United States Patent [19]

Kurose et al.

[11] **3,842,773**

[45] **Oct. 22, 1974**

[54] **HULL CONSTRUCTION METHOD EMPLOYING HULL CONSTRUCTION WORK UNITS**

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[22] Filed: **June 11, 1971**

[21] Appl. No.: **152,353**

[52] **U.S. Cl.** ..... **114/65 R,** 114/77 R

[51] **Int. Cl.** **B63b 3/00**

[58] **Field of Search** ..... 114/65, 77, 78, 79; 29/200 A; 105/177

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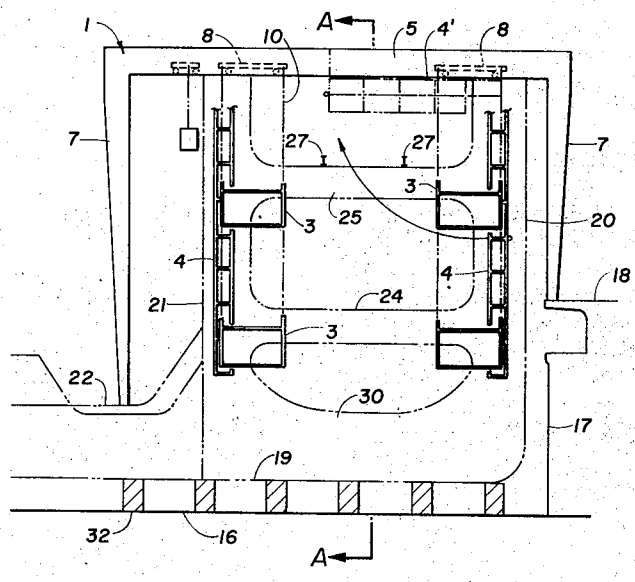
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[57] **ABSTRACT**

A hull construction method whereby the lower layer of the hull is subjected to construction operation by means of a lower work unit, and an upper work unit is movably placed on the thus constructed lower layer of the hull so that the construction operation of the upper layer of the hull is conducted by the said upper work unit.

7 Claims, 6 Drawing Figures



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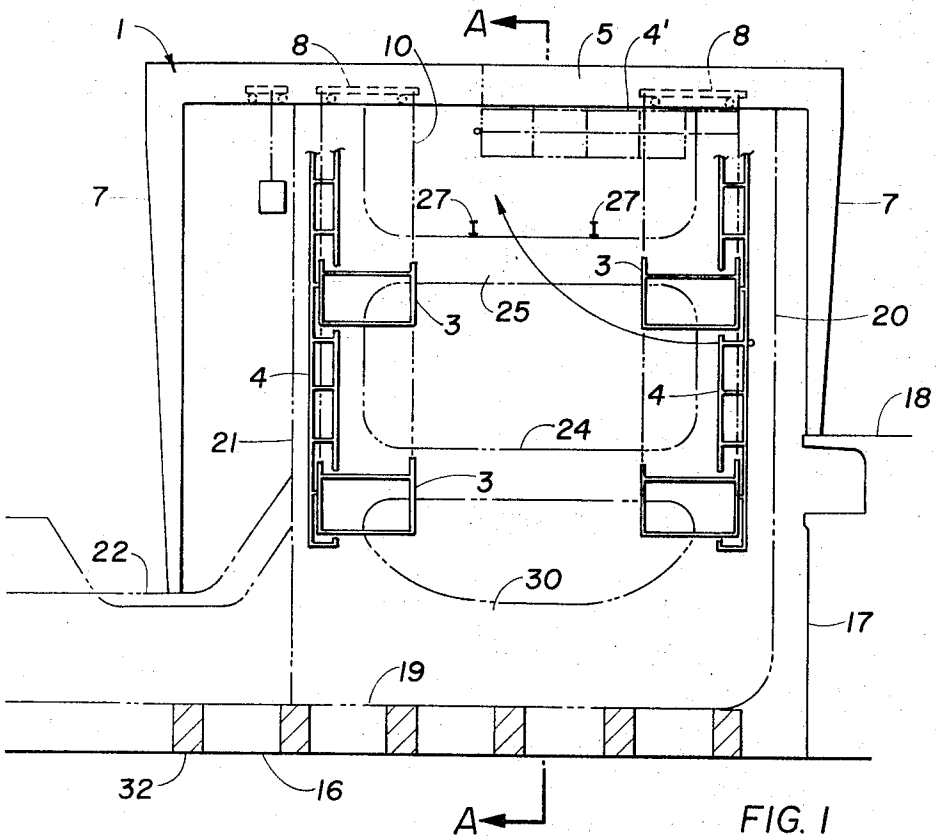


