Dec. 21, 1965 H. W. DIETERT 3,224,609

SACK OPENING STRUCTURE

Original Filed Feb. 18, 1963

FIG. 1

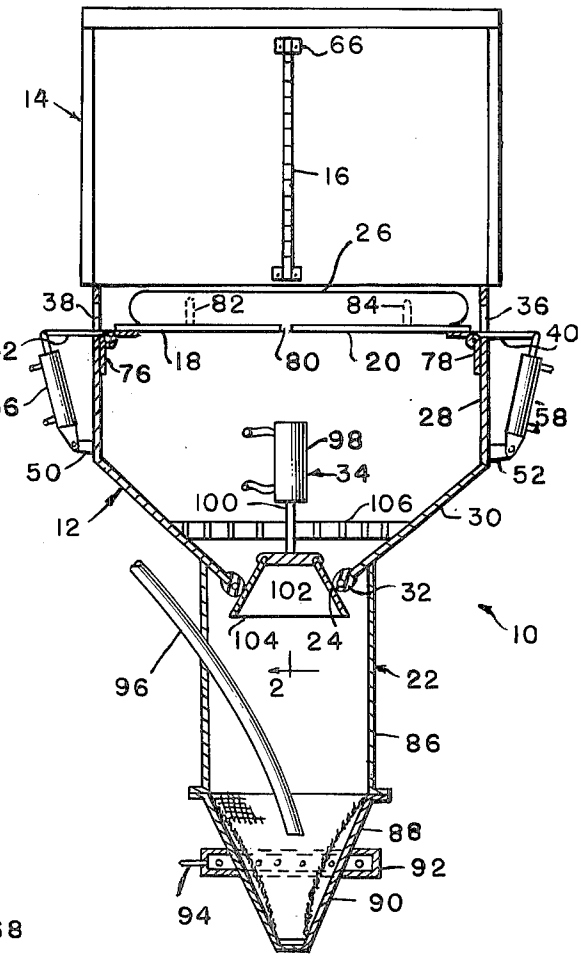


FIG. 3

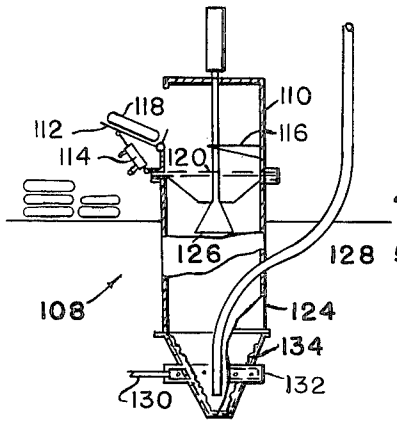
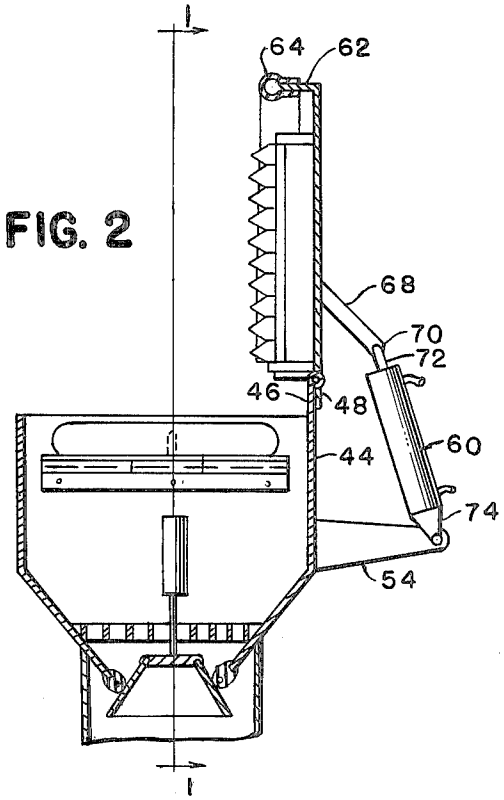


FIG. 2



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3,224,609

SACK OPENING STRUCTURE

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Original application Feb. 18, 1963, Ser. No. 259,069, now Patent No. 3,168,926. Divided and this application July 23, 1964, Ser. No. 384,694

8 Claims. (Cl. 214—305)

The invention relates to material handling apparatus and refers more specifically to structure for opening sacks of powdered material.

