

【DESCRIPTION】

【Invention Title】

MARINE FLOATING DOCK MOUNTING DEGREE CONTROL SYSTEM

【Technical Field】

5 The present invention relates to a marine floating dock mounting degree control system, and more particularly, to a marine floating dock mounting degree control system in which a structure is fabricated at a marine floating dock, continuous floating dock monitoring can be performed based on rigid inner walls so that a degree of mounting can be controlled, and a degree of mounting inner blocks
10 can be efficiently performed.

【Background Art】

Docks are equipment installed at a dockyard or harbor so as to build or repair a ship. Docks may be classified into two types of docks, such as a dry dock that digs in the ground with a length, a width, and a depth at which the ship can come in
15 and go out, at a place that is adjacent to the sea with a sufficient depth of water, connects the ground to the sea, reinforces sidewalls and a bottom of the dry dock with ferroconcrete or sheet piles, and installs a dock gate at an entrance of the dry dock, and a floating dock that is a steel-made box having a concave cross-section, has many tanks inside the floating dock, puts water into the tanks so as to be sunken,
20 draws the ship into the concave portion of the box, and then drains water from the tanks by using a pump and floats in a status where the ship is loaded.

FIG. 1 is a view of a floating dock according to the related art.

The floating dock is a steel-made box having a concave cross-section and has many tanks inside the floating dock. The floating dock puts water into the tanks so

as to be sunken, draws the ship into the concave portion of the box, and then drains water from the tanks by using a pump and thus floats in a status where the ship is loaded. That is, when the ship is fabricated in the floating dock and the tanks are filled with water and thus the ship floats, a ship delivery work can be performed.

5 The floating dock is mainly fabricated and used so that the ship can be immediately repaired at the sea without drawing the ship toward a seashore.

A dock is a place where a ship is fabricated by mounting large ship-body blocks assembled at a factory. When large ship-body blocks are mounted in a part of a large dock for fabricating a large ship in a status where the large dock is floating
10 on the sea, a phenomenon in which a load is concentrated on the corresponding part and the dock is distorted, occurs. A degree of straightness of the ship required when the ship is built, is within the range of a reference error. Ship-body blocks mounted in the dock need to be assembled while maintaining the degree of straightness. When the large ship-body blocks are stepwise mounted in the dock,
15 due to deformation of the floating dock caused by the concentrated load that occurs in the floating dock, as described above, it is regarded in the art that a large ship cannot be built in the floating dock by stepwise mounting and assembly of ship-body blocks, like in the dry dock.

【Disclosure】

20 【Technical Problem】

The present invention is directed to providing a marine floating dock mounting degree control system in which a structure is fabricated at a marine floating dock, continuous floating dock monitoring can be performed based on rigid inner

walls so that a degree of mounting can be controlled, and a degree of mounting inner blocks can be efficiently performed.

【Technical Solution】

One aspect of the present invention provides a marine floating dock mounting degree control system, including: a monitoring portion including a draft sensor disposed in a dock and measuring a bending degree of a bottom of the dock and a photographing portion disposed outside the dock and measuring a status of sidewalls of the dock; a measurement portion that is disposed in the dock and measures a status of ship-body blocks mounted in the dock in real time; a mounting degree control portion that is disposed in the dock and controls a mounting degree of the dock that varies according to an effect of the ship-body blocks mounted within the dock; and a controller that analyzes a current situation of the dock and a current situation of the mounting degree based on information measured by the monitoring portion and the measurement portion and controls the mounting degree control portion to control the mounting degree of the dock according to a result of analysis, wherein the controller comprises a coordinate transformation portion that transforms the information measured by the monitoring portion and the measurement portion into one reference coordinates and an analysis portion that analyzes the current situation of the dock and the current situation of the mounting degree based on the coordinate information transformed by the coordinate transformation portion.