FIG. 1

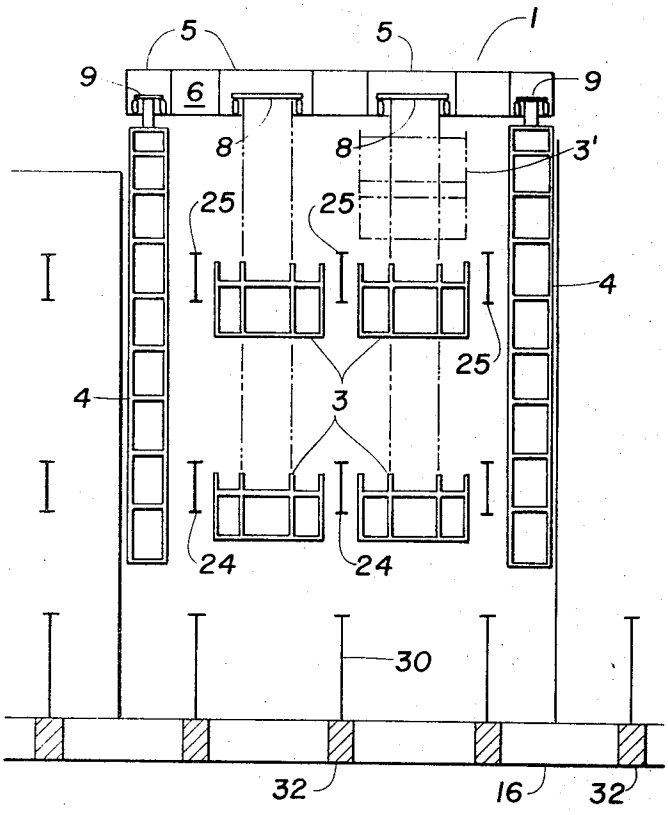


FIG. 2

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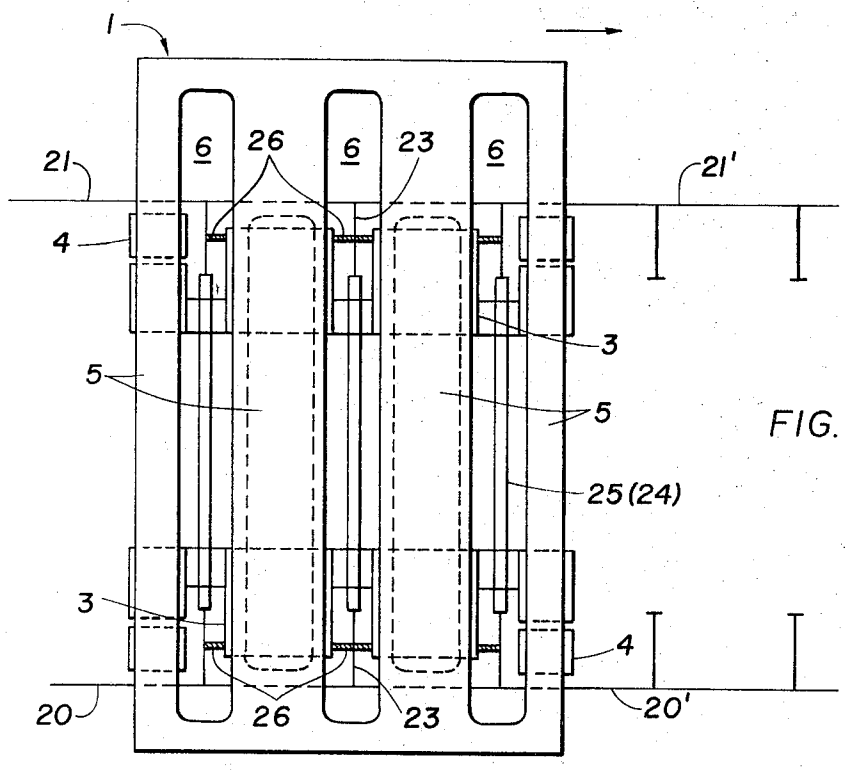


