United States Patent

German

[15] 3,665,886

[45] May 30, 1972

[54] SHIP CONSTRUCTION

[72] Inventor: **William H. German**, 20180 Lakeshore Road, Baie D'Urfe, **Quebec, Canada**

[22] Filed: **Feb. 25, 1970**

[21] Appl. No.: **14,076**

[52] **U.S. Cl.** **114/73**

[51] **Int. Cl.** **B63b 25/02**

[58] **Field of Search** ..... 114/73, 72, 74 R, 74 A, 78, 114/79, 83, 65 R, 68, 40–42, 0.5 R, 116, 67 A

[56] **References Cited**

UNITED STATES PATENTS

2,352,296	4/1944	Szego	114/65 R X
3,087,454	4/1963	Lorentzen	114/74 R
2,754,791	7/1956	Nieding	114/67 A
993,440	5/1911	Duplessis	114/41
1,425,243	8/1922	Duthie	114/78 X
3,246,623	4/1966	Cambell et al.	114/74 X

FOREIGN PATENTS OR APPLICATIONS

31,509	12/1920	Norway	114/41

Primary Examiner—Milton Buchler

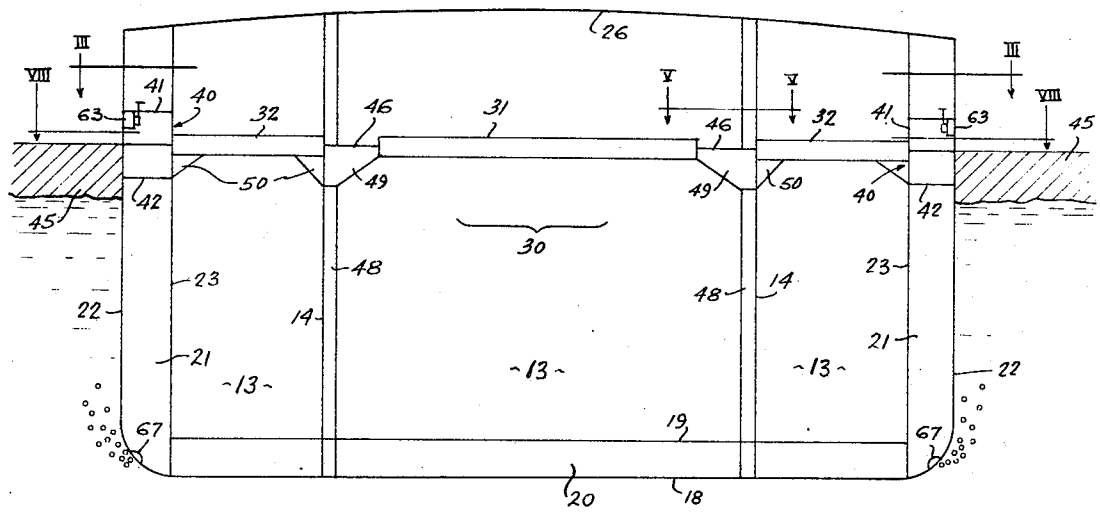
Assistant Examiner—F. K. Yee

Attorney—Peter Kirby, Charles P. Curphey and Norris M. Eades

[57] **ABSTRACT**

A hull of the bulk carrier type is strengthened for arctic service by beams extending along each side of the cargo carrying portion of the vessel approximately at the load water line. Struts extend transversely across the hull at spaced intervals to interconnect the beams and resist external ice pressures. The beams are also used as ducts to convey heated water for heating the hull in the vicinity of the water line. Some of this heated water can be discharged down the outside of the hull from a location somewhat above the load water line.

5 Claims, 9 Drawing Figures



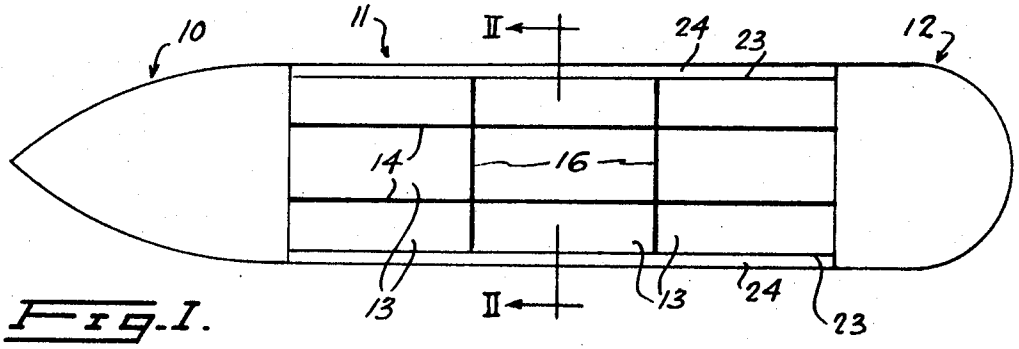


Fig. 1.
PRIOR ART

