# United States Patent [19]

**Broes**

[11] **3,786,772**

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


[54] **CATAMARAN SHIP'S STRUCTURE**


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[73] Assignee: **Stradco Inventions & Research Co.,** Washington, D.C.



[22] Filed: **May 2, 1972**

[21] Appl. No.: **249,595**

[52] **U.S. Cl.** ..... **114/43.5,** 114/61

[51] **Int. Cl.** ..... **B63b 35/28**

[58] **Field of Search** ... 114/43.5, 61, 66.5 F, 66.5 H, 114/66.5 R, 45, 72, 73, 77 R, 77 A, 0.5 R, 40–42; 214/12



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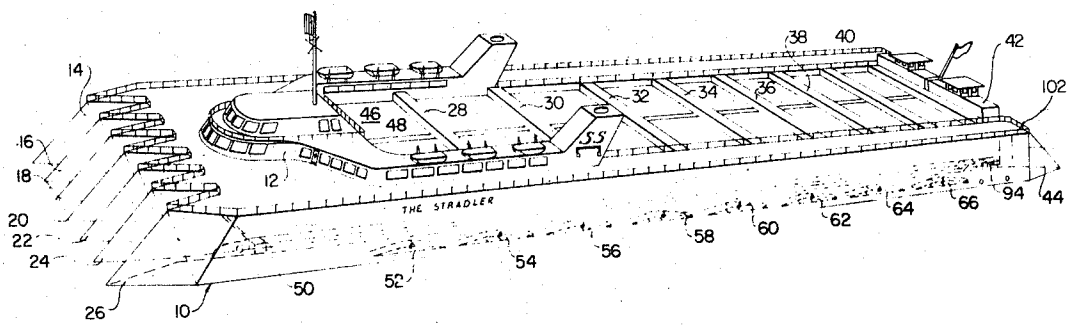
*Primary Examiner*—George E. A. Halvosa
*Assistant Examiner*—Sherman D. Basinger



[57] **ABSTRACT**

A catamaran type vessel having a plurality of longitudinally extending hulls defining longitudinal propulsion channels intermediate said hull form and one or more elevators vertically liftable intermediate the hulls, so as to vary the height of the elevator with respect to the surface of the water. As a result, the ship may be used for the transport of cargo in a variety of vertical attitudes, as well as a dry dock. The elevator may be supported above the surface of the water or it may be lowered to permit the floating in of another vessel prior to dry docking operation.


