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DISPENSING BIN AND METHOD FOR LOADING AND UNLOADING SAME

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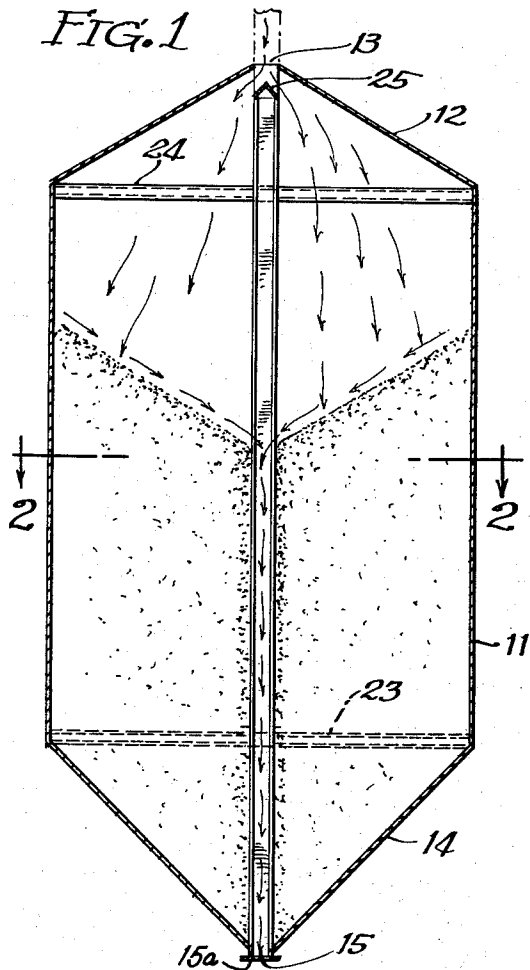


FIG. 2

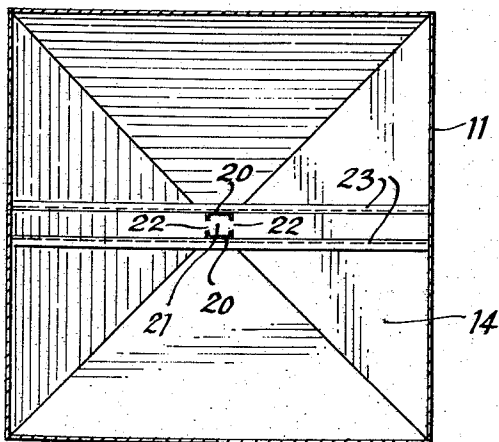


FIG. 3

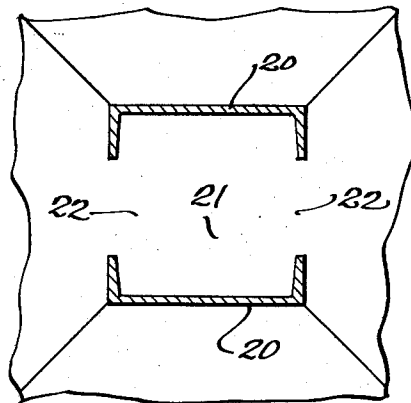
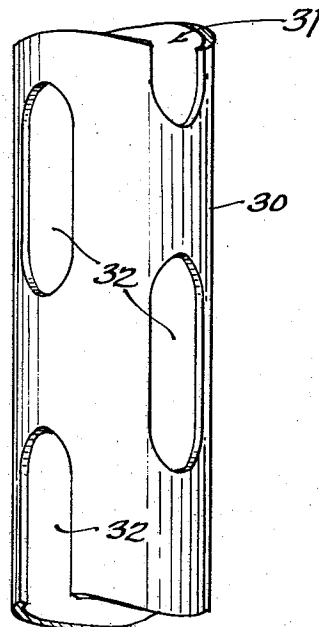


FIG. 4



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1

3,094,243

DISPENSING BIN AND METHOD FOR LOADING AND UNLOADING SAME

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Continuation of application Ser. No. 705,034, Dec. 24, 1957. This application June 13, 1960, Ser. No. 35,841
2 Claims. (Cl. 222-1)

This invention relates to a dispensing bin for granular material and in particular to a dispensing bin which prevents segregation of the granular material in accordance with characteristics of individual particles thereof as the material moves toward a discharge opening at the bottom thereof. This application is a continuation of application Serial No. 705,034, filed December 24, 1957, now abandoned.