The measurement portion may measure a ground marking position and a support level value on the dock before the ship-body blocks are mounted within the dock, and while the ship-body blocks are mounted within the dock, the measurement portion may measure the ship-body blocks so that the ship-body blocks are arranged,

and after the ship-body blocks are mounted within the dock, the measurement portion may measure a position where the ship-body blocks are mounted.

One or more measurement portions may be disposed in the dock, and each measurement portion may measure a status of the ship-body blocks mounted within the dock by using a local coordinate shape (LCS) that is based on a position of each measurement portion, and each measurement portion may measure a common point that is placed outside the dock so that the coordinate transformation portion can coordinate-transform the information of the ship-body blocks measured by the measurement portion.

The photographing portion may capture an image of a part of the sidewalls of the dock and may capture an image of the dock by using a global coordinate shape (GCS) that is based on inner walls of the dock, and the draft sensor may measure a bending degree of the bottom of the dock by using the GCS that is based on the inner walls of the dock.

The photographing portion may capture an image of a common point that is placed outside the dock so that the image captured by the photographing portion can be coordinate-transformed by the coordinate transformation portion.

The coordinate transformation portion may transform coordinates of the information of the dock monitored by the monitoring portion and coordinates of the information of the ship-body blocks measured by the measurement portion into one coordinate system.

The controller may control the mounting degree control portion so that the information measured by the monitoring portion and the measurement portion follows a predetermined mounting degree reference value.

The mounting degree control portion may ballasting control a bottom surface of the dock according to control of the controller.

【Advantageous Effects】

As described above, a floating dock is continuously monitored based on rigid
5 inner walls of a dock, and a degree of mounting inner blocks in the dock is controlled so that the status of the floating dock can be more exactly grasped and simultaneously ballasting of the dock can be more exactly performed.

【Description of Drawings】

FIG. 1 is a conceptual view of a floating dock according to the related art.

10 FIG. 2 is a perspective view of a marine floating dock mounting degree control system according to an embodiment of the present invention.

FIG. 3 is a block diagram of a configuration of a marine floating dock mounting degree control system according to an embodiment of the present invention.

15 FIG. 4 is a perspective view of a monitoring portion of a marine floating dock mounting degree control system according to an embodiment of the present invention.

FIG. 5 is a perspective view of an electronic distance measurement of a marine floating dock mounting degree control system according to an embodiment of the present invention.

20 FIG. 6 is a schematic view of a mounting degree control operation of a marine floating dock mounting degree control system according to an embodiment of the present invention.

【Modes of the Invention】

Hereinafter, embodiments of the present invention will be described with reference to the attached drawings in detail.

First, a configuration of a marine floating dock mounting degree control system according to an embodiment of the present invention will be described with reference to FIGS. 2 and 3. FIG. 2 is a perspective view of a marine floating dock mounting degree control system according to an embodiment of the present invention, and FIG. 3 is a block diagram of a configuration of a marine floating dock mounting degree control system according to an embodiment of the present invention.

The marine floating dock mounting degree control system according to an embodiment of the present invention includes an electronic distance measurement 50 that is a measurement portion, a monitoring portion 100, a controller 200, and a mounting degree control portion 300.

The electronic distance measurement 50 measures the status of ship-body blocks that are disposed in a dock 1 and mounted within the dock 1 in real time. The electronic distance measurement 50 measures a distance between objects to be measured by using electronic waves, such as laser, thereby grasping the status of the objects to be measured, such as three-dimensional (3D) positions of the objects to be measured. Here, the objects to be measured are ship-body blocks mounted within the dock 1.

The measuring portion may include a 3D position measuring device that may measure 3D positions of the ship-body blocks, or radar, as well as the electronic distance measurement 50.

The monitoring portion 100 includes a draft sensor 110 and a photographing portion 130. The monitoring portion 100 grasps a current situation of the dock 1.

The draft sensor 110 is disposed in the dock 1 and measures a degree of bending of a bottom surface 3 of the dock 1.

The photographing portion 130 includes one or more cameras. Also, one or more photographing portions 130 are disposed at an outside 7 of the dock 1 and measure the status of sidewalls 5 of the dock 1.

