

PATENT SPECIFICATION

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(54) PNEUMATIC CONVEYING OF GRANULAR MATERIALS FROM A NONPRESSURIZED ENVIRONMENT

(71) We, SUN SHIPBUILDING AND DRY DOCK COMPANY, of Foot of Morton Avenue, Chester, Pennsylvania 19013, United States of America, a corporation organised under 5 the laws of the State of Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following 10 statement:—

The present invention relates generally to a pneumatic system for unloading granular material from a nonpressurized container, and more particularly pertains to a pneumatic system for unloading grain from an 15 open vessel such as a barge.

There presently exists a substantial demand for the shipment of granular material, 20 such as wheat to various parts of the world. At the same time, the present political and economic situation around the world has resulted in a surplus of oil tankers. In view of the surplus of oil tankers and the demand 25 for the shipment of wheat, it would be desirable to be able to transport wheat in vessels designed for the carriage of oil.

The loading and unloading of granular materials should be handled as quickly and 30 efficiently as possible. One method used in the prior art to unload granular material such as wheat has utilized "VACUUMATOR" (Trade Mark) equipment, which is in the nature of a giant vacuum cleaner. 35 This equipment is brought on board the vessel being unloaded, and wheat is simply vacuumed out of the vessel holds during unloading. One problem with this approach is that it is very time consuming.

Often, wheat transporting ships are too 40 large to dock in port, and accordingly these large ships must be loaded and unloaded in deeper water away from the docks. In this situation, the cargo may be loaded onto 45 smaller vessels, such as barges, for transportation between the dock and larger ship. Some of these large ships, such as oil tankers, have large blower systems on board which are utilized for various functions. It 50 would be desirable to have a system for

unloading granular material from a vessel, such as a barge, which operates rapidly and efficiently, and which could take advantage of an existing blower system.

Our copending application No. 42441/77 55 (Serial No. 1 591 474) filed 12th October 1977 describes a system for removing granular materials such as wheat from a pressurized hold in a tanker and comprising:

(a) a source of pressurized gas coupled to the pressurized hold;

(b) a discharge pipe for transporting granular materials out of the pressurized hold and having a discharge end outside the 65 pressurized hold and a pick-up section in the pressurized hold, the discharge pipe exiting from an upper portion of the hold; and

(c) a pressurized gas pipe, coupled to the 70 pressurized gas, for transporting pressurized gas to the pickup section of the discharge pipe where the pressurized gas will flow into and entrain the granular material and transport it out of the pressurized hold through 75 the discharge pipe.

The present invention provides a system for removing granular material from an open non-pressurized container, which comprises:

(a) a plenum chamber having input means for a source of pressurized gas and coupled to a first pipe extending into said granular material;

(b) a second discharge pipe inside and 85 concentric with said first pipe extending from the bottom of said first pipe through said plenum chamber to provide for discharge of said granular material to the outside of said plenum chamber; and

(c) valve means at the bottom of said first pipe to control the flow of granular material to said second concentric pipe; whereby, when a pressurized gas is introduced into said plenum chamber, said gas 95 flows downwardly through said first pipe and pushes any granular material admitted by said valve upwardly through said second discharge pipe.

In accordance with the invention, the dis-

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charge pipe for transporting granular material out of the container has a discharge end outside the container and a pickup section in the container. The first, pressurized gas pipe, coupled to a source of pressurized gas, transports pressurized gas to the pickup section of the discharge pipe where it flows into and entrains the granular material. The granular material is then transported from the container through the discharge pipe. The discharge pipe and the pressurized gas pipe are concentric pipes, with the discharge pipe being the inner pipe. Preferably, the non-pressurized container is a non-pressurized hold of a ship, and the system is used to transport granular material from the hold onto a second ship already having a source of pressurized gas existing thereon. The plenum chamber is utilized to couple the source of pressurized gas to the pressurized gas pipe. Further, the valve mounted at the pickup section of the discharge pipe allows grain to flow towards the pickup section while isolating the pressurized gas from surrounding granular material.

