United States Patent [19]

Eustace

[11] **3,773,093**

[45] **Nov. 20, 1973**

[54] **BOW LIQUID CARGO HANDLING SYSTEM**

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[22] Filed: **Mar. 20, 1972**

[21] Appl. No.: **236,141**

[52] **U.S. Cl.** ..... **141/388,** 9/8 P, 137/236, 141/279

[51] **Int. Cl.** **B65b 1/04,** B65b 3/00

[58] **Field of Search** ..... 141/279, 387, 388; 137/236, 615; 9/8 P; 114/230

[56] **References Cited**

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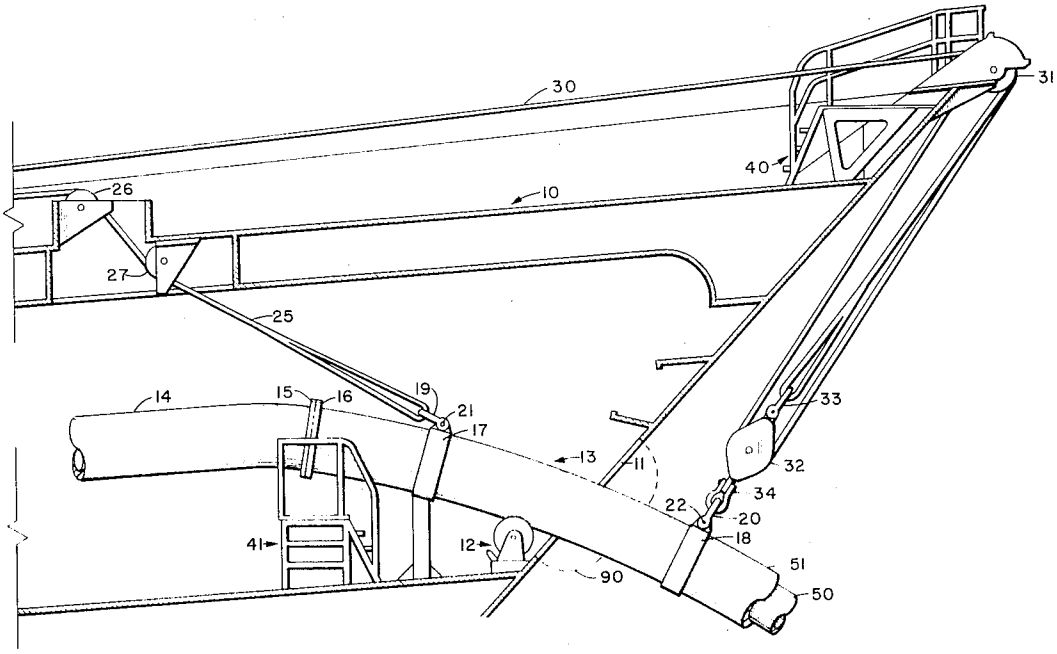
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Primary Examiner—Donald E. Watkins
Attorney—Josepn C. Kotarski et al.

[57] **ABSTRACT**

A tanker bow products line handling system adapted to be connected to a mooring products line floating in the water wherein the bow of the ship has an opening large enough to accommodate the mooring products line and lift systems for holding, connecting and disconnecting the mooring products line with the ship products line.