In dispensing bins for granular materials such as sand, grain and coal, it is common to withdraw the material from the bottom of the bin through a gated discharge opening. As the material is withdrawn from the bottom of the bin, usually in successive discharges, the remaining material within the bin is caused repeatedly to shift with the result that there is a significant segregation of the particles in accordance with their individual characteristics such as weight, size and/or density. This is objectionable since the material obtained in one discharge will differ substantially from that obtained in a subsequent discharge in that the two discharges will have different concentrations of particles of a given characteristic. In particular the last discharges from a bin will tend to have a disproportionately large percentage of low density or large particles, the smaller particles or particles of heavier density having worked their way past the larger or lighter density particles as a result of the churning action caused by previous discharges.

A dispensing bin constructed in accordance with the present invention will discharge granular material from the bottom of the bin without permitting segregation of the material in accordance with the characteristics of the individual particles thereof. It is to be noted that apparatus constructed in accordance with the present invention is not intended as a mixing apparatus such that otherwise segregated materials may be mixed, but that it does permit withdrawal of material without causing segregation. This function is accomplished in accordance with the present invention without moving parts. More particularly, no part of the apparatus other than the discharge gate is movable either automatically or manually.

In accomplishing this result, apparatus constructed in accordance with the present invention permits withdrawal of the material through a gated discharge opening at the bottom of the bin but actually withdraws material from the uppermost level of the material in the bin. In so removing the upper levels of the material in the bin, there is no movement of any of the material in the bin except for a simple sliding movement of the uppermost level of material followed by a straight drop. It will readily be seen, therefore, that little or no opportunity is provided for segregation of the material in accordance with the characteristic of the individual particles.

It is an object of the invention to provide an improved dispensing bin for granular materials which permits withdrawal of the material through a discharge opening at the bottom of the bin without permitting segregation of the material.

It is another object of the invention to provide an improved dispensing bin for granular materials having the characteristics described immediately above and which employs no moving parts.

It is a further object of the invention to provide an improved dispensing bin for granular materials which withdraws such material from the uppermost layers within

2

the bin and discharges the material through an opening in the bottom of the bin.

It is another object of the invention to provide an improved dispensing bin having the characteristics described immediately above and which employs no moving parts.

It is a still further object of the invention to provide an improved dispensing bin for granular materials in which the material is discharged through an opening in the bottom of the bin and in which movement of material within the bin is limited to the uppermost levels.

This invention, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings, in which like parts are designated by like reference numerals:

FIGURE 1 is a cross-sectional view of a dispensing bin illustrating one embodiment of the invention;

FIG. 2 is a cross-sectional view taken along the line 2-2 of FIG. 1;

FIG. 3 is a greatly enlarged partial view of the central portion of the apparatus shown in FIG. 2; and

FIG. 4 is a partial view of an alternative embodiment of a portion of the apparatus of FIGS. 1-3.

The illustrated embodiments of the invention are specifically intended to handle sand. However, the invention has application to dispensing bins for handling any form of granular material regardless of the nature of the material or the size of the individual particles. More particularly, the granular material may be inert materials such as sand and gravel, or edible materials such as grain of various forms. The material also may be of small particle size as in the case of sand or grain and it may be of large particle size as in the case of lump coal, it being necessary only to proportion the apparatus in accordance with the size of the particles.

The dispensing bin illustrated in the drawing includes a generally vertical wall 11 defining the main body of the bin. While the wall 11 defines a bin of square, horizontal cross section, it will be readily understood that the bin may be of any desired cross section. It will also be understood that the wall 11 need not be vertical since the bin might be spherical or tapered or of any suitable shape without altering the applicability of the present invention.