This application is a division of copending patent application, Serial No. 259,069, filed February 18, 1963, now Patent No. 3,168,926.

In the past the opening and emptying of sacks of powdered material such as a bonding agent for granular material to be used in conditioning foundry sand as, for example hygeria wood flour, sea coal or bentonite has been a problem in foundry operations since the opening and emptying of such sacks produces a considerable amount of dust. The dusting of the powdered material is undesirable in that a certain amount of the powdered material is lost and floats in the atmosphere or settles on foundry equipment giving the area of sack opening and emptying a dusty, messy appearance. The settled dust may also adversely affect foundry equipment such as scales, batching apparatus and the like.

Further, the dusting of powdered material in opening and emptying sacks in the usual manner with a sharp instrument and manually emptying sacks into a hopper or tank is dangerous to the health of sack opening personnel in that their respiratory systems may be damaged by inhaling the small particles of the powdered material floating in the air. Masks and other devices to prevent inhaling of the powdered material are uncomfortable and reduce the efficiency of the sack opening personnel.

It is therefore one of the purposes of the present invention to provide improved sack opening structure.

Another object is to provide sack opening structure which is automatic and sealed to prevent dusting during the opening and emptying of the sacks.

Another object is to provide automatic sack opening apparatus including a housing, means for loading the housing with a sack of material to be opened and means for subsequently opening the sack to permit the powdered material therein to flow into the hopper.

Another object is to provide sack opening structure as set forth above and further including means for positioning the open sacks to permit ready emptying of the sacks into the housing.

Another object is to provide sack opening structure as set forth above and further including means for emptying the housing into a storage tank positioned therebeneath.

Another object is to provide sack opening structure including a housing having a door in one side thereof on which a sack to be opened may be positioned, means for automatically opening and closing the door, a knife blade for splitting the sack open positioned in the housing to intercept a sack placed on the door on closing of the door to split open the sack and a grate in the housing to intercept the split sack while permitting the powdered material to pass therethrough.

Another object is to provide sack opening structure including a housing, a cover for the housing, a pair of grates pivotally supported from opposite sides of the housing and means for pivoting the grates from a horizontal position in which a sack of powdered material may be supported on the grates into an inclined position, a cover over said housing, a knife carried by the cover for splitting open a sack positioned on the grates when the cover is closed, and a valved opening in the housing for emptying the housing.

Another object is to provide sack opening structure as set forth above and further including stakes on the grates to retain portions of a split sack on the grates on pivoting of the grates into an inclined position.

Another object is to provide sack opening structure which is simple in construction, economical to manufacture and efficient in use.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

FIGURE 1 is a longitudinal section view of sack opening structure constructed in accordance with the invention taken substantially on the line 1—1 in FIGURE 2.

FIGURE 2 is a longitudinal section view of a portion of the sack opening apparatus illustrated in FIGURE 1 taken substantially on the line 2—2 in FIGURE 1.

FIGURE 3 is a diagrammatic, partly broken away, elevation view of a modification of the sack opening structure illustrated in FIGURE 1.

With particular reference to the figures of the drawing one embodiment of the present invention will now be considered in detail.

The sack opening structure 10 illustrated in FIGURE 1 includes a housing 12 having a cover 14 on which knife structure 16 is mounted and including the pivotally mounted grates 18 and 20 positioned therein. The storage tank 22 is positioned beneath the housing 12 and is separated therefrom by the valved opening 24.

In operation a sack of granular material 26 is positioned on the grates 18 and 20. The cover 14 is closed so that knife structure 16 splits the sack 26 open. After the sack 26 is split open the grates 18 and 20 are pivoted to empty the powdered material which may be a foundry granular material additive such as hygeria wood flour, sea coal, bentonite and the like, into the housing 12. The powdered material will then proceed by gravity into the storage tank 22 through the valved opening 24. The cover 14 may then be opened again and grates 18 and 20 pivoted back into their original horizontal position as shown to receive another sack of powdered material after the split sack has been removed therefrom.

