CONTAINER FOR A BULK MATERIAL

A container for bulk material is described, said container comprising a container body comprising at least one container side and at least one aperture; the container body further comprising at least one door moveable between a first position in which said door substantially occludes said aperture, and a second position where said aperture is substantially open; further wherein said door is hingeably connected to said container side so as to be pivotable between said first position and said second position; said container further comprising at least one lifting member connected to said door; said container further comprising at least one retardation mechanism connected to said lifting member; wherein said retardation mechanism is operable to retard a pivotal movement of said door.
Container for a Bulk Material

Field of the Invention

The present invention relates to a container for a bulk material, and more particularly to a container for bulk material that comprises at least one pivotable door and at least one retardation mechanism, wherein the retardation mechanism is operable to slow a pivotable motion of the door.

Background to the Invention

In large scale construction projects, it is often necessary for large amounts of a bulk material to be loaded, unloaded and transported during the building process. In the state of the art, the loading of these bulk materials on to a lorry or train is typically undertaken via a bulk material loading system, under the control of a crane operator.

Typically, each bulk material loading system comprises a square or rectangular skip, wherein the bottom of the skip is formed from a plurality of doors. During operation of the bulk material loading system, the doors that form the bottom of the skip remain closed, allowing the skip to be filled with bulk material such as building aggregates or waste materials. Subsequently the skip is lifted by a crane, moving the skip, and the bulk material contained therein, to a position where the bulk material may be dispensed onto a waiting train or lorry. This dispensing process is initiated when the doors that form the bottom of the skip are opened, under the control of the crane operator.

During the operation of a bulk material loading system similar to that described above, there is a period during which a skip containing bulk material depends from a crane, potentially above a number of site workers or members of the general public. In this case, any accidental discharge of the bulk material from the skip is unacceptable, due to the possibility of serious injury to persons in the vicinity of the construction site.

To prevent the possibility of any accidental discharge of bulk materials from the skip, the skip doors are constructed and connected to the sides of the skip to ensure that both the weight of the skip itself, and the weight of its contents, prevent any accidental discharge of the bulk material. In this case, one end of each door is connected to a side of the skip with a hinged connection, such that each door depends downwardly from a side of the skip. Additionally, the skip is coupled to the crane with chains connected to attachment points located at a second end of the doors themselves.
As such, when a crane lifts the skip, the weight of the skip and its contents are transferred to the crane through the doors. In this case, the force exerted by the crane on the second end of the doors pulls these doors upwards, ensuring the doors remain closed whilst the skip depends from the crane. Therefore, any accidental discharge of the skip's contents is prevented.

To allow the skip to discharge its contents, it is necessary to utilise an unloading gantry. In the state of the art, unloading gantries are most usually formed from a framework of beams capable of supporting both the weight of the skip and its contents. Each unloading gantry is located in an area where it is desirable for a skip to discharge its contents, and may be sized appropriately to contain a lorry or train carriage.

In the unloading process, the crane lowers the skip such that projections extending from the sides of the skip are lowered on to the unloading gantry. In this process, the weight of the skip is transferred from the crane to the unloading gantry itself, removing the force that ensures the doors remain in the closed position. After this point, the chains coupling the doors of the skip to the crane continue to be lowered, and the doors of the skip begin to open under the weight of the bulk material, allowing the skip to dispense its contents into the area below the unloading gantry.

Whilst, at first instance, a bulk material unloading system in accordance with the above description appears to provide a satisfactory solution, there are disadvantages associated with such a system. One such disadvantage is the requirement for an unloading gantry to allow the skip to dispense any bulk material it contains. The construction of any such unloading gantry will require a capital expenditure, and it may be difficult to position the gantry in a location that is convenient for all users of the system.