The upper end of the dispensing bin shown in the drawing is closed with a pyramidal roof portion 12 with the exception of a port 13 through which the bin may be filled. The lower portion of the bin is formed of an inverted pyramidal portion 14 terminating in a discharge opening 15. This discharge opening is gated by any suitable form of gate 15a to control the discharge of material from the bin. Since various forms of gate are well known in the art and since the particular form of gate does not constitute a feature of the present invention it is not shown in detail in the drawing or described in detail herein. It is believed to be sufficient for the purpose of disclosing the present invention to state that the gate 15a serves to permit and to stop the flow of material at the discretion of an operator.

It is well recognized in the art that when granular material is withdrawn from the bottom of a dispensing bin such as that so far described, there will be a resulting mixing and churning of the material remaining in the bin such that segregation of the material will take place in accordance with the characteristics of the individual particles. In general, small or dense particles will find their way to the bottom more rapidly than large or less dense particles, with the result that the latter will be concentrated in the last withdrawals. The novel apparatus described below and incorporated in the dispensing bin thus far described serves to minimize shifting and sliding of

3

the material within the dispensing bin whereby segregation of the material is substantially avoided.

This apparatus comprises, in the embodiment of FIGS. 1-3, a pair of channel members 20 which define a vertical passage 21 extending substantially throughout the height of the dispensing bin. The channel members 20 extend through and fill the opening 15 at the bottom of the dispensing bin whereby the passage 21 has exclusive communication with the actual discharge opening. In other words, there is no communication between the bin and the actual discharge opening except by way of the passage 21. The channel members 20 are spaced apart to provide a pair of vertical openings 22 through which the material in the bin may pass into the vertical passage 21 defined by the channel members 20.

Preferably, short portions of the channel members extend below the opening 15 and are covered to form a chute, as shown in FIG. 1. The gate, referred to above, for controlling discharge is preferably arranged in this chute.

These channel members may be supported by any suitable means and in the illustrated embodiment of the invention are supported by two pairs of beams 23 and 24 which extend from wall to wall of the bin and engage the outer surfaces of the channel members 20. The beams 23 support the channel members 20 near their lower ends, while the pairs of beams 24 similarly support the channel members near their upper ends.

The flanges of the channel members 20 preferably terminate below the upper peak of the bin, and support a baffle 25 which may be fastened thereto by spot-welding. Material entering the opening 13 at the top of the dispensing bin will strike the sloping surfaces of the baffle 25 such that it is thrown to the sides of the bin. This prevents piling up of the material within the vertical passage 21 and irregular distribution of the material in the bin. Alternatively, the channel members may terminate completely at a point below the top of the bin and may have a pyramidal baffle secured thereto.

When the gate at the discharge opening 15 is opened to withdraw material, the material located within the vertical passage 21 may discharge with a straight vertical drop whereas material located outside the vertical passage, even though it lies closely adjacent the vertical openings 22, must move laterally as well as downwardly before it can enter the vertical passage 21. Accordingly, material outside the vertical passage remains substantially stationary while the material within the vertical passage moves downwardly and out through the discharge opening 15. Observation has confirmed that little or no material enters the vertical passage 21 through the vertical slots 22 below the uppermost level of material within the bin.

The vertical passage 21 is continuously refilled, during discharge, by material from the uppermost level within the bin. The upper surface of the material in the bin tends to assume a sloping or conical form as suggested by the phantom lines in FIG. 1. Particles at the uppermost level must move laterally as well as downwardly to reach the vertical passage 21, but the resulting tumbling action is confined to a thin top layer of material. Accordingly any segregation of particles resulting from this tumbling action is on a very small scale and the effect is not accumulative. Since there is negligible shifting and sliding of the great bulk of material below the uppermost level and the tumbling action at the uppermost level has insignificant segregating effect, there is negligible segregation of the material.

