

INWARD TIPPING BARGE

Field of the Invention

This invention relates to a system including a barge from transporting bulk material to a receiving vessel. More particularly, this invention relates to a barge having multiple containers for storing the containers that are unloaded in a particular sequence to promote stability of the barge. Still more particularly, this invention relates to a barge having multiple containers that are tipped inwards into the center of the barge to unload the bulk material onto a conveyor for unloading of the material from the barge.

10 Summary of the Prior Art

It is often a problem to transport bulk materials such as quarried, mined, or other excavated materials from one site to another. For purposes of this discussion, a bulk material is any material, such as coal; ore; or quarried, and/or excavated material that often has to be transported in large quantities to a second site for use or further processing. Often the excavation sites, such as a quarry or a mine are located adjacent a waterway. Thus, large container vessels are often used to transport bulk material from one site to another site.

However, it is often a problem to load the bulk material onto the ship for transport. Commonly the material must be loaded from land onto the vessel using scoop shovels or other mechanical shovel equipment to load the material into a hold. This is often a problem in that this requires the vessel dock either proximate land or shallow water.

A second method is to place the material on a barge. Once docked beside the vessel the material is then shovelled into a transport container that is lifted onto the barge.

Both of these methods have disadvantages.

When a vessel is docked to land, the amount of bulk material that can be loaded onto the ship is limited. The load is limited because the vessel must maintain enough displacement to allow movement in the shallow water. Furthermore, care must be given
5 in maintaining load balance to promote stability to reduce listing which may effect the mobility of the vessel.

When a barge is used to transport materials to the vessel in deeper water, other problems arise. One problem is maintaining the stability of the barge during the unloading process. Care must be taken to ensure that load balance on the barge is
10 maintained to prevent listing and/or capsizing. Furthermore, it is often a problem to lift the material from the level of the barge to the deck of the vessel. In most cases, a boom or other lifting apparatus must be used which limits the amount of material that can be loaded at one time increasing the amount of time required to load a vessel.

In light of the above described and other problems, those skilled in the art are
15 constantly striving to improve the process of loading vessels with bulk materials to decrease the loading time required and increase the amount of material that may be moved.

Summary of the Invention

20 The above and other problems are solved and an advance in the art is made by a tipping barge in accordance with this invention. A tipping barge in accordance with this invention has a plurality of containers that are aligned in a particular manner. The containers can then be unloaded in a predetermined order to promote the stability of the barge to prevent listing and/or capsizing. Thus, there is no need for additional equipment
25 such as ballast tanks to be added to the barge or extra time taken to ensure load stability

and making the barge less expensive to produce. Secondly, a conveyor system is provided on the barge that receives the bulk material from the containers and offloads the material. This improves the speed of removal by allowing more material to be removed at once and minimizes the need for load balancing on the receiving vessel.

5 In accordance with embodiments of this invention, a tipping barge has a first conveyor system and containers. The first conveyor system is affixed to a transport surface of the barge aligned substantially along a center line of the barge. The first conveyor system moves bulk material from a second end of the barge towards a first end of the barge. The containers hold the bulk material during transport and are aligned
10 along opposing sides of the first conveyor system. Each container is configured to open inward to allow bulk material to pour onto the first conveyor system.

 In one embodiment, there is a lifting system for each container that causes each container to tilt inwards towards the first conveyor system to allow the bulk material to pour onto the first conveyor system. In this embodiment, hinges affix an end of each
15 container closest the first conveyor system to a deck of said barge. The hinges act as a pivot point about which each of the containers is lifted to cause said material to pour onto the first conveyor system.

 In some embodiments, the containers are arranged in a first column and a second column along opposing sides of the first conveyor system. Further, each of the
20 containers in the first column oppose a mated container in the second column to form rows. In these embodiment, the containers are configured such that a first row proximate the first end of the barge pours bulk material onto said first conveyor system. Then a second row proximate the second end of the barge pours bulk material onto the first conveyor system in response. This is repeated until all of the containers are emptied.

In a preferred exemplary embodiment, the barge includes an odd number of rows including a center row. The rows are unloaded by emptying the rows of filled containers closest to the opposing ends moving inwardly with the center row being unloaded last.

5 In most embodiments, each container has a base and side walls that extend upwards from proximate a perimeter of base. In some embodiments, the base is sloped upward from a first end proximate said first conveyor system towards a second end to promote pouring when the container is tipped.

