

[54] METHOD FOR MOVING AND LIFTING A SHIP SECTION

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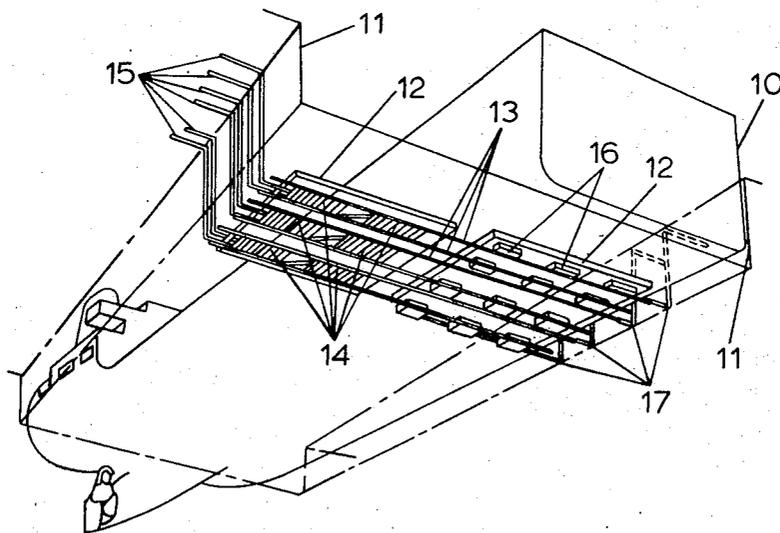
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[57] ABSTRACT

The movement of a section of a ship during assembly or repair is facilitated by cushions of pressurised fluid positioned beneath the section, lateral escape of the fluid being prevented by flexible skirts. When in position the section is raised to a desired height by fluid inflatable lift bags. The fluid may be water, and when working in a dry dock is advantageously sea water.

