United States Patent

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[54] **SYSTEM OF MOVING LADEN SHIPS THROUGH SHALLOW DRAFT-LIMITED WATERS**
5 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **114/45**
[51] **Int. Cl.** **B63c 1/02**
[50] **Field of Search** 114/45, 45.5, 46, 46.5, 49

[56] **References Cited**

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ABSTRACT: A method of lifting laden ships through shallow draft-limited waters comprising moving a specially constructed buoyant carrier capable of lifting a fully laden ship into position relative to fully laden ship, forming an assemblage by relatively moving the ship into the carrier so that the carrier bottom forms the assemblage bottom, for example, by flooding tanks of the carrier, reducing the draft of the assemblage by pumping water from the flooded carrier tanks until the assemblage draft is less than that of the full laden ship and within the safe draft limits of the waters through which the assemblage is to be moved and moving the assemblage through the shallow draft-limted waters.

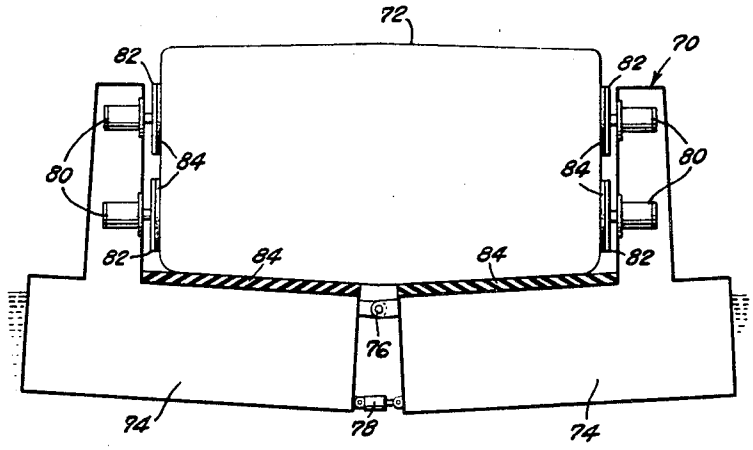


Fig. 1.