**Summary of the Invention**

According to a first aspect of the present invention, there is provided a container for a bulk material, said container comprising a container body comprising at least one container side; and at least one aperture; said container body further comprising at least one door moveable between a first position in which said door substantially occludes said aperture, and a second position where said aperture is substantially open; further wherein said door is hingedly connected to said container side so as to be pivotable between said first position and said second position; said container further comprising at least one lifting member connected to
said door; said container further comprising at least one retardation mechanism connected to said lifting member or door; wherein said retardation mechanism is operable to retard a pivotable movement of said door.

In this way, there is provided a container for bulk material that can deposit the bulk material it contains without the use of an unloading gantry. The provision of a retardation mechanism allows the movement of the doors of the container to be slowed, allowing for either the controlled release of material from the bulk container or, alternatively, the controlled closing of the container doors when the container is lifted by a crane.

Preferably, said retardation mechanism is operable to retard said pivotable movement of said door from said second position to said first position. In this way the movement of the door to occlude the aperture is slowed.

Where the closing of the container doors is slowed, a period of time is provided during which, after lifting, the container may be moved away from the deposited material. As such, this time period may be used to move the container sufficiently such that the doors do not impinge on the deposited material as they close. In this case, due to the time delay related to the retardation mechanism, it is not essential that the doors of the container are above the level of the bulk material when the lifting process commences. Therefore, the present invention provides a container for bulk material that may be used to deposit material directly into a truck, lorry, train carriage, or directly onto the ground, without the use of an unloading gantry.

In some embodiments, movement of the doors can optionally be stopped by the retardation mechanism, wherein the doors are held at any intermediary position between said first position and said second position for a period of time. Preferably the intermediary position and the period of time is to be determined by a controller which may be human or automated.

Preferably said container further comprises at least one mounting bracket, said retardation mechanism being connected to said container by at least said mounting bracket. Preferably, said retardation mechanism is pivotably connected to said mounting bracket.

It may also be preferable for said container to further comprise at least one load transfer member connected to said retardation mechanism. Preferably said load transfer member is pivotably connected to said retardation mechanism.
Preferably said load transfer member is connected to said lifting member. More preferably, said load transfer member is pivotably connected to said lifting member.

Preferably said container further comprises at least one load transfer bracket, and said load transfer member is connected to said container by at least said load transfer bracket. Preferably said load transfer member is pivotably connected to said load transfer bracket.

It may also be preferable to provide a container for bulk material wherein a first end of said load transfer member is connected to said lifting member, and wherein a second end of said load transfer member is connected to said load transfer bracket.

Preferably said retardation mechanism is connected to said load transfer member, at a point generally equidistant said first end and said second end of said load transfer member.

It may be preferable to provide all of the above features, either alone or in combination, to provide a retardation mechanism that is coupled to the container to allow the retardation mechanism to effectively operate to retard a pivotable movement of the door.

Preferably said retardation mechanism extends as said door moves from said first position to said second position. In such a way, the extension of the retardation mechanism may be used to control, the movement of the door. Preferably said retardation mechanism extends substantially downwardly.

Preferably said container contains at least two retardation mechanisms, the angle between said retardation mechanisms increasing as they extend.

Preferably, said retardation mechanism comprises a hydraulic mechanism. Preferably said retardation mechanism comprises an electromagnetic system. Preferably said retardation mechanism comprises a linear friction device, a rotary friction device or a centrifugal friction device. Preferably said retardation mechanism comprises a rotary vane device, or a semi rotary vane device. Preferably said retardation mechanism comprises a pendulum, sprag clutch or ratchet. Preferably said retardation mechanism is computer controlled. Preferably said retardation mechanism is a timed mechanism. More preferably, said retardation mechanism is any two or more of the above in combination.
Preferably, said hydraulic mechanism comprises a hydraulic ram. Preferably, the rate of retardation provided by the hydraulic ram is adjustable. Preferably the rate of retardation provided by the ram is computer controlled.

Preferably, said hydraulic mechanism comprises a hydraulic cylinder arranged to move reciprocally along a hydraulic rod.

Preferably the hydraulic mechanism further comprises a fixed piston, arranged to limit the reciprocal movement of the hydraulic cylinder along the hydraulic rod.

