

AN APPARATUS AND METHOD FOR DISCHARGING FLOUR FROM LINER BAGS IN CARGO CONTAINERS

Field of Invention

The invention relates to an apparatus and method for discharging of flour from a liner bag in a cargo container.

Background

Historically, the transportation of flour is carried out from individual bags weighing typically 10 to 25kgs each. These bags are manually packed into cargo containers for transportation and are manually unpacked at the destination. This process of transporting flour in individual bags is inefficient as it requires time and manpower to physically load and unload the bags from the cargo containers. Often, in the process of handling the bags, the bags are inevitably subject to much wear, sometimes resulting in breakage, loss and/or contamination of the flour in the bags. The individual bags are also generally not moisture proof and are not suitable for the long term storage of the flour. Where the flour is to be stored on a long term basis or repackaged into smaller bags for sale, the bags will have to be unloaded into storage bins or silos. Again, the manual process of unloading individual bags of flour requires much time and manpower.

The use of liner bags in cargo containers has been introduced. Liner bags are large flexible bags for lining the insides of cargo containers and containing liquid or powdered goods such as flour during transportation. At the destination, the liquid or powdered goods are then discharged from the liner bags into conveying pipelines or other transport systems and transported into the relevant storage bins/silos. However, it has been found that conventional methods of discharging powdered goods, such as applying a tilt to the container to discharge the powdered goods by gravitational force does not work well with

some type of flours. For example, the discharge of wheat flour using such a method may take up to 5 hours.

Summary

The present invention is an apparatus and method for discharging flour from liner bags in cargo containers as defined in the claims.

Brief Description of Drawings

The invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figures 1a and 1b are perspective views of an apparatus for the discharge of flour from liner bags in cargo containers.

Figures 2a and 2b are perspective views of another apparatus for the discharge of flour from liner bags in cargo containers.

Figures 3a and 3b are perspective views of a further apparatus for the discharge of flour from liner bags in cargo containers.

Figure 3c is a sectional view of the apparatus for the discharge of flour from liner bags in cargo containers.

Detailed Description

As shown in Figures 1a and 1b, numeral 100 generally designates an apparatus for the discharge of flour from liner bags in cargo containers. Apparatus 100 includes a sheath

body 10 with an inlet 15 and outlet portions 19, formed of rigid or semi-rigid materials such as stainless steel or aluminium sheets. The sheath body may be formed of other materials as long as the material is sufficiently rigid to allow the transmission of agitation action and energy such as vibration without loss. In the example shown in figures 1a and 1b, the sheath body 10 is formed in the shape of a funnel with a wider inlet portion 15 of rectangular or generally rectangular shape which tapers down to a narrower outlet portion 19 of circular cross-section. As the taper of the funnel develops, the rectangular shape of the funnel becomes generally octagonal defined by the edges 11a, 11b, 11c, 11d, (other edges not shown). The surfaces between the edges 11 may be flat or somewhat rounded. At the outlet portion 19 of the sheath body 10, the shape of the outer surface of the sheath body 10 transforms to being of circular or generally circular cross-section. However, other shapes of the sheath body 10 may be used as long as the sheath body 10 is able to receive and fit over a discharge outlet 16 of a liner bag 18 in a cargo container body 20 and the sheath body 10 is in contact with the discharge outlet 16 such that agitation action from the sheath body 10 may be provided to the discharge outlet 16. The discharge outlet 16 of the liner bag 18 may also be fitted over the inlet portion 15 of the sheath body 10 as long as there is sufficient contact between the discharge outlet 16 and the sheath body 10 such that agitation action from the sheath body 10 may be provided to the discharge outlet 16. Apparatus 100 also includes an agitator 12 for providing an agitation action to the sheath body 10. In the example shown in figures 1a and 1b, the agitator 12 is a vibration motor mounted on the surface of the sheath body 10. When the vibration motor 12 is switched on, a vibrating action is provided from the vibration motor 12 to the sheath body 10 and the discharge outlet 16. The vibrating action causes any flour that may be stuck on the inside surfaces of the discharge outlet 16 or clumped together inside the discharge outlet 16 to be broken up for discharging from the liner bag 18 into flexible pipes 22 connected to the outlet portion 18 of the sheath body 10 for further processing or storage. Retaining elements 14 such as steel cables or straps are further provided and attached to the sheath body 10 to hold the sheath body 10 in position over the cargo container opening, specifically over the

discharge outlet 16. Other known or obvious forms of retaining elements 14 may also be used to secure the sheath body 10 to ensure that the sheath body 10 remains in position over and in contact with the discharge outlet 16 during the operation of the apparatus 100.