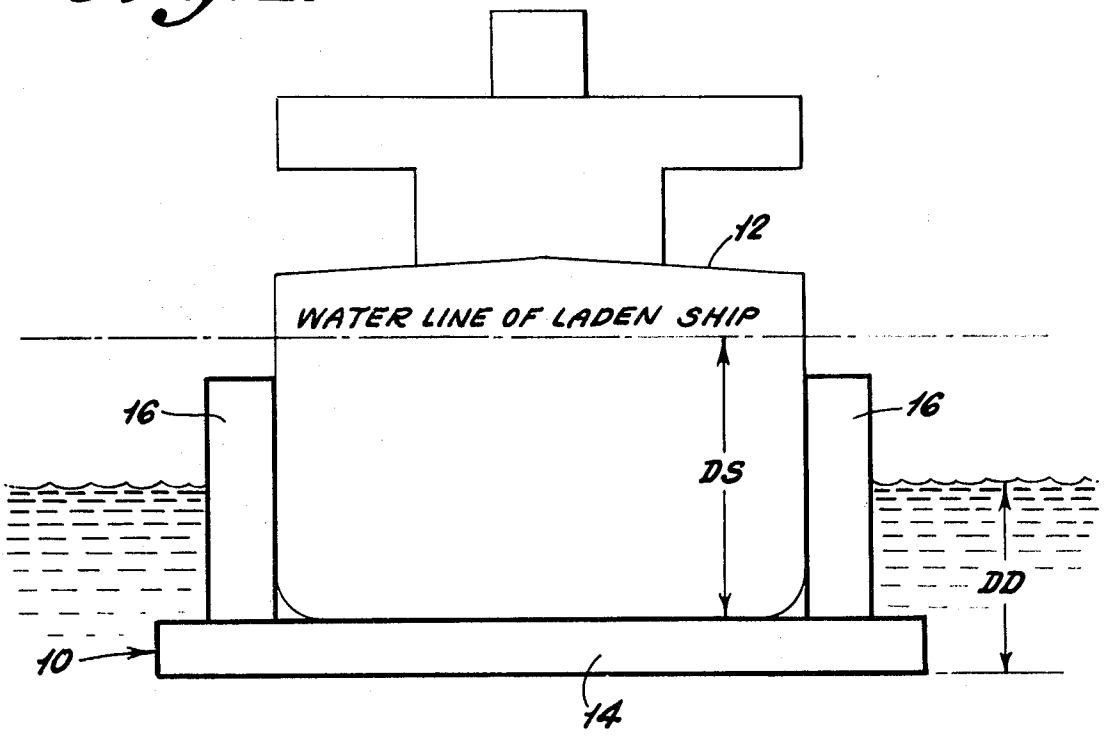
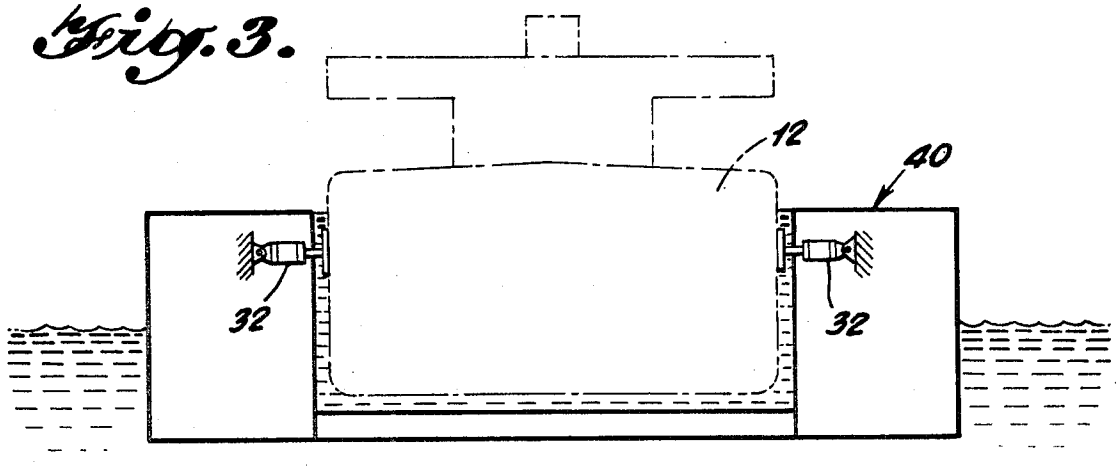


Fig. 3.



