

[54] **CARGO TRANSFERRING VESSEL AND METHOD**

[76] Inventor: **Robert F. Cecce**, 8320 Verona Dr.,  
New Carrollton, Md. 20784

[22] Filed: **Aug. 7, 1972**

[21] Appl. No.: **278,231**

[52] U.S. Cl. .... **214/13, 114/43.5, 212/3, 214/152**

[51] Int. Cl. .... **B65g 67/58**

[58] Field of Search .... **214/12, 13, 14, 152; 114/45, 43.5; 212/3**

[56] **References Cited**

**UNITED STATES PATENTS**

738,084	9/1903	Titcomb.....	214/13
779,852	1/1905	Holzappel.....	214/13 X
1,292,852	1/1919	Musuer.....	214/13
1,300,954	4/1919	Gray.....	114/45 X
1,617,990	2/1927	Donnelly.....	114/45
2,379,685	7/1945	Crandall.....	114/45
3,104,766	9/1963	Sasadi.....	214/14

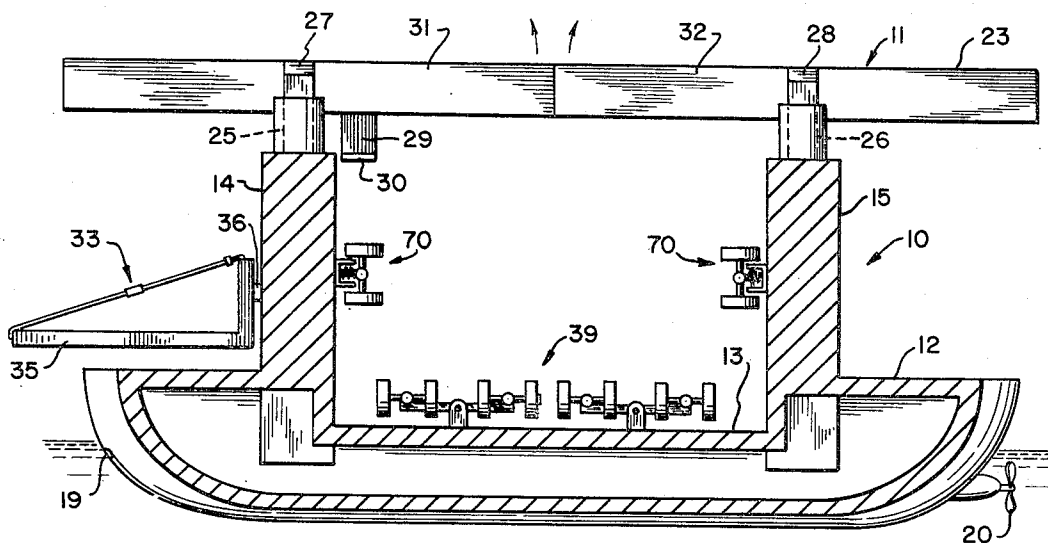
Primary Examiner—Frank E. Werner

Attorney, Agent, or Firm—Michael W. York

[57] **ABSTRACT**

A cargo transferring vessel and method for transferring cargo between a small ship or lighter and a larger ship. The cargo transferring vessel is capable of being partially submerged to various depths to permit a large ship to float over the center portion of its hull and is then capable of increasing its buoyance to bring wheels of wheel assemblies on the center portion of its hull into contact with the hull of the larger ship to eliminate relative pitching, rolling and up and down movements between the larger ship and the cargo transferring vessel which might be caused by waves or rough water. A stabilizing apparatus is provided on the side of the hull of the cargo transferring vessel for exerting a downward force on the hull of the smaller ship for assisting in preventing relative movement between the smaller ship and the combined cargo handling vessel and the larger ship. The wheel assemblies are capable of conforming to the shape of the hull of the larger ship and they permit the cargo transferring vessel to be located at various positions along the hull of the larger ship. The cargo transferring vessel and method permit the transfer of cargo between a large and a small ship without the undesirable pitching, rolling and up and down movements between the large ship, the smaller ship and the cargo transferring vessel.