FIG. 3

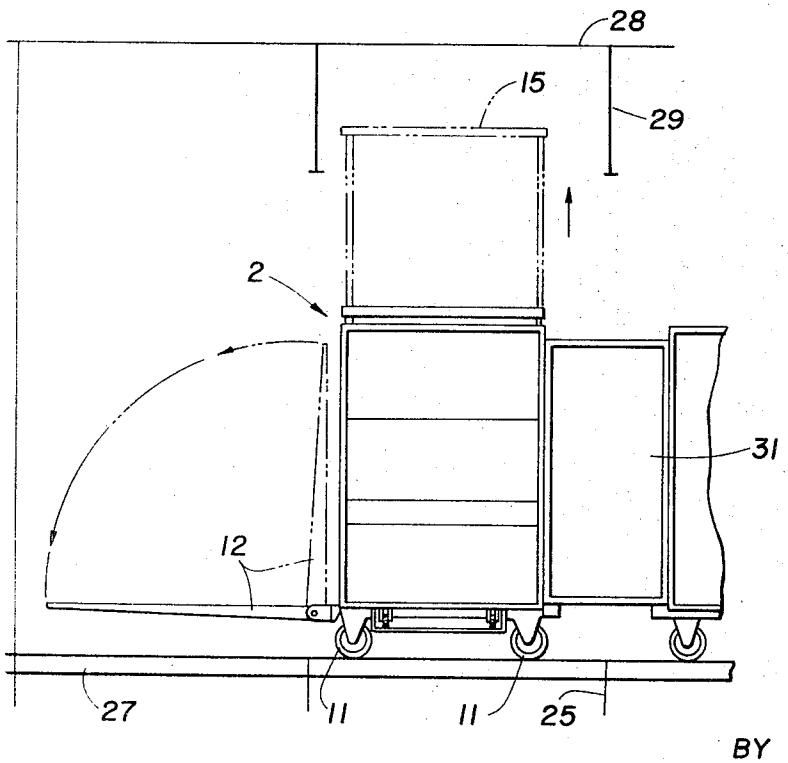


FIG. 5

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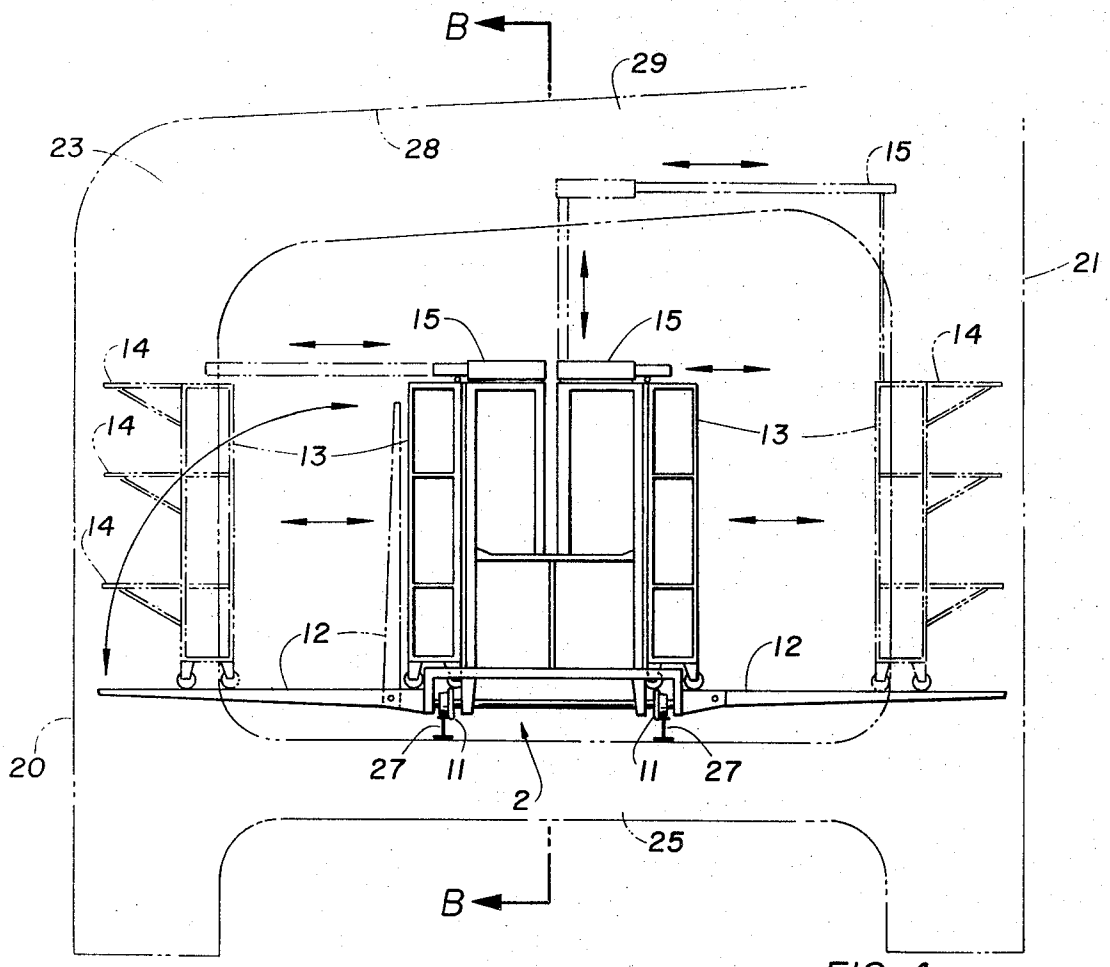


FIG. 4

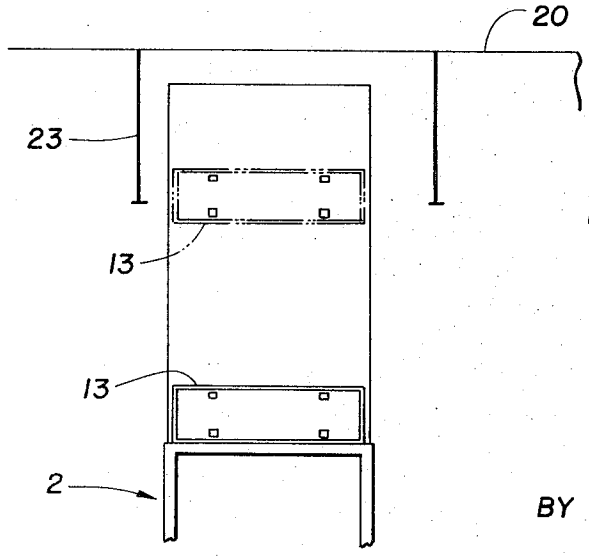


FIG. 6

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HULL CONSTRUCTION METHOD EMPLOYING HULL CONSTRUCTION WORK UNITS

DETAILED EXPLANATION OF THE INVENTION

The present invention relates to a method for construction of a hull of vessel employing a plurality of movable hull construction work units.