It will be apparent that the means defining the vertical passage 21 may be of various forms. A single vertical opening 22 might be provided, in which case the means defining the vertical passage 21 might be box-like in horizontal cross section with an opening provided in only one wall thereof. The means defining the vertical passage 21 might also be tubular with one or more vertical openings. Still further, the means defining the open-

4

ing of the passage 21 might be of any desired cross section with numerous large perforations therein such that a substantially continuous vertical opening is provided in effect. Where a substantially continuous vertical opening is specified herein it is to be understood that the opening is substantially continuous in a vertical direction only to the extent that as the level of the material in the bin falls, an opening into the vertical passage 21 is always provided for the material which at any given moment lies adjacent the uppermost level of material within the bin. It will be apparent that if the substantially continuous vertical opening in the means defining the vertical passage 21 is discontinuous to the extent that there is no opening for a height of, for example, two inches, when the level of the material in the bin immediately adjacent the vertical passage 21 reaches the bottom of the opening above the two-inch dead space, material will then flow into the next opening two inches below with the result that there is some churning of material in the upper few inches of the material in the bin. However, any segregation of material would be limited to the material in this upper stratum and accordingly would be limited to this relatively small quantity of material and would not be accumulative. Accordingly, it may be seen that if the substantially continuous vertical opening is not in fact absolutely continuous, a small amount of churning and a small amount of segregation would theoretically occur. However, since the segregation would not be accumulative and would be confined to segregation within a relatively small batch, the effect, for most practical purposes, would be negligible.

If one or more actually continuous vertical openings should be considered undesirable in a given application of the invention for the reason that it weakens the means which define the vertical passage, a vertical passage which is fully continuous, in effect, may be obtained in the manner illustrated in the embodiment of FIG. 4. In this embodiment a tube 30 defines a vertical passage 31 and material is permitted entry to this passage by slots 32. These slots are of limited length but successive slots overlap in the vertical direction such that material at all levels has access to the passage 31. The slots 32, additively, constitute a continuous vertical opening such that all levels of material within the bin have access to the vertical passage 31 through one or more of these overlapping slots. In view of the analysis presented above, it will be understood that even if the slots 32 were short of overlapping in a vertical direction they would still provide a substantially continuous vertical opening and would function satisfactorily.

A dispensing bin has now been described which provides for the discharge of granular material from the bottom thereof without permitting segregation of the granular material in accordance with the individual characteristics of the particles. This is accomplished by withdrawing the uppermost levels of material first through the bottom opening, without the use of any moving parts other than the conventional gate means at the bottom opening.

It will be apparent that the invention may be varied in its physical embodiment without departing from the spirit of the invention, and it is desired, therefore, that the invention be limited only by the scope of the appended claims.

The invention having thus been described, what is claimed and desired to be secured by Letters Patent is:

1. In combination, a bin, a gated discharge outlet at the bottom of said bin, a mixture of granular material disposed in said bin, a fixed, straight, tubular means disposed substantially centrally within said bin and extending vertically therein from said outlet to a location in proximity to the top of said bin, an inlet opening at the top of said bin, said tubular means defining a longitudinal slot extending throughout its length to provide exclusive communication between said bin and said dis-

5

charge outlet to permit the upper layer of granular material within said bin to flow into said passage at any level of said upper layer and to prevent the lower layers of granular material within said bin from flowing into said passage by virtue of the weight of the upper layers of said material thereon, a downwardly and radially outwardly inclined conically shaped baffle located at the top of, and closing the upper end of, said conduit, a closure member over the top of said bin having a centrally disposed inlet opening positioned directly above and in proximity to said baffle, said inlet opening being the only inlet for said granular material to said bin whereby granular material may fall by gravity alone through said passage and said outlet without segregation.

2. A method of loading and unloading a mixture of granular material from a storage bin through a discharge opening in the bottom of said bin in a manner to prevent segregation of said mixture into different sized particles comprising the placing of a conduit in a vertical position with its bottom end in communication with said discharge opening, providing aperture means in the side walls of said conduit throughout the length thereof, so as to afford continuous communication between the bin space surrounding the conduit and said discharge opening, via said aperture means and the interior of the conduit, providing

6

an inlet opening at the upper center of said bin, and providing baffle means, in close proximity to said inlet opening, for causing material entering the bin to be directed toward, and impinge upon, the sides of said bin whereby said material is caused to descend by gravity downwardly and radially inwardly toward said conduit aperture means, whereby the granules of said granular material enter the conduit by gravity only from the upper layer of the material in said bin and are discharged by gravity through said discharge opening, no matter at what level said upper layer may be disposed.

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