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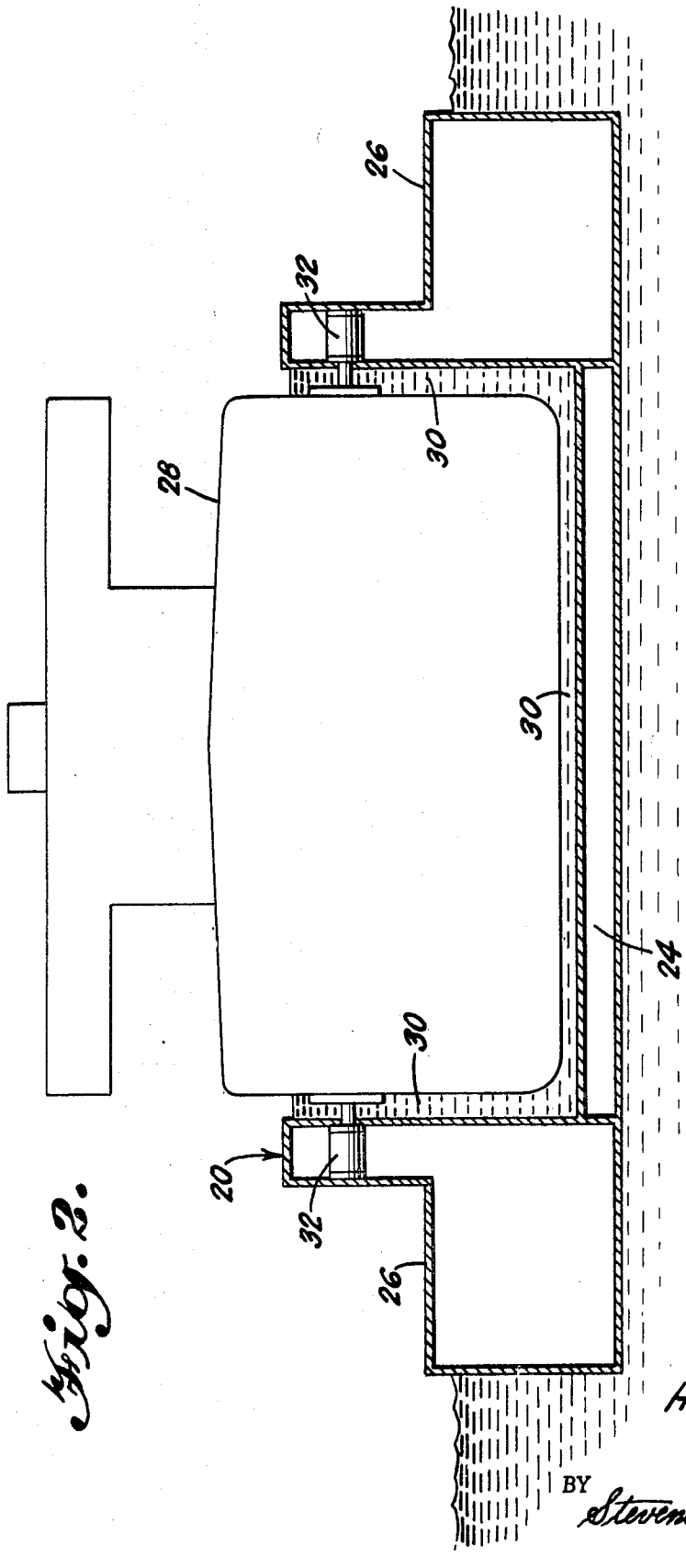


Fig. 2.

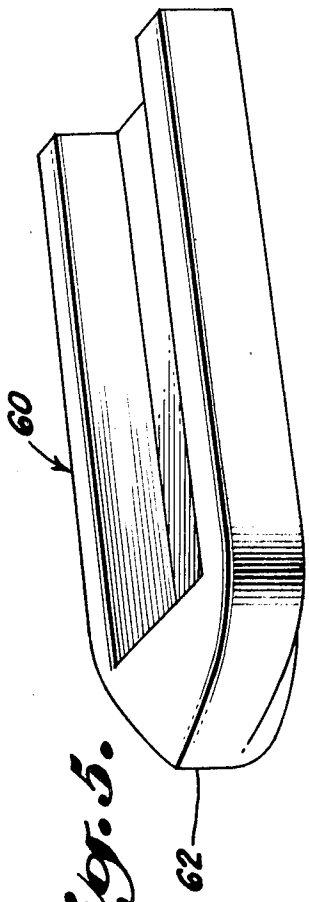
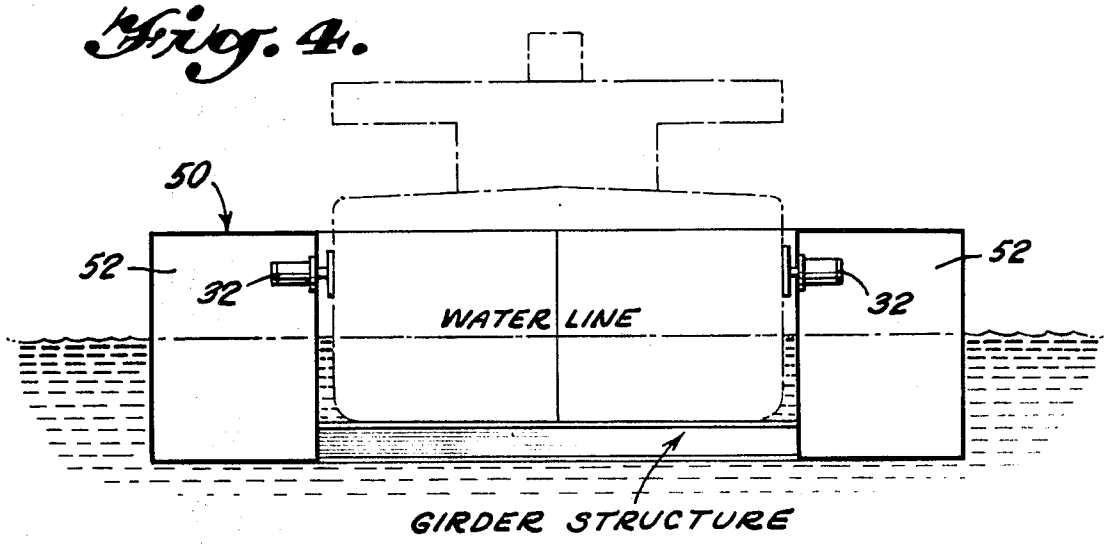