In the conventional hull construction method employed in building a very large ship such as supertankers, a great number of pieces for erecting stagings for hull construction works are welded to the hull being constructed, and then arms or brackets are welded to these pieces to support the planks or the like as the platforms upon which the workmen accomplish the hull construction works which are mainly consisting of welding works by welding machines and other equipment. When the works are accomplished, the staging are removed.

In this method, a large number of staging materials are required and the erection and removal of the stagings are laborious and expensive. Furthermore, it is dangerous to move from one working location to another the heavy machinery and equipment on the stagings.

It is therefore the primary object to eliminate these and other problems encountered in the conventional hull construction method.

Briefly stated, the present invention provides a novel hull construction method employing hull construction work units characterized in that the hull construction works are divided into a plurality of work sections in the direction of depth or draft of a hull to be constructed; a plurality of lower work units in the form of a gantry-like structure upon or in which are mounted a plurality of working platforms or stages, welding machines and other equipment required for hull construction are so arranged as to transversely bridge the lower work sections of said plurality of work sections so that the lower hull structures are completed by a sequence of hull construction works which mainly consist of welding works; and thereafter a plurality of upper work units each of which carries a plurality of working platforms or stages and stagings, which are adapted to extend into operative positions and retract or folded back to inoperative positions, and welding machines and other machinery and equipment required for hull construction, are made to ride on rails laid upon the uppermost structual members of said completed lower hull structures so that the upper hull structures are sequentially completed, whereby the entire hull construction is completed.

According to one aspect of the present invention, the conventional stagings are all eliminated so that the saving in labor, time and cost may be advantageously achieved.

According to another aspect of the present invention, the welding machines and other machinery and equipment required for hull construction may be incorporated within the work units and be longitudinally moved from one working location or one hull block to another when the work units are moved so that it is only the workmen who must move from one hull block to another. Therefore the working conditions are much improved and the accidents may be prevented to such a degree hitherto impossible by the conventional method. Thus all of the works on the shipway are much facilitated.

The present invention will become more apparent from the following description of the preferred embodiment thereof taken in conjunction with the accompanying drawings.

FIG. 1 is a schematic longitudinal sectional view illustrating a hull under construction by a lower work unit in accord with the present invention;

FIG. 2 is a schematic sectional view looking in the direction of the arrow A of FIG. 1;

FIG. 3 is a top view thereof;

FIG. 4 is a schematic vertical sectional view, on enlarged scale, illustrating an upper work unit in accord with the present invention and the subassemblies of the hull welded together by this unit;

FIG. 5 is a schematic longitudinal side view thereof looking in the direction of the arrow B of FIG. 4; and

FIG. 6 is a top view thereof.

Briefly, according to the hull construction method of the present invention, a hull is divided into an upper and lower sections so that the upper and lower subassemblies are assembled together by an upper unit 2 and a lower unit 1 respectively.

First referring to FIGS. 1–3, the lower work unit 1 comprises a gantry-like structure comprising a plurality of cross beams 5 which are longitudinally spaced apart from each other by a spacing 6, and supporting elements 7 supporting the cross beams 5 at their both ends. In the gantry-like structure there are mounted a plurality of carriages 8 and 9 (four being shown in the instant embodiment) for movement laterally of the hull, and a gondola-like stage 3 is suspended from each of the carriage 8 while a ladder-like stage 4 from each of the carriages 9. If necessary, the machinery, equipment, tools and the like required for construction of the hull may be mounted upon the lower work unit 1, and the workmen may accomplish the hull construction works, mainly welding works, on the stages 3 and 4.