Preferably the reciprocal movement of the hydraulic cylinder along the hydraulic rod is arranged to be remotely controlled.

Preferably the piston is located substantially centrally on the hydraulic rod and disposed within the interior of the hydraulic cylinder, wherein the piston is arranged to define an upper and lower compartment of the hydraulic cylinder.

Preferably the remote control of the reciprocal movement of the hydraulic cylinder along the hydraulic rod is carried out by controlling the flow of hydraulic fluid into or out of the upper or lower compartment of the hydraulic cylinder.

In most preferable embodiments, a piston coupled to a hydraulic rod is disposed within an interior of a hydraulic cylinder, the diameter of the piston being such that it defines two compartments within said cylinder, preferably an upper compartment and a lower compartment. In accordance with said preferable embodiments, the cylinder further comprises hydraulic fluid within at least one of the said compartments and wherein movement of the cylinder causes movement of hydraulic fluid from one compartment and into another. Preferably said movement of hydraulic fluid can be controlled, wherein preferably said control is carried out through the adjustment of a valve. Under normal operation in said preferable embodiments, movement of the cylinder is urged by movement of one or more of the lifting members. Remote manual control can preferably be used to override said movement of the cylinder, and therefore control the rate of opening or closing of the doors. In such embodiments, the manual control may be used to halt the opening and closing of the doors, holding said doors at any intermediary position between a first closed position and a second open position for a length of time, which may preferably be determined by an operator of said manual control and/or an automated control system.
Preferably, said container further comprises at least one support member. More preferably, said support member is located on an outer surface of said container side. Preferably, said support member projects outwardly from the container body. Preferably said support member comprises a substantially planar bottom face. Preferably said support member is tapered. Preferably said support member is substantially triangular.

Preferably, said container further comprises at least two support members positioned substantially opposite one another.

Preferably, said container further comprises a crane attachment member from which said loading member depends.

Preferably said door is hingeably connected to said container side by at least one hinge. Preferably said hinge extends substantially along the entire length of at least one edge of said door. Preferably, said hinge may be located proximate a vertex of said door.

Preferably said container comprises at least two doors. Preferably said doors are equal in size.

Preferably said lifting member is bifurcated. In this case, a bifurcated lifting member may provide additional stability to the container for bulk materials whilst it is suspended.

Preferably the time taken for the retardation mechanism to allow the doors to return to the first closed position from the second open position in response to a load is adjustable. Preferably the time taken for the retardation mechanism to allow the doors to return to the first closed position from the second open position in response to a load is controlled by a user, more preferably by a computer.

Preferably said lifting member comprises a rope or chain. Preferably said lifting member is flexible and substantially inextensible.

According to a second aspect of the present invention, there is provided a container for bulk materials substantially as hereinbefore described with reference to the accompanying drawings.
**Detailed Description**

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

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Figure 1 is an isometric view of a container for a bulk material in accordance with the present invention, where the doors are in a closed position;

Figure 2 is an end view of a container for a bulk material in accordance with the present invention, where the doors are in a closed position;

Figure 3 is an isometric view of a container for a bulk material in accordance with the present invention, where the doors are in an open position;

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Figure 4 is an end view of a container for a bulk material in accordance with the present invention, where the doors are in an open position;

Figure 5 is an end view of a container for bulk material in accordance with the present invention, where the doors are in a closed position;

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Figure 6 is an end view of a container for bulk material in accordance with the present invention, where the doors are in an open position;

Figure 7 is sectional view of a retardation mechanism of a container for bulk material in accordance with the present invention; and

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Figure 8 is an end view of a container for bulk material in accordance with the present invention, where the doors are in a closed position and the lifting member is slack.