**10 Claims, 22 Drawing Figures**



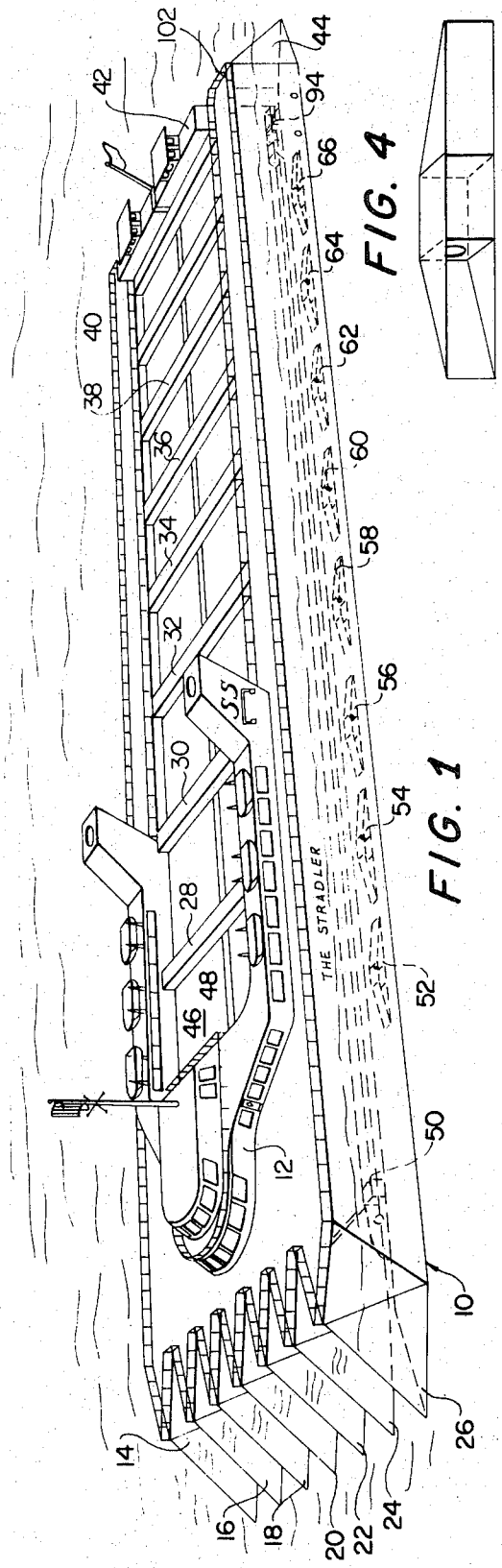



FIG. 1



FIG. 4

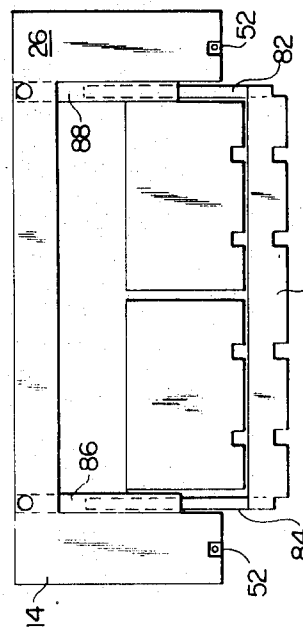



FIG. 3

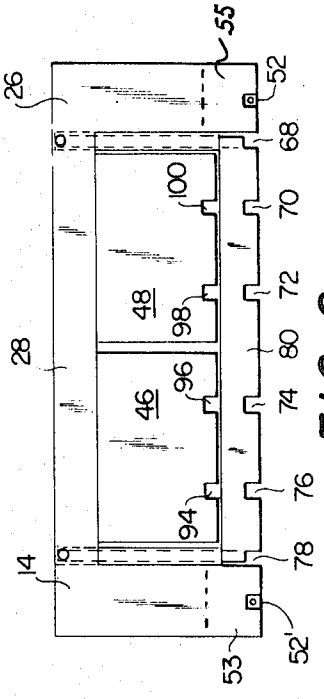



FIG. 2

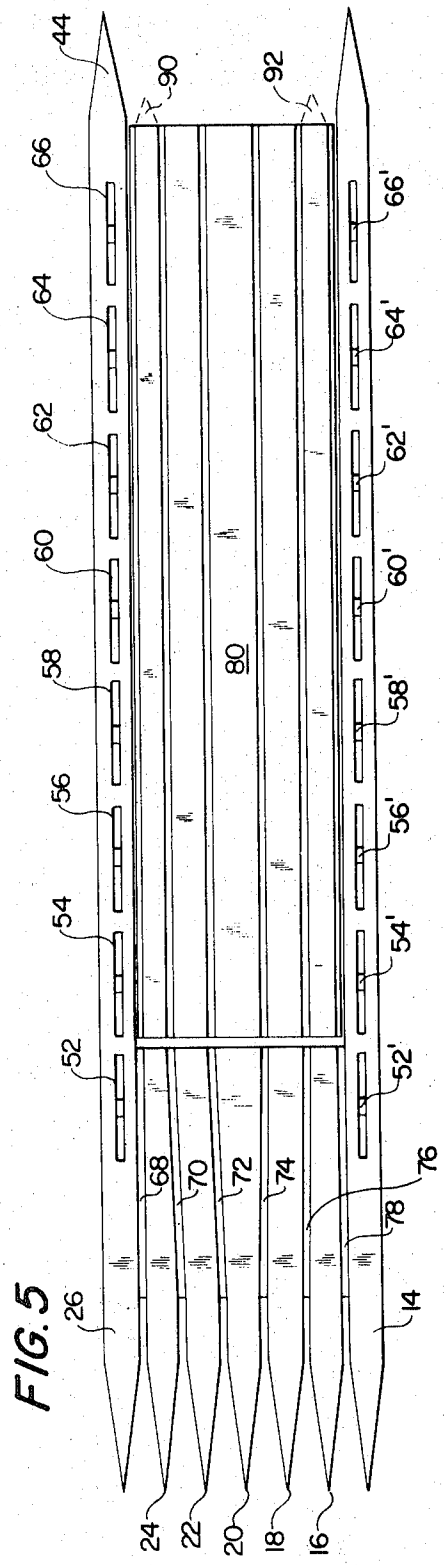



FIG. 5