Next referring to FIGS. 4–6, the upper work unit 2 will be described. In general, the upper work unit 2 comprises a carriage having wheels 11 rode upon rails 27, which are laid upon cross ties 25, for longitudinal movement, retractable stages or platforms 12 swingably fixed to the both sides or four sides, if necessary, of the carriage, stagings 13 each of which has a plurality of retractable stages or platforms 14 and is adapted to transversely move on the extended stage or platform 12, and stages or platforms 15 each of which is mounted upon the top of the carriage in such a way it may be vertically and transversely extended and retracted as indicated by the chain lines in FIGS. 4 and 5. It is seen that these stages or platforms 12, 14 and 15 and stagings 13 may be retracted or folded back to the carriage as indicated by the solid lines in FIGS. 4–6. The welding machines, and other equipment, tools and the like may be mounted in the carriage, and the workmen may accomplish the hull construction works, mainly the welding works, on the stages or platforms 12, 14 and 15.

Next the method of the full construction in accord with the present invention employing the lower and upper work units 1 and 2 of the type described will be described in detail hereinafter. In the instant embodiment, it is assumed that a hull of a large tanker be constructed. Prior to the description, the hull structural

parts and dockyard components will be described in brief. First, reference numeral **16** denotes the bottom of the shipway; **17,** the side wall thereof; **18,** the ground level; **19,** a bottom shell plating; **20,** a side shell plating; **21,** a longitudinal bulkhead between a center tank and a wing tank on the starboard side; **22,** a transverse frame in the center tank; **23,** arthwartship frames welded to the longitudinal bulkhead **21** and the side shell plating (See FIG. 3); **24** and **25,** cross ties; **26,** outrigger means (See FIG. 3) for preventing the swinging of the gondola-like stages **3,** extended from the arthwartship or vertical frames **23**; **28,** an upper deck plating; **29,** a deck beam; **30,** transverse floors laid over the bottom plating; **31,** (See FIG. 5) a segment for connecting the unit **2**; **3'** and **4'**, gondola-like stages **3** and ladder-like stages **4** in inoperative or stored position in the lower work unit **1**; and **20'** and **21'**, an outer shell plating and a longitudinal bulkhead to be erected and welded in the next step by the lower work unit **1.**

The subassembly of the side shell plating including the vertical frames **23** is erected upon the keel blocks or the like **32** and then the lower work units **1** are lowered in such a way that they bridge over the starboard and port wing tanks respectively and one supporting element **7** is anchored on the ground **18** while the other supporting element **7** on the vertical floors **22** in the center tank of the hull. Thereafter, the bottom subassembly **19,** the longitudinal bulkhead subassembly **21,** the side shell plating subassembly **20** are welded together by the workmen standing on the stages **3** and **4.** In this case, the roof may be covered over the cross beams **5** of the lower work units **1** so that the hull construction may be advantageously proceeded even on a rainy day. After welding of the above three subassemblies, the hull structural members or cross ties **24** and **25** are lowered by the stages **3** and **4** through the spacings **6** between the cross beams **5** to predetermined locations where they are welded to the arthwartship or vertical frames **23** joined to the longitudinal bulkhead and side shell plating subassemblies **20** and **21.**

When one block of the hull is completed in the manner described above, the next side shell plating and longitudinal bulkhead subassemblies **20'** and **21'** in the next block are erected while the lower work unit **1** remains in the position shown in FIG. **3.** In this case the workmen or shipwrits on the stages **4** may see to it that these subassemblies are precisely aligned with those in the preceding block. Thereafter the lower work unit **1** is raised by a gantry crane or the like and moved to the next block so as to bridge over the subassemblies **20'** and **21'**, so that the hull construction works similar to those accomplished in the preceding block may be started again. In the similar manner, the lower work units **1** are advanced from one block to another on both of the starboard and port sides to complete the hull from the bow to the stern or vice versa. Alternatively two lower work units **1** may be employed to alternately advance them for the hull construction in a similar manner described above.

