

SYSTEM AND METHOD FOR CONTAINER LIFTING AND ENGAGEMENT

Field of the Invention

5 The invention relates to the engagement and lifting of shipping containers and in particular those containers used for bulk materials. In particular the invention relates to lifting apparatus arranged to lift bulk material containers and rotate these containers so as to empty the contents.

10 **Background**

Bulk material containers used for grain, mineral ore and other forms of particulate material. Bulk material handling assemblies are therefore specialized spreaders are used to engage said containers, having been modified to rotate the containers and so
15 emptying the contents to fill trucks, ship holds and other forms of subsequent transport, in as efficient manner as possible.

A particular issue with all shipping containers is optimizing the space in which they are stored so to minimize clearance between containers. This, however, presents a problem
20 in allowing lifting devices to have sufficient clearance to engage the containers. Some clearance between containers will typically be provided to allow this. For ground based storage this inherent inefficiency can be managed, though is not desirable. For more

expensive storage such as on a ship or for rail carriages, the luxury of including an inefficient gap between containers can be costly.

Other prior art devices have considered this issue with one device having movable
5 components that project downwards from the spreader to engage the container and lift the container relative to the spreader so as to engage the container within the spreader for normal operation. The problem presented with such systems involves having sufficiently strong projecting members to be able to engage and lift a container that may be moving due to movement of the ship or the application of wind. However, if these
10 members are too large to accommodate such movement and eccentric forces the larger projecting members may still require a gap between containers to fit within the confined space of tightly packed containers. Accordingly, this type of system is impractical in having to compromise strength in order to achieve the result.

15 **Summary of Invention**

In a first aspect the invention provides a bulk material handling assembly comprising: a head frame having a pair of fixed support members; each fixed support member having a container engaging member in rotational engagement with the fixed support member;
20 each container engaging member having a first pair of twist lock devices for engaging a container in a space between the fixed support members when the container engagement members are in a first position; the container engaging members rotatable 180° to a second position, each having a second pair of twist lock devices for engaging a

container in the second position; wherein a container engaged with the second pair of twist lock devices as the container engaging members are in the second position is positioned wholly outside of the space between the fixed support arms.

- 5 In a second aspect the invention provides a method of handling a bulk material container, the method comprising the steps of: providing a head frame having a pair of fixed support members, each fixed support member having a container engaging member in rotational engagement with the fixed support member; each container engaging member having a first pair of twist lock devices and a second pair of twist
- 10 lock devices; rotating each container engaging member from a first position to a second position, so as to direct the second pair of twist lock devices downwards; engaging the container with each second twist lock devices and lifting the container; placing the container on a surface and disengaging each second pair of twist lock devices; rotating each container engaging member from the second position to the first position, so as to
- 15 direct the first pair of twist lock devices downwards; re-engaging the container with each first pair of twist lock devices.

Accordingly, by providing twist lock devices at opposed faces of the container engaging member, the rotational function of the bulk material handling assembly can be used in

20 order to place the twist lock devices outside of the fixed support members allowing engagement of containers in a tightly packed orientation.

In one embodiment the process may involve lifting the container away from the tightly packed orientation and placing it in a clear zone to then disengage the container, rotate the container engaging member to their normal position and re-engaging the container in a conventional position for normal operation.

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Brief Description of Drawings

It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention. Other
10 arrangements of the invention are possible and consequently, the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

Figures 1A and 1B are various views of a bulk material handling assembly according to
15 one embodiment of the present invention;

Figure 2 is a cross-sectional view of a container engaging member according to a further embodiment of the present invention;

20 Figures 3A to 3C are various views of the bulk material handling assembly of Figure 1 with the container engaging members in the second position;

Figures 4A and 4B are various views of the bulk material handling assembly according to a further embodiment of the present invention; and

Figure 5 is an elevation view of the bulk material handling assembly with a container in the first position.

Detailed Description

The ability of the container engaging members, having distinct twist lock devices in opposed directions, allows the engagement of containers in two separate positions. A first position to be used for normal operation whereby the container can be rotated in order to empty the bulk material. The second position provided by the present invention allows the container engaging members to rotate 180 degrees so as to be directed downward. By having the second pair of twist lock devices directed downward whilst the container engaging member is in the second position allows a container to be engaged but in a position outside the space defined by the fixed support members.