8 Claims, 7 Drawing Figures



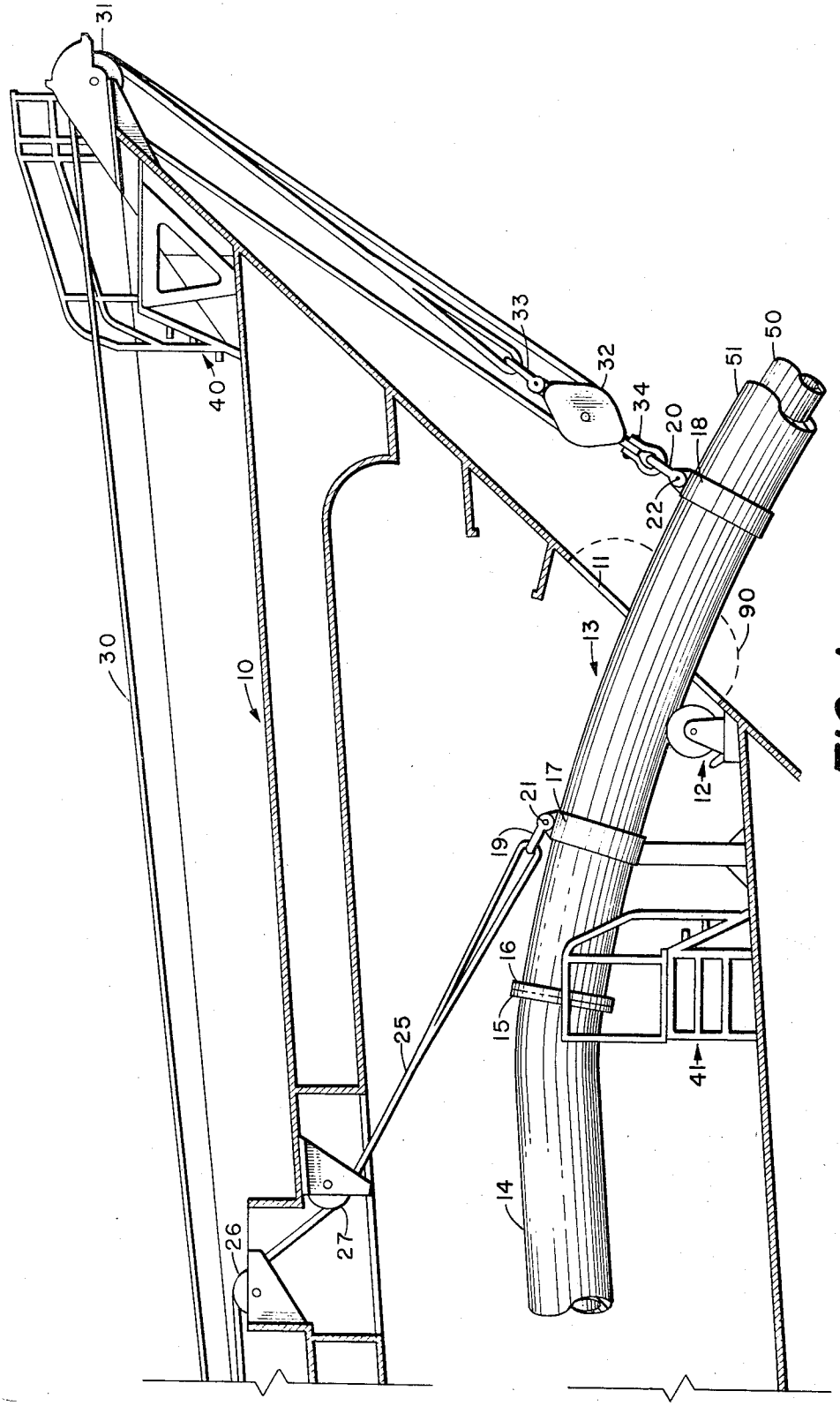

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FIG. 1

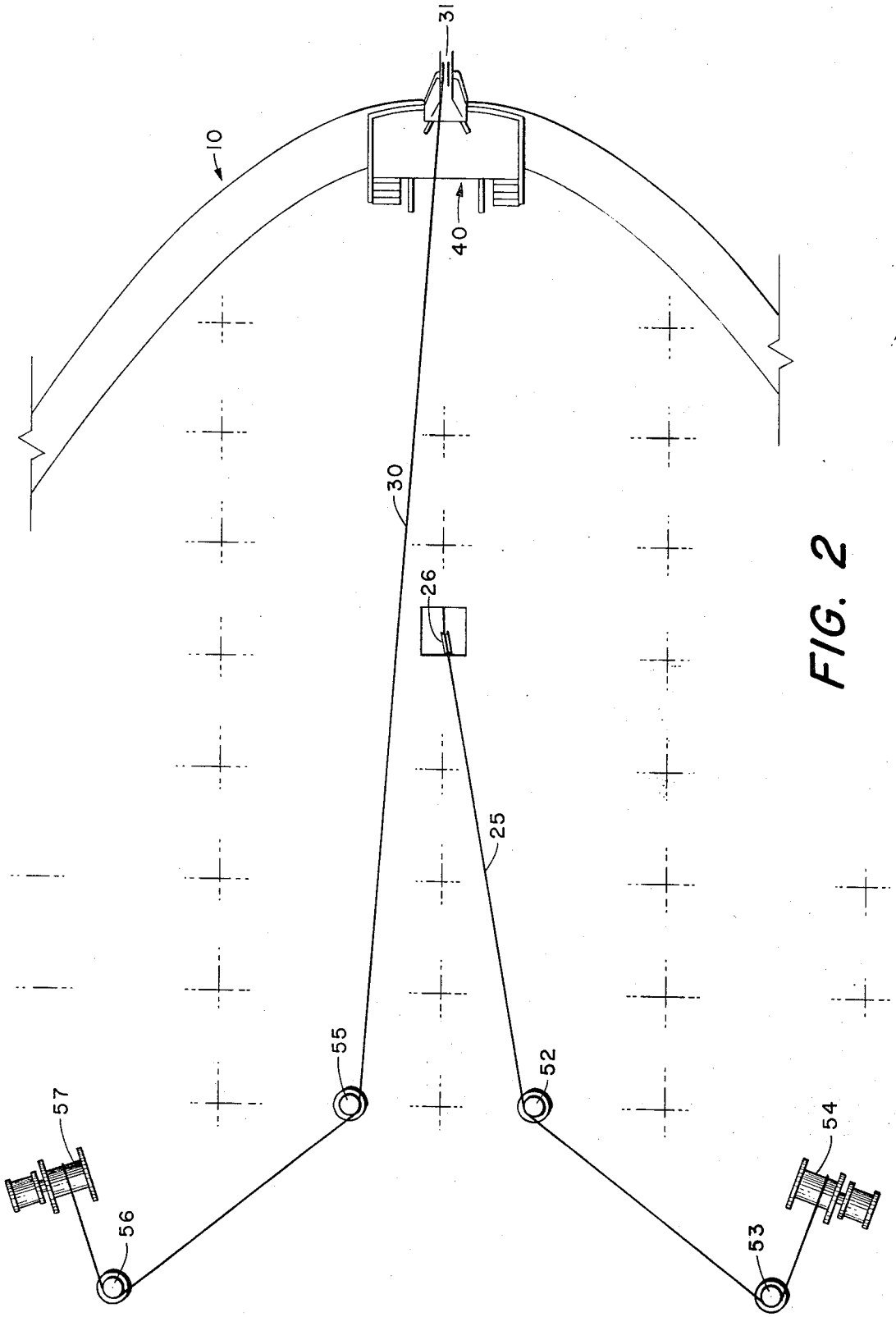


FIG. 2

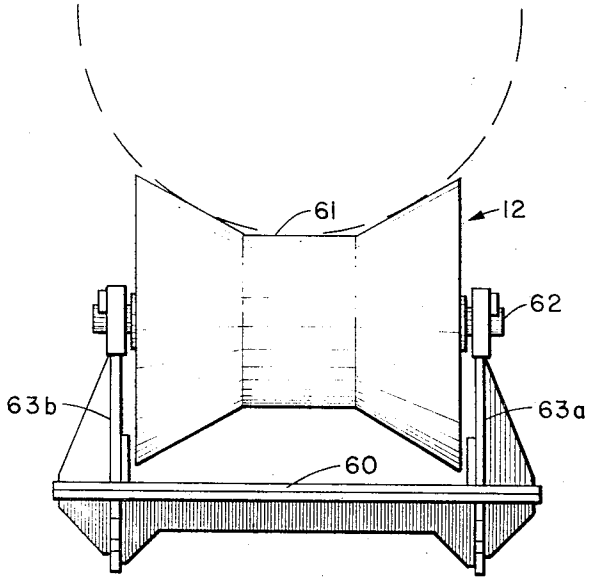


FIG. 3

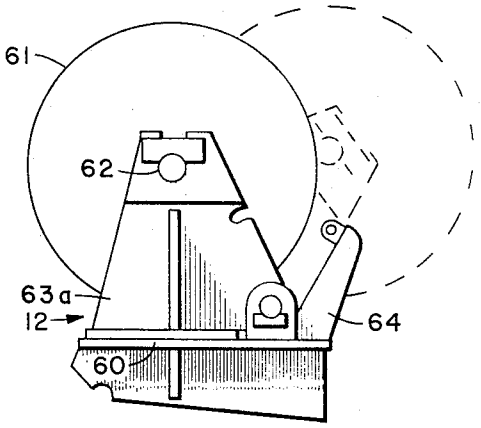


FIG. 4

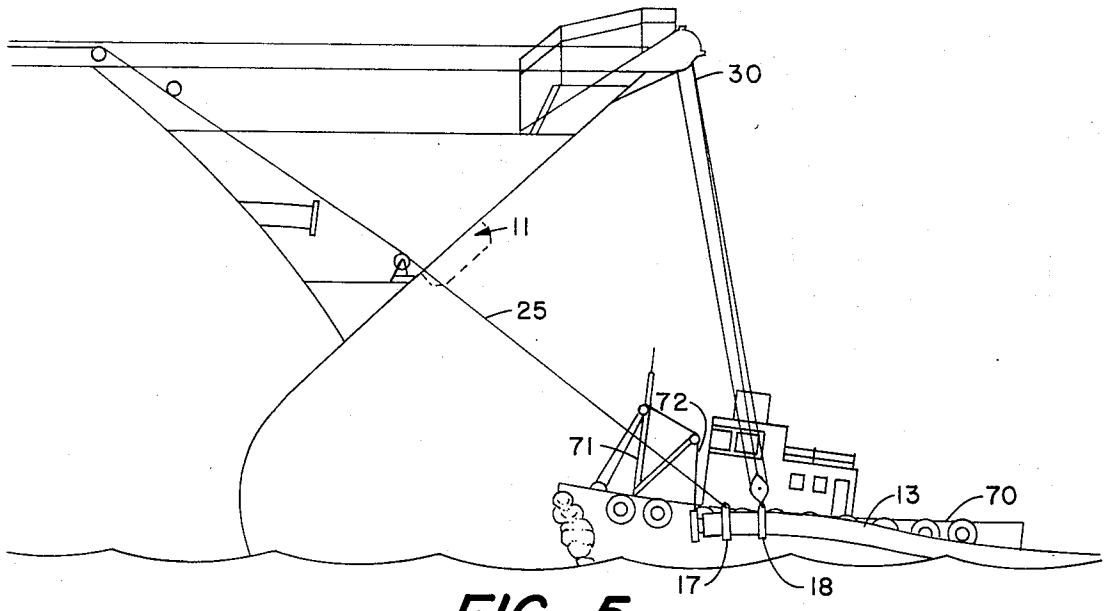


FIG. 5

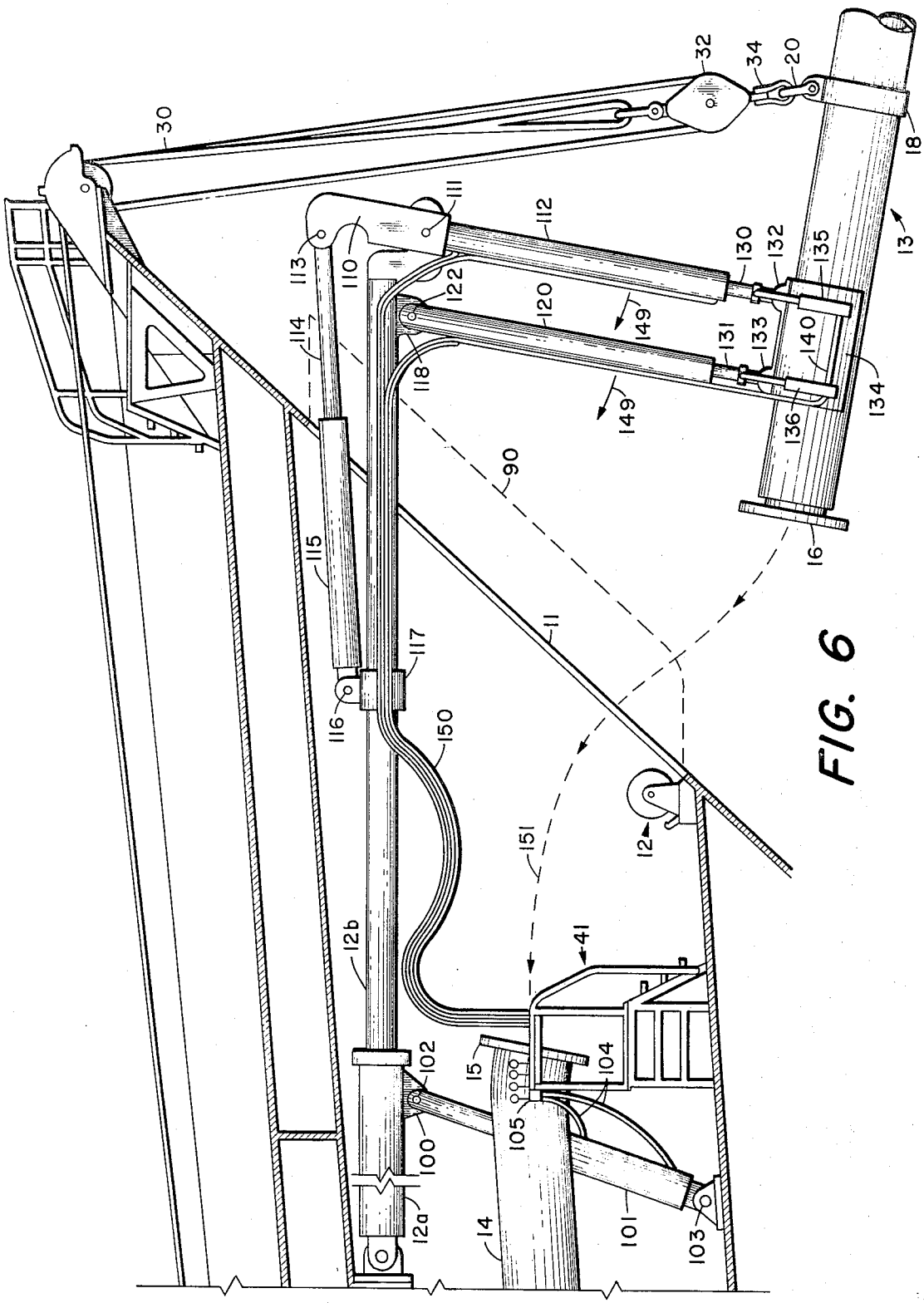

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FIG. 6