**9 Claims, 7 Drawing Figures**



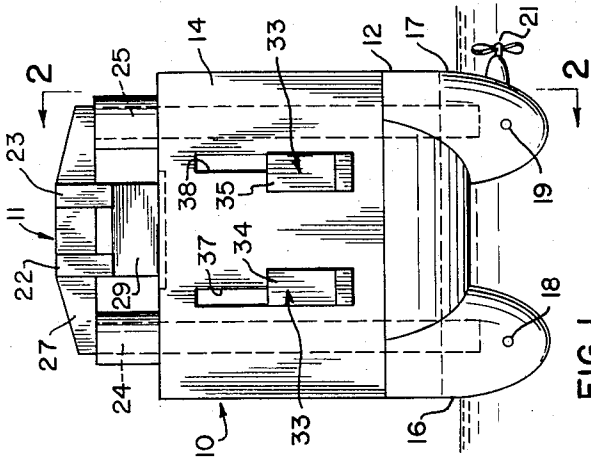


FIG. 1

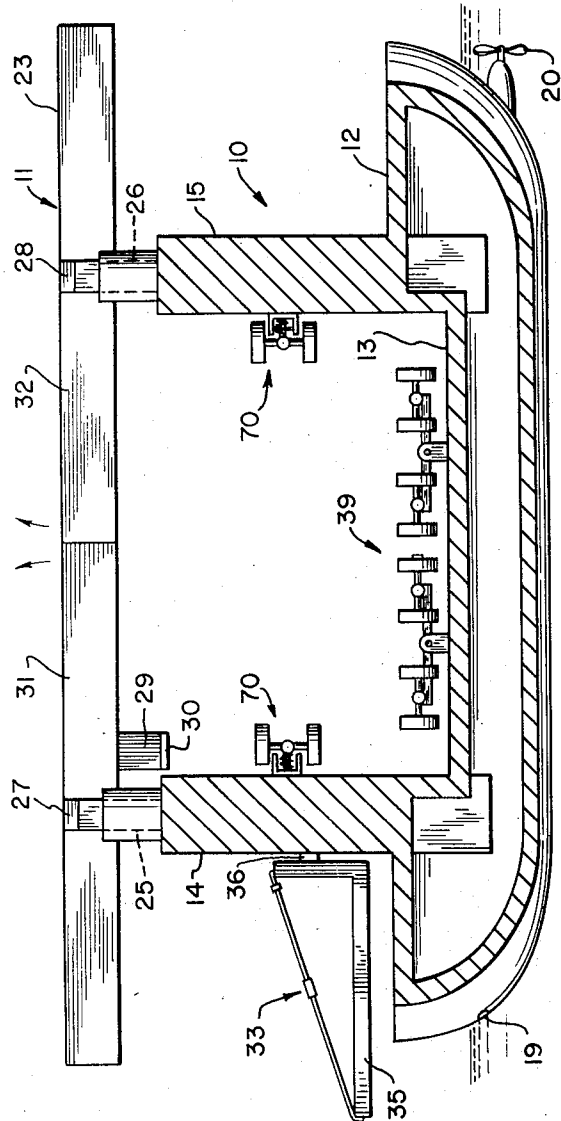


FIG. 2

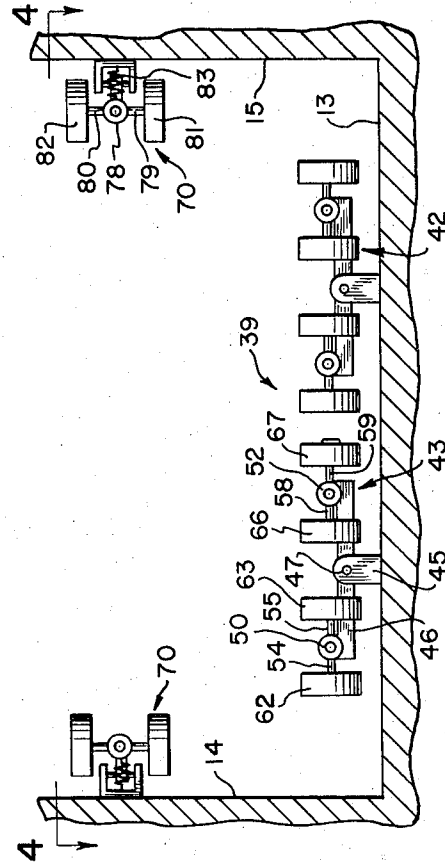


FIG. 3