Referring to Figure 1 of the drawings, there is shown a container for a bulk material 100 in accordance with the present invention. Here, the container for a bulk material 100 comprises a container body 110 with four sides 111, 112, 113, 114, a first aperture 115 and a second aperture 116. The four sides 111, 112, 113, 114 of the container body 110 are positioned in two orthogonal pairs, such that the container body 110 has a rectangular cross section in the horizontal plane.
The first aperture 115 is located at the top edge of the four sides 111, 12, 13, 14, and extends parallel to the horizontal plane, its outer limits defined by the four sides 111, 12, 13, 14. The second aperture 116 is located at the bottom edge of the four sides 111, 12, 13, 14, and extends parallel to the horizontal plane, its outer limits defined by the four sides 111, 12, 13, 14. The four sides 111, 12, 13, 14, first aperture 115 and second aperture 116 therefore define a cuboid. The first aperture 115 is suitable for the insertion of bulk material into the container, and the second aperture 116 is suitable for the deposition of bulk material from the container.

The container for bulk material 100 further comprises a first door 120 and a second door 130. The first door 120 is pivotably connected to the first side 111 of the container body 110, this pivotable connection extending along the bottom edge of the first side 111. The pivotable connection between the first door 120 and the first side 111 of the container body is provided by a hinge. The second door 130 is pivotably connected to the third side 113 of the container body 110, this pivotable connection extending along the bottom edge of the third side 113. The pivotable connection between the second door 130 and the third side 113 of the container body is also provided by a hinge.

The first door 120 and the second door 130 are both dimensioned such that they are each capable of occluding half the second aperture 116. In Figure 1, the first door 120 and the second door 130 are in a closed position, both substantially parallel to the horizontal plane, and substantially perpendicular to the sides 111, 12, 13, 14 of the container body 110. In this closed position, the first door 120 and the second door 130 both occlude half of the second aperture 116, forming a closed bottom of the container body 110. As such, in the closed position, the first door 120, second door 130 and the container body form a vessel suitable for containing a bulk aggregate.

The container body 110 further comprises strengthening ribs 140. These strengthening ribs 140 comprise vertical struts. Additionally, these strengthening ribs 140 are located at regular intervals along the first 111 and second sides 113 of the container body. The container body 110 further comprises an upper flange 150 forming a substantially continuous perimeter around the top edge of the four sides 111, 12, 13, 14, and a lower flange 160 forming a substantially continuous perimeter around the bottom edge of the four sides 111, 12, 13, 14. The presence of both the upper 150 and lower 160 flanges helps prevent and deformation of the container body 110 when it is loaded with bulk material.
The container body still further comprises support members 170. In Figure 1, the support members 170 are located at the corners of the container body 110. Additionally, the support members 170 are located in two opposed pairs. Figure 1 schematically illustrates the support members being located on the first 111 and third 113 sides of the container body.

The support members 170 extend vertically on the sides 111, 113, of the container body 110, and are substantially triangular in shape, increasing in width as they extend downwardly. The support members have a substantially planar boom surface that is suitable for resting on the edges of a container into which the user desires to place the aggregate material. In this case, the support members are constructed such that they are capable of supporting the weight of both the container itself, and the bulk material it contains.

The container for bulk material 100 further comprises a first lifting member 180 and a second lifting member 181, both attached to the container body 110. The lifting members 180 depend from a crane attachment member 190, the crane attachment member in the form of an elongate bar. The first lifting member 180 and the second lifting member 181 are attached to opposite ends of the crane attachment member 190, so as in use the container for bulk material 100 may depend from a crane, the weight of the container for bulk material 100 being transmitted to the crane via the crane attachment member 190.

In the present embodiment of the invention, each of the components hereinbefore mention in the specific description may be substantially formed of steel, although the use of other resilient materials is also envisaged by the inventor.

Further features of the container for bulk material 100 can be distinguished in Figure 2. Here, it can be seen that the lifting member 180 comprises a chain. The lifting member 180 depends vertically from the crane attachment member 190 in a single strand until it reached the splitter 200. Below the splitter 200, the lifting member 180 is bifurcated into a first bifurcated section 182 and a second bifurcated section 183. Each bifurcated section depends generally downwardly from the splitter 200, with an acute angle formed between the vertical and each bifurcated section. During the operation of the container for bulk material 100, the first 182 and second 183 bifurcated sections may both pivot in relation to the splitter 200, such that the angle between each bifurcated section and the vertical is variable.