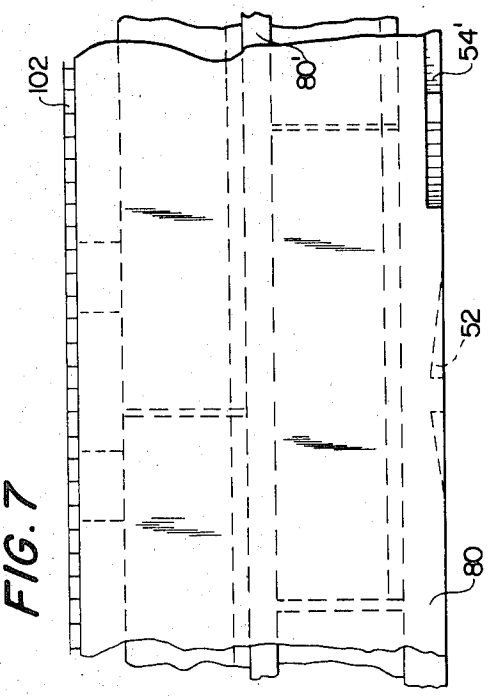



FIG. 7

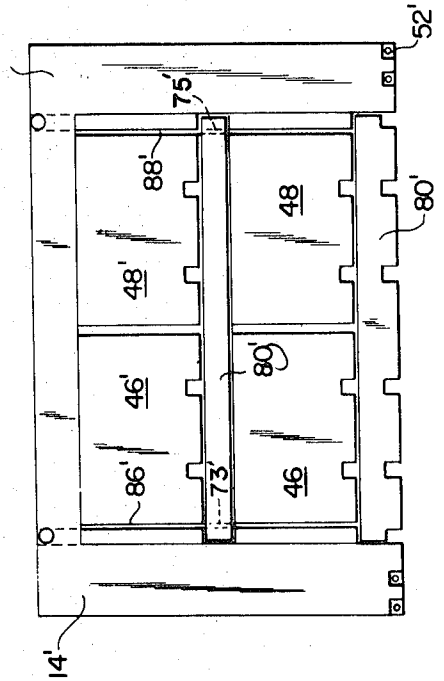



FIG. 6

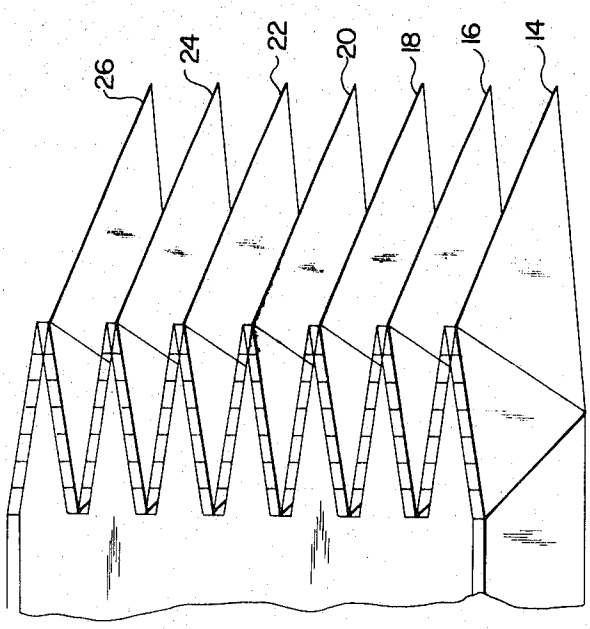



FIG. 11

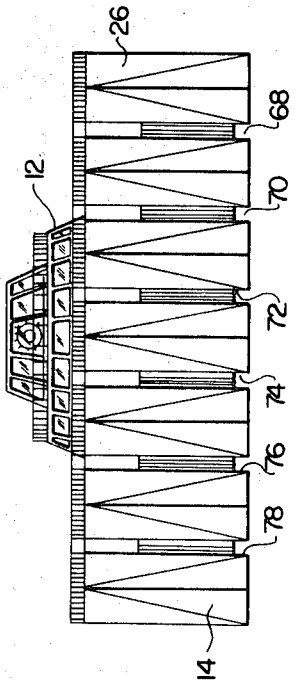



FIG. 10

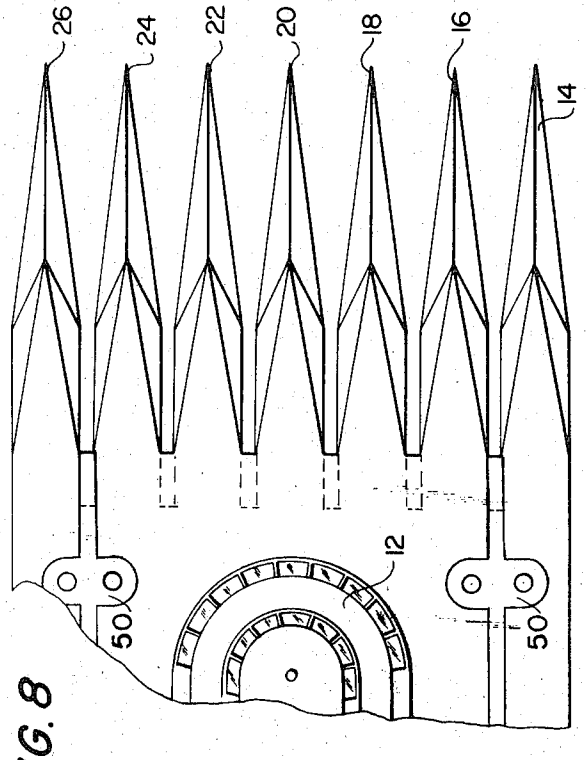