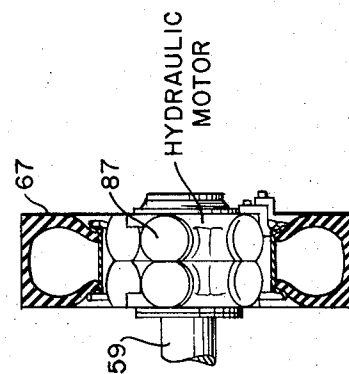


FIG. 7

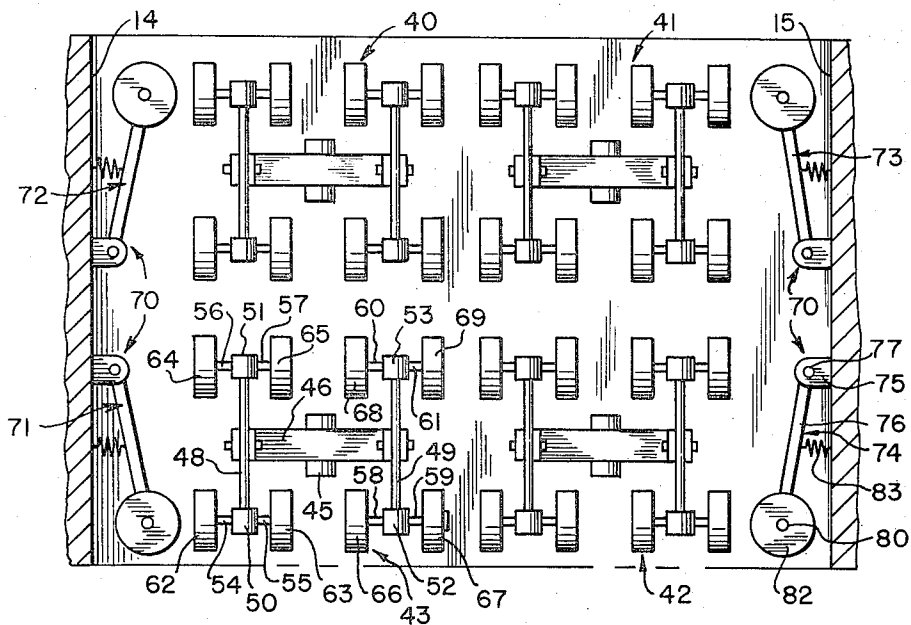


FIG. 4

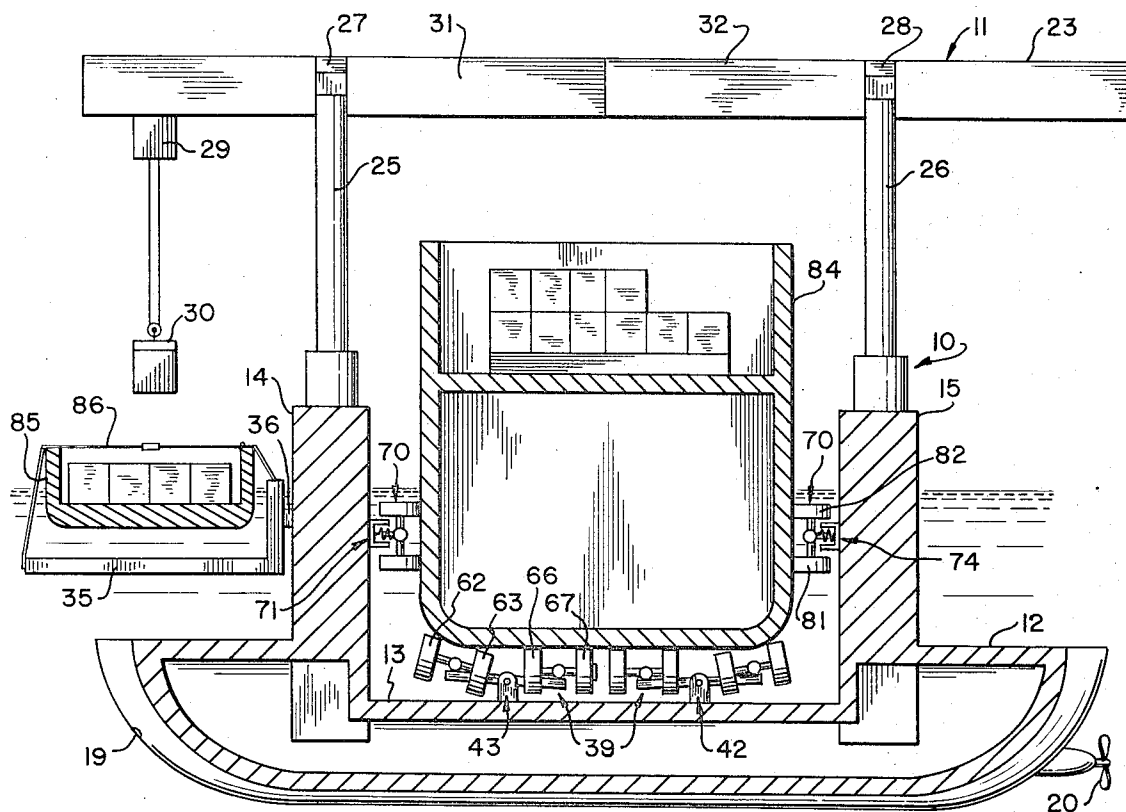
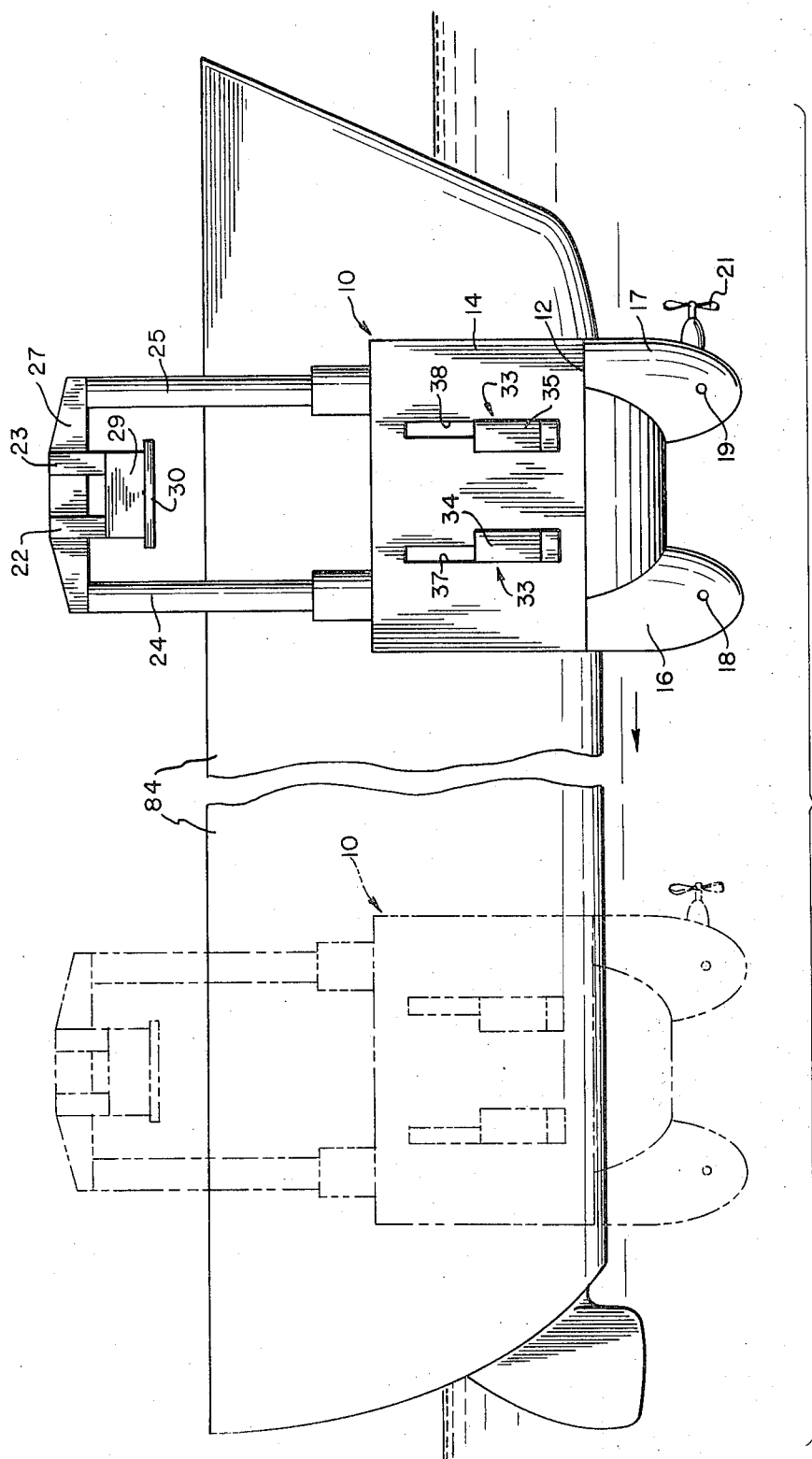