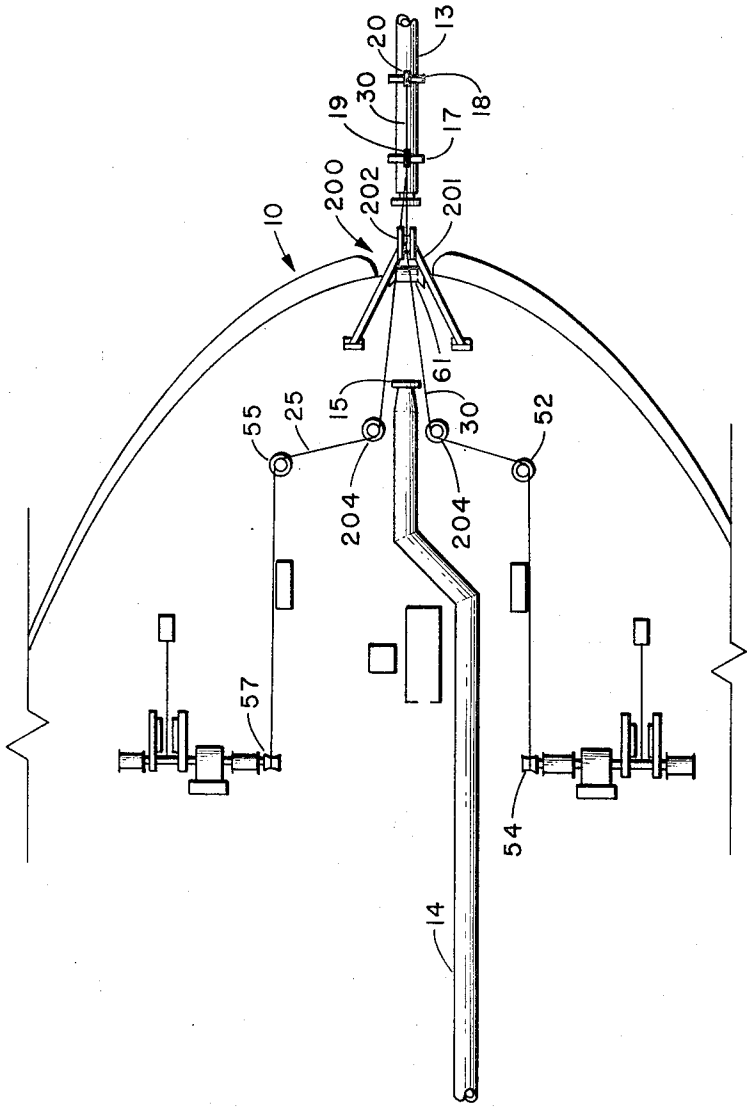


FIG. 7

BOW LIQUID CARGO HANDLING SYSTEM

STATE OF THE ART

Prior to the invention herein disclosed, the method for loading or discharging cargo from large tankers consisted of a plurality of pipes terminating amidship. The midship terminus of the pipes, however, presents several problems with the large tankers since most of these tankers now load and off-load from monomoorings. For example, a monomooring must have a products pipe line connected between the mooring and the midship terminus of the products pipe on the ship. The length of the pipe must be equal to the length of the ship and the distance between the bow of a ship and the monomooring, including an additional amount for safety. Such a products pipe line could easily be 2,000 feet long. When the ship is not connected to the products pipe line, the pipe line is designed to float in the water. Currents and winds, of course, cause the pipe line to drift, oftentimes into the shipping lanes creating a real hazard to ships, to the pipe line, and in addition creating a potential source of pollution when the terminal does not require the pipe to be cleared of oil. A ship, if it should cut the pipe line, would discharge the oil into the environment. A pipe line several thousand feet long and 24 inches in diameter could contain many barrels of crude.