Fig. 5.

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Fig. 4.



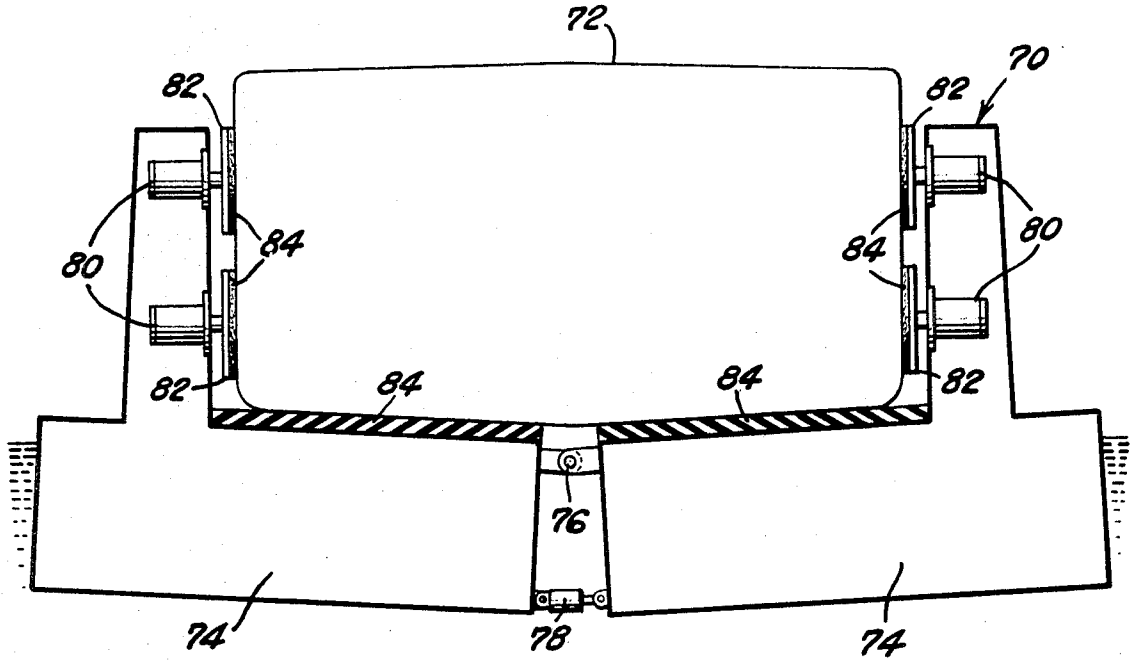


Fig. 6.