5 The controller 200 includes a coordinate transformation portion 230 and an analysis portion 270. Also, the controller 200 may use a wired or wireless communication method so as to receive information measured by the monitoring portion 100 and the electronic distance measurement 50. That is, aspects of the present invention are not limited to one among methods, such as a local area network (LAN), wireless broadband Internet (WiBro), and Bluetooth, and all methods may be
10 applied to the present invention.

The coordinate transformation portion 230 transforms the information measured by the monitoring portion 100 and the electronic distance measurement 50 into one reference coordinates.

The analysis portion 270 analyzes the current situation of the dock 1 and a
15 current situation of a mounting degree based on the information transformed by the coordinate transformation portion 230.

Also, the controller 200 controls the mounting degree control portion 300 to control a mounting degree of the dock 1.

The mounting degree control portion 300 is disposed in the dock 1. Also,
20 the mounting degree control portion 300 controls the mounting degree of the dock 1 that varies according to the effect of the ship-body blocks mounted within the dock 1. In detail, the mounting degree control portion 300 changes the status of the bottom surface 3 of the dock 1 or sidewalls 5 of the dock 1 according to control signals of the controller 200.

Next, an operation of monitoring the floating dock 1 by using the monitoring portion 100 that is one of the configuration of the marine floating dock mounting degree control system according to an embodiment of the present invention will be described with reference to FIG. 4. FIG. 4 is a perspective view of a monitoring
5 portion of a marine floating dock mounting degree control system according to an embodiment of the present invention.

The monitoring portion 100 provides information used to grasp the status of the dock 1 before the ship-body blocks are mounted within the dock 1, the status of the dock 1 while the ship-body blocks are mounted within the dock 1, and the status
10 of the dock 1 after the ship-body blocks are mounted within the dock 1, respectively.

Also, the monitoring portion 100 provides the status information of the bottom of the dock 1 for mounting degree control after the ship-body blocks are mounted within the dock 1.

The photographing portion 130 included in the monitoring portion 100
15 captures an image of the sidewalls 5 of the dock 1. The photographing portion 130 captures an image of a partial surface of the sidewalls 5 of the dock 1. For example, the photographing portion 130 captures an image of four point surfaces of edges of the sidewalls 5. Four point surfaces of the edges of the sidewalls 5 are 35-1, 35-2, 35-3, and 35-4, as illustrated in FIG. 4.

20 Also, one or more photographing portions 130 may be disposed. The photographing portion 130 may include two photographing portions, as illustrated in FIG. 4. When two photographing portions 130 are disposed, as illustrated in FIG. 4, one photographing portion 130a captures an image of two point surfaces 35-1 and 35-2 included in one sidewall. Also, the other photographing portion 130b captures
25 an image of two point surfaces 35-3 and 35-4 included in the other sidewall.

Also, the photographing portion 130 captures an image of the sidewalls 5 of the dock 1 in a predetermined cycle. That is, the photographing portion 130 continuously captures an image of the sidewalls 5 of the dock 1 in the predetermined cycle and provides information used to monitor a change in the status of the dock 1.

5 Also, the photographing portion 130 captures an image of the dock 1 by using a global coordinate shape (GCS) that is based on inner walls of the dock 1.

Also, the photographing portion 130 captures an image of a common point 53 that is placed at the outside 7 of the dock 1 so that the captured image can be coordinate-transformed by the coordinate transformation portion 230 of the
10 controller 200.

Although the monitoring portion 100 of the dock 1 monitors the dock 1 by using a camera system, the monitoring portion 100 may monitor the dock 1 by making an application system using 3D long distance measurement equipment, such as an indoor global positioning system (iGPS) or an electronic distance measurement.
15 In this case, a part corresponding to an emission portion of the configuration of the measurement equipment may be installed at a relatively stable place (inner walls), and a sensor corresponding to a light receiving portion may be mainly installed at a place where measurement is to be performed, thereby constituting the application system.