FIG. 5



**FIG. 6**

## CARGO TRANSFERRING VESSEL AND METHOD

## BACKGROUND OF THE INVENTION

In many instances it is necessary to transfer cargo from small ships or lighters to larger ships or to transfer cargo from larger ships to lighters due to the absence of adequate docking facilities for the larger ships. The transfer of cargo between large and small ships has been accomplished in various manners in the past. One way in which such transfer has been accomplished is through the use of cargo handling equipment on board the larger ship. This method of transferring cargo is inefficient and expensive since the on-board cargo handling gear on the larger ship is idle for the majority of time and since usually it is necessary to provide separate cargo handling gear to load or unload cargo at various locations on the ship. The cargo handling equipment may also be located on the smaller ship or the lighter. However, the small size of the ship places very definite limits on the capacity of the cargo handling gear which in most instances precludes the efficient and practical transfer of cargo in this manner.

Another method of transferring cargo between large and small ships has been through the use of a separate ship or vessel which has the cargo handling equipment. This method has several advantages over the previous methods. It eliminates the need for inefficient and expensive cargo handling equipment on the larger ships and it eliminates any necessity for the smaller ships to carry any cargo handling equipment. The cargo handling vessels or boats used with this method have had a number of configurations. Some cargo handling vessels have been designed to be located adjacent to and between the bigger and the smaller ship. An example of such a cargo handling ship or vessel is disclosed in the recently issued U.S. Pat. No. 3,645,405. Other cargo handling ships or vessels have been designed to be partially submersible to permit a portion of the hull of the vessel to be located below the bottom of the ship which is to be loaded or unloaded. Such vessels or apparatus have been known for some time and an example of such a vessel is disclosed in U.S. Pat. No. 719,517.

In spite of the advantages associated with the use of separate cargo handling ships or vessels there are problems associated with their use which have limited their effectiveness in the past. One major problem is that if the water is rough or if there are waves, the large ship, the lighter and the cargo transferring vessel will most probably all be pitching, rolling and moving up and down in the water in relation to each other. This, of course, makes the safe and efficient transfer of cargo extremely difficult since it is quite possible for one of the ships to move upward or the cargo vessel to move downward in such a manner that the cargo may be smashed against the deck of one of the ships. In addition, it is extremely difficult to attach cargo to the cargo transferring apparatus under such conditions. Even if the cargo vessel is moored alongside the larger ship and the lighter this cannot prevent this upward and downward movement and some of the pitching and rolling.

It has been proposed in the past to transfer cargo from a comparatively large ship to a smaller ship by raising the larger ship out of the water through the use of a pontoon or pontoons which are used to lift the

larger ship. Transfer of the cargo is then effected by opening doors or ports in the sides or the bottom of the hull of the larger ship and permitting the cargo to fall into the smaller ship. Such a cargo transfer system is disclosed in U.S. pat. No. 779,852. This type of cargo transfer system will eliminate relative pitching and up and down movement between the pontoon or pontoons and the larger ship, but not between the smaller and the combined large ship and pontoon structure. The type of cargo transfer system proposed in U.S. Pat. No. 779,852 has a number of disadvantages. This system is limited to the transfer of cargo from relatively small ships since the buoyancy requirements to raise large ships would require the pontoon structure to be prohibitively large. In addition, this system is only suitable for the transfer of cargo through openings in the sides or in the bottom of the hull of the large ship and few if any modern ships have such cargo transferring openings or ports. Furthermore, this system does not permit transfer of cargo from the smaller ship to the larger ship.

The method and cargo transferring vessel of this invention overcomes these disadvantages associated with other transferring methods or systems and provides a cargo transferring vessel and method which eliminate most if not all relative movement between the larger ship, the cargo transferring vessel and the smaller ship when cargo transfer is taking place. The cargo transferring vessel and method of this invention also eliminate any need for cargo handling equipment on board the large or the small ship and there is no need to lift the large ship out of the water. The cargo handling vessel of this invention is also capable of unloading or loading cargo at various locations along the hull of the larger ship.