More specifically, the housing 12 of the sack opening structure 10 has a rectangular upper portion 28 with vertically extending sides and a lower portion 30 which tapers inwardly to the circular opening 24 in the bottom of the housing 12. An annular rubber seal 32 is provided around the opening 24 operable in conjuction with the valve assembly 34 to seal the opening 24. Slots 36 and 38 are provided in the upper portion 28 of the housing 12 through which the actuating arms 40 and 42, respectively, for grates 18 and 20 extend. The side 44 of housing 12 extends upwardly as shown in FIGURE 2 to provide the portion 46 upon which the cover 14 is pivotally secured as by hinge means 48. Supporting brackets 50, 52 and 54 for the actuating cylinders 56, 58 and 60 are secured to the housing 12 as shown in FIGURES 1 and 2.

The cover 14 is rectangular and substantially flat. Cover 14 includes the flange 62 extending around three sides thereof on which is positioned sealing member 64 which may be of rubber or suitable flexible plastic. The knife structure 16 is secured to the cover 14 by convenient means such as brackets 66 shown in FIGURE 1. The cover actuating arm 68 is secured to cover 14 as shown best in FIGURE 2. Actuating arm 68 is pivotally connected at 70 to piston 72 of actuating cylinder 60. Cylinder 60 is pivotally connected at end 74 to mounting bracket 54 therefor as shown best in FIGURE 2. The cylinder

60 may be pneumatically or hydraulically operated and serves to open and close the cover 14 as desired.

Grates 18 and 20 are secured within the housing 12 by hinge means 76 and 78 respectively and extend substantially entirely across the width of the housing 12 as shown best in FIGURE 2. The grates 18 and 20 are slightly separated at 80 to permit the knife structure 16 to extend therethrough on closing of the cover 14 whereby a sack 26 may be entirely split in two.

Stakes 82 and 84 respectively are positioned on the grates 18 and 20 to retain the sacks 26 on the grates 18 and 20 after the sacks are split in two and the grates 18 and 20 pivoted into an inclined position on actuation of the cylinders 56 and 58 to permit the material in the sack 26 to flow by gravity into the housing 12.

Storage tank 22 includes the cylindrical portion 86 secured by convenient means, such as welding, to the portion 30 of housing 12. A conical portion 88 is secured to the bottom of the cylindrical portion 86 of tank 22 by convenient means (not shown) and includes therein the diffusing filter 90 for passing air from the diaphragm 92 into tank 22 from a source of air (not shown) connected to the conduit 94. Thus as more fully set forth in the above referenced patent application powdered material in the tank 22 may be transferred from the storage tank 22 out through the conduit 96 with the valve assembly 34 closed.

Valve assembly 34 includes the actuating cylinder 98 which again may be either hydraulic or pneumatic, the actuating piston 100 movable in cylinder 98 which supports the disc 102 having the conical valve 104 cooperable with the sealing member 32 to seal opening 24 secured thereto. Grate 106 is provided in conjunction with valve structure 34 to support the valve structure 34 and to permit powdered material to fall therethrough while retaining any portion of the sack 26 which might become loose and otherwise tend to fall into the storage tank 22.

In over-all operation of the sack opening structure 10 a sack 26 of powdered material is positioned on the grates 18 and 20 with the cover 14 open and the grates 18 and 20 held in the position illustrated in FIGURE 1 by the cylinders 56 and 58. The stakes 82 and 84 pierce the bag 26.

The cover 14 is then closed by actuation of the cylinder 60 whereby the knife structure 16 slices through the bag 26. Simultaneously with the slicing of the bag 26 the sealing means 64 seals the housing 12 to prevent dust from escaping from the housing 12. The valve 104 is held open at this time by means of the cylinder 98.

The cylinders 56 and 58 are then actuated to pivot the grates 18 and 20 into an inclined position in which the powdered material is drained by gravity from the split portions of the sack 26. The powdered material then drains through grate 106, opening 24 and into the tank 86.

At this time the valve 104 is closed, the cylinders 56 and 58 actuated again to place the grates 18 and 20 in the position illustrated in FIGURE 1 and the cylinder 60 is actuated to again open the cover 14. The halves of the sack 26 may then be removed from the grates 18 and 20 on which they have been retained by the stakes 82 and 84. Air under pressure may then be passed into the diaphragm 92 and through the filter 90 into tank 22 to force the powdered material through the conduit 96.

