SYSTEM FOR PNEUMATIC EMPTYING OF NON-PRESSURIZABLE CONTAINERS FILLED WITH BULK MATERIAL

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ABSTRACT

A system for handling and emptying containers for fluid or pulverulent material. The container includes a discharge opening adjacent a lowermost corner and near a longitudinal edge. A second opening is provided at a remote corner of the container for allowing pressure compensation. The container is placed upon a suitable support means so that the longitudinal edge comprises the lowermost portion of the container which is then placed within a pressure vessel through an access opening in one end thereof. After the discharge opening of the container is connected to a flow pipe extending outwardly through the pressure vessel, a removable wall of the pressure vessel is sealed and the pressure vessel and container therein are rotated upwardly about an axis located adjacent to the openable end of the pressure vessel.

2 Claims, 7 Drawing Figures
SYSTEM FOR PNEUMATIC EMPTYING OF NON-PRESSURIZABLE CONTAINERS FILLED WITH BULK MATERIAL

BACKGROUND OF THE INVENTION

Heretofore, it has been proposed to empty thin-walled containers of bulk material by placing the containers within a pressure vessel, connecting the interior of the container to a flow pipe leading out of the pressure vessel, tilting the pressure vessel and container, and exposing the interior of the pressure vessel to pneumatic pressure for forcing the material from the container and from the pressure vessel to the flow pipe. As a result, the wall of the thin-walled container is subjected to equal pressure on all sides thereof, thereby precluding damage to the container and the material is caused to flow therefrom under the force exerted by the pressure within the pressure vessel and container.

The prior art is exemplified by my earlier granted U.S. Pat. No. 3,568,865, dated March 9, 1971. Prior to the present invention, the containers were inserted into the pressure vessel and rested on one of the flat side walls so that the outlet opening of the container was remote from the opening of the pressure vessel through which the container is introduced. Difficulties therefore resulted regarding the connection of the discharge opening of the container to the discharge conduit which extends through the wall of the pressure vessel. More importantly, difficulties ensued regarding the complete emptying of the container because it, together with the pressure vessel, could be tilted by a maximum of 45° and it was, therefore, necessary to provide special baffles in corners adjacent the discharge opening of the container so that the material contained therein could be completely supplied to the discharge opening.

SUMMARY OF THE INVENTION

One of the objectives of the present invention is to eliminate the disadvantages present in the prior art and does so by providing the pressure vessel with a removable wall adjacent the tilting axis so that the discharge opening of the container is readily accessible when the pressure vessel is open. Means are provided for inserting the container, quadrangle in its cross-section, so that the discharge opening is arranged at the container end near the bottom thereof and in the vicinity of one of its longitudinal edges. The container is specially oriented within the pressure vessel so that the discharge opening is adjacent the lowermost point of the container and the discharge opening is conveniently accessible for being connected with the flow-pipe discharge means of the pressure vessel.

In this regard, it is recommended to provide means for inserting the container into the pressure vessel including guides which extend into the interior of the pressure vessel after the wall of the pressure vessel has been removed to provide the opening therein.

The invention further provides for a lifting apparatus for the container in front of the removable or pivotable face wall of the pressure vessel over the guide means extending thereinto. The lifting apparatus is used to suspend the container so that the longitudinal edge adjacent to the discharge opening is located downwardly, and the container is readily placed upon a wheeled vehicle in this position and then moved through the opening and into the pressure vessel.

A still further object of the invention is to provide lifting apparatus for the container in front of the openable wall member of the pressure vessel for positioning the container upon a wheeled vehicle so that the discharge opening of the container is adjacent a lowermost longitudinal edge when the wheeled vehicle and container are moved into the pressure vessel upon guide rails extending therein.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter and the several views illustrated in the accompanying drawings:

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view and shows a container capable of being filled with bulk material and provided with a lower discharge opening and an upper vent opening.

FIG. 2 is a side elevation of the container resting upon a flat support surface prior to being lifted and rotated by a preferred lifting apparatus.

FIG. 3 is a side elevation view showing the container supported in a preferred orientation by the lifting apparatus.

FIG. 4 is an end view of a wheeled vehicle positioned to receive the container.

FIG. 5 is a side elevation of a stationary tiltedly supported pressure vessel having an end wall shown in an open position, the pressure vessel being pivotally mounted adjacent the openable end thereof.

FIG. 6 is a side elevation of the pressure vessel in tilted position with the container being disposed therein in the emptying position.