The accompanying drawing illustrates a side view of one embodiment of the present invention.

30 The drawing illustrates a system for removing a granular material, such as wheat, from a nonpressurized container, such as an open barge. The granular material is illustrated as being present to a level 10 which covers the lower portion of the removal system. Pressurized gas is supplied to the system by a blower system 12. In some embodiments where an oil tanker already having a blower system is involved in the 40 loading/unloading operation, the already existing blower system may be advantageously utilized for the blower 12. Gas from the blower system is supplied to a plenum chamber 14 which is open to a pipe 45 16 which extends down, into the granular material being removed, to near the bottom of the container. The grain flows through a rotary isolation valve 18, the function of which is to allow grain to enter a chamber 50 20 while isolating surrounding grain from the pressurized gas in the chamber 20. The rotary isolation valve may be one of several different types which are commercially available today, such as are available from 55 Sprout, Waldron & Company, Inc., Muncy, PA 17756 and Young Corporation. The valve is driven by a drive motor 22, mounted on top of the plenum chamber 14, which drives a shaft 24, which in turn drives an 60 enclosed sprocket 26. The sprocket 26 drives an enclosed chain 28, which drives a further sprocket 30, which in turn drives a rotor having a plurality of vanes 32. As the rotor rotates, grain fills each void between adjacent vanes, and is rotated

through the valve to its bottom where it is discharged into the chamber 20. The vanes serve to isolate the pressurized chamber 20 from the surrounding grain so that it is not simply blown away. The grain 70 entering chamber 20 is entrained by the gas pumped down the pipe 16, and the gas and entrained material mixture flow into the end of a discharge pipe 34, which is positioned inside, and concentric with, the pressurized 75 gas pipe 16. The entrained grain is then pumped up a discharge pipe 34, and is unloaded into some suitable container. For instance, where an oil tanker is being loaded with grain from a barge, the discharge pipe 80 34 may extend into the hold of the adjacent tanker, and the blower system from the oil tanker may be utilized as the blower 12.

In operation, the grain is removed until it has been depleted down to a level at 85 which additional grain will not flow towards the valve 18. At this time, removal has to be accomplished in some other manner. For instance, workers may shovel the remaining grain into the valve 18, or vacuum equipment may be utilized, or the grain may simply be shovelled into containers for removal.

Although the term granular material has been used herein, it should be understood 95 that this term has been chosen as a generic term for all types of material (such as powders) to which the teachings of the present invention may be applicable. Also, the illustrated embodiment has been explained with reference to a tanker and a 100 barge. However, the teachings of the present invention are also applicable to the removal of granular materials from other types of containers such as trains, trucks, bins and 105 warehouses.

WHAT WE CLAIM IS:—

1. A system for removing granular material from an open non-pressurized container, which comprises:

(a) a plenum chamber having input means for a source of pressurized gas and coupled to a first pipe extending into said granular material;

(b) a second discharge pipe inside and concentric with said first pipe extending from the bottom of said first pipe through said plenum chamber to provide for discharge of said granular material to the outside of said plenum chamber; and

(c) valve means at the bottom of said first pipe to control the flow of granular material to said second concentric pipe; whereby, when a pressurized gas is introduced into said plenum chamber, said gas flows downwardly through said first pipe and pushes any granular material admitted by said valve upwardly through said second discharge pipe.

2. A system as claimed in Claim 1 130

wherein the non-pressurized container is a nonpressurized hold of a ship, and wherein the system is utilized to remove granular material from the nonpressurized hold onto 5 a second ship having said source of pressurized gas existing thereon.

3. A system for removing granular material from an open non-pressurized con-

tainer substantially as herein described with reference to the accompanying drawing.

ELKINGTON & FIFE,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London WC1V 6SH.
Agents for the Applicants.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*