In some embodiments, the first conveyor system pours the bulk material over an edge of the first end of the barge. In other embodiments, the first conveyor system
10 transfers the bulk material to a second conveyor system proximate the first end of the barge. The second conveyor system is configured to receive the bulk material from the first conveyor system and pour the bulk material over an edge of the barge. Preferably, the second conveyor system is aligned substantially perpendicular to the first conveyor system with a first end proximate an unloading point of the first conveyor system and a
15 second end proximate an edge of one side of the barge for dropping the bulk material over the side of said barge. Further, the second conveyor system may have a first end at a first height lower than the first conveyor system and a second end at a second height higher than the first end of the second conveyor system.

In some embodiments, the system also includes a loading platform over a body of
20 water having a base above the water under which the barge is moored. An opening through the base of the platform is sized to expose the containers on the barge to allow the bulk material to be loaded into the containers.

Also, some embodiments may include an unloading barge to aid in unloading the bulk material. The unloading barge preferably has a first unloading conveyor system on
25 a top deck that receives the bulk material from the barge. The first unloading conveyor

system has a first end at a first height for receiving said bulk material from the barge and a second end at a second height higher than the first height for pouring the bulk material onto a receiving vessel.

5 Brief Description of the Drawings

The above and other features and advantages of this invention are set forth in the following detailed description and are shown in the following drawings:

Figure 1 illustrating a top view of a tipper barge in accordance with one exemplary embodiment of this invention;

10 Figure 2 illustrating a perspective view of the tipper barge in accordance with the exemplary embodiment of Figure 1;

Figure 3 illustrating a rear view of the tipper barge with containers tipped in accordance with the exemplary embodiment shown in Figure 1;

15 Figure 4 illustrating a perspective view of a loading platform for the tipper barge in accordance with the exemplary embodiment of Figure 1; and

Figure 5 illustrating a perspective view of the tipper barge and an unloading barge in accordance with the embodiment shown in Figure 1.

Detailed Description

20 This invention relates to a system including a barge for transporting bulk material to a receiving vessel. More particularly, this invention relates to a barge having multiple containers for storing the materials that are unloaded in a particular sequence to promote stability of the barge. Still more particularly, this invention relates to a barge having multiple containers that are tipped inwards into the center of the barge to unload the bulk
25 material onto a conveyor for unloading of the material from the barge. For ease of

understanding, components shown in multiple drawings are given the same reference numeral throughout this description.

A system for loading and unloading bulk material under a body of water is provided in accordance with this invention. In particular, the system includes a barge
5 having multiple containers that may be tilted inward of the barge to cause bulk material in the containers to pour onto a conveyer system on the barge for removal. This containers may be configured so that the unloading of the containers may be coordinated to promote stability of the barge to reduce listing of the barge and prevent capsizing. This eliminates the need of ballast tanks or other devices for maintaining the load
10 distribution of the bulk material on the barge during an unloading process.

Figure 1 illustrates a top view of barge 100 in accordance with one exemplary embodiment of this invention. Barge 100 has a top deck 112 having a first end 109, second end 107, first side 106, and second side 108. First conveyor system 110 is a conventional conveyor belt or the like operated by a drive motor (Not shown) for
15 transporting the bulk material from one end of barge 100 to another end. In this embodiment, first conveyor system 110 is aligned along a center line of barge 100 from proximate second end 107 to proximate first end 109. When in operation, first conveyor system 110 rotates to cause material to move from second end 107 towards first end 109.

In the shown embodiment, first conveyor system 110 ends proximate the
20 beginning of the containers on the barge and delivers the material to second conveyor system 115 described below. In other embodiments, first conveyor system 110 may extend over first end 109 to pour transport bulk material over first end 109 to a receiving station. In these other embodiments, first conveyor system 110 may have an upward slope from second end 107 to first end 109 to facilitate the pouring of the bulk material
25 over first end 109.

Second conveyor system 115 is aligned to be substantially perpendicular to first conveyor system from second side 108 to first side 109. Second conveyor system 115 receives bulk material from the end of first conveyor system 110 and pours the material over one of the sides 106 or 108 of barge 100. As can be seen in Figure 2, second
5 conveyor system 120 may be sloped rising upwardly from a first elevation at a first end proximate first conveyor system 110 to a second elevation at a second end that pours the material over the side to improve delivery of the bulk material.

On barge 100, the bulk material is stored in multiple containers 120, 125, 130, 135, 140, 145, 150, 155, 160, and 165. One skilled in the art will note that although 10
10 containers are shown, barge 100 may include any number of containers as determined by the size of the barge and the respective containers. The bulk material is held in individual container to facilitate loading, unloading, and maintaining load balance. The bulk containers are containers having a base and sidewall extending upwards from the base to enclose a holding area. Preferably a top side is open. Although, it is envisioned
15 that some types of removable covering or covering having an opening could be used without departing from this embodiment. Furthermore, the base of each container may be sloped upwards from the base at a first end towards a second end to promote pouring when the container is tilted.