The first bifurcated section 182 terminates at a first door attachment point 210. The first door attachment point 210 is located centrally on the short edge of the first door 120, and comprises a protrusion to which the first bifurcated section 182 is pivotably coupled. The second
bifurcated section 183 is similarly coupled to a second attachment point 211 located centrally on the short edge of the second door 130. At the opposing end of the container body 110, the second lifting member 181 is similarly bifurcated and attached to the first door 120 and the second door 130.

The first bifurcated section 182 is further connected to the container body 110 via a first retarding apparatus. The first retarding apparatus comprises a first mounting bracket 220, a first retarding mechanism 230, a first load transfer member 240 and a first load transfer bracket 240.

As seen in Figure 2, the first mounting bracket 220 is affixed to the exterior surface of the container body 110, adjacent its top edge. The first mounting bracket 220 is welded to the exterior of the container body 110, and is positioned such that it protrudes outwardly. The first retarding mechanism 230 depends downwardly from the first mounting bracket 220, the first retarding mechanism 230 being pivotable in relation to the first mounting bracket. In Figure 2, the first retardation mechanism is a hydraulic ram, although other mechanisms are envisaged by the inventor.

The first retarding mechanism 230 is further connected a first load transfer member 240. As illustrated in Figure 2, the first load transfer member 240 is elongate and comprises steel or other suitable material. The lower end of the first retarding mechanism 230 is attached to central location on the first load transfer member 240, this connection again being pivotable to allow the first load transfer member 240 to rotate relative to the first retarding mechanism 230. A first end of the first load transfer member 240 is pivotably connected to the first bifurcated section 182, and the second end of the first load transfer member 240 is connected to the first load transfer bracket 250.

The connection between the first load transfer member 240 and the first load transfer bracket 250 is pivotable, allowing the first load transfer member 240 to rotate relative to the first load transfer bracket 250. The first load transfer bracket 250 protrudes from the outer surface of the container body 110. Here, the first load transfer bracket 250 is welded to the surface proximate the intersection between the first side 111 and the fourth side 114.

The second bifurcated section 183 is similarly connected to the container body 110 via a second retarding apparatus comprising a second mounting bracket 221, a second retarding mechanism 231, a second load transfer member 241 and a second load transfer bracket 241. At the opposing end of the container body 110, the second lifting member 181 is similarly
attached to the container body 110 via a third retardation apparatus and a fourth retardation apparatus. In this way, the container for bulk material 100 has two orthogonal planes of symmetry, these planes of symmetry lying perpendicular to the plane of the first aperture 115.

The coupling of the first 180 and second 181 lifting members to the container via retardation apparatus allows control to be extended over the opening and closing on the first door 120 and the second door 130, described in detail in relation to Figure 3.

Figure 3 illustrates a container for bulk materials 100 wherein the first door 120 and the second door 130 have moved to an open position, such that the second aperture 116 is no longer obstructed. Here, the support members 170 are resting on the outer edge of a vessel for receiving bulk material, such as a train carriage (not shown). In this case, a crane or similar is no longer bearing the weight of the container for bulk material 100 and, as such, when the crane attachment member 190 is lowered further by the crane the tension is reduced in the first 180 and second 181 lifting members, allowing them to become slack.

Due to the weight of the first door 120 and the second door 130, any slack in the first 180 and second 181 lifting members is immediately taken up via a downwards movement of the first 120 and second 130 doors. In this way, as the crane attachment member 190 is lowered, the first 120 and second 130 doors gradually move from the closed position where the second aperture 116 is occluded, to the open position where any material contained within the container body 110 is able to exit the container body via the second aperture 116 under the influence of gravity.

