APPARATUS AND PROCESS FOR FILLING BAGS

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FIG. 1

FIG. 2

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APPARATUS AND PROCESS FOR FILLING BAGS

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This invention relates to improvements in apparatus and process for filling bags, and more particularly to a method of filling bags with finely divided bulk material such as sugar, cement, fertilizer and the like, and other pulverized material.

Although it has heretofore been suggested to provide apparatus and methods of bagging such material, the devices and methods heretofore known have had a number of disadvantages. Some of such devices have employed complicated bag clamping apparatus which included expensive electrical and mechanical devices such as trigger actuating mechanisms. Others of such devices have depended upon the impact of the slug within the bag to cause the bag to fall away from the spout with a resulting loss of material in dust and tailings and inaccuracies in the weight of the material in the bag.

It is accordingly an object of this invention to overcome the disadvantages just referred to.

It is another object of this invention to provide an improved process and apparatus for filling bags with finely divided material quickly and simply, keeping the loss of material in dust and tailings to a minimum and also insuring more accurate weight of material in the bag.

It is another object to control the fall of the bag and the impact force that strikes the bag when it comes into contact with the conveyor belt that transports the filled bag away from the filling station. It is another object of this invention to provide bag filling means which is relatively inexpensive, which has relatively few moving parts, and which is extremely inexpensive to maintain.

Other objects and advantages of the invention will further become apparent hereinafter and in the drawings of which:

Fig. 1 represents a front elevation view of a bag filling apparatus comprising one specific embodiment of this invention, prior to filling the bag;

Fig. 2 represents a partial view similar to Fig. 1, after filling the bag;

Fig. 3 represents a central sectional view of the apparatus of Fig. 1, on an enlarged scale and with parts broken away in order more clearly to illustrate important details;

Fig. 4 represents a view in cross section taken as indicated by the lines and arrows IV—IV which appear in Fig. 3;

Fig. 5 represents a view similar to Fig. 3, showing a modified form of the invention;

Fig. 6 represents a view similar to Fig. 5, showing another modification;

Fig. 7 represents a fragmentary view in section and on an enlarged scale of that form of extensible sleeve shown in Fig. 6; and

Fig. 8 represents a view similar to Fig. 7, showing another form of extensible sleeve.

Although specific terms are used in the following description for clarity, these terms are intended to refer only to the structures shown in the drawings, and are not intended to define or limit the scope of the invention.

Turning now to the specific form of the invention selected for illustration in the drawings, the numeral 11 designates a feed hopper disposed above a feed conveyor 12 through which finely divided material 13 flows and is dropped into weighing and bag loading apparatus designated generally by the numeral 14. This apparatus is supported by vertical support members 15 that are joined together by horizontal channels 16 to form a rigid structure. Mounted on top of members 15 is a top support plate 17 that has fixed thereto and depending therefrom a surge hopper 18 which is positioned to catch the falling material 13. Pivotedly mounted on the bottom of hopper 18 is a gate 21 which is of conventional design and operates to insure a uniform flow of material 13 into a weigh hopper 22 vertically disposed below hopper 18. A gate 23 is provided at the bottom of hopper 22 which is pivotally connected and includes a balancing weight 24. Weigh hopper 22 is supported by linkage 29 from scale beams mounted on plate 17. The weighing operation is a standard one. Material 13 passes through surge hopper 18 whose gate 21 remains open until a predetermined weight of material is contained in weigh hopper 22. At this time, the scale beam trips a micro switch which activates a solenoid that releases the catch to open gate 23. As gate 23 begins to open, it trips another micro switch that activates a solenoid to close gate 21 until the material 13 has been emptied from hopper 22 and gate 23 has returned to its closed position. As soon as gate 23 has closed, the solenoid holding gate 21 in closed position is de-energized to open gate 21, allowing the material 13 which has in the meantime accumulated in surge hopper 18 to fall into weigh hopper 22. Material 13 continues to pass through hopper 18, until the predetermined weight is again reached in hopper 22, at which time the above cycle is repeated.

Immediately below hopper 25 is located a bag filling apparatus designated generally by the numeral 26 which is heretofore more fully described. Fig. 1 shows a bag B held by the operator around the lower end of apparatus 26 before bag B is filled with material 13. Arranged below bag B is a conveyor 27 which acts to remove bag B away from the filling station after it is filled.

Fig. 2 illustrates bag filling apparatus 26 after the bag B has been filled and just before bag B strikes conveyor 27.

Referring now to Fig. 3 of the drawings, the collecting hopper 25 has at its bottom edge an annular bolting flange 31. Flange 31 is bolted to a corresponding flange 32 of a fixed spout 33.