Preferably, containers 120, 125, 130, 135, 140, 145, 150, 155, 160, and 165 are
20 positioned proximate first conveyor system 110 to allow the bulk material in the containers to be poured onto first conveyor system 110. As shown in Figure 3, the containers such as container 120 and 145, tip inwardly to pour the stored bulk material onto first conveyor system 110. In this embodiment, a lift system comprising an underpinning system including a piston, such as pistons 205, 210, under each container

lifts an end of the container to cause contents of the container to pour over the opposite end.

To eliminate the need of ballast tanks or other means for load balancing, containers 120, 125, 130, 135, 140, 145, 150, 155, 160, and 165 are configured so that the bulk material may be unloaded from the containers in a predetermined sequence that promotes load stability which in turn reduces listing and prevents capsizing. In this embodiment, containers 120, 125, 130, 135, and 140 are aligned as one column along one side of first conveyor system 110 and containers 145, 150, 155, 160, and 165 are aligned in a second column along a second, opposite side of first conveyor system 110. Furthermore, opposing containers 140/165, 135/160, 130/155, 125/150, and 120/145 form rows of containers. Although barge may contain any number of containers, preferably barge 100 contains an odd number of rows to facilitate unloading.

In accordance with this embodiment, the containers are unloaded in the following manner. The process begins by tilting first row 140/165 closed a first end 109 of the barge inwards towards first conveyor system 110 to allow the bulk material to pour onto first conveyor system 110. After the materials in the containers 140/165 in the first row are poured onto first conveyor system 110, containers 120/145 in a last row closest second end 107 are tilted inwards towards first conveyor system 110 and bulk material in these containers is poured onto first conveyor system 110. When the contents of the containers of the last row are emptied, the process is repeated from the next closest rows to front end 109 and second end 107 until all the containers are emptied. Preferably, barge 100 includes an odd number of rows and a center row is the last row to be emptied. One skilled in the art will further notice that if a barge is long enough and contains a great number of rows, then more than one row may be emptied at a time. The exact sequence being left to those skilled in the art.

In addition to barge 100 show in Figures 1-3, the system may include a loading platform 400. Loading platform 400 is affixed to the shore and is either a pier or a floating pontoon. Loading platform includes a top surface over which vehicle or other machinery for loading the bulk material may be placed. Loading platform 400 is elevated to allow barge 100 to be positioned in the water under platform 400. An opening 410 through loading platform exposes the top openings containers 120, 125, 130, 135, 140, 145, 150, 155, 160, and 165 to loading surface 405 to allow bulk material to be loaded into the containers. Once all of containers 120, 125, 130, 135, 140, 145, 150, 155, 160, and 165 are loaded, barge 100 is moved from loading platform 400 and moored next to the vessel for unloading.

Although, barge 100 may be dock directly to a vessel 600 (Figure 5) for unloading, a system in accordance with this invention may provide an unloading barge moored to a side of vessel 600 to facilitate the transfer of material. Figure 5 illustrates an embodiment having an unloading barge to facilitate unloading of barge 100 and loading vessel 600. In this embodiment, loaded barge 100 is docked along side the unloading barge 510. Once barge 100 is moored next to the unloading barge 510, barge 100 is unloaded in the following manner. Second conveyor 115 pours the material into hopper 520 on deck 515 of the unloading barge 510. From hopper 520, the material is poured onto first unloading conveyor system 525. First unloading conveyor system 525 is a conventional conveyor or other conveyance system that has a first end at a first receiving elevation and a second end at a higher unloading point. One skilled in the art will recognize that the unloading barge may only include first unloading conveyor system 525 which would be configured to pour bulk material into a hold 610. However in this embodiment, first conveyor system is aligned to have an unloading point over second

hopper 530. The bulk material is poured from the second end of first unloading conveyor system 525 into hopper 530.

Hopper 530 directs the bulk material onto a first end of second unloading conveyor system 535. Second unloading conveyor system 535 has a first end at a
5 receiving station under hopper 530 and a second end that overhangs an edge of the unloading barge at second, higher height for pouring bulk material into a hold 610 of vessel 600.

Those skilled in the art will recognize the above describes one possible embodiment of a system including an inward tipping barge for transporting bulk material
10 in accordance with this invention. It is envisioned that those skilled in the art can and will design alternative system that infringe this invention as set forth in the following claims either literally or equivalently.

What is claimed is:

1. A system for transporting bulk material from a first point to a second point including:

a barge having a transport surface having a first end, a second end, a first side,

5 and a second side characterized by:

a first conveyor system on said transport surface aligned substantially

along a center line of said barge for moving material from said second end of said

barge towards said first end of said barge; and

a plurality of containers for holding said bulk material aligned along

10 opposing sides of said first conveyor system wherein each of said plurality of containers is configured to open inward to allow said bulk material to pour onto said first conveyor system.