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SYSTEM OF MOVING LADEN SHIPS THROUGH SHALLOW DRAFT-LIMITED WATERS

BACKGROUND

The art at the present time recognizes the desirability and need for building ships of large cargo capacity and already ships are presently being constructed with 250,000 to 300,000 tonnage capacities. This, of course, means that the draft of such ships is also increasing and drafts of 60 feet or more are not uncommon. The desirability of using larger ships is a recognized economic fact, but their use has produced a correlative problem in that many locations cannot accommodate such deep draft vessels. Therefore, moving such large ships through draft-limited waterways and loading and unloading of such ships pose serious problems for which technical solutions must be found as quickly as possible.

Additionally, recent inland discoveries of mineral deposits, oil, etc. along or near navigable waterways, such as rivers, have resulted in the necessity for transporting bulk materials in large volume along these riverways, if these materials are to be economically recovered. If it were possible to effect this transportation by these large ships, the development of these inland regions would be greatly speeded and facilitate due to the favorable economic factors that characterize use of such ships. To move large quantities of bulk material using ships of low tonnage would render recovery of questionable economic feasibility. Proposals to develop transportation systems to bring these materials to coastal regions via overland routes are being studied but such schemes are in general deemed to be too costly.

The only known recognition of the aforesaid problem of moving deep draft ships over shallow draft-limited waters has been the suggestion in the art that laden ships be fitted along their hulls with structure that will cooperatively couple with pontoons brought alongside for the purpose of lifting the ships and reducing their draft. As will be evident, this solution necessitates all ships being specially outfitted to preselected standard specifications and all pontoon structures being likewise outfitted in a standard complementary cooperative way. The impracticality of this suggestion is evident from the failure of the art to adopt same and the criticism by shipbuilding facilities, ship owners and operators of the severe burdens that would be imposed upon them by the adoption of this suggestion.

BRIEF DESCRIPTION OF INVENTION

The solution presented by this invention takes the form of specially constructing a buoyant carrier facility that will accommodate and lift a fully laden ship, forming an assemblage of the carrier and the ship characterized in that the carrier bottom is the bottom of the assemblage and the draft of the assemblage is substantially less than that of the fully laden ship by itself. Thereafter, the assemblage is self-propelled, towed or otherwise moved through the draft-limited waters until waters of suitable depth to accommodate the draft of the fully laden ship are reached, whereupon the assemblage is unformed and the released ship proceeds in normal fashion. The specially constructed buoyant carrier facility must be capable of lifting a weight at least three times that of the weight of the empty ship, reduce its draft by a factor of at least 15 percent, and effect transportation of this weight for a considerable distance, for example, up to 300 miles.

The term buoyant carrier as used herein is intended to cover a special-type marine vessel which is capable of lifting a fully laden ship and transporting same. To this end, the buoyant carrier facility may be fitted with keel and hull blocks as used in a drydock so that the ship will be fully or partially supported on the carrier and may be fully removed from the surrounding water or partially immersed in the surrounding water. Under these circumstances, the carrier may have doors or gates which could be closed to enable the water then within the facility to be pumped out leaving the ship supported by the blocks completely. However, a fully laden ship supported on blocks could place undue stress upon the hull and therefore, better arrangements would be to support substantially the entire bottom area of the ship or to float the ship in the carrier. Also, when the ship is being directly supported by the carrier, the front and rear of the carrier can be open to the sea to enable the ship's propulsion system to propel the assemblage.

OBJECT OF THE INVENTION

It is therefore a primary object of the invention to present an economically feasible technical solution to the problem of moving a laden ship through draft-limited waters by providing a method or system of reducing the draft of such ships through the use of a specially constructed buoyant carrier.

Other and further objects of the invention shall be described in the following detailed description when taken in view of the appended drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic representation of an assemblage according to the present invention; and

FIGS. **2–6** are schematic representations of other arrangements.

DETAILED DESCRIPTION OF INVENTION

According to the invention, see FIG. **1**, carrier **10** is characterized by bottom tank **14** and wing tanks **16** formed and constructed as a single rigid structure. The tanks are built according to accepted practices and include the usual bulkheads, web rings and stiffening members. The usual ancillary equipment such as piping, pumps, etc. are present to flood and discharge tanks **14** and **16** as necessary. A propulsion unit may also be present as well as a system to control oscillations within tanks **14** and **16** and the carrier structure itself.

