extension contacts said cam and moves said cam shaft means into said arcuated offset notches to permit clearance of said cover extension as it moves to a position above said cam, said cam shaft means thereafter returning by gravity to the bottom of said slots thereby permitting said cover extension to rest on said cam and thereby holding said cover in a partially closed position until said cam is rotated further to raise said cover to a fully closed position.

4. In a bin having a bottom discharge opening, the improvement which comprises in combination, a cover for said bottom discharge opening and a cam latching mechanism therefor;

said cover

being attached to a cover-retaining member which has means pivotally attaching it to a bottom

portion of said bin to swing downwardly from a closed position to an open position, said cover-retaining member having an upwardly curved extension on a side opposite said pivoting means; said curved extension having seating means adjacent its end;

said latching mechanism comprising:

A. a pair of support brackets spaced apart and extending vertically from a bottom portion of said bin, each of said brackets having an angled slot with an arcuated center offset notch, the angular position of said slot being such that the bottom of said slot is closer to said cover pivoting means than is the top of said slot, said offset being on the side of said slot away from said cover pivoting means.

B. a lobed cam having an essentially elliptical vertical cross-section positioned between said support brackets, said cam having an edge projection extending at one end,

C. shaft means pivotally supporting said cam for pivotal movement about a substantially horizontal axis, said shaft means being carried by said slots in said brackets, at least one of said shaft means capable of engaging a tool to rotate said cam about its axis, cam stopping means attached to said support bracket at a point above said offset to prevent full rotation of said cam;

whereby,

said seating means of said upwardly curved extension of said cover in its closed position rests on said cam lobe and when unlatching said cover by rotating said cam about 180° away from said stopping means, said cover drops and said extension then rests on the opposite end of said cam to achieve a partially open position, and whereby further rotation of said cam in the same direction engages said cam projection with the end of said extension and moves said supporting cam shaft means into said arcuated offset notches allowing said cover to fall clear of said latching mechanism to a fully open position; and whereby in closing said discharge opening said cover extension contacts said cam and moves said cam shaft means into said arcuated offset notches to permit clearance of said cover extension as it moves to a position above said cam, said cam shaft means thereafter returning by gravity to the bottom of said slots, thereby permitting said cover extension to rest on one end of said cam and thereby holding said cover in a partially closed position until said cam is rotated further toward said stopping means to raise said cover to a fully-closed position.

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