Thus it will be seen that the sack opening structure 10 is completely automatic and that it requires only the manual positioning of a sack 26 on the grates 18 and 20 and the removing of the opened and empty portions of the sack 26 in a cycle of operation. Further it will be seen that the sack opening structure 10 is substantially dust free so that other foundry equipment is not affected by the sack opening operation. The sack opening operation can therefore be moved much closer to the point of use of the powdered material. Also, due to the reduction in dust at the sack opening and emptying operation the operation may be more efficient and less dangerous to health.

The modified sack opening structure 108 illustrated in FIGURE 3 includes the housing 110 having the door 112 therein operated by the cylinder 114 and the knife 116 extending from one side thereof for intercepting a sack 118 on closing of the door 112 to split the sack 118 open. Grate 120 is provided in the bottom of housing 110 to intercept the sack after it is split open so that the sack may easily be removed from the housing 110 on opening of the door 112.

Again the tank 124 is provided beneath the housing 110 to receive the powdered material in the sack 118 through the valve 126. The powdered material may be removed from the tank 124 and through the conduit 128 on application of air from line 130 through diaphragm 132 and filter 134 into tank 124 as before.

While one embodiment of the present invention and a modification thereof have been disclosed in detail, it will be understood that other embodiments and modifications of the invention are contemplated. It is the intention to include all embodiments and modifications of the invention as are defined by the appended claims within the scope of the invention.

What I claim as my invention is:

1. Sack opening structure comprising a housing having an opening therein, a closure for said opening, knife means operably associated with said housing and closure for splitting open a sack positioned in the housing in response to closing of the closure, a tank positioned beneath the housing, an opening in said housing between the housing and tank, a valve in the opening between the housing and tank through which the contents of the sack will pass by gravity into the tank from the housing on splitting open of the sack with the valve open and pneumatic conveyor means in said tank for feeding the material from the tank with the valve closed.

2. Structure as set forth in claim 1 wherein the closure is a door in the side of the housing, a sack of material is positioned on the door and the means for splitting open the sack is a knife extending transversely of the housing operably associated with the door to intercept a sack positioned on the door on closing of the door.

3. Structure as set forth in claim 2 wherein the means for retaining the sack comprises a grate extending transversely of the housing below the knife.

4. Structure as set forth in claim 1 wherein the closure is a cover, the means for splitting open sacks is a knife carried by the cover and further including a pair of grates pivotally mounted at opposite sides of the housing for receiving a sack thereon adjacent said cover.

5. Structure as set forth in claim 4 wherein the means for retaining the sacks adjacent the cover comprises a pair of stakes secured to the grates for piercing a sack positioned thereon prior to cutting thereof on closing of the cover.

6. Structure as set forth in claim 1 wherein the knife means comprises a knife blade secured in the housing for intercepting sacks positioned on the closure on closing of the closure to split the sacks open and further including a grate positioned between the knife blade and valve for receiving the sack after it has been opened by the knife blade while permitting the contents of the sack to pass through the opening between the housing and tank with the valve in an open position into the tank.

7. Structure for breaking open sacks of powdered material comprising a housing having a tapered lower end terminating in a valved opening, a valve in said opening, a grate extending over said opening, a pair of doors pivotally secured to opposite sides of said housing at the top thereof, said doors parting centrally of said housing and covering substantially the entire top of the housing, means for pivotally moving said doors, stakes secured to said doors for holding a sack thereon, a cover for said housing pivotally secured to one of the other sides thereof at the top and having sealing means extending around the periphery thereof, a knife blade secured to and extending

transversely of said cover for splitting open a sack positioned on said doors on closing of the cover, means for selectively closing the cover, a tank positioned beneath the valved opening in the housing for receiving the powdered material from the sack after it has passed through the grate and by the valve with the valve in the open position.

8. Sack opening structure comprising a housing having an opening therein, a closure for said opening, knife means operably associated with said housing and opening for splitting open a sack positioned in the housing in response to closing of the closure, a tank positioned beneath the housing, an opening in said housing between the housing and tank through which the contents of the sack will pass by gravity into the housing from the tank on splitting open of the sack and pneumatic conveyor means in said tank for feeding the material from the tank with the valve closed.

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