The first door 120 and the second door 130 are coupled to their respective retardation apparatus and, as such, the movement of the doors results in a concomitant movement of the components of these retardation apparatus. Taking the first retardation apparatus as an example, in the movement of the first door 120 from the closed position to the open position, the hydraulic ram which forms the retardation mechanism 230 extends downwardly from a retracted position to an extended position. Additionally, the first retardation mechanism 230 pivots around its connection with the first mounting bracket 220 to a position in which it is substantially vertical.

Furthermore, the movement of the first door 120 results in the first load transfer member 240 pivoting in relation to all of the first bifurcate section 182, the first retardation mechanism 230 and the first load transfer bracket 250. This pivoting of the first load transfer member 240 results in its movement from a position where it is substantially inclined from the horizontal
when the first door 120 is in the closed position, to a position where it is substantially declined from the horizontal where the first door 120 is in an open position.

Additionally, the first load transfer member 240 extends below the bottom edge of the container body 110 when the first door 120 is in the open position. Finally, the first bifurcate section 182 rotates around its connection to the first door 120, at the first door attachment point 210. Each of the second, third and fourth retardation apparatus undergo the same series of movements in repose to the opening of the first 120 and second 130 doors.

The process of closing the first 120 and second 130 doors is illustrated in Figure 4, again described in relation to the first retardation apparatus. The process of closing the first 120 and second 130 doors of the container for bulk material 100 commenced when a crane imparts an upward force on the crane attachment member 190. This upwards force creates a concomitant increase in the tension in the first lifting member 180 and subsequently the first bifurcate section 182. This tension or load on the first bifurcate section 182 places a load on the first door 120, resulting in its upward motion. In the absence of any resistance, this force imparted by the crane would result in the immediate return of the first door 120 to the closed position from the open position, and the occlusion of the second aperture 116.

However, due to the coupling of the first bifurcate section 182 to the first retardation mechanism 230, the return of the first door 120 to the closed position is not immediate. In the open position, the hydraulic ram that comprises the retardation mechanism 230 is in an extended position. As such, due to the pressure of hydraulic fluid in the hydraulic system, the hydraulic arm resists any return to its retracted position, and the concomitant movement of the first door 120 from the open position to the closed position. Therefore, due to the coupling between the first door 120 and the first retardation mechanism 230, there is a delay between the lifting of the container for bulk material by the crane, and the closing of the first door 120. An identical process occurs in relation to the second door 130, under the influence of its related retardation apparatus.

Where the closing of the first 120 and second 130 doors is delayed, a period of time is provided during which, after lifting, the container for bulk material 100 may be moved away from any deposited material. As such, this time period may be used to move the container for bulk material 100 sufficiently such that neither the first door 120 nor the second door 130 impinge on any deposited material as they close.
In this case, due to the time delay related to the retardation mechanism 230, it is not essential that the first door 120 and the second door 130 of the container for bulk material 100 are above the level of and deposited bulk material when the lifting process commences. Therefore, the hereinbefore described embodiment of the invention may be used to deposit material directly into a truck, lorry, train carriage, or directly onto the ground.

In use, the relaxation time of the retardation mechanism 230, the time taken for the retardation mechanism to allow the doors to return to the closed position from the open position in response to a load is adjustable, more specifically controlled by the user. In this way the response time of the retardation mechanism 230 may be adjusted to ensure it is appropriate for the deposition of material to be undertaken.

For example, a lower response time for the retardation mechanism 230 may be required when depositing bulk material directly onto the ground, as opposed to where material is being deposited into a train carriage and the container for bulk material 100 is resting on the support members 170. In the present case, adjustment of the retardation mechanism 230 is undertaken with the variation of the damping properties of the hydraulic ram, either directly under the control of the user, or remotely using a computerised control system.