FEATURES AND ADVANTAGES

This invention contemplates loading and off-loading a large crude tanker by connecting the products line from the monomooring onto the products line in the ship through the bow of the ship. Such a connection affords several important advantages. It will, for example, shorten the products line by 700 or 800 feet, thus drastically reducing the navigational hazard and potential pollution hazard of the floating line. Secondly, it maintains the line in a fairly direct manner between the monomooring and the ship at all times, thus reducing the amount of line that is in the shipping lanes and reducing the hazard the products line affords to shipping. In addition to the above, a bow loading system can be made more easily and more efficiently since more of the loading equipment is aboard ship and in a convenient location for lifting the products line from the monomooring to the products line aboard ship.

BRIEF DESCRIPTION OF THE FIGURES

Referring to the drawings, FIG. 1 is a partial cross-sectional view of the bow of a ship showing the products line from the monomooring connected to the products line or fluid handling system on the ship;

FIG. 2 is a top view of the bow of a ship showing the winch anc cable configurations necessary to operate the lifting system connected to the monomooring products line;

FIG. 3 is a full view of the roller used to ease the products line aboard ship;

FIG. 4 is a side view of FIG. 3;

FIG. 5 is a side view of the system in the process of connecting the pulling mechanism to the monomooring products line terminus;

FIG. 6 is a partial cross-sectional view of the bow of a ship showing a hydraulic system for assisting in lifting the mooring products line aboard ship and connecting it to the products line from the holes of the tanker; and

FIG. 7 is a partial top view of another embodiment of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to all of the Figures but in particular to FIGS. 1 through 4, the bow of a ship generally referred to as **10** has an opening **11** therethrough. Positioned at the bottom of opening **11** is a roller **12** adapted to permit easy entry of a products line **13**. A ship's products line **14** has a mounting flange **15** at its terminus. Products line **13** likewise has a mounting flange **16** at its terminus and includes bands **17** and **18** secured around products line **13** for the purpose of attaching shackles **19** and **20** which are pivotally attached to bands **17** and **18** through pivots **21** and **22**, respectively.

A hauling wire rope **25** passes through a pair of pulleys **26** and **27**, through shackle **19** and is terminated on itself by splicing or any other normal manner. A second hauling wire rope **30** passes through a double pulley **31** to a free pulley **32**, back through the double pulley **31** and terminates at a shackle **33**. Wire ropes **25** and **30** are hereafter referred to as ropes for simplicity. Free pulley **32** is connected through a shackle **34** to shackle **20**. A platform generally referred to by arrow **40** affords a means for servicing double pulley **31** and directing the hose lifting operations. A ladder **41** affords access for securing a flange **15** to flange **16**. Products line **13** comprises an inner flexible pipe **50** and an outer flotation wall **51**. Flotation wall **51** is designed to afford sufficient flotation to pipe **50** so that the assembly will float on the surface of the water. Products line **13** often includes marking buoys and/or lights to reduce the hazard the pipe affords to navigation.

Referring to FIG. 2, rope **25** passes over pulley **26**, around a pulley system **52**, a second pulley system **53**, and to a steam engine driven windlass **54**. Rope **30** passes over double pulley **31** to a pulley **55**, a second pulley **56**, and to a second steam engine driven windlass **57**. Windlasses **54** and **57** are used to raise the anchors for the ship. It is obvious, of course, that special windlasses could be installed if one did not desire to use the anchor windlass.

FIGS. 3 and 4 illustrate in more detail the roller **12** shown in FIG. 1 and comprise a base **60**, a tapered roller **61**, an axle **62** and axle supporting means **63***a* and **63***b*. A locking mechanism **64** prevents the roller from turning once the pipe is aboard ship.

OPERATION

The operation of the system described in FIGS. 1 through 4 is illustrated in FIGS. 1 and 5. Referring to FIG. 5 a tug **70** has a derrick **71** mounted on the deck of the ship. It is obvious, of course, that the derrick can be either forward or aft of the cabin and various types of derricks can be used. Also various types of ships can be used, and the tug **70** is only for illustrative purposes.