FIG. 8

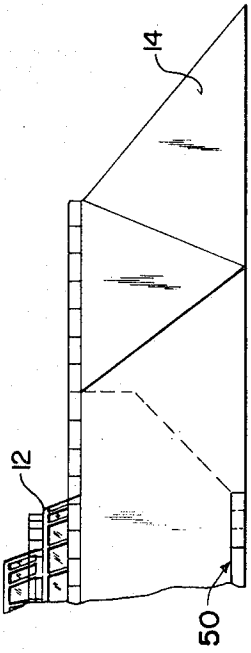



FIG. 9

FIG. 13

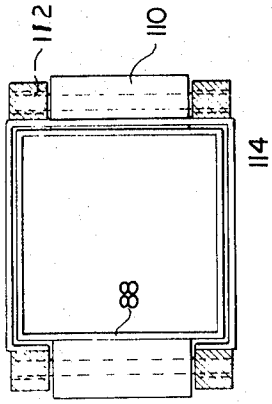
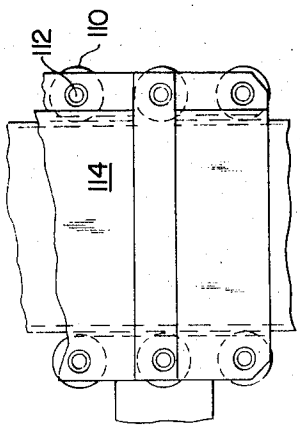



FIG. 14



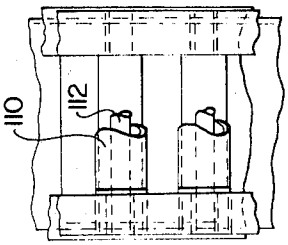
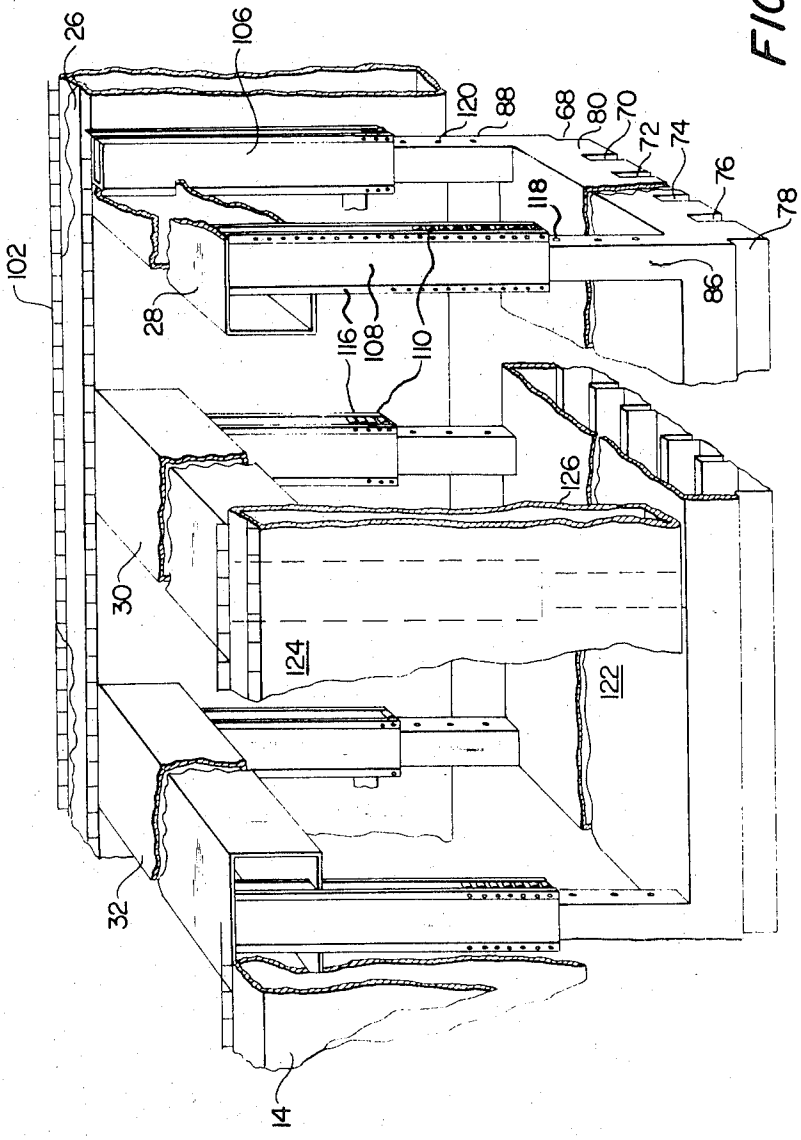