The container for bulk material 300 as shown in the embodiment of Figure 5 substantially corresponds to the container of Figure 1 with an alternate retardation mechanism 302 as described herein below and with reference to Figures 5 to 8. The container for bulk material 300 of the embodiment of Figure 5 comprises a retardation mechanism 302 having an hydraulic cylinder 304 enabled to move reciprocally along a hydraulic rod 306. Connected to the uppermost surface of the hydraulic cylinder 304 are lifting members 308. One lifting member 310 is orientated vertically and is coupled to an attachment member from which the lifting member depends. The two further lifting members 312 are each arranged to couple the uppermost surface of the hydraulic cylinder 304 to the doors 314, and as such, pivotable movement of the doors 314 is governed by the positioning of the uppermost surface of the hydraulic cylinder 304. In the embodiment of Figure 5, the uppermost surface of the hydraulic cylinder 304 is in a terminal raised position and as such the doors 314 are in a first closed position. The uppermost surface of the hydraulic cylinder 304 in Figure 5 reaches a terminal raised position since the uppermost surface of the hydraulic cylinder 304 abuts an upper surface of a housing 316 comprising said retardation mechanism 302, or an interior surface of the hydraulic cylinder 304 abuts an interior movement inhibition mechanism such as, for example, a piston coupled to the rod 306.
Figure 6 shows the same example embodiment of that depicted in Figure 5, with the uppermost surface of the hydraulic cylinder 304 in a terminal lowered position, and as such the doors 314 are in a second open position. In use, the attachment member 318 of the embodiment depicted in Figure 5 is raised, by for example a crane, and as such the uppermost surface of the hydraulic cylinder 304 is in a terminal raised position. The attachment member 318 of the embodiment of Figure 6 is lowered, causing the uppermost surface of the hydraulic cylinder 304 to become lowered. The uppermost surface of the hydraulic cylinder 304 in Figure 6 reaches a terminal lowered position since the lowermost surface of the hydraulic cylinder 304 abuts a lower surface of the housing 316 comprising the retardation mechanism 302, or an interior surface of the hydraulic cylinder 304 abuts an interior movement inhibition mechanism such as, for example, a piston coupled to the rod 306.

The retardation mechanism 302 of Figure 5 and Figure 6 is shown in more detail in Figure 7, which depicts a cross-section configuration of the retardation mechanism 302. The hydraulic cylinder 304 is enabled to reciprocally move along the hydraulic rod 306. The hydraulic rod 306 comprises a piston 320 positioned at the centre of the length of the hydraulic rod 306, which is arranged to define a maximum travel distance for the hydraulic cylinder 304 in either direction along the hydraulic rod 306. Upward and downward forces impinging upon the lifting members 310, 312 are arranged to cause corresponding movement of the hydraulic cylinder 304 in situations where a manual override is not engaged.

Manual control of movement of the hydraulic cylinder 304 in either direction along the hydraulic rod 306, which may occur remote of the container for bulk material 300, is performed in the embodiment shown by controlling the flow of hydraulic fluid between upper 322 and lower 324 compartments within the hydraulic cylinder 304 defined by the piston 320.

Movement of fluid from a lower compartment 324 into an upper compartment 322 causes corresponding movement of the hydraulic cylinder 304 down the hydraulic rod 306. Movement of hydraulic fluid from an upper compartment 322 to a lower compartment 324 causes movement of the hydraulic cylinder 304 upwards along the hydraulic rod 306. In such a way, the container for bulk material 304 according to the present invention may be as shown in Figure 8, and filled with bulk material. This can be used for stockpiling containers for bulk material ahead of removal from a site, or for resting said container for bulk material on a floor. As can be seen in Figure 8, the lifting members 312 coupling the uppermost surface of the hydraulic cylinder 304 to the doors 314 are slack and as such lifting of the container 300 would cause opening of the doors 314 and the spilling of container contents from the doors 314.
Controlled movement of the hydraulic cylinder 304 from a terminal lowered position to a terminal raised position causes the lifting members 312 coupling the uppermost surface of the hydraulic cylinder 304 to the doors 314 to become taut and as such keeps the doors 314 in the first closed position while the attachment member 318 is raised, by for example a crane.

When the container for bulk material 300 is raised, the doors 314 are inhibited from opening and as such the contents of the container 300 are not spilled from the doors 314.