Thus, where a conventional lifting apparatus is unable to engage a container because of interference by the fixed support members of the apparatus, the bulk material handling assembly according to the present invention is able to project down below the assembly to engage the container and thus avoid interference between adjacent containers and the assembly itself.

Figures 1A and 1B show the bulk material handling assembly 5 according to the present invention. Here, the assembly 5 appears as a conventional lifting apparatus having a head frame 10 with a pair of fixed support members 15 projecting downwards. The fixed support members include motors 20 to rotate the container engaging members to
5 empty an engaged container by rotation. There are also side support beams 30 for assisting in the support of the container during rotation.

There is a space 55 defined by the fixed support members into which a container is positioned when engaged with the container engaging members 25 when the container
10 engaging members 25 are in a first position. This corresponds with the conventional operation of the bulk material handling assembly 5.

Figure 2 shows a cross-sectional view of a twist lock beam 35 mounted to the container engaging members. Here a beam 40 includes a first pair of twist locks 45 which are
15 used to engage the container when the container engaging members are in a first position.

On an opposite side of the beam 40 are a second pair of twist lock devices 50 directed in the opposite direction. With the container engaging members 25 being in a first
20 position as shown in Figures 1A and 1B the first pair of twist lock devices 45 are directed downwards and the second pair of twist lock devices 50 are directed upwards.

Figures 3A to 3C show the container engaging members 25 in a second position corresponding to the bulk material handling assembly 60 being in an orientation to engage a container in a close packed arrangement. Here, the second pair of twist lock devices 50 are now directed downwards following the container engaging members 5 having rotated 180 degrees from the first position to the second position. Figure 3B shows the first pair of twist lock devices 45 now directed upwards.

Figures 4A and 4B show the next step in the container engaging procedure whereby the assembly 60 has now lowered so as to bring the container engaging members, and in particular, the second twist lock devices into the engagement with a container 70. It can be seen from Figures 4A and 4B that a container 75 adjacent to the first container 70 has little or no clearance. Nevertheless, the handling assembly 60 according to the present invention readily engages the container 70 without interference from the adjacent container 75. It can be further seen that engagement with the container 70 maintains the 15 container wholly outside the space 55 defined by the fixed support members 15.

Thus the procedure permitted by the present invention involves the bulk material handling assembly 5 with the container engaging members in a first position moving to the required position to engage a container. At the appropriate time the container 20 engaging members rotate from the first position to the second position so as to direct the second twist lock devices downwards. The handling assembly is then lowered to bring the second twist lock devices into engagement with the container and once engaged the container can be lifted and transported to a clear area. The container is then disengaged

(not shown) from the second twist lock devices and the container engaging members rotated 180 degrees from the second position back to the first position. The handling assembly then lowers to engage the container once again. However, the engagement is now with the first twist lock devices which engage the container so as to be within the

5 space 55 between the fixed support members as shown in Figure 5.

Claims

1. A bulk material handling assembly comprising
a head frame having a pair of fixed support members;
5 each fixed support member having a container engaging member in rotational engagement with the fixed support member;
each container engaging member having a first pair of twist lock devices for engaging a container in a space between the fixed support members when the container engagement members are in a first position;
10 the container engaging members rotatable 180° to a second position, each having a second pair of twist lock devices for engaging a container in the second position;
wherein a container engaged with the second pair of twist lock devices as the container engaging members are in the second position is positioned wholly
15 outside of the space between the fixed support arms.
2. The bulk material handling assembly according to claim 1, wherein each container engaging member includes a twist lock beam, said twist lock beam having the first and second pair twist lock devices coupled thereto.
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3. The bulk material handling assembly according to claim 1 or 2, further including at least one support beam parallel to the longitudinal axis of the head frame, the support beam arranged to support the container during rotation.

4. A method of handling a bulk material container, the method comprising the steps of:

5 providing a head frame having a pair of fixed support members, each fixed support member having a container engaging member in rotational engagement with the fixed support member;

each container engaging member having a first pair of twist lock devices and a second pair of twist lock devices;

10 rotating each container engaging member from a first position to a second position, so as to direct the second pair of twist lock devices downwards;

engaging the container with each second twist lock devices and lifting the container;

placing the container on a surface and disengaging each second pair of twist lock devices;

15 rotating each container engaging member from the second position to the first position, so as to direct the first pair of twist lock devices downwards;

re-engaging the container with each first pair of twist lock devices.