

Aug. 22, 1967

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3,336,896

SHIP DOCKING DEVICE

Filed Oct. 20, 1965

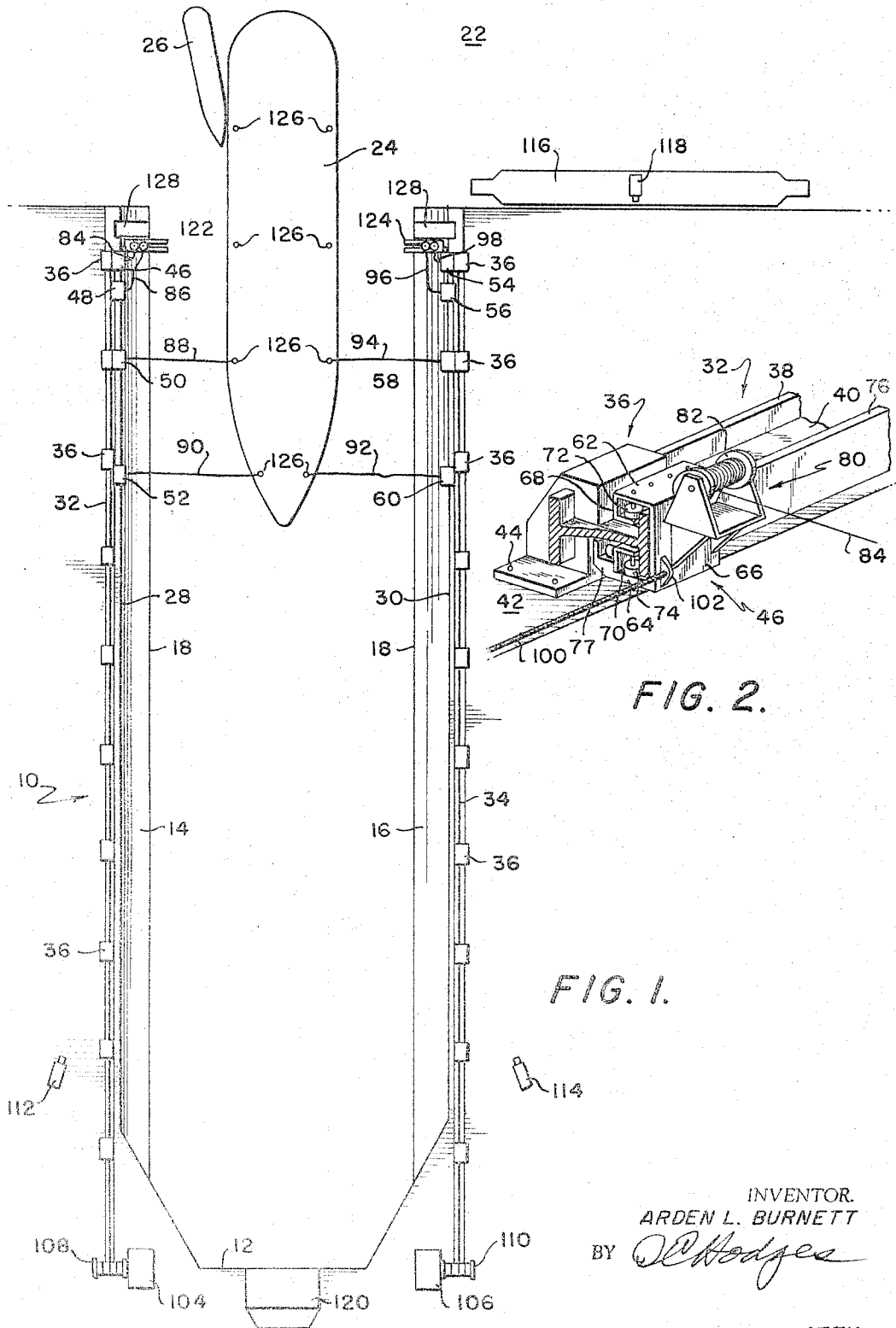


FIG. 2.

FIG. 1.

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1

3,336,896

SHIP DOCKING DEVICE

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Filed Oct. 20, 1965, Ser. No. 499,113
14 Claims. (Cl. 115-7)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a ship hauling device and more particularly to a device whereby a ship may be hauled into a drydock and accurately positioned over supporting blocks with the use of a minimum number of personnel.