FIG. 15

FIG. 12



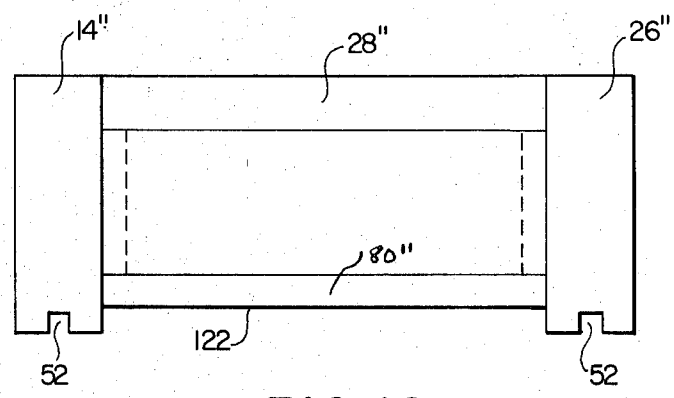



FIG. 16

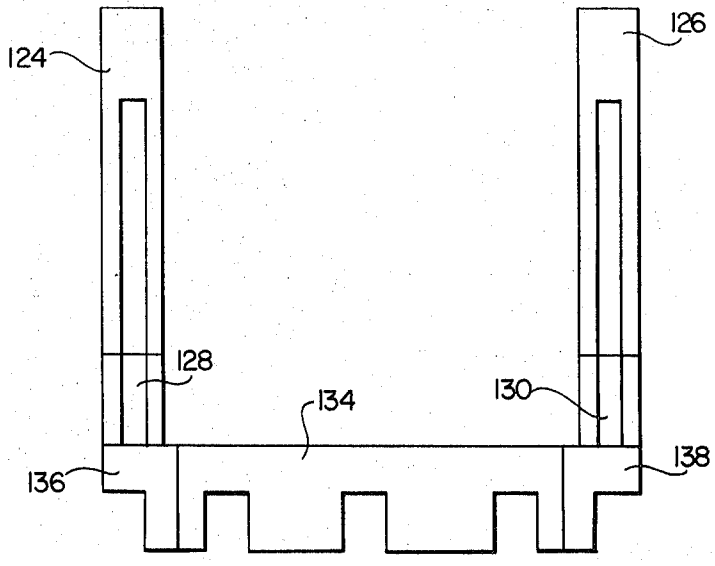



FIG. 17

FIG. 18

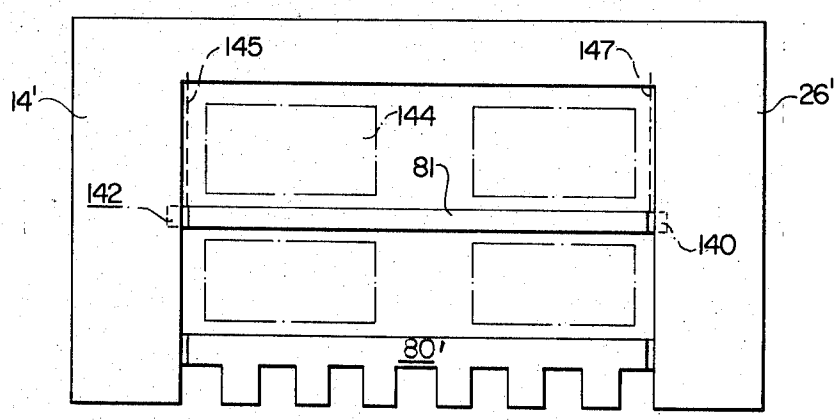



FIG. 19

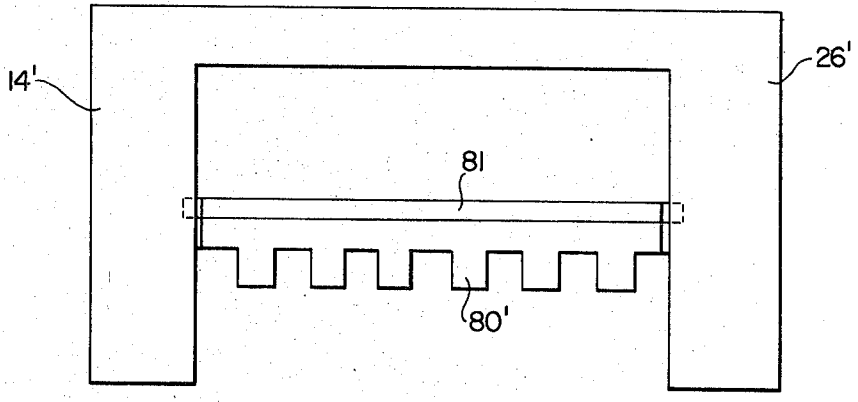
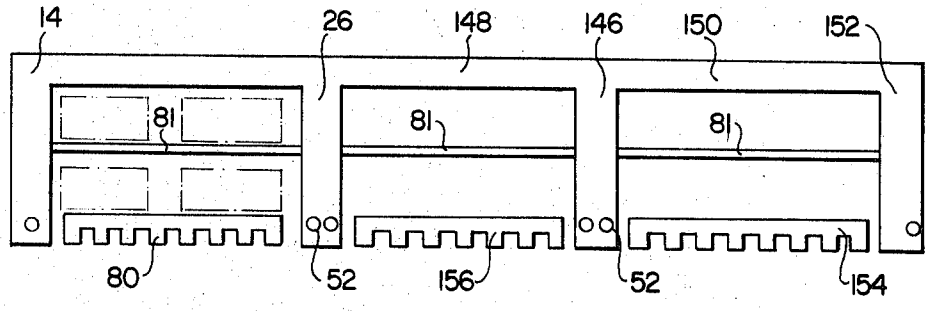



FIG. 21



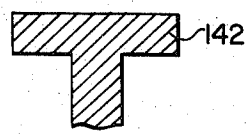




FIG. 20

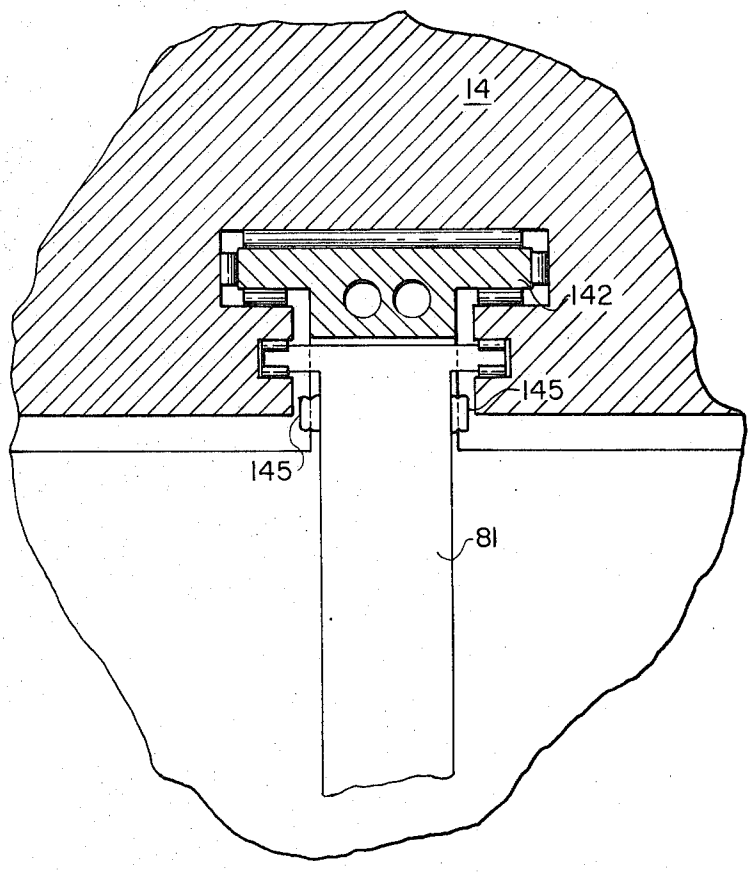



FIG. 22

# CATAMARAN SHIP'S STRUCTURE

## BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

Ships, particularly multi-hull ships used for the transport of containerized cargo. The ships are constructed so that there are defined intermediate the hull sections a plurality of hydraulic jet propulsion channels permitting smooth flow of water beneath the ship and providing lateral stability.

2. DESCRIPTION OF THE PRIOR ART U.S. Pat. Nos. to Fechtenburg, 2,381,583 ; to Forlano, 2,467,022; to Nemec, 3,318,276; to Holm, 3,428,016; and to Schroeder, 3,191,568.