Various modifications may be made to the described embodiment without departing from the scope of the present invention. The structure and orientation of the container may be of an alternative design and shaping, and various modifications may be made to the retardation apparatus whilst remaining within the scope of the present disclosure.
CLAIMS

1. A container for a bulk material, said container comprising
   a container body comprising at least one container side; and
   at least one aperture;
   said container body further comprising at least one door moveable between a first
   position in which said door substantially occludes said aperture, and a second position
   where said aperture is substantially open;
   further wherein said door is hingeably connected to said container side so as to be
   pivotable between said first position and said second position;
   said container further comprising at least one lifting member connected to said
   door;
   said container further comprising at least one retardation mechanism
   connected to said lifting member or door;
   wherein said retardation mechanism is operable to retard a pivotable
   movement of said door.

2. A container for bulk material according to claim 1, wherein said retardation mechanism
   is operable to retard said pivotable movement of said door from said second position
   to said first position.

3. A container for bulk material according to claim 1 or claim 2, wherein said container
   further comprises at least one mounting bracket, said retardation mechanism being
   connected to said container by at least said mounting bracket.

4. A container for bulk material according to any preceding claim, wherein said retardation
   mechanism extends as said door moves from said first position to said second position.

5. A container for bulk material according to claim 4, where said retardation mechanism
   extends substantially downwardly.

6. A container for bulk material according to any preceding claim, wherein said retardation
   mechanism comprises a hydraulic mechanism.

7. A container for bulk material according to claim 6, wherein said hydraulic mechanism
   comprises a hydraulic cylinder arranged to move reciprocally along a hydraulic rod.
8. A container for bulk material according to claim 6 or claim 7, wherein the hydraulic mechanism further comprises a fixed piston, arranged to limit the reciprocal movement of the hydraulic cylinder along the hydraulic rod.

9. A container for bulk material according to claim 6, claim 7 or claim 8, wherein the reciprocal movement of the hydraulic cylinder along the hydraulic rod is arranged to be remotely controlled.

10. A container for bulk material according to claim 9, wherein the piston is located substantially centrally on the hydraulic rod and disposed within the interior of the hydraulic cylinder, wherein the piston is arranged to define an upper and lower compartment of the hydraulic cylinder.

11. A container for bulk material according to claim 10, wherein the remote control of the reciprocal movement of the hydraulic cylinder along the hydraulic rod is carried out by controlling the flow of hydraulic fluid into or out of the upper or lower compartment of the hydraulic cylinder.

12. A container for bulk material according to any preceding claim, wherein said container further comprises at least one support member.

13. A container for bulk material according to claim 12, wherein said support member is located on an outer surface of said container side.

14. A container for bulk material according to claim 12 or claim 13, wherein said container further comprises at least two support members positioned substantially opposite one another.

15. A container according to any preceding claim, wherein said container further comprises an attachment member from which said lifting member depends.

16. A container for bulk material according to any preceding claim, wherein said door is hingeably connected to said container side by at least one hinge.

17. A container for bulk material according to any preceding claim, wherein said container comprises at least two doors.
18. A container for bulk material according to any preceding claim, wherein said lifting member is bifurcated.

19. A container for bulk material according to any preceding claim, wherein the time taken for the retardation mechanism to allow the doors to return to the first position from the second position in response to a load is adjustable.

20. A container for bulk material according to any preceding claim, wherein said lifting member comprises a rope or chain.
A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D88/12 B65D88/58 B65D90/00 B65D90/62

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>X</td>
<td>EP 0 244 323 Al (NORMANDE NETTOI EMENT [FR]) 4 November 1987 (1987-11-04) page 4, line 4 - page 9, line 33; figures 1-7</td>
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<td>US 1 077 986 A (JOHNSTON JAMES WILLIAM [US]) 11 November 1913 (1913-11-11) page 1, line 48 - page 2, line 45; figures 1-6</td>
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<td>A</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search
8 November 2017

Date of mailing of the international search report
22/11/2017

Name and mailing address of the ISA/

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