In the past when a ship was to be laid up for repairs in a drydock the required maneuvering typically was accomplished by first, positioning the ship with a tug so that one end thereof was located adjacent the drydock opening and its length aligned with the length of the basin, next hauling lines were taken from aboard the ship and attached to hauling capstans to provide motive power for the ship, men then took lines from the bow of the ship as it neared the end of the dock and "walked" the lines along the rim of the dock to a suitable location where they were temporarily secured to bollards and cleats, tension was applied to these lines selectively to control the direction and speed of the ships entry to the basin. New lines were taken successively from the ship as it moved into the dock and the first lines moved to bollards and cleats further within the dock until it was completely contained therein and lastly the final locating of the ship over the supporting blocks on the bottom of the drydock basin was accomplished by selectively tensioning various lines until both ends of the ship were properly positioned.

The prior art operation, as above described, is unsatisfactory from several standpoints. One of the most outstanding disadvantages is the excessive manpower required. Forty or more men are employed during the docking operation to handle the various lines and capstans and coordination among them is a constant problem during the period of initial entry, during the final alignment over the supporting blocks, and whenever the water level in the basin is changed.

A further defect in the prior art becomes apparent during the aforementioned alignment stage when it is impossible for a single individual to keep both ends of the ship under observation at all times, with the result that fore and aft alignment of the ship is exceedingly difficult.

The device of the present invention is designed to eliminate all of the defects of the prior art systems by the provision of dockside apparatus, capable of being operated by one man, which expeditiously performs the docking and alignment operations swiftly and accurately with a great reduction in manpower.

It is therefore an object of the invention to provide an improved ship hauling device that reduces the manpower required in the docking of ships in drydocks.

It is another object of the invention to provide a ship hauling device that makes final alignment of ships less time consuming and more accurate.

It is still another object of the invention to provide a ship hauling device which reduces the necessity for the use of tugs both on entry to and withdrawal from the basin.

It is a final object of the invention to provide a ship hauling device that can complete an entire docking operation under the operation of one man.

Other objects and many of the attendant advantages of the invention will be readily appreciated as the same

2

becomes better understood by reference to the following detailed description of a preferred embodiment thereof when considered in connection with the accompanying drawing wherein:

FIG. 1 is a plan view of a drydock basin embodying the device of the invention; and

FIG. 2 is an enlarged perspective view of a carriage and winch means embodying the present invention.

The device of the present invention achieves its many advantages by the provision of relatively easily controllable means to draw the ship within the drydock, with only initial assistance from a tug boat, and to position the ship at its fore and aft ends with respect to the supporting blocks on which it is to rest after water removal. Ship positioning begins with the placement by a tug or tugs of an end of the ship adjacent the drydock mouth. First positioning means, having one end thereof attached to the land, is then taken aboard the ship and attached thereto. Lateral movements of this positioning means then will effect a repositioning of the ship within the width of the basin. If a single first positioning means is used it would be a rigid elongated member so as to be capable of both pushing and pulling movements but, if dual positioning means are used, one on each side of the basin, movement in either direction is possible by the application of tension alone and flexible positioning means may be employed. Means for applying tension to the positioning means may be located shipboard or dockside and may comprise manual or power means, although in the present device the use of power is favored, to reduce the number of workmen required. With the first positioning means attached, propelling means are activated to draw the ship further within the basin using the positioning means as required to effect widthwise repositioning. Normally a single positioning means would not be sufficient for the entire docking operation so additional positioning means would be sequentially attached to the ship at points spaced from the first positioning means as the ship is moved within the basin, so as to achieve the capability of movements to align the ship with the length of the basin and/or the supporting blocks on the floor of the basin.

The aforementioned propelling means may take several forms and may be simply a single line attached to the end of the ship to draw it in. Preferably however, the propelling means are arranged to draw the ship within the basin by moving the aforementioned positioning means along the length of the basin. Suitable for this purpose would be self-powered carriages mounting the positioning means. The carriages may be track mounted, suspended or merely steerable. Their power may be wholly self-contained such as with gasoline engines or by track-supplied electric motors. If the carriages are not self powered any other means for moving them may be suitable. The use of a hauling device propelling the carriages by hauling cables attached thereto is specifically contemplated. The cable may be hauled by a winch device so as to be operable in one direction only or may be continuous and hauled by a drum device so as to be reversible and usable to propel the ship in either direction.

With any of the above mentioned modifications the provisions of centralized control means will greatly enhance the utility of the invention. To make this central control possible, the positioning means and propelling means are made remotely controllable. This can be accomplished, for example, by supplying electric power to each of the carriages carrying the positioning means in such a manner that both the motive power to the carriage and the driving power for the positioning means are controllable from a remote location. The remote controlling location is selected to give the operator a clear view of the entering ship. To increase the observation of the

side portions of the ship and to make the rear observable, various means such as mirrors or television systems may be employed. The rear view of the ship is especially valuable during the final stages of docking when the ship is being positioned over the supporting blocks, since perfect alignment must be maintained in order that the ship come to rest on the blocks properly as the water is pumped from the basin and the ship settles. Mirrors could be arranged to provide this rear view but television apparatus is more ideally suited to that purpose. For a direct rear view a camera may be located on the caisson which is moved into position across the entrance of the dock in preparation for pumping the basin.