## BRIEF DESCRIPTION OF THE INVENTION

This invention relates to cargo transferring vessels and methods for transferring cargo between a small ship and a larger ship and more particularly to cargo transferring vessels and methods in which the cargo transferring vessel is capable of decreasing its buoyancy to permit a portion of the hull of the cargo transferring vessel to be located beneath the hull of the larger ship.

It is an object of the present invention to provide a cargo transferring vessel and method for transferring cargo between a larger ship and a smaller ship which can greatly reduce or eliminate relative motion between the larger ship and the cargo transferring vessel when cargo transfer is being effected.

It is an object of the present invention to provide a cargo transferring vessel and method for transferring cargo between a larger ship and a smaller ship which can reduce or eliminate relative motion between the smaller ship, the cargo transferring vessel and the larger ship when cargo transfer is being effected.

It is also an object of the present invention to provide a cargo transferring vessel and method for transferring cargo between a larger ship and a smaller ship which can eliminate the need for on-board cargo transferring apparatus on the larger or the smaller ship.

It is also an object of the present invention to provide a cargo transferring vessel and method for transferring cargo between a larger ship and a smaller ship which can permit the safe and efficient transfer of cargo between larger ships and smaller ships even though the water may be rough.

It is also an object of the present invention to provide a cargo transferring vessel and method for transferring cargo between a larger ship and a smaller ship in which relative movement between the cargo transferring vessel and the larger ship is reduced or eliminated by submerging a portion of the hull of the cargo transferring vessel underneath the hull of the larger ship and contacting the hull of the larger ship without the need to have sufficient buoyancy to appreciably raise the larger ship.

It is also an object of the present invention to provide a cargo transferring vessel and method which can permit the cargo transferring vessel to contact the hull of the larger ship to prevent relative movement between the cargo transferring vessel and the larger ship without damaging the hull of the larger ship.

It is a further object of the present invention to provide a cargo transferring vessel and method for transferring cargo between a larger ship and a smaller ship which can readily permit cargo to be transferred at various locations along the hull of the larger ship even though the shape and dimensions of the hull of the larger ship may differ at the various transfer locations.

The present invention provides a cargo transferring vessel and method in which a variably submersible cargo transferring vessel is provided that has a portion thereof which is variably submersible below the bottom of the hull of a large ship in order that means for contacting and variably conforming to the bottom of the hull of the large vessel located on a portion of the hull of the cargo transferring vessel can be brought into contact with the bottom of the hull of the large vessel to prevent relative movement between the cargo transferring vessel and the large ship. The cargo transferring vessel also has means for exerting a downward force against a smaller ship to prevent relative movement between the smaller ship and the cargo transferring vessel to assist in permitting transfer of cargo between the large ship and the smaller ship without undesirable relative motion between the larger ship, the smaller ship and the cargo transferring vessel.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be hereinafter more fully described with reference to the accompanying drawings in which:

FIG. 1 is a front elevational view of the cargo transferring vessel of the present invention with its cargo transferring equipment in the stowed or non-transfer position;

FIG. 2 is a sectional view of the cargo transferring vessel of the present invention taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged view partly broken away of a portion of the structure illustrated in FIG. 2;

FIG. 4 is a sectional view of a portion of the cargo transferring vessel of the present invention taken along the line 4—4 of FIG. 3;

FIG. 5 is a sectional view of the cargo transferring vessel illustrated in FIG. 2 with its cargo transferring equipment in its operative position and with the cargo transferring vessel in position to transfer cargo from a larger ship to a smaller ship;

FIG. 6 is a side elevational view of a large ship illustrating how the cargo transferring vessel of the present invention can be located at various locations along its

hull to transfer cargo between the larger ship and a smaller ship; and

FIG. 7 is an enlarged view, partly in section, of a portion of a wheel assembly of the structure illustrated in FIG. 3.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the figures, the cargo transferring vessel of this invention is illustrated and is designated generally by the number 10. FIGS. 1 through 4 illustrate the cargo transferring vessel 10 with its cargo transferring apparatus 11 in its stowed or non-transferring position. The cargo transferring vessel 10 comprises a variably submersible hull 12 which has an inner portion 13 with a flat upper side, and two upstanding rectangular shaped superstructures 14 and 15 which extend upward from the hull 12 and are connected to cargo transferring apparatus 11. As best illustrated in FIG. 1, the hull 12 has two parallel pontoon type sections 16 and 17 which each have ports such as the respective ports 18 and 19 for admitting or exhausting water to reduce or increase the buoyancy of the hull. Attached to one end of each of the respective pontoon type sections 16 and 17 is a motor and connected propeller, one of which is shown and designated by the number 20, for propelling the cargo transferring vessel 10 through the water. Another motor and connected propeller 21 is attached to the side of the pontoon type section 17 for maneuvering the cargo transferring vessel 10 into position to transfer cargo.