Surrounding spout 32 is positioned a longitudinally extensible and retractable spout sleeve 33. Sleeve 33 has provided at its upper edge (at the left in Fig. 3), a stop flange 34 that is adapted to cooperate with a stop flange 35 mounted on the outer periphery of spout 32 in order to limit the downward travel of sleeve 33. Sleeve 33 is cylindrical in shape having a circular wall 36 spaced at a distance from circular wall 37 of spout 32 in order to provide an air vent 38 for the air escaping from bag B when it is being filled. The lower edge 41 of sleeve 33 is turned inwardly to direct the flow of material 13 toward the center of spout 32 and sleeve 33. Extending from opposite sides of sleeve 33 is a pair of horizontal arms 42, to the end of which are attached springs 43. The upper ends of springs 43 are fastened to lugs 44 mounted on collecting hopper 25. Though springs 43 are shown in the drawings as attached between arms 42 and hopper 25, it is realized that springs 43 can be connected directly to sleeve 33, and therefore in describing the operation, spout
32 and sleeve 33 are recited as being operatively connected. It is as more clearly shown in Figs. 3 and 4, pairs of guide rods 45 are welded to the exterior of walls 37 and cooperating centering rods 46 are welded to the interior of walls 36. Centering rods 46 are disposed and arranged with guide rods 45 to limit the relative motion between spout 32 and sleeve 33 to a longitudinal direction.

In the alternative form of extensible sleeve 47 shown in Fig. 5, sleeve 47 is provided with a retaining ring 48 and spout 51 is provided with a retaining ring 52. Disposed between the retaining rings 48 and 52 is a spring 53 that continuously urges sleeve 47 upwardly relative to spout 51. Ring 48 is perforated along its top at 52 to provide for free passage of the air escaping from bag B as it is being filled. Disposed about the outer surface of sleeve 47 is a guard plate 54 that is positioned to prevent the operator from placing the open end of bag B about fixed spout 51 in the initial step of operation.

Fig. 6 illustrates another alternative form of extensible spout which comprises a bellows type sleeve 55 made of elastic material such as rubber, neoprene or the like, and having a coil spring 56 molded therein. A clamp 57 is attached to the upper end of sleeve 55 and is securely spaced about spout 58 and spaced away from that spout. Pairs of guide rods 60 are welded to the outer surface of spout 58 and are disposed to register with centering rods 62 which are welded to the inside of a collar 63 attached to the lower end of sleeve 55. It is important to note that air passing from bag B as it is being filled, escapes through the vent 64 formed between sleeve 55 and spout 58, and in doing so passes through a baffle formed by the corrugations of sleeve 55. The corrugations of sleeve 55 and the passage of air thereover cause a turbulence of the escaping air and minimize the escape of fine particles from bag B to the surrounding atmosphere.

Fig. 7 is a fragmentary view in section and on an enlarged scale of the extensible sleeve 55 of Fig. 6, and shows that the sleeve 55 is made of molded rubber, enclosing a coil spring 56. Fig. 8 illustrates another form of the extensible sleeve similar to that shown in Fig. 6, but here a sleeve 65 is made of a fabric and is interwoven with a spring 66 having coils of a large diameter arranged in alternate layers with coils of one other spring 67, such coils having a smaller diameter than spring 66.

In operation, the operator places the open end of bag B about the longitudinally extensible sleeve 33 and holds the bag against the sleeve 33 by hand until the slug of material has dropped into the bag, causing the sleeve to be extended so that the bag strikes the conveyor 27. After the bag is on conveyor 27, the operator then releases his hold on the bag, thereby releasing sleeve 33 which automatically raises to its initial position. In placing the bag about sleeve 33, the operator places his hands firmly about the upper end of the bag, grasping it in such a manner as to completely enclose sleeve 33 thereby preventing the escape of fine particles of material 13 being loaded. This cycle is repeated each time a bag is applied to sleeve 33 and a slug is weighed and dropped. Arms 42, and guard plate 54 in the alternative form of Fig. 5, are provided to prevent the operator from initially placing the bag up against spouts 32 and 51, respectively.

It is of particular advantage for the operator to hold the open end of the bag about the extensible sleeve since that prevents material from escaping from the bag in the form of dust and tailings and thus insures more accurate weight of the material in the bag. The operator continues to hold the open end of the bag about the extensible sleeve until the bottom of the bag comes in contact with the conveyor belt that transports the filled bag away from the filling station. Here again, escape of material in the form of dust, that results if an opened filled bag strikes the conveyor, is avoided since by following the operation herein described the top of the bag remains closed until the bag rests on the conveyor and the rate of fall of the bag is under the control of the operator. When the open end of the empty bag is placed about the extensible sleeve, the bag contains air that is displaced by the charge of material falling into the bag. This entrapped air escapes through the vent between the extensible sleeve and the fixed spout as is indicated by the arrows in Fig. 3.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment. Various changes may be made in the shape, size and arrangement of parts. For example, equivalent elements may be substituted for those illustrated and described herein, parts may be reversed, and certain features of the invention may be utilized independently of the use of other features, all without departing from the spirit or scope of the invention as defined in the subjoined claims.
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