The general operational concepts of the invention along with various possible modifications having been discussed, a preferred embodiment will now be described in detail.

In FIG. 1 there is indicated at numeral 10 a drydock of generally conventional construction having an end-wall 12, and sloping sidewalls 14 and 16 visible to the water line 18. Shown entering the basin 20 from the river or other body of water 22 is a ship 24 being assisted by tug 26. Mounted adjacent rims 28 and 30 of the basin are I-beam rails 32 and 34. These rails shown diagrammatically in FIG. 1 can be better visualized by reference to FIG. 2 where an enlarged cross-section of rail 32 is shown. Also best shown in FIG. 2 are the rail supporting stanchions 36 being constructed of steel concrete or other suitable material and supportingly surrounding one flange 39 and a portion of the web 40 of the rail 32 so as to support the web 40 thereof substantially horizontally. Stanchion 36 is securely anchored to the yard floor 42 through fastening holes 44 by suitable fastening means (not shown).

Mounted for movement along the rails on either side of the basin are carriages 46, 48, 50, 52, 54, 56, 58 and 60. All the carriages are substantially identical and their construction will be apparent from a consideration of the detailed view of carriage 46 shown in FIG. 2. Carriage 46 is there shown to comprise a substantially U-shaped portion including legs 62 and 64 and bight portion 66. Legs 62 and 64 have mounted thereon respectively L-shaped wheel supporting members 68 and 70 carrying between themselves and the legs a series of wheels of which, wheels 72 and 74, are visible in FIG. 2. The wheels bear against the inside of flange 76 and allow movement of the carriage along the rail.

Mounted at the end of leg 64 is member 77 which carries a series of wheels one of which is shown at numeral 78. These wheels cancel the rotational components resulting from the carriages own weight and tension from the winch cable.

The winch 80 is powered preferably by an electric motor (not shown), and is carried by the bight portion 66 of carriage 46. The winch includes drum 82 with positioning cable 84 wound thereon. The other winches carried by the other carriages are substantially identical and have positioning cables 86, 88, 90, 92, 94, 96 and 98 respectively wound thereon.

As a means of propelling the carriage along the rims 28 and 30, propelling cables are attached to the carriages. An exemplary one of these cables is shown in FIG. 2, identified by numeral 100 and attached to carriage 46 by bracket 102. A second cable end (not shown) would be attached to each carriage if the propelling system is to be made reversible as will be explained more fully hereinafter.

The propelling cables are powered from hauling winches 104 and 106 which have multiple section drums 108 and 110. Each of the sections on the drums can be engaged individually and each carries a cable from one of the four carriages shown on either side of the basin.

On either side of the basin and near the rear thereof are two television cameras 112 and 114. Mounted on the caisson 116 is a third camera 118. The companion receivers to these three sets are installed in the control console of

the control tower 120. This tower contains, as well, all the controls necessary to operate the carriage winches and propelling drums and so centralizes control of the complete docking operation. The tower may conveniently be mounted on a hydraulic cylinder so as to be elevatable for a better view of the ship and basin.

A final feature of the preferred embodiment of the invention are the buoy brackets 122 and 124. These brackets are hinged so as to be retractable to prevent interference when they are not required but are shown in the operative position with two buoys still contained in each. The buoys therein contained are used to carry the positioning cables and may be floated on the surface of the water at the entrance to the dock to be picked up from the deck of the ship 24. The lines attached thereto when picked up are secured to the ships bollards 126. The brackets 122 and 124 are, however, designed to eliminate the need to float the buoys by holding them in a position where a deck hand aboard ship 24 may sequentially pick them one at a time from the bracket. Conveniently the bracket may spring load the buoys toward the opening of the bracket where they are held by a suitable catch until hooked by the aforementioned deck hand.