In the use of apparatus 100, the discharge outlet 16 of the liner bag 18 is inserted into the inlet portion 15 of the sheath body 10 and pulled through, perhaps as far as the outlet portion 19 of the sheath body 10 and folded over the outlet portion of the sheath body 10 but operation may still ensue as long as the discharge outlet 16 is received in the inlet 15 of the sheath body 10. A flexible pipe 22 is then connected over the outlet portion 19 of the sheath body 10 on one end of the flexible pipe 22 and to a conveying pipeline/system (not shown) on the other end of the flexible pipeline 22. When an agitator 12, such as the vibration motor in the present apparatus is activated, agitation action in the form of vibration energy is transmitted from the agitator 12 to the sheath body 10 and the discharge outlet by contact. The vibration energy assists to facilitate the flow of the flour in the discharge outlet into the flexible pipeline 22 for further processing or storage. In other arrangements, the agitator 12 need not be mounted directly on the sheath body 10, as long as the agitation action is transmitted to the sheath body 10.

As shown in Figures 2a and 2b, numeral 200 generally designates another apparatus for aiding the discharge of flour from liner bags in cargo containers. Apparatus 200 includes a support frame 30 for mounting over the opening of a cargo container (not shown). Provided on the body of the support frame 30 are frame securing elements 32 such as releasable clamps for mounting the support frame 30 over the opening of a cargo container (not shown). Apparatus 200 further includes a sheath body 10 generally as described above with respect to figures 1a and 1b secured to the support frame 30 at a position where the sheath body 10 will be able to receive and fit over a discharge outlet (not shown) of a liner bag (not shown) in the cargo container (not shown) over which the support frame 30 is to be mounted. Apparatus 200 further includes an agitator 12 for providing an agitation action to the sheath body 10. In the example shown in figures 2a

and 2b, the agitator 12 is a vibration motor mounted on the surface of the sheath body 10 although direct mounting on the sheath body is not required, as discussed above; for instance, the agitator 12 could be mounted on support frame 30 and the agitating action of the agitator 12 is transmitted to the sheath body 10 through the support frame 30, although this is not the most efficient technique. The support frame 30 ensures that the sheath body is held securely in position over and in sufficient contact with the discharge outlet (not shown) of the liner bag (not shown) such that an agitation action from the sheath body 10 may be transmitted to the discharge outlet (not shown) of the liner bag (not shown). Support frame 30 also provides support to the liner bags (not shown) and holds it in place in the cargo container (not shown) when the cargo container (not shown) is tilted at an angle during the discharging process. The sheath body 10 may optionally be provided with retaining elements (not shown) such as steel cables or straps to further secure the sheath body 10 to the support frame 30 or the cargo container body (not shown). To prevent the agitation action from the agitator 12 from being absorbed and dissipated by the body of the support frame 30, a resilient element 34 is provided. One or more resilient elements 34, such as compression springs, compressible rubber or other devices such as hydraulic or pneumatic pistons may be provided on the support frame 30 for mounting the sheath body 10 onto the support frame 30. The compressive action of the compression springs, compressible rubber or the compressible fluid medium of the hydraulic or pneumatic pistons allow the sheath body 10 to vibrate without the vibration energy of the sheath body from being absorbed and dampened by the body of the support frame 30.

In the use of apparatus 200, the support frame 30 is first mounted over the opening of a cargo container (not shown) via releasable clamps 32. The discharge outlet (not shown) of a liner bag (not shown) is inserted into the inlet portion 15 of the sheath body 10 and pulled through the outlet portion 19 of the sheath body 10 and folded over the outlet portion of the sheath body 10 although as noted above with regard to figures 1a and 1b, the apparatus may still function without pulling the discharge outlet (not shown) through

the outlet portion 19 of the sheath body 10. A flexible pipe 22 is then connected over the outlet portion 19 of the sheath body 10 on one end of the flexible pipe 22 and to a conveying pipeline/system (not shown) on the other end of the flexible pipeline 22. When an agitator 12, such as the vibration motor in the present apparatus is activated, agitation action in the form of vibration energy is transmitted from the agitator 12 to the sheath body 10 and the discharge outlet by contact. The vibration energy causes any flour that may be stuck on the inside surfaces of the discharge outlet 16 or clumped together inside the discharge outlet 16 to be broken up for discharging into the flexible pipeline 22 for further processing or storage. Where resilient elements 34 such as compression springs are used, the vibration energy is isolated to the sheath body 10 and the discharge outlet (not shown) of the liner bag (not shown) and loss of vibration energy by absorption by the support frame 30 and the cargo container body (not shown) is minimised. Further, the risk of damage to the cargo container body (not shown) caused by excessive vibration is also minimised. As a result, a less powerful agitator 12 such as a smaller vibration motor may be used.