Tug **70** using cable **72** lifts the terminus of the monomooring products line **13** from the water. The ship drops lines **30** and **25** which are fished out of the water by the tug and connected to bands **17** and **18**, respectively. The usual manner for connecting the lines is to place shackle **20**, for example, through shackle **34** over the pivot mounting of band **18** and insert a pin therethrough. Once ropes **25** and **30** are attached to bands **17** and **18**, respectively, windlasses **54** and **57** begin pulling ropes **25** and **30** toward opening **11**. Rope **30**

will lift products line 13 until line 13 is nearly even with opening 11. Windlass 54 will operate only enough to keep the slack out of line 25. Once the products line 13 is nearly even with openings 11, windlass 54 will begin to pull rope 25, urging products line 13 into opening 11. The tension afforded by windlass 57 will then depend solely on its assistance in positioning pipe 13 onto roller 12. Rope 25 will then pull products line 13 to a point wherein it is fairly even with flange 15 whereupon men standing on platform 14 will make the final adjustments of flange 15 so that it mates with flange 16 whereupon the flanges will be bolted or connected in any usual manner.

It is obvious that a hydraulic clamping system can be incorporated to mate flange 15 with flange 16. It is also obvious that a Kelly valve can be used to shut off products line 14 in case of an emergency. Since the connection is being made under the deck of the ship, adequate ventillation means must be incorporated to eliminate any hazard such as an explosion. To assist in the above, fans and other usual ventilating means such as openings in the deck (not shown) can obviously be used, all of which are well within the skill of the art. A door 90 can be placed over the opening to secure it during non-use. The door is hinged and can be clamped in any well-known manner.

One of the advangtages of the bow loading system is that normally the hose can be fished out of the water without the use of tug 70. The procedure describing the tug is for illustrative purposes only. While a tug makes the operation easier from a handling standpoint, the use of the tug is not a necessary equipment.

SECOND EMBODIMENT

Referring to FIG. 6, a second embodiment is illustrated which incorporates a hydraulic system for pulling the products line 13 into opening 11 and comprises telescoping hydraulic cylinders 12*a* and 12*b*. Cylinder 12*a* has attached at a pivot 100 lifting hydraulic cylinder 101, pivotally attached at 102 and to the deck at 103. Hydraulic operating tubes 104 are attached to a console 105 and to a hydraulic pump (not shown). Cylinder 12*b* has connected thereto a pivotal arm 110 which is attached to cylinder 12*b* at pivot 111. Connected to arm 110 at one end is a hydraulic cylinder 112 and at the other end a pivot 113 which is attached through hydraulic piston 114 to a hydraulic cylinder 115. Cylinder 115 is pivotally attached at 116 to a clamp 117 which attached to cylinder 12b. A second hydraulic cylinder 120 is attached to a second pivotal mounting 118. Cylinder 112 is attached to arm 110, and cylinder 120 is pivotally attached at 122 to mounting 118. Pistons 130 and 131 are pivotally attached at 132 and 133 to hydraulic clamp 134, respectively. Hydraulic cylinders 135 and 136 open and close hydraulic clamp 134 and are operated by hydraulic lines 140. The hydraulic inlets and outlets in the various-mentioned cylinders are connected to console 105 through the pipes at 150 and to a hydraulic pump (not shown).

OPERATION

The connection of free pulley 32 and its shackle 34 to band 18 through shackle 20 is done in precisely the same manner as described in the operation of the preferred embodiment. Rope 30 hoists the products pipe line 13 from the monomooring to a point where hydraulic clamp 134 can fasten around and close down on the end of pipe 13. The operation of the clamp is affected by hydraulic cylinders 35 and 36 which open and close the hydraulic clamp in any well known manner. Cylinders 12*a* and 12*b* are extended by hydraulic means out opening 11 as far as possible so that the products pipe line can be hydraulically secured as soon as it is near the opening. Hydraulic cylinder 101 can be operated to position cylinder 12*a* in a lateral direction as necessary. Hydraulic cylinder 115 can be moved to rotate arm 110 by the pivot 111. Since cylinders 120 and 112 are parallel, movement of arm 110 will also maintain the position of the clamp at the same relative angle. As the pipe 13 nears opening 11, cylinder 115 will extend piston 114, closing in the arms 112 and 120 in the direction of arrows 149. The cylinders 12*a* and 12*b* can then be retracted, pulling the products pipe line into and toward the ship products line 14 as shown by arrow 151. Any minor adjustment in angle can be made by operating hydraulic cylinder 130 or 131 individually or in unison. Once flange 116 meets with 115, any system as previously mentioned can be used to clamp the flanges together.