In the preferred embodiment of the invention as above described the entire docking operation may be accomplished by a single man at dockside. The operation is commenced by the positioning of the bow (or stern) end of the ship to be serviced adjacent the mouth of the drydock basin so that deck crewmen with long poles may pick from the buoy brackets the first set of buoys having cables 90 and 92 attached thereto. The loop ends of these cables would then be passed over the first of the ships bollards 126 and the operator in control tower 120 would take up on the tension of the cables selectively so that the bow of the ship would be positioned centrally of the basin. The propelling means would then be activated and carriages 52 and 60 would begin to draw the ship into the basin. When a sufficient length of the ship had been drawn within the basin the second pair of cables would be taken aboard and the second pair of winches and carriages activated. This process of sequentially attaching the cables and drawing the ship into the basin would be continued until the entire set of carriages (in the disclosed embodiment—4 pairs) had been attached. The caisson 116 would then be moved into position and seated in seat 128. With the caisson in this position the camera 118 will view directly the stern of the ship and cameras 112 and 114 will view the sides. Thus the operator will have a clear view of all sides of the ship and will be able to accurately position the ship over the supporting blocks on which the ship must rest firmly when the water is withdrawn from the basin.

To facilitate the use of camera 118 during the precision positioning, the picture it transmits has sighting lines superimposed thereon. These lines allow initial positioning to within less than one inch and allow readjustment to stay within that tolerance as water is removed. After repair of the ship and the flooding of the basin, the ship may be moved out of the basin with maximum facility if an aforementioned modification of the preferred embodiment is employed.

The referred to modification is the one whereby the propelling means are made reversible. This may be accomplished by providing continuous cables to the carriages and providing a return route for the added cable. This route would essentially be from the carriage involved to idler pulleys near the open end of the basin and then to the propelling drums 108 and 110. Winches 104 and 106 would be made to include reversible motors so that the carriages could be selectively moved towards the mouth of the basin, thereby guiding and propelling the ship into the river or other body of water 22 in a manner substantially the reverse of that employed in docking the ship.

In the absence of the described modification the ship

5

removal would be accomplished by a tug taking a line off the stern of ship 24 and then hauling it toward the body of water 22. As the ship is moved out the carriages would be pulled along side and their winches would be maintaining the ships position in the center of the basin.

In summary, what has been provided by the instant invention is a docking device that greatly increases the speed and accuracy of the docking of ships in drydocks while at the same time reducing the man power required and thereby the expense of the operation.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. For example, the number of carriages may differ from the eight shown depending on ship size, deck size, etc.

What is claimed is:

1. A device for the docking of ships comprising: a drydock having two sides; a plurality of pairs of positioning means to allow said ship to be moved from side to side; means for sequentially positioning and sequentially attaching said pairs of positioning means at respective points along the port and starboard sides of said ship as said ship enters said drydock, said last named means being positioned near the entrance of said drydock; and propelling means connected to said positioning means to cause the movement of said ship forward and rearward.
2. The device of claim 1 wherein said positioning means are supported on said propelling means and movable therewith.
3. The device of claim 1 which further includes means to keep all sides of said ship under observation from a single location.
4. A device for the controlled movement of ships into a drydock having a generally elongated rectangularly shaped basin and openable to a body of water at one of the narrow ends thereof comprising: a plurality of positioning winches located along the sides of said basin including cables for connection to a ship entering said basin; means for sequentially positioning and sequentially attaching said cables at respective points along the port and starboard sides of said ship as said ship enters said drydock, said last named means being positioned near the entrance of said dock; and a plurality of propelling means selectively movable along the rim of said basin; said winches being mounted on said propelling means to move said ship forwardly or rearwardly in said basin.

6

5. The device of claim 4 wherein said propelling means comprise self-powered carriages mounted on tracks.

6. The device of claim 4 wherein said propelling means comprise rail-mounted carriages attached to hauling cables.

7. The device of claim 6 wherein said hauling cables are powered from remotely controllable hauling winches.

8. The device of claim 4 further including a central control tower for the co-ordination of the docking operation, television cameras located so as to view the sides and rear of said ship, and correspondingly television receivers located in the control tower, whereby all sides of the ship are visible therefrom.

9. The device of claim 4 further including I-beam rails mounted along both rims of said basin with the webs thereof being maintained in a generally horizontal position;

said propelling means being constrained to travel along said rail by wheeled portions of said propelling means contacting the flange and web portions of said rail.

10. The device of claim 9 further comprising central control means located at a control tower to selectively activate each of said carriage means and winch means.

11. The device of claim 10 wherein said control means is selectively coupled to said carriage means and said winch means by electrical means.

12. The device of claim 9 further including bracket means to removably constrain the ends of said cable from said positioning means within a pair of brackets located adjacent the open end of said basin.

13. The device of claim 10 further comprising television cameras located on either side of said basin and at the open end thereof; and

television receivers corresponding to said cameras located in said control tower;

said cameras being oriented so as to provide a view of the side and rear of said ship whereby all sides of said ship are visible from said tower.

14. The device of claim 9 wherein said I-beam rails are supported by stanchions;

said stanchions engaging the flange at the opposite end of said web from said flange supporting said carriages.

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