As shown in figure 3, numeral 300 generally designates a further apparatus for the discharge of flour from liner bags in cargo containers. Apparatus 300 includes the support frame 30, sheath body 10, agitator 12, releasable clamps 32 and optionally the resilient elements 34 of apparatus 200 and further includes a rotary valve 42 secured to the support frame and a pipe 22 connecting the outlet portion 19 of the sheath body 10 to an inlet 44 of the rotary valve 42. In the example of figure 3a, the pipe 22 is a flexible pipe, but rigid piping may also be used for reasons which will be discussed below. The rotary valve 42 further includes a first outlet 46 and rotating segmented compartments (not shown) for transporting and segregating flour entering the inlet 44 to a first outlet 46. The first outlet 46 of the rotary valve 42 is connected to a conveying pipeline 50 having air flowing therethrough from a pneumatic air pump (not shown). Flour enters the rotary valve 42 from inlet 44 of the rotary valve 42 and is rotated in the segmented compartments (not shown) to the first outlet 46 of the rotary valve 42 where it falls by

gravity into the conveying pipeline 50. The rotary valve optionally includes a second outlet 48 which is connected to an air filter 52. The second outlet 48 allows air pressure and flour dust accumulated in the segmented compartments (not shown) of the rotary valve 42 after the segmented compartment (not shown) has rotated past the first outlet 46 of the rotary valve 42 to escape and the flour dust is captured by the air filter 52.

In the use of apparatus 300, the support frame 30 is again mounted over the opening of a cargo container (not shown) via releasable clamps 32. The discharge outlet (not shown) of a liner bag (not shown) is inserted into the inlet portion 15 of the sheath body 10 and pulled through the outlet portion 19 of the sheath body 10 and folded over the outlet portion of the sheath body 10. A short pipe 22 is then connected over the outlet portion 19 of the sheath body 10 on one end of the pipe 22 and to the rotary valve 42 secured to the support frame 30 on the other end of the pipe 22. When an agitator 12, such as the vibration motor in the present apparatus is activated, agitation action in the form of vibration energy is transmitted from the agitator 12 to the sheath body 10 and the discharge outlet by contact. The vibration energy assists to facilitate the breaking up of any flour that may be stuck or clumped together inside the discharge outlet 16 for discharging into the pipe 22 and the rotary valve 42. As the sheath body 10 and the rotary valve 42 are both secured to the support frame 30, the relative distance between the sheath body 10 and the rotary valve 42 will remain constant and there will not be a need for the pipe 22 to be a flexible pipe or for an additional length of the pipe 22 to accommodate any change in the relative distance between the sheath body 10 and the rotary valve 42 as a result of the tilting action of the cargo container (not shown). The pipe 22 will not become distorted and impede the quick and efficient and quick discharge of flour.

It is to be understood that the foregoing description of the apparatus of the invention is intended to be purely illustrative of the principles of the invention, rather than exhaustive thereof, and that changes and variations will be apparent to those skilled in the art, and

that the present invention is not intended to be limited other than as expressly set forth in the following claims.

Claims

1. An apparatus for discharge of flour from a liner bag in a cargo container, the apparatus comprising:
a sheath body being in contact with a discharge outlet of the liner bag, the sheath body having an inlet for receiving the discharge outlet of the liner bag;
a support frame for mounting on the cargo container, the support frame being removable from the cargo container, the sheath body being mounted on the support frame; and
an agitator for providing an agitation action to the sheath body.
2. An apparatus for discharge of flour from a liner bag in a cargo container, the apparatus comprising:
A sheath body being in contact with a discharge outlet of the liner bag, the sheath body having an inlet received by the discharge outlet of the liner bag;
a support frame for mounting on the cargo container, the support frame being removable from the cargo container, the sheath body being mounted on the support frame; and
an agitator for providing an agitation action to the sheath body.
3. An apparatus as claimed in claims 1 or 2, wherein the support frame includes a resilient element on which the sheath body is mounted.
4. An apparatus as claimed in claim 3, wherein the apparatus further includes a rotary valve mounted on the support frame and a pipe connecting an outlet of the sheath body to an inlet of the rotary valve.
5. A method for discharging flour from a discharge outlet of a liner bag in a cargo container, the method comprising:
receiving the discharge outlet in a sheath body;
mounting a removable support frame on the cargo container;
mounting the sheath body on the support frame; and

providing an agitation action to the sheath body.