Holm shows the use of amphibious means and Schroeder has been selected as showing water intervening between the barge-cargo storage areas. Forlano shows the use of a hydraulic compulsion system including stearing jets in a ship. Nemec is selected as showing the securement of barges within an oceangoing vessel.

However, none of the references show the use of a multi-hull ship, having a plurality of bows in combination with the intervening elevators which rigidize the hulls with respect to each other, while supporting the cargo in a variety of vertical attitudes. None show the formation of longitudinally extending channels intermediate the bows and beneath the elevator structure.

## SUMMARY OF THE INVENTION

According to the present invention, the multi-hull ship includes at least two longitudinally extending hull forms defining a catamaran structure, with a plurality of bows interposed between the hull forms and including longitudinally extending propulsion channels intermediate the bows. A plurality of transverse beams extend topside between the hulls and an elevator is positioned intermediate the hulls so as to be liftable vertically with respect to the sea's surface. Hydraulic propulsion units are supported in the hulls so as to communicate with the water and drive the vessel, as water surges through the longitudinally extending propulsion channels.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the proposed multi-hull ship, showing the hydraulic propulsion units in phantom.

FIG. 2 is a transverse section, showing positioning of the elevator and cargo barges with respect to the hulls.

FIG. 3 is a similar view showing lowering of the elevator beneath the hulls so as to admit barges or the like during loading.

FIG. 4 is an enlarged schematic view of the hydraulic propulsion unit such as the type illustrated in applicant's earlier application entitled "An Hydraulic Propulsion System" (Ser. No. 237,717), filed Mar. 23, 1972.

FIG. 5 is a bottom view of the proposed ship, showing the longitudinally extending propulsion channels with a modified stern element illustrated in phantom.

FIG. 6 is a transverse section of a further modification employing superposed, identical elevator elements.

FIG. 7 is a fragmentary side elevation, showing the superposed elevator elements in phantom.



FIG. 8 is a fragmentary top plan showing the bow elements.

FIG. 9 is a fragmentary side elevation of the bow elements.

FIG. 10 is a front view of the ship's bow.

FIG. 11 is a fragmentary perspective of the bow elements.

FIG. 12 is a fragmentary perspective showing positioning of the elevator posts with respect to the hull structure tracks.

FIG. 13 is a transverse section through the elevator posts and hull wells showing roller bearing support of the posts.

FIG. 14 is a fragmentary side elevation showing engagement of the rollers with the elevator posts.

FIG. 15 is a fragmentary perspective showing mounting of the rollers in the hull wells.

FIG. 16 is a transverse section of a further modification wherein the longitudinally extending channels have been eliminated at the bottom of the elevator and instead there is an opening across the entire bottom surface of the elevator intermediate the hulls.

FIG. 17 is a transverse section showing positioning of the elevator with respect to the stern posts and the provision of a pump room at either side of the elevator.

FIG. 18 is a transverse section showing positioning of a modified lower center beam with respect to the lower elevator.

FIG. 19 is a further view showing lifting of the lower center beams and the elevator with the surface of the sea.

FIG. 20 is an enlarged fragmentary section showing the key configuration of the elevator posts as it engages the inner surface of the hull wells.

FIG. 21 is a transverse section of a structure embodying four hull forms so as to have three sets of elevator sections and transverse beams.

FIG. 22 is a transverse section of the engagement of the elevator with the adjacent hull form, according to the FIGS. 18 and 19 concepts.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS:

In FIG. 1 the multi-hull ship 10 is illustrated as comprised of outer hull forms 14 and 26 with intervening bow elements 16, 18, 20, 22 and 24. A ship's bridge 12 is illustrated as positioned forwardly of transverse beams 28, 30, 32, 34, 36, 38 and 40 extending intermediate the outer hulls 14 and 26. The stern operating bridges 42 are illustrated as positioned above decks with respect to reverse shear stern element 44.

As illustrated in FIG. 5, a plurality of longitudinally extending propulsion channels 68, 70, 72, 74, 76 and 78 extend rearwardly intermediate the bow sections and are registrable with corresponding channels at the bottom of the elevator element 80. Optional stern configurations 90 and 92 may be positioned at the aft end of these channels so as to define a surface for converging action of water jets.

The ship may be driven by hydraulic jet propulsion elements of the type described in applicant's earlier filed application, Ser. No. 237,717, and entitled "An Hydraulic Propulsion System." These may be aligned, as illustrated in FIGS. 1 and 2 so as to include jet elements 52, 54, 56, 58, 60, 62, 64 and 66. Optional hy-

draulic jet elements may be positioned in the bow as at **50** and in the stern as at **94.** Each or all hydraulic jet elements may have additional air ingestion means so as to assist in hydraulic drive.