The cargo transferring apparatus 11 comprises two elongated rectangular shaped rails 22 and 23, four vertically mounted elongated cylindrical supports, three of which are illustrated and designated by the numbers 24, 25, and 26, and two rail supports 27 and 28 which are connected to the rails and to the tops of the cylindrical supports. The cargo transferring apparatus 11 also includes a cargo handling carriage 29 and an associated hoist 30. The cargo handling carriage is movably connected to the two rails 22 and 23 and is capable of moving along the rails. As best illustrated in FIG. 2, each rail 22 and 23 has two sections, such as the sections 31 and 32 which are shown for the rail 23, which are pivotally mounted on the respective rail supports 27 and 28 so that they may be pivoted upward to clear the superstructure of a large ship in a manner which will be hereinafter more fully described. The four vertically mounted posts, including the posts 24, 25, and 26 are vertically movable by a hydraulic system, which is not shown since such systems are well known in the art, so that the rail supports 27 and 28, the two connected rails 22 and 23, and the cargo handling carriage 29 and associated hoist 30 can be elevated. Located on the outside of the superstructure 14 is a small ship stabilizing apparatus 33 which is used to exert a downward force on a small ship to stabilize the small ship when it comes alongside the cargo transferring vessel 10. The stabilizing apparatus 33 comprises two parallel mounted L-shaped fork-lift like projections 34 and 35 and each projection is connected to an arm, such as the arm 36 illustrated in FIG. 2, which rides in the respective slots 37 or 38 and are moved up or down by the action of a hydraulic system (not shown) to raise or lower the projections located in the superstructure 14.

As best illustrated in FIGS. 3 and 4, means for contacting and variably conforming to the bottom of the

hull of a large ship generally designated by the number 39 are located on the top of the inner portion 13 of the hull and comprise four identical wheel assemblies 40, 41, 42, and 43 which are located in a rectangular shaped pattern. Since the four wheel assemblies are substantially identical only one of the assemblies, assembly 43, will be described. The wheel assembly 43 comprises a mounting member 45 whose lower end is rigidly secured to upper surface or deck of the inner portion 13 of the hull 12, a cross arm 346 which is pivotally connected at its center to the upper end of the mounting member by means of a pin 47, and two axles 48 and 49 which extend through and are pivotally connected to the opposite ends of the cross arm 46. The wheel assembly also includes axle mounting members 50 and 51 which are rotatably mounted on the ends of the axle 48 and similar axle mounting members 52 and 53 which are rotatably mounted on the ends of the axle 49. Each axle mounting member 50, 51, 52, and 53 has respective axle projections 54 and 55, 56 and 57, 58 and 59, and 60 and 61 extending from its sides which rotatably mount respective wheels 62 and 63, 64 and 65, 66 and 67, and 68 and 69. In view of the construction of the wheel assemblies, such as the assembly 43, the wheels are capable of contacting and conforming to the bottom of a ship's hull even if the hull has a curved or irregular shape either fore and aft or from starboard to port and the wheels are also capable of conforming to different contours of the bottom of the ship's hull which may be present at different locations along the same hull.

As best illustrated in FIGS. 3 and 4, means for contacting and variably conforming to the sides of a portion of the hull of a large ship designated generally by the number 70 are connected to the inside walls of the superstructures 14 and 15 and comprise identical wheel assemblies 71 and 72 located on the interior wall of the superstructure 14 and identical wheel assemblies 73 and 74 located on the interior wall of the superstructure 15. Since the wheel assemblies 71, 72, 73, and 74 are identical only the wheel assembly 74 will be discussed in detail. The wheel assembly 74 comprises a mounting member 75 rigidly connected to the interior wall of the superstructure 15, an extension arm 76 with its inner end pivotally connected to outer end of the mounting member 75 by means of the pin 77, and a wheel mounting member 78 having axle projections 79 and 80 extending from its sides which is rotatably mounted on the outer end of the mounting member 76. Wheels 81 and 82 are rotatably mounted on the outer ends of the respective axle projections 79 and 80. A large compression spring 83 has one of its ends connected to the interior side of the arm 76 and its other end connected to the interior wall of the superstructure 15 and this spring serves to bias the arm 76 in an outward direction.

FIGS. 5 and 6 illustrate the cargo transferring vessel 10 in use transferring cargo between a larger ship 84 and a smaller ship or lighter 85. The hull 12 of the cargo transferring vessel 10 and portions of its superstructures 14 and 15 have been submerged in the water by admitting water into ports such as the ports 18 and 19 in the respective pontoon sections 16 and 17 in order that the wheels such as the wheels 62, 63, 66, and 67 of the means for contacting and conforming to the bottom of the hull 39 can be brought into contact with and conform to the bottom of the hull of the larger ship

84. In addition, the wheels such as the wheels 81 and 82 of the means for contacting and variably conforming to the sides of the hull of the larger ship 70 are in contact with and conform to the contour of the sides of the hull of the larger ship. The L-shaped projections, one of which is shown and designated by the number 35, are also in place under the smaller ship 85 and cables, one of which is shown and designated by the number 86, are connected to the respective L-shaped projections and extend upward over the hull of the smaller ship to exert a downward force against the hull of the smaller ship to stabilize it and to prevent relative motion between the smaller ship and the cargo transferring vessel 10.

As illustrated in FIG. 7, for the wheel 67, one or more of the various wheels of the means for contacting and conforming to the bottom of a large ship 39 may be driven by a hydraulic motor 87. The hydraulic motor 87 is located on the end of the axle projection 59 and is connected to the wheel 67 to drive the wheel under the control of a hydraulic system (not shown) located within the cargo transferring vessel 10 to move the cargo transferring vessel in relation to the larger ship 84 while its wheels, such as wheels 62 through 69, maintain contact with the bottom of the hull of the larger vessel. The hydraulic motor 87 permits the cargo transferring vessel 10 to be readily moved and located at various cargo transferring positions along the hull of the larger ship 84. The types of hydraulic motors which may be used with this invention include hydraulic wheel motors which are available from Houdaille Hydraulics Division of Houdaille Industries, Inc. located at 537 East Delarin Avenue, Buffalo, New York.

