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Apparatus for displacing working platforms

The invention concerns an apparatus for displacing working platforms, wherein for pivotal movement of the working platforms in vertical planes there are provided booms which are mounted horizontally pivotably about vertical axes to a carrier portion
10 and which are pivotable into a basic position.

Such apparatuses can be used for example for the inspection or maintenance of the inside walls of a tank chamber.

A usual tanker is subdivided into tank chambers of dimensions of 20 m x 20 m x 20 m. They have a standardised upper filling opening of 1250 x 750 mm which, apart
15 from an entry opening for operators, represents the sole access to the tank chamber. To treat the inside walls of the tank chamber, there are provided working stations which are displaceable in three directions, from which the inside walls can be inspected, treated with sand blasting, phosphorised and painted. Just in order to minimise the stoppage times of the ship in the dockyard but also for technical reasons treatment of
20 the entire inside space should be concluded in the shortest possible time. In that sense the recommendation is for more than one working cage to be arranged on the central mast, wherein the use of four cages in practice does in fact represent the upper limit.

Assembly of the apparatus in the interior of the tank chamber is difficult because of the working conditions prevailing there. The activities in that respect should
25 therefore be reduced to a minimum.

Along those lines, an apparatus of the kind defined in the opening part of this specification is disclosed in WO 2006/119520. It is already substantially ready for use as soon as the carrier portion with the booms is inserted into the tank chamber, to the lower limit position. It is only then still necessary to connect the working cages
30 previously introduced into the tank chamber and possibly bend arms connecting them to the booms, to the booms.

In that basic position the booms must bear very closely against each other so that they can be pushed through the standardised entry opening of the tank chamber. With the configuration disclosed in WO 2006/119520 the booms in the basic position are displaced radially outwardly with respect to their vertical axes of rotation. In that
5 case the pivotal movement of a boom about its vertical axis would be impeded by the adjacent boom. In accordance with the state of the art the operating position of the apparatus is therefore reached by the vertical axes of the booms being displaced radially outwardly about 100 mm by means of a four-bar linkage mechanism. That however involves a relatively high level of structural complication and expenditure.

10 The problem of the present invention is to avoid the high level of construction complication and expenditure in the state of the art.

The specified problem is solved in that the booms in the basic position are displaced relative to the associated vertical pivot axes in the direction of a closed contour which surrounds the carrier portion together with the booms, wherein a free
15 position for opening of the booms is already afforded by pivotal movement thereof about the pivot axis.

By virtue of that arrangement it is possible, by mere pivotal movement of the booms about the respective vertical pivot axis, to reach an operating position or free position in which the booms can be pivoted about their horizontal pivot axis without
20 impeding each other. That free position is afforded without an additional displacement of the pivot axis. That is described in detail with reference to the drawing.

Protection is also claimed for a use of the apparatus according to the invention for the inspection or treatment of the inside walls of a tank chamber, with the proviso that the basic position allows introduction and removal of the booms together with the
25 carrier portion through an upper opening of the tank chamber.

The apparatus according to the invention can also be used in relation to oil platforms for the inspection or treatment of individual regions. Such maintenance is necessary in oil platforms for corrosion protection.

Further uses of the apparatus according to the invention for the inspection or
30 treatment of inside or outside spaces in other regions of technology are conceivable.

Further advantages and details of the invention will be apparent from the specific description hereinafter. A use of the invention for the inspection or treatment of the inside walls of a tank chamber is shown by way of example.

Figure 1 diagrammatically shows the various phases in introducing and
5 installing an apparatus in accordance with WO 2006/119520, and

Figures 2 to 5 respectively show in a cross-section and a perspective view in four phases the transition from the basic position into the operating position in the case of an apparatus according to the invention.

In accordance with the state of the art disclosed in WO 2006/119520 and the
10 embodiment of Figures 2 to 5 it is provided that the booms of a treatment apparatus are stowed in the folded-together condition in a tube 1. That casing tube firstly serves as protection from damage to the awkward and complicated mechanism and the steel construction structure designed to the strength limit, in the rough dockyard working conditions. It allows horizontal mounting of the system on the ship until the tube 1 with
15 the booms stowed therein is moved by means of the ship's crane 15 by means of a steel cable 7 to the position of use. There (left-hand image in Figure 1) the tube 1 together with the booms stored therein is lowered through the opening of a tank chamber, formed by a dome 13, and after complete lowering connected by means of an automatic locking system 16 to the dome 13. As the tube 1 is now fixed to the dome 13, upon
20 further downward movement of the cable 7 booms 2 fixed to a carrier portion 3 are extended downwardly (second and third images in Figure 1). That is then followed by locking of the carrier portion 3 to the flange 31 at the lower end of the tube 1 and finally connection of the booms 2 to prepared bend arms 5 and platforms 6.

In the introduced condition the booms 2 must bear very closely against each
25 other so that they can be packed in the tube 1. A rotary movement of the booms would not be possible with the configuration known from WO 2006/119520, for which reason that involves the vertical pivot axes of the booms 2 being radially pushed out, that is to say by involving a transition from the third to the fourth view in Figure 1.

The invention is not restricted to configurations in which the carrier portion 3
30 together with the booms 2 is introduced through the introduction opening defined by the dome 3, together with an encasing tube 1. In principle the carrier portion could also

be fixed to a mast projecting for example into the interior of a tank chamber or to struts which carry the deck 11.

What is essential for the invention is the notion that the booms 2, in a basic position as is shown in Figure 2, are arranged around the carrier portion 3 in such a way
5 that they can be moved into the operating position shown in Figures 3 to 5 by mere pivotal movement about the vertical axes 8. For that purpose the booms 2 in the basic position shown in Figure 2 are oriented in the same direction along the peripheral contour 1' which extends as closely as possible to the inside of the tube 1.

It will already be apparent from Figure 3 that the pivotal movement of the
10 booms 2 about their respective vertical axis 8 permits actuation of the booms 2 by their pivotal movement about a horizontal axis 20.

As shown in Figure 4 therefore both the booms 2 and also the bend arms 5 pivotably mounted thereto can be pivoted by means of the associated hydraulic system in their entire actuation plane, wherein that plane itself is again rotatable about the
15 associated vertical axis 8.

It is particularly advantageous that in the basic position the bend arms 5 can be pivoted to the booms 2. That measure affords a very small cross-section so that, in the optional use of a tube 1, the entire arrangement consisting of carrier portion 3, booms 2 and bending arms 5 can be easily pushed through the tube 1.

CLAIMS

1. Apparatus for displacing working platforms (6), wherein for pivotal movement of the working platforms (6) in vertical planes there are provided booms (2) which are mounted horizontally pivotably about vertical axes to a carrier portion (3) and which are pivotable into a basic position, characterised in that the booms (2) in the basic position (Figure 2) are displaced relative to the associated vertical pivot axes (8) in the direction of a closed contour (1') which surrounds the carrier portion (3) together with the booms (2), wherein a free position for opening of the booms (2) is already afforded by pivotal movement thereof about the pivot axis (8) without an additional displacement of the pivot axis (8).

2. Apparatus according to claim 1 characterised in that the contour (1') extends within the inside wall of a tube (1), through which the carrier portion (3) together with the booms (2) is displaceable.

3. Apparatus according to claim 2 characterised in that the carrier portion (3) is lockable to the lower edge of the tube (1).

4. Apparatus according to one of claims 1 to 3 characterised in that in the basic position bending arms (5) are pivoted to the booms (2).

5. Apparatus according to one of claims 1 to 4 characterised in that the vertical pivot axes (8) of two booms (2) are arranged near two diagonally opposite corners of the approximately rectangular contour (1') and the other two booms (4) are arranged near the longitudinal centre of the contour (1').

6. Apparatus according to one of claims 1 to 5 characterised in that in the direction of the contour (1') a vertical pivot axis (8) and the associated boom (2) respectively follow each other.

7. Use of an apparatus according to one of claims 1 to 6 for the inspection or treatment of the inside walls of a tank chamber, with the proviso that the basic position allows introduction and removal of the booms together with the carrier portion through an upper opening of the tank chamber.