The individual elevator **80** is illustrated in FIGS. **2, 3** and **12** as including the bottom longitudinal channels **68, 70, 72, 74, 76** and **78,** a plurality of like vertical posts **86** and **88** having registering pinholes **118** and **120** with support pins and complementally engageable with rectangular plate **114** defining a vertical well in the hull section. Rollers **110,** supported upon shafts **112** extending through corner elements **116** may provide for roller bearing of the stern post elements. Suitable cable **73'** and **75'** shown in phantom, may be used for raising and lowering the elevators. Alternatively, various types of bearing elements may be employed. The top surface **122** of the elevator thus is movable vertically with respect to the surface of the sea. Plates **124** and **126** constitute the outer hulls.

A plurality of cargo barges **46** and **48** having identical registering channels **94, 96, 98** and **100** may be floated into position upon the elevator **80,** as illustrated in FIG. **3.** Then the elevator may be lifted so that its lower surface is flush with the bottom of the hulls **14** and **26** during transit. Water may thus surge through these channels in aligned barges **46** and **48** throughout the length of the vessel, as well as through the lower elevator channels. Optional ballasting tanks **53** and **55** may be provided in the hull sections **14** and **26** which also provide for quarters, ship's machinery and the like.

In the modification illustrated in FIG. **16,** the longitudinally extending channels have been eliminated from elevator **80''** which has a void **122** intermediate the bottoms of the hull sections **14''** and **26''.**

In FIG. **17,** the elevator section **130** is shown with its posts **128** and **130** complementally engaging wells **124** and **126,** while pump rooms **136** and **138** are defined at opposite sides of the elevator.

In FIG. **18,** a further modification is shown wherein there is a lower elevator **80'** and a plurality of transverse lower center beams **81** supporting cargo barges **144.** The lower center beam may be raised and lowered by cable means **145,** and **147** positioned at either side so as to raise and lower the beam with respect to the elevator. In the nonloaded position, illustrated in FIG. **19,** the beam **81** and lower elevator **80** may be both raised above the surface of the water during transit.

In FIG. **20** there is illustrated the key configuration **142** of engagement of the lower center beam with a corresponding track in the hull forms **14'** and **26'.**

In the modification illustrated in FIG. **21** a plurality of hulls **14, 26, 146** and **152** are provided with similar lower elevators **80, 156** and **154.** Similar transverse beams **81** are provided. According to this mode of invention, the ship may be multiplied laterally so as to have numerable hulls, the hull forms being lockably by means of the top transverse beam members **148** and **150** as well as the interlocking of the center beam members **81** and elevators with respect to adjacent hull forms.

Manifestly, the hull structure, jet propulsion drive and elevators may be varied substantially without departing from the spirit of the invention.

I claim:

**1.** A multi-hull ship comprising:

A. two longitudinally extending hull forms defining a catamaran structure;

B. a plurality of bows interposed between said hull forms and including longitudinally extending channels intermediate said bows;

C. transverse beams extending topside between said hulls;

D. at least one pair of superposed elevators keyed with respect to said hull forms by a keying element and independently liftable with respect to each other, said elevators extending longitudinally between said hull and aft of said bows, said elevators being reciprocable vertically with respect to the water's surface; and including longitudinally extending channels registering with said longitudinally extending channels intermediate said bows; and

E. hydraulic propulsion units supported in said hulls and in communication with said water, so as to drive said vessel.

**2.** A multi-hull ship as in claim **1,** including stern configurations intermediate said longitudinally extending channels at said stern with an aft hydraulic propulsion unit communicating with said channels, so as to divert discharged water on either side of said stern configurations.

**3.** A multi-hull ship as in claim **1,** said elevators being raised by cable means.

**4.** A multi-hull ship as in claim **3,** said elevators being secured vertically with respect to said hulls by pin means extensible through said elevator and a portion of said hull form.

**5.** A multi-hull ship as in claim **4,** said elevator including vertically extending strut members complementally engaging individual track members supported in said hull form and including roller bearing means interposed between said track members and said strut members.

**6.** A multi-hull ship as in claim **5,** said hull members including a plurality of vertically downwardly extending female posts, said vertically extending struts complementally engaging said posts, as said elevator is raised and lowered.

**7.** A multi-hull ship as in claim **6,** including a plurality of roller elements secured inwardly of said posts so as to engage said strut.

**8.** A multi-hull ship as in claim **7,** wherein said keying element has a T configuration in cross-section.

**9.** A multi-hull ship as in claim **8,** wherein said elevator may be lowered beneath said hull forms, so as to support said structure in a dry dock attitude.

**10.** A multi-hull ship as in claim **9,** said elevator including pump means permitting ballasting intake of water into said elevator and said hull form.

* * * * *