20 The draft sensor 110 included in the monitoring portion 100 is installed at the bottom surface 3 of the dock 1. Also, one or more draft sensors 110 may be instead at the bottom surface 3 of the dock 1. Also, one or more draft sensors 110 may be installed at the bottom surface 3 of the dock 1 at regular intervals.

Also, the draft sensor 110 measures a degree of bending of the bottom surface
25 3 of the dock 1 by using the GCS that is based on the inner walls of the dock 1.

As described above, the information collected by the monitoring portion 100 is transformed into one reference coordinates by using the coordinate transformation portion 230 included in the controller 200 so that integrative current situation control can be performed. In detail, since dock information collected by the draft sensor 5 110 and the photographing portion 130 has a local coordinate shape (LCS), the dock information is transformed into the GCS that is reference coordinates based on the captured common point.

The information on the reference coordinates transformed in this way is again transformed into information that indicates the current situation of the dock 1 by 10 using the analysis portion 270 of the controller 20.

Next, an operation of grasping the status of the ship-body blocks mounted within the dock 1 by using the electronic distance measurement 50 of the marine floating dock mounting degree control system according to an embodiment of the present invention will be described with reference to FIG. 5.

15 FIG. 5 is a perspective view of an electronic distance measurement of a marine floating dock mounting degree control system according to an embodiment of the present invention.

Also, the electronic distance measurement 50 undergoes the following detailed procedures so as to grasp the status of ship-body blocks 9 mounted within 20 the dock 1.

First, before the ship-body blocks 9 are mounted within the dock 1, a ground marking position of a ground marking that is a reference line indicated on the dock 1 in vertical and horizontal lines and a support level value are measured. While the ship-body blocks 9 are mounted within the dock 1, the ship-body blocks 9 are 25 measured so that the ship-body blocks 9 can be arranged. Last, after the ship-body

blocks 9 are mounted within the dock 1, a position where the ship-body blocks 9 are mounted, is measured.

The controller 200 may grasp a current situation and a condition in which the ship-body blocks 9 are mounted within the dock 1, based on information measured
5 through this procedure.

In detail, one or more electronic distance measurements 50 may be disposed in the dock 1. In FIG. 5, two electronic distance measurements 50 are installed in the dock 1. As illustrated in FIG. 5, each of electronic distance measurements 50a and 50b that are disposed in the dock 1 measures the status of the ship-body blocks 9
10 mounted in the dock 1 by using the LCS that is based on a position of each of the electronic distance measurements 50a and 50b.

Since status information measured in this way is information measured based on the position of each of the electronic distance measurements 50a and 50b, the status information needs to be transformed into reference coordinates so that an
15 integrative current situation of mounting and a current situation of the dock 1 can be analyzed.

To this end, the electronic distance measurement 50 measures a common point 55 that is placed at the outside 7 of the dock 1 so that the measured information of the ship-body blocks 9 can be coordinate-transformed by the coordinate
20 transformation portion 230 of the controller 200.

Next, an operation of controlling a mounting degree of the dock 1 based on the information of the dock 1 and the ship-body blocks 9 collected by the monitoring portion 100 and the electronic distance measurement 50 will be described with reference to FIG. 6. FIG. 6 is a schematic view of a mounting degree control

operation of a marine floating dock mounting degree control system according to an embodiment of the present invention.

First, when the ship-body blocks 9 are mounted within the dock 1, the bottom surface 3 of the dock 1 is changed, like in (1) of FIG. 6. This status is grasped by the monitoring portion 100 and the electronic distance measurement 50, like in a degree analysis procedure shown in 1) of FIG. 6.

The following procedure is a mounting degree control procedure in which the analysis portion 270 of the controller 200 analyzes a change in the current situation of the dock 1 and the current situation of the mounting degree based on already-stored CAD information of the bottom surface 3 of the dock 1. This procedure is shown in 2) of FIG. 6.

After the mounting degree control procedure is finished, the analysis portion 270 performs a simulation before mounting degree control is actually performed. This procedure is shown in 3) of FIG. 6.

Last, the controller 200 transmits the control signals to the mounting degree control portion 300 based on analysis data on which the simulation is performed, and the mounting degree control portion 300 controls a mounting degree according to the control signals of the controller 200. In detail, the mounting degree control portion 300 drives the bottom surface 3 of the dock 1 so that a simulated mounting degree can be maintained. That is, the mounting degree control portion 300 ballasting controls the bottom surface 3 of the dock 1 according to the control signals of the controller 200. Ballasting control is performed in such a way that ballast water of a ballast tank is controlled so that the bottom surface 3 of the dock 1 can be balanced. This procedure is shown in (2) of FIG. 6.

While the invention has been shown and described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

【CLAIMS】

【Claim 1】

A marine floating dock mounting degree control system comprising:

5 a monitoring portion comprising a draft sensor disposed in a dock and measuring a bending degree of a bottom of the dock and a photographing portion disposed outside the dock and measuring a status of sidewalls of the dock;

a measurement portion that is disposed in the dock and measures a status of ship-body blocks mounted in the dock in real time;

10 a mounting degree control portion that is disposed in the dock and controls a mounting degree of the dock that varies according to an effect of the ship-body blocks mounted within the dock; and

a controller that analyzes a current situation of the dock and a current situation of the mounting degree based on information measured by the monitoring portion and the measurement portion and controls the mounting degree control
15 portion to control the mounting degree of the dock according to a result of analysis,

wherein the controller comprises a coordinate transformation portion that transforms the information measured by the monitoring portion and the measurement portion into one reference coordinates and an analysis portion that analyzes the current situation of the dock and the current situation of the mounting degree based
20 on the coordinate information transformed by the coordinate transformation portion.

【Claim 2】

The marine floating dock mounting degree control system of claim 1,
wherein the measurement portion measures a ground marking position and a support
level value on the dock before the ship-body blocks are mounted within the dock,
and

- 5 while the ship-body blocks are mounted within the dock, the measurement
portion measures the ship-body blocks so that the ship-body blocks are arranged, and
 after the ship-body blocks are mounted within the dock, the measurement
portion measures a position where the ship-body blocks are mounted.

【Claim 3】

- 10 The marine floating dock mounting degree control system of claim 1,
wherein one or more measurement portions are disposed in the dock, and
 each measurement portion measures a status of the ship-body blocks mounted
within the dock by using a local coordinate shape (LCS) that is based on a position of
each measurement portion, and

- 15 each measurement portion measures a common point that is placed outside
the dock so that the coordinate transformation portion coordinate-transforms the
information of the ship-body blocks measured by the measurement portion.

【Claim 4】

- The marine floating dock mounting degree control system of claim 1, wherein the
20 photographing portion captures an image of a part of the sidewalls of the dock and
captures the dock by using a global coordinate shape (GCS) that is based on inner
walls of the dock, and

 the draft sensor measures a bending degree of the bottom of the dock by
using the GCS that is based on the inner walls of the dock.

【Claim 5】

The marine floating dock mounting degree control system of claim 1,
wherein the photographing portion captures an image of a common point that is
placed outside the dock so that the image captured by the photographing portion is
5 coordinate-transformed by the coordinate transformation portion.

【Claim 6】

The marine floating dock mounting degree control system of claim 1,
wherein the coordinate transformation portion transforms coordinates of the
information of the dock monitored by the monitoring portion and coordinates of the
10 information of the ship-body blocks measured by the measurement portion into one
coordinate system.

【Claim7】

The marine floating dock mounting degree control system of claim 1,
wherein the controller controls the mounting degree control portion so that the
15 information measured by the monitoring portion and the measurement portion
follows a predetermined mounting degree reference value.

【Claim 8】

The marine floating dock mounting degree control system of one of claims 1
through 7, wherein the mounting degree control portion ballasting controls a bottom
20 surface of the dock according to control of the controller.