The cargo transferring vessel 10 is used and the method of this invention is carried out in the following manner. Once a larger ship such as the ship 84 has come into the location where it is to be unloaded or loaded, the cargo transferring vessel propels itself out to its vicinity through the use of its motors and connected propellers, such as the motor and connected propeller 20, and a smaller ship or lighter, such as the ship 85, is also sent out to the vicinity of the larger ship. The cargo loading vessel 10 is then partially submerged by admitting water into its hull 12 through ports in its hull, such as the ports 18 and 19, to such an extent that the upper portions of the various wheels of the means for contacting and conforming to the bottom of the hull of a large ship 39 are located at a depth in the water which is below the lowest portion of the bottom of the larger ship 84 as it rides in the water.

The cargo loading vessel 10 is then propelled through the water through the use of its maneuvering motor and connected propeller 21 so that the inner portion 13 of its hull 12 and the attached means for contacting and conforming to the bottom of the hull 39 are located beneath the hull portion of the larger ship 84 which is to be loaded or unloaded. Alternatively, the cargo handling vessel 10 can remain stationary and the larger ship 84 can move itself into position so the bottom of its hull is over the contacting and conforming means 39. If necessary to avoid any superstructure on the larger ship 84, the sections of the rails 22 and 23, such as the sections 31 and 32 of the rail 23, are pivoted upward to clear any such superstructure while the cargo loading vessel 10 is being positioned or while the larger ship is being moved into position. Water is then pumped out of the hull 12 of the cargo transferring ves-

sel 10 through ports such as the ports 18 and 19 until the wheels of the four wheel assemblies 40, 41, 42, and 43, such as the wheels 62, 63, 64, 65, 66, 67, 68 and 69 are firmly in contact with the hull of the larger ship 84 without exerting a force against the hull of the larger ship which would appreciably raise the larger ship in the water. It should be noted that the use of the multiple wheels 62 through 69 distributes the upward force caused by the buoyancy of the hull 12 of the cargo transferring vessel over a comparatively large area of the bottom of the hull of the larger ship 84 and this prevents any damage to the bottom of the hull of the larger ship. At the same time the wheels of the wheel assemblies, such as the wheels 81 and 82 of the wheel assembly 74, of the means for contacting and variably conforming to the sides of the hull of the larger ship contact and conform to the sides of the portion of the hull of the larger ship which is to be loaded or unloaded to prevent or greatly reduce lateral movement between the hull of the larger ship and the cargo transferring vessel 10.

The smaller ship 85 is then brought alongside the cargo transferring vessel 10 and is positioned over the L-shaped extensions 34 and 35 which have been lowered to a depth which is below the depth of the bottom of the hull of the smaller ship. The cables, such as the cable 86, are then secured over the hull of the smaller ship 85 and then the L-shaped extensions 34 and 35 are moved downward slightly so that the cables exert a downward force against the hull of the smaller ship which acts against the upward force of the smaller ship's hull due to its buoyancy. The cargo transfer operation is then carried out between the larger ship 84 and the smaller ship 85 in a conventional manner through the use of the cargo transferring apparatus 11. In some instances, where water conditions permit, the use of the L-shaped projections 34 and 35 and the associated cables may be dispensed with and in such cases the smaller ship is merely brought alongside the cargo transferring vessel 10 prior to the cargo transferring operation.

After the cargo transferring operation has been completed at one location along the hull of the larger ship 84, the cargo transferring vessel 10 and the smaller ship 85 may be moved to another location along the hull of the larger ship, such as the location indicated by the phantom lines in Fig. 6. Movement of the cargo transferring vessel 10 can be accomplished through the use of one of the hydraulic motors 87 to rotate the wheel 67 while it maintains contact with the bottom of the hull of the larger ship 84.

Although less desirable and less efficient, the motor and connected propeller 21 or cables (not shown) connected between the cargo transferring vessel and the larger ship can be used to move the cargo transferring vessel 10 along the hull of the larger ship 84. It should be noted that the unique means for contacting and conforming to the bottom of the hull of the larger ship 39 and means for contacting and conforming to the sides of the hull of the larger ship 70 permit such movement of the cargo transferring vessel 10 since their respective wheels rotate along the bottom and sides of the larger ship's hull and conform to changing contours in the bottom or sides of the hull.

During the cargo transferring operations, it may be desirable to increase or decrease the buoyancy of the hull 12 of the cargo transferring vessel 10 to maintain

the wheels of the hull contacting and conforming means 39 in contact with the bottom of the hull of the larger ship without exerting a force against the bottom of the hull which would tend to appreciably raise the bottom of the hull of the larger ship above its normal unsupported depth as the location of the bottom of the hull in the water changes as a result of the addition of cargo to or the removal of cargo from the larger ship. In a similar manner it may be desirable to raise or lower the projections 34 and 35 to maintain a moderate downward force through the cables, such as the cable 86, on the hull of the smaller ship as cargo is added or removed from the smaller ship. Similar adjustments in the buoyancy of the hull 12 of the cargo transferring vessel 10 and the projections 34 and 35 may be desirable as the cargo transferring vessel is moved to various locations along the hull of the larger ship 84.