6 Claims, 3 Drawing Figures



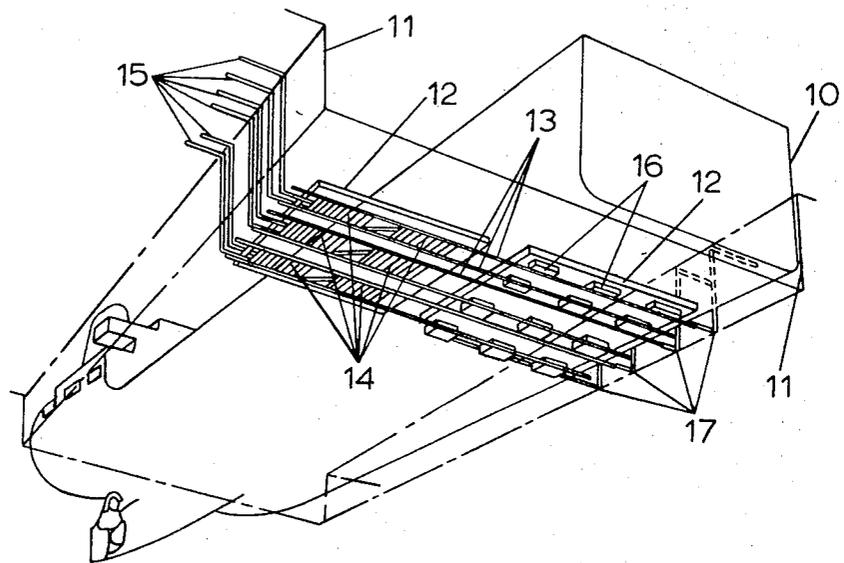


FIG.1

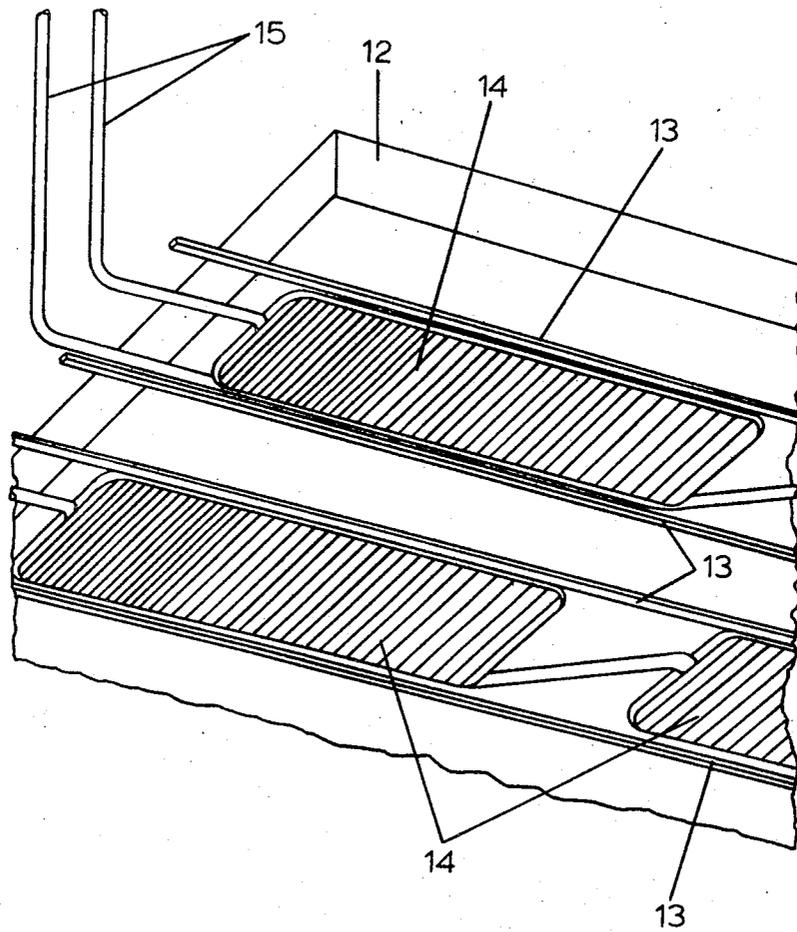


FIG.2

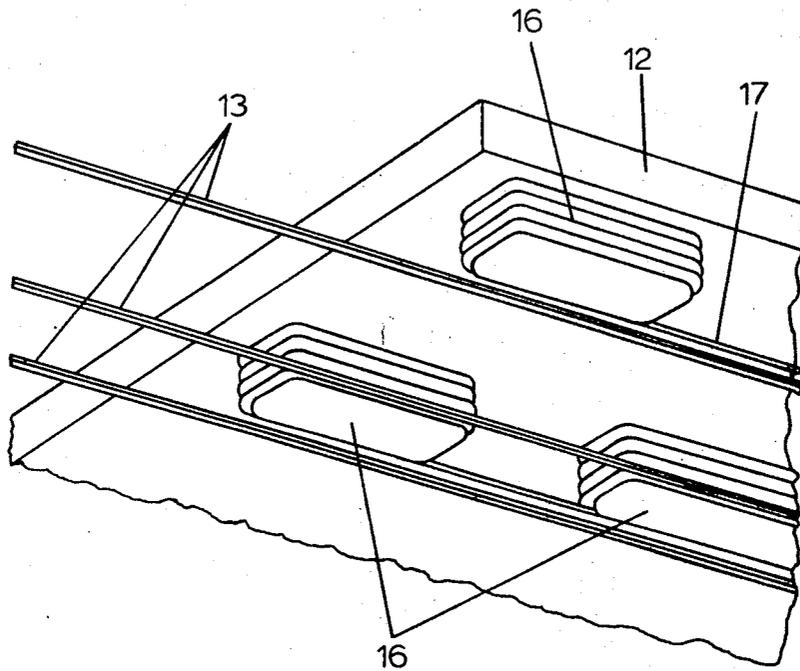


FIG.3

## METHOD FOR MOVING AND LIFTING A SHIP SECTION

This invention concerns a method for moving into position sections of ships during their assembly or repair.

Accordingly the invention consists in a method of moving a section of a ship into position wherein the section is supported on at least one cushion of pressurized fluid positioned beneath the section, lateral escape of the fluid from the cushion being substantially prevented by a skirt of flexible material.

The propulsive effort to move the section may be provided by winch and cable means, and when the section has been moved into the correct position relative to the remainder of the ship it may be raised to the required height, if desired, by means of fluid inflatable lift bags. Each lift bag may be an integral part of a flexible skirt, the two forming a fluid inflated movement and lift pad. Alternatively, the lift bags may be separate, being placed in position in the deflated condition, so that the ship section is moved into position over them and they are then inflated to lift it into position.

The pressurized fluid for the cushion and for inflating the lift bags may be water or air, sea water being a very convenient source of fluid in ship repair dry docks.

The invention finds particular use in the movement of large repair units underneath ships in dry dock, and one such embodiment will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of part of a large oil tanker in dry dock,

FIG. 2 is an enlargement of a part of FIG. 1 illustrating skirt pads, and

FIG. 3 is an enlargement of a part of FIG. 1 illustrating lift bags.