When the lower work units **1** are advanced from one block to another, the stages **3** and **4** are stored in the positions indicated by the imaginary lines **3'** and **4'** in FIGS. **1** and **2.**

After the construction of the lower half on one hull block is completed, the rails **27** are laid longitudinally upon the uppermost cross ties **25** so that the upper work units **2** may ride on them.

A number of the upper work units **2** may be selected depending upon a length of one hull block, that is the lower work unit **1** and the shipbuilding schedule, and are connected by the segments **31** with each other as shown in FIG. **5** as a train which may be traveled upon the rails **27** according to the shipbuilding schedule.

Now the hull construction works by the upper work units **2** will be described. First the stages or platforms **12, 14** and **15** are extended and the upper deck subassembly **28** is erected and welded together with the side shell plating and longitudinal bulkhead subassemblies **20** and **21.** Thereafter the stages or platforms **12, 14** and **15** are retracted to the positions indicated by the solid lines in FIG. **4** so that the upper work units **1** may be advanced through an opening defined by the side shell plating and longitudinal bulkhead subassemblies **20** and **21,** the upper deck subassembly **28,** the vertical frames **23** and the deck beams **29.** When the upper working units **2** reach the next working location, the stages or platforms **12, 14** and **15** are extended again and the required hull construction works, mainly welding works are accomplished. When the construction of the hull is completed, these upper work units may be removed out of the completed hull through an opening (not shown) formed through the deck.

It is understood that the preferred embodiment described above is given as a way of illustration and that various modifications and variations may be effected within the scope of the present invention. For example, the hull construction method of the present invention may be applied also in hull construction of other types of vessels. One or plurality of lower work units **1** may be employed as needs demand. The depth of the hull may be divided into more than two work sections, for example into three of four work sections. That is, when the section in which the upper work units **2** are employed for hull construction is further divided into subsections, the upper work units **2** may be moved from one sub-section to another sub-section immediately above as the hull construction works proceed. Alternatively, individual upper work units may be installed on individual sub-sections. A still another variation is to employ only one upper work unit **2.** Furthermore instead of the gondola-like and ladder-like stages **3** and **4** of the lower work unit **1,** the fixed stagings may be provided or instead of the ropes suspending the gondola-like stages **3,** the guide pillars or the like may be installed.

What is claimed is:

1. A method for constructing a hull having center and wing tanks formed from prefabricated blocks which comprises assembling adjacent wing and center tank blocks; deploying a lower work unit in the form of a gantry with legs to straddle a wing tank block and a contiguous wall of a center tank block with one of said legs within the center tank block and the other outside of said blocks; securing said wing and center tank blocks from work stages on said lower unit; moving said lower work unit longitudinally of the hull to a new work site; disposing rails upon upper structural elements of said wing and center tank blocks secured by said lower work unit; mounting an upper work unit on said rails for movement therealong, said upper work units comprising work platforms movable between extended, operable positions and retracted, transport positions; completing upper hull structures from said work platforms in said operable positions; moving said platforms

to said retracted positions and advancing said upper work units to a different work site within the hull.

2. A method as claimed in claim **1** wherein said lower work unit comprises movable work stages, said stages being moved at each work site for the completion of assignments at that site.

3. A method as claimed in claim **2** wherein said work stages of said lower work unit are moved vertically and horizontally at each work site.

4. A method as claimed in claim **3** wherein said work stages are suspended from carriages and said carriages are moved transversely of the hull.

5. A method as claimed in claim **1** which comprises forming a roof on said lower work unit.

6. A method as claimed in claim **1** wherein said lower work unit is moved to a new work site by lifting said unit and moving it longitudinally of the hull.

7. A method as claimed in claim **1** wherein said gantry type lower work unit has one leg thereof disposed on the ground and another disposed on a structural element of said center tank block.

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