Although the invention has been described in considerable detail with reference to a certain prepared embodiment, it will be understood that variations and modifications may be made within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A cargo handling vessel for transferring cargo between a larger and a smaller ship comprising a variably submersible hull, said variably submersible hull having a portion thereof adapted to be submerged below the hull of said larger ship, means connected to said hull portion for contacting and variably conforming to the contours of the bottom of the hull of said larger ship, means operatively connected to the hull of said cargo handling vessel for exerting a downward force against said smaller ship which acts against the buoyancy of said smaller ship for preventing relative motion between said cargo handling vessel and said smaller ship, said force exerting means having a portion thereof extendable outward in the water from the hull of said cargo handling vessel at a level below the hull of said smaller ship as said smaller ship rides in the water and means located on the hull of said cargo handling vessel for transferring cargo between said larger and smaller ships.

2. A cargo handling vessel for transferring cargo between a larger and a smaller ship comprising; a variably submersible hull, said variably submersible hull having a portion thereof adapted to be submerged below the hull of said larger ship; means connected to said hull portion for contacting and variably conforming to the contours of the bottom of the hull of said larger ship; and cargo transferring means for transferring cargo between said larger and smaller ships comprising two separated superstructures extending upward from said hull, at least one vertically movable post connected to each superstructure, at least one cross rail connected to the upper ends of said posts, and cargo hoisting means movably connected to said cross rail.

3. The cargo transferring vessel of claim 2 wherein said cross rail comprises two sections and wherein said two sections are pivotally connected to said posts.

4. A method for transferring cargo between a larger ship and a smaller ship comprising the steps of providing a variably submersible vessel having cargo transferring equipment and means for contacting and variably conforming to a portion of the bottom of the hull of said larger ship, partially submerging said variably submersible vessel to a depth in the water at which said means for contacting and variably conforming to the



bottom of the hull of said larger ship is located below the depth of the bottom of the hull of said larger ship as it rides in the water, positioning said means for contacting and variably conforming to the bottom of the hull of said larger ship underneath a portion of the bottom of said larger ship, raising the level of said variably submersible vessel in the water to permit said means for contacting and variably conforming to the bottom of the hull of said larger ship to exert an upward pressure on the bottom of the hull of said larger ship without appreciably raising the hull of said larger ship, bringing said smaller ship into the vicinity of said variably submersible vessel, transferring cargo between said larger ship and said smaller ship through the use of said cargo transferring equipment, and adjusting the depth of said variably submersible vessel in the water to permit said means for contacting and variably conforming to the hull of said larger ship to continue to contact and conform to the bottom of the hull of the larger ship and to exert an upward pressure thereon without tending to appreciably raise the bottom of the hull of said larger ship to compensate for changes in the depth of the bottom of the hull of said larger ship occurring as a result of the transfer of cargo between said larger and smaller ships.

5. The method of claim 4 further comprising the steps of providing means on said variably submersible vessel for contacting and variably conforming to the sides of the hull of said larger ship and bring said means for contacting and variably conforming to the sides of the hull of said larger ship into contact with the sides of the hull of said larger ship while raising the level of said variably submersible vessel in the water to permit said means for contacting and variably conforming to the bottom of the hull of said larger ship to contact and variably conform to the bottom of the hull of said larger ship.

6. A method for transferring cargo between a larger ship and a smaller ship comprising the steps of providing a variably submersible vessel having cargo transferring equipment and means having rotatable members for contacting and variably conforming to a portion of the bottom of the hull of said larger ship, partially submerging said variably submersible vessel to a depth in the water at which said means for contacting and variably conforming to the bottom of the hull of said larger ship is located below the depth of the bottom of the hull of said larger ship as it rides in the water, positioning said means for contacting and variably conforming to the bottom of the hull of said larger ship underneath a portion of the bottom of said larger ship, raising the level of said variably submersible vessel in the water to

permit said means for contacting and variably conforming to the bottom of the hull of said larger ship to exert an upward pressure on the bottom of the hull of said larger ship without appreciably raising the hull of said larger ship, bringing said smaller ship into the vicinity of said variably submersible vessel, transferring cargo between said larger ship and said smaller ship through the use of said cargo transferring equipment, and changing the relative location of said variably submersible vessel and said larger ship while maintaining said rotatable members rotating in contact with a portion of the bottom of the hull of said larger ship.

7. The method of claim 6 wherein said step of changing the relative location of said variably submersible vessel and said larger ship while maintaining said rotatable members in rotating contact with a portion of the bottom of the hull of said larger ship includes adjusting the depth of said variably submersible vessel to compensate for variations in the depth of portions of the bottom of the hull of said larger ship due to hull design.

8. A cargo handling vessel for transferring cargo between a larger and a smaller ship comprising a variably submersible hull, said variably submersible hull having a portion thereof adapted to be submerged below the hull of said larger ship, means connected to the hull of said cargo handling vessel for contacting and conforming to the contours of the bottom of the hull of said larger ship comprising at least one wheel assembly having wheels for contacting and variably conforming to the bottom of the hull of said larger ship, at least one motor operatively connected to one of the wheels of said wheel assembly for providing power to cause rotation of said wheel, and means located on the hull of said cargo handling vessel for transferring cargo between said larger and smaller ships.

9. A cargo handling vessel for transferring cargo between a larger and a smaller ship comprising a variably submersible hull, said variably submersible hull having a portion thereof adapted to be submerged below the hull of said larger ship, means connected to the hull of said cargo handling vessel for contacting and variably conforming to the contours of the bottom of the hull of said larger ship comprising at least one wheel assembly having wheels for contacting and variably conforming to the bottom of the hull of said larger ship, means connected to the hull of said cargo handling vessel for contacting and variably conforming to the sides of the hull of said larger ship, and means located on the hull of said cargo handling vessel for transferring cargo between said larger and smaller ships.

\* \* \* \* \*