The laden ship **12** is supported with carrier **10**. Laden ship **12**, by itself, has a draft DS as indicated whereas the assemblage of ship **12** and carrier **10** has a smaller draft of DD with the factor DS–DD representing the reduction in draft.

As already noted, laden ship **12** can be supported in carrier **10** by blocks with the support space sealed by gates or doors, but this arrangement could produce undue hull stresses. Leaving off the doors or gates would result in the ship **12** being partly supported by the water and leading to the possibility of using the ship's powerplant for propulsion.

FIG. **2** shows an arrangement in which a laden ship **28** is floated in carrier **20** comprised of bottom tank **24** and stepped wing tanks **26**. The space within the carrier is generally watertight and a body of water **30** surrounds ship **28** and floats same. This improves the support of the ship hull and aids in uniformly transferring stresses. Chocks or hydraulic positioning members **32** serve to maintain the relative position of ship **28** within carrier **20**.

FIG. **3** shows a carrier **40** of the same type as the carrier **20** of FIG. **2** except it is not stepped. Either carrier **20** or **40** can be provided with cargo-handling facilities such as gantry cranes, cargo, pumps, conveyors and the like as the width of the wing tanks may cause cargo-handling difficulties. Further, the upper section of the wing tanks, the portion above the waterline, can be used to off-load cargo, such as oil, during transport of the assemblage to reduce ship turnaround time.

In FIG. **4** the bottom tank of carrier **50** has been eliminated and wing tanks **52** are interconnected by a suitable girder structure to achieve the single rigid structure necessary for the carrier.

In FIG. **5** the forward end of carrier **60** is provided with a bow **62** to reduce water resistance during transport.

FIG. **6** shows a way to eliminate keelblocks and achieve a better support of the ship. Ship **72** is supported by carrier **70** with a maximum area of contact. Carrier **70** is comprised of two tank sections **74** hinged together at **76**, their upper adjacent corners, and are interconnected by a hydraulic ram **78** and their lower adjacent corners. By operation of ram **78**, the sections **74** can be pivoted upwardly to bring the surfaces of

sections 74 into good contact with the bottom of ship 72. The upstanding sides of each tank section 74 can also be profiled to conform to the ship sides and may also contain hydraulically actuated rams 80 to force large plates 82 against the sides of ship 72 at suitable intervals to support the ship and take some of the load. Also a resilient material 84 can be interposed between the ship 72 and tank sections 74 as well as between plates 82 and the sides of ship 72 to enable smoother load transfers.

In the practice of the invention, the ship and carrier are brought together to have a resultant draft substantially less than that of the ship alone and the assemblage transported through a draft-limited waterway which the ship alone otherwise could not traverse. Bearing in mind the foregoing, those skilled in the art will immediately recognize the wide variety of applications to which the present invention can be put.

What is claimed is:

1. Apparatus for reducing the draft of a laden ship comprising a rigid buoyant structure to receive the laden ship and to elevate the same so that the draft of the ship and buoyant structure together is substantially less than that of the ship alone, the apparatus comprising: first and second buoyancy tank sections; adjustable hinge means intermediate and connecting said first and second buoyancy tank sections; means associated with said first and second buoyancy tank sections for adjusting the relative positions of said first and second buoyancy tank sections so that the surfaces of the respective sections adjacent said laden ship may be made to substantially conform to the shape of said laden ship; and means associated with each of said first and second buoyancy tank sections for maintaining said laden ship secure with respect to said first and second buoyancy tank sections when said laden ship is elevated.

2. The apparatus of claim 1, wherein the ship is maintained in at least a partially floating condition within the carrier.

3. The apparatus of claim 1 wherein the carrier is open fore and aft and the ship powerplant propels the assemblage.

4. The apparatus of claim 1 wherein portions of the carrier are forced into intimate contact with the ship.

5. Apparatus according to claim 1 wherein resilient means are interposed between said structure and said ship.