2. The system of claim 1 further including:

15 a plurality of lifting systems each corresponding to one of said plurality of containers to cause said one of said plurality of containers to tilt inwards towards said first conveyor system to allow said bulk material to pour onto said first conveyor system.

20 3. The system of claim 2 further including:

a plurality of hinges each affixing an end closest said first conveyor system of one of said plurality of containers to a deck of said barge wherein each of said plurality of hinges is a pivot point about which each of said plurality of containers is lifted to cause said material to pour onto said first conveyor system.

4. The system of claim 1 wherein said plurality of containers are arranged in a first column and a second column along opposing sides of first conveyor system.

5. The system of claim 4 wherein each plurality of containers in said first column
5 oppose a mated container in a second column to form a plurality of rows.

6. The system of claim 5 wherein said plurality of containers are configured such that a first of said plurality of rows proximate said first end of said barge pours bulk material onto said first conveyor system and a second of said plurality of rows
10 proximate said second end of said barge pours bulk material onto said first conveyor system in response to said pouring by said first of said plurality of rows.

7. The system of claim 6 wherein said plurality of rows include an odd number of rows, inclusive of a center row, and wherein said plurality of rows are unloaded from
15 said loaded containers closest to the opposing ends of said barge inward with said center row being unloaded last.

8. The system of claim 1 wherein each of said plurality of containers is characterized by:
20 a base; and
side walls extending upwards from proximate a perimeter of base.

9. The system of claim 8 wherein said base is sloped upward from a first end proximate said first conveyor system towards a second end.

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10. The system of claim 1 wherein said first conveyor system pours said bulk material over an edge of said first end of said barge.

11. The system of claim 1 wherein said barge is further characterized by:

5 a second conveyor system proximate said first end of said barge and configured to receive said bulk material from said first conveyor system and pour said bulk material over an edge of said barge.

12. The system of claim 11 wherein said second conveyor system is aligned
10 substantially perpendicular to said first conveyor system with a first end proximate an unloading point of said first conveyor system and a second end proximate an edge of one side of said barge for dropping said bulk material over said one side of said barge.

13. The system of claim 11 wherein said second conveyor has a first end at a first
15 height lower than said first conveyor system and a second end at a second height higher than said first end of said second conveyor.

14. The system of claim 1 further including:

 a loading platform over a body of water having a base above the water under
20 which said barge is moored; and

 an opening through said base sized to expose said plurality of containers on said barge to allow said bulk material to be loaded into said plurality of containers.

15. The system of claim 1 further including:

25 an unloading barge having a top deck characterized by:

a first unloading conveyor system on said top deck that receives said bulk material from said barge.

16. The system of claim 15 wherein said first unloading conveyor system has a first end at a first height for receiving said bulk material from said barge and a second end at a second height higher than said first height for pouring said material onto a receiving vessel.

17. A method for transporting bulk material between two points comprising:

loading said bulk material into a plurality of containers on a barge wherein said plurality of containers are aligned along opposing sides of a first conveyor system substantially aligned along a center line of said barge and wherein each of said plurality of containers is configured to open inward to allow said bulk material to pour onto said first conveyer system;

pouring said bulk material from each of said plurality of containers to said first conveyor system; and

moving said bulk material from said first conveyor system to an unloading point on said barge.

18. The method of claim 17 wherein said plurality of containers are arranged in a first column and a second column along opposing sides of said first conveyor system and each said plurality of containers in said first column oppose a mated container in said second column to form a plurality of rows, said method further comprising:

pouring said bulk material from said containers in a first of said plurality of rows proximate a first end of said barge pours bulk material onto said first conveyor; and

pouring said bulk material from a second of said plurality of rows proximate said second end of said barges in response to said pouring by said first of said plurality of rows.

5 19. The method of claim 18 wherein said plurality of rows include an odd number of rows, inclusive of a center row, and wherein said plurality of rows are unloaded from said loaded containers closest to the opposing ends of said barge inward with said center row being unloaded last.

10 20. The method of claim 17 further comprising:
 positioning said plurality of containers of said barge to align with an opening through a loading platform; and
 loading said plurality of containers by pouring said bulk material through said opening.

15 21. The method of claim 17 further comprising:
 transferring said bulk material from an end point of said first conveyor system to a second conveyor system on said first end of said barge; and
 pouring said bulk material over an edge of said barge using said second conveyor
20 system.

22. The method of claim 21 further comprising:
 transferring said bulk material from said second conveyor system to a third conveyor system on an unloading barge; and

transferring said bulk material from said unloading barge to a receiving vessel using said third conveyor system.