FIG. 7 is an elevational view, with portions broken away, and shows the tilted pressure vessel with the container disposed therein and pressure lines and discharge lines in operative positions.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As is shown in FIG. 1, the container 1 is quadrangle in cross-section and is provided with a pair of filling openings capable of being closed by covers 2, a discharge opening 3 located at a lower portion thereof, and a pressure compensation opening 4 located at a diagonal, uppermost corner from the discharge opening 3. The discharge opening 3 is shown as being located closely adjacent a longitudinal edge 6 of the container 1.

When the container filled with bulk material arrives at the place of destination, a lifting apparatus including a sling and cable 7 is attached to the container 1 in such a way that is suspended with the longitudinal edge 6, which is adjacent to the discharge opening 3, in a lowermost position when the container 1 is lifted in the manner best shown in FIG. 3. In this position, the container 1 is placed upon a wheeled, rail vehicle 8 which is guidedly supported upon rails 9. As is best shown in FIG. 5, the guide rails 9 extend into a pressure vessel 10 and are parallel to the longitudinal axis thereof. An openable wall member 11 is pivotally connected at its uppermost end to the pressure vessel 10 so that, when opened, the vehicle 8 and container 1 can be moved into the pressure vessel 10 in such a manner that the discharge opening 3 is disposed at the open end of the
pressure vessel adjacent the wall member 11. This way, the discharge opening 3 can be readily connected through the wall of the pressure vessel to an area, such as a receiving tank (not shown) outside of the pressure vessel. For this purpose, as is shown in FIG. 7, a pipe 12 is extended through and is welded to, the cylindrical side wall of the pressure vessel 10. The end of the pipe 12 which extends into the pressure vessel is capable of being connected in a simple manner by a hose 13 to the discharge opening 3 of the container 1, for example, by means of a bayonet connection. After the connection has been provided, the wall member 11 is pivoted to its closed position and hermetically seals the pressure vessel 10. Subsequently, as is shown in FIGS. 6 and 7, the pressure vessel, and the container 1 and wheeled vehicle 8 disposed therein, are tilted upwardly by means such as a fluid motor. With the container 1 in the tilted position shown in FIGS. 6 and 7, the side walls and end wall thereof guide the material within the container towards the discharge opening 3 so that a substantially complete emptying of the container 1 is permitted without requiring additional baffles within the container 1. During discharge of the material from the container 1, compressed air is blown into the pressure vessel 10 from a compressor 14 through a conduit 15. The compressed air also enters the interior of the container 1 through the pressure compensation opening 4 and forces the bulk material out of the discharge opening 3 through the hose conduit 13 and the pipe 12, which is welded into the wall of the pressure vessel 10, to a conduit 16, which provides a flow path for moving the material from the container 1 to a desired location such as a receiving tank or reservoir (not shown).

While preferred forms and arrangement of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the spirit and scope of the invention, as defined in the appended claimed subject matter.

I claim:

1. In a system for pneumatically emptying a container filled with material and having a discharge opening disposed at a bottom portion thereof, wherein said container is inserted within a pressure vessel and prior to being subjected to pneumatic pressure the interior of said container is opened to that of the pressure vessel and to an area outside of said pressure vessel, said pressure vessel and said container then being raised into an inclined position about a tilting axis and subjected to pneumatic pressure within the interior of said pressure vessel, the improvement being characterized in that said pressure vessel includes an openable wall member means located adjacent to said tilting axis for providing a passageway through which said container can be moved into and out of said pressure vessel, said pressure vessel including connection means formed therein and located closely adjacent to said passageway for connecting with said discharge opening of said container and providing a flow path for moving said material between the interior of said container and the exterior of said pressure vessel, and a wheeled vehicle movable into said pressure vessel and including support means thereon for supporting said container in a position such that a longitudinal edge comprises the lowermost portion of said container.

2. In a system for pneumatically emptying a container filled with material and having a discharge opening disposed at a bottom portion thereof, wherein said container is inserted within a pressure vessel and prior to being subjected to pneumatic pressure the interior of said container is opened to that of the pressure vessel and to an area outside of said pressure vessel, said pressure vessel and said container then being raised into an inclined position about a tilting axis and subjected to pneumatic pressure within the interior of said pressure vessel, the improvement being characterized in that said pressure vessel includes an openable wall member means located adjacent to said tilting axis for providing a passageway through which said container can be moved into and out of said pressure vessel, said pressure vessel including connection means formed therein and located closely adjacent to said passageway for connecting with said discharge opening of said container and providing a flow path for moving said material between the interior of said container and the exterior of said pressure vessel, said container being quadrangle in cross section, said discharge opening being provided in said container closely adjacent to a lower corner thereof and adjacent to a longitudinal edge of said container, and lifting apparatus arranged adjacent said openable wall member means for raising and rotating said container about a horizontal axis for locating said longitudinal edge at the lowermost portion of said container.