Another embodiment is shown in FIG. 7. Similar numbers correspond to similar elements shown in FIGS. 1 and 2. The primary difference in this embodiment is the mounting of the products line 14 on the deck of the ship. Roller 61 is fitted into a notch 200. An A-frame 201 is mounted over the notch and roller 61 so that it will extend past the bow of the ship. Cable 25 is connected to the forward position of the products line 13 and attached to band 17. Wire rope 30 passes over pulley 202 and attaches to band 18 on products line 13. As in the embodiment shown in FIG. 2, wire ropes 25 and 30 are attached to bands 17 and 18 by means of shackles 19 and 20, respectively. An additional pulley 204 may be used to turn the direction of the wire ropes, if necessary.

The operation of this embodiment is similar to the previous embodiments, namely, windlass 54 pulls rope 30, lifting the products line out of the water. Then windlass 57 tightens wire rope 25, pulling the products line over the roller 61 and in close engagement to flange 15. The ship products line 14 and products line 13 are easily assembled.

While a roller 61 is illustrated, a piece of smooth and curved metal, such as a portion of a pipe, could be used.

This system, like the preceding systems, is quite adaptable to fishing the products line out of the water without the use of a tug; and, where shipping regulations or seas will permit, it will be the normal procedure for retrieving the products line.

It is obvious that only three embodiments of this invention have been shown. Many modifications and changes can be made which are well within the skill of the art, once the objects and features of this invention are understood as disclosed in the specification and claims.

It is also obvious that the hydraulic system in this application has been shown jointly with the rope lifting means 30. It is obvious that under many conditions the hydraulic system could be used without the rope lifting system, particularly where the hydraulic system could be extended far enough when the ship is loaded to reach the pipe lying in the water. The ideal conditions for using the hydraulic system would be to retrieve the

monomooring products line from the water without the assistance of the tug.

I claim:

1. A tanker bow products line handling system adapted to be connected to a mooring products line floating in the water comprising:

a. an opening in the bow of said tanker,

b. lifting means mounted on the bow of said tanker for connection to said mooring products line,

c. a ship's products line having a terminus at said opening,

d. means cooperating with said lifting means for pulling said mooring products line into said opening, and

e. means for connecting said mooring products line terminus to the terminus of said tanker products line.

2. A system as described in claim 1 wherein said lifting means comprises a band on said mooring products line; a winch, rope and pulley arrangement mounted on said tanker; and means for connecting said pulley to said band.

3. A system as described in claim 1 wherein said means for hauling said mooring products line into said opening comprises a band on said mooring products line, a winch and rope mounted on said ship, and means for attaching said rope through said opening and to said band.

4. A system as described in claim 1 wherein said means for hauling said mooring products line into said opening comprises a telescoping hydraulic system.

5. A system as described in claim 4 wherein said telescoping hydraulic system comprises a substantially horizontal telescoping arm; hydraulic cylinder means for positioning said arm; said arm attached at one end pivotally to said ship; a second arm means pivotally attached at the remaining end of said arm; clamp means attached to said second arm whereby said clamp means can be rigidly secured around said mooring products line terminus and said first and second arms operated in a manner to pull said mooring prouducts line through said openings and into mating relationship with the terminus of said tanker products line.

6. A tanker bow products line handling system adapted to be connected to a mooring products line floating in the water comprising;

a. an opening in the bow of said tanker,

b. a tanker products pipe line having a terminus at said opening, and

c. means mounted at the bow of said tanker for lifting said products pipe line from said water and mating it with the tanker products line terminus.

7. A system as described in claim 6 wherein said means for lifting said products line out of said water and mating it with the terminus of said ship's products line comprising:

a. An extendible hydraulic cylinder means attached at one end to the ship and having a hydraulic clamping means attached to the other end,

b. means for opening and closing said clamp so that it can be secured around the terminus of said pipe, and

c. means for operating said extendible hydraulic cylinder to lift said products line out of said water and move it through said opening to the terminus of said ship's products line.

8. A system as described in claim 6 wherein said lifting means comprises:

a. first and second means for connecting thereto, respectively, first and second rope means,

b. means for attaching one rope means through a pulley means at the bow of said ship to said products line terminus, and

c. means for connecting said second rope through said opening to said products line terminus.

* * * * *