DEVICE FOR CONTROLLING LIST AND LEVEL OF PONTOON

Inventor: Ietoshi Yamura, Nerimaku, Tokyo, Japan
Assignee: Mitsui Shipbuilding and Engineering Co. Ltd., Tokyo, Japan
Filed: Nov. 18, 1970
Appl. No.: 90,713

ABSTRACT

For a floating dry dock comprising a plurality of pontoons which are interconnected, means for leveling each pontoon. The apparatus has two interconnected systems, one of which corrects the list or inclination of the pontoon and the other of which controls the depth of flotation. Each pontoon has a vertical pipe with a float in it which is responsive to the depth of flotation which operates an indicator for the second system. Automatic controls may be provided for both systems and the systems for each pontoon may be coupled with the systems for the other pontoons in the dry dock.

2 Claims, 7 Drawing Figures
DEVICE FOR CONTROLLING LIST AND LEVEL OF PONTOON

This invention relates to a device for controlling list and level of pontoons, and more particularly to device suited for use in a floating dock comprising a plurality of pontoons which are joined together.

The object of the present invention is to provide a controlling device which may maintain each pontoon in horizontal state and keep the top surface of the pontoon in flush relationship with those of the other pontoons.

The device according to the present invention comprises pontoons of which watertight subdivision is divided into the front and rear, left and right, and central compartments a system for correcting list or inclination of each pontoon by feeding water into the front and rear and left and right compartments in the respective pontoons and a system in which water feed and discharge are conducted in the central compartment so as to uniformize the level of each pontoon.

The present invention will be understood from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a plan view showing the watertight compartments and piping provided in the interior of a pontoon according to the present invention;

FIG. 2 is a cross sectional view illustrating a condition in which water feeding is conducted in the interior of a floated pontoon;

FIGS. 3a, 3b and 3c are diagrammatic views illustrating the operations of a reversible type pump;

FIG. 4 is a side view illustrating a condition in which the structures on two pontoons are joined together and

FIG. 5 is a sectional view of a device for detecting the draught after submergence of the pontoon.

Now, the invention will be described in detail with reference to the accompanying drawings. As shown in FIG. 1 watertight bulkheads are provided in the interior of a pontoon to divide the interior into a front compartment 1, a rear compartment 2, a port compartment 5, a starboard compartment 6 and a central compartment 9, into which water is to be fed. In the center of said central compartment is also provided a machinery chamber compartment 12 in which reversible flow-effecting means, in the present instance pipe and pump means 4, 8 and 11 are disposed. No water is introduced into the machinery chamber compartment. At the top of each pontoon is provided a watertight manhole which is closed when the pontoon is submerged. The front and rear compartments 1 and 2 are communicated with each other through a pipe 3 with the reversible pump means 4, and the right and left compartments 5 and 6 are communicated with each other through a pipe 7 having the reversible pump means 8, while the central compartment 9 is communicated with outside water through a pipe 10 with the reversible pump means 11. The left end of the pipe 10 opens out through the bottom of the pontoon and is communicated with outside water. The reversible pump means 11 is communicated with the compartments 1 or 2 and 5 or 6 through a sluice valve (not shown), to communicate the compartments with outside water to adjust the amount of water in each compartment.

The portions denoted by reference numbers 1 to 8 belong to the system for controlling each pontoon in horizontal state. While the portions indicated by reference numbers 9 to 11 represent compartments and

water feeding and discharging means which belong to another system by which each pontoon is controlled to keep its waterline level at a predetermined height and to be adjusted in flush relation with the levels of other pontoons.

Referring now to FIG. 2, there are shown a pontoon in cross section and a structure, such as a ship building block, mounted on said pontoon, where reference number 13 denotes such structure and the oblique lines in the pontoon indicate water fed thereinto. It will be noted that, in this case, part of water in the starboard watertight compartment 6 is transferred into the port watertight compartment 5 to counterbalance the unbalanced load of the pontoon 13, thereby to keep the horizontal disposition of the pontoon. Correction of a list of the pontoon in the longitudinal direction by transfer of water from the front to rear compartment, or vice versa, may be conducted in the same manner.

The reversible pump means, as shown diagrammatically in FIG. 3, comprises a pump 14, a pair of three-way valves 15 disposed in front and in back of the pump, and a circular pipe encircling said pump 14 with flow pipe lines extending leftwise and rightwise from middle parts of said circular pipe. By suitable switching of the three-way valves 15, it is possible to let water flow from right to left as shown in FIG. 3a or to let it flow from left to right as shown in FIG. 3c, or to let it flow circularly, without allowing rightwise or leftwise transfer, while operating the pump as shown in FIG. 3b.

The central reversible pump means may be replaced by an arrangement in which the top of the watertight compartment is made air tight and is connected with a compressed air pipe and water in the watertight compartment is transferred by opening or closing of an air valve to allow ingress of outside water or egress of inside water. The pontoon list is detected by such means as pendulum, draught difference, etc., while the pontoon level is detected by a draught gauge, and the changeover valve for water feed or discharge is operated correspondingly thereto, thereby to control the list and level of each pontoon.

FIG. 4 shows still another embodiment where the structures 13, 13c on a pair of pontoons are joined together and then the pontoons are submerged, thereby the structures may be floated up and drawn out from the pontoons. At the sides of the pontoons are provided buoyancy tanks 16 for maintaining floating stability of the pontoons. Numeral 17 in the figure indicates the draught at the time of completion of the structure assembly, and numeral 18 indicates the draught where the pontoons are submerged and the structure thereon can be drawn out in a floated condition. A large amount of water is introduced into the pontoons which are on the level of draught 17 until they sink down to the draught line 18. On each of the floating tanks 16 are given the depth indications (not visible in the drawings) for indicating the draught to provide visual guidance. In the inside of each floating tank 16 is provided a vertical pipe 19 which extends to the bottom of the pontoon, as shown in FIG. 5, and a float 20 adapted to indicate the draught depth is floated in said vertical pipe. The float 20 is suspended by a cable which is passed round a pulley 21 provided a top the tank 16 and connected to a weight 22. Rotation of said pulley is relayed to a draught detecting signal transmitter which, in turn, actuates a draught indicator arranged on a centralized meter board, whereby water may be
introduced into the pontoon to correct list and water line level of each pontoon after it has been submerged. This may be conducted under automatic control.

After the structures on the pontoons have been floated up and drawn out from the latter, water is discharged out of the pontoons to allow them to float up, while keeping their horizontal disposition and same level relation with each other. This water discharge may be conducted under automatic control. When structures are assembled on three or more pontoons, it is also possible to control water feed and discharge in the same manner as described above so as to maintain their horizontal alignment.

Thus, according to the present invention, control for pontoon list and level by water feed and discharge into or out of the interior compartments in each pontoon is separated into two systems which comprise a list correcting system and a level correcting system, so that the controlling operation is simplified and, if desired, full automation of the operation is also made possible with ease.

What is claimed is:
1. In a device for controlling list and waterline level of pontoon characterized in that the interior of the pontoon is divided by watertight bulkheads into front and rear compartments, right and left compartments and a central compartment, piping and reversible flow-effecting means for communicating said front compartment with rear compartment to correct fore and aft list without substantial change in the water-line level, second piping and reversible flow-effecting means communicating said right compartment with left compartment to correct port and starboard list without substantial change in the water-line level, and third piping and reversible flow effecting means communicating said central compartment with outside water to control the waterline level without substantial change in list, said reversible flow-effecting means comprising a unidirectional pump, a circular pipe encircling said pump, a pair of three-way valves connecting the intake and exhaust of said pump with said circular pipe, said two valves dividing said circular pipe into separated segments, and a flow pipe connected to each segment so that by manipulation of said valves, operation of said pump effects flow into one flow pipe and out the other, or effects flow out the one and into the other, or effects flow through the pump without flow through said flow pipes.
2. A device according to claim 1 including a vertical pipe extending upwardly from the bottom of the pontoon, a float in said pipe and a pulley supporting said float at the water level whereby a change in the water line level of said pontoon effects rotation of said pulley.