Referring to the drawings, a 250,000 t.d.w. oil tanker 10 having a damaged skin on part of its hull bottom is positioned in a dry dock 11 so as to be to one side thereof. The damaged skin is cut away and removed. A repair unit 12 is assembled on the floor of the dry dock 11 clear of the underside of the tanker 10. The repair unit 12, which weighs in the order of 1,000 tons, is supported on six rails 13 which run across the floor of the dry dock 11 to a position beneath the hole in the underside of the tanker 10 into which the repair unit 12 has to be fitted. The clearance between the underside of the tanker 10 and the floor of the dry dock 11 is in the order of six feet, whilst the total thickness of the repair unit 12 is in the order of five feet six inches.

When assembly of the repair unit 12 is complete and it is ready to be moved into position, six skirt pads 14 (illustrated diagrammatically in the drawings) of flexible material are positioned beneath the repair unit 12, a pair of skirt pads 14 being positioned between each alternate pair of rails 13. The sides of the skirt pads 14 are restrained by suitable means such as strips of metal (not shown) releasably attached to the underside of the repair unit 12. Each skirt pad 14, which measures in the order of 40 feet by 15 feet, is supplied with pressurized fluid at a pressure of five pounds per square inch by way of flexible supply pipes 15. The pressurized fluid may be air, but in a dry dock where a good head of sea water is available, this sea water is a very convenient source of fluid.

When the repair unit 12 is supported on six cushions of pressurized fluid, defined by the six skirt pads 14, it is moved into position beneath the underside of the tanker 10 by any suitable propulsive means (not shown). Such means may conveniently be cables attached to the repair unit 12 and wound onto suitably positioned winches.

When the repair unit 12 is in the correct position beneath the tanker 10 it will need to be raised in the order of six feet to position it for fixing in the bottom of the tanker 10. This is accomplished by 12 lift bags 16 which are suitably positioned on the floor of the dry dock 11 beneath the tanker 10, the repair unit 12 being moved into position over the top of the lift bags 16. With the repair unit 12 in the correct position, the lift bags 16 are inflated with pressurized fluid to raise the repair unit 12 through the required height into position in the bottom of the tanker 10. Once again, the fluid used to inflate the lift bags is conveniently sea water, although air may be used, the fluid being supplied through supply lines 17.

In order to keep construction of the lift bags 16 relatively simple, lateral stability of the repair unit 12 during its elevation into position in the bottom of the tanker 10 may be obtained by external means such as guide wires suitably deployed to strong points in the base of the dock. Alternatively, stability may be built into the lift bags.

Each flexible skirt pad 14 is preferably constructed to include a sheet of flexible material which lies adjacent the underside of the repair unit, the skirt part, which is constructed of flexible sheet material, depending downwardly from this sheet. The skirt part may be of corrugated form in vertical cross-section, the concavities of the corrugations facing towards the cushion. Where the space between the underside of the repair unit and the floor of the dock is limited, the skirt part may be a single convolution, again being concave towards the cushion. The free edges of the skirt part are held in position against the pressure of the cushion by ties or webs attached back to the sheet of flexible material which lies adjacent the underside of the repair unit.

The pressurized fluid supply pipes 15 may be brought into each skirt pad through the skirt part; however, if the height of the skirt pad is too small to allow this the pipes may be brought into the top of the skirt pad through feed holes in the repair unit, these holes being made good when the repair unit is in position.

I claim as my invention:

1. A method of moving a section of a ship into position for assembly and/or repair of a ship in a dry dock comprising the steps of:

- a. locating a plurality of rails under the ship and laterally of the dock;
- b. assembling or placing the section on the rails;
- c. positioning a plurality of flexible skirt pads beneath section and between alternate rails;
- d. positioning a plurality of lift bags under the ship and between alternate rails not in line with the skirt pads;
- e. supplying pressurized fluid to the skirt pads by way of flexible supply pipes until the section is wholly supported on pressurized fluid cushions;
- f. applying propulsive effort to the section to move it across the dock until it is under the ship and over the lift bags; and

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- g. supplying pressurized fluid to lift bags to raise section into position for assembly or repair.
- 2. A method of moving a section of a ship into position as claimed in claim 1, wherein the propulsive effort is applied to the section by cable and winch means.
- 3. A method of moving a section of a ship as claimed in claim 1, wherein each flexible skirt pad comprises a sheet of flexible material which lies adjacent an underside surface of the section and has a flexible skirt part

- depending downwardly from its periphery.
- 4. A method of moving a section of a ship as claimed in claim 1, wherein the pressurized fluid is air.
- 5. A method of moving a section of a ship as claimed in claim 1, wherein the pressurized fluid is water.
- 6. A method of moving a section of a ship as claimed in claim 5, wherein the pressurized fluid is sea water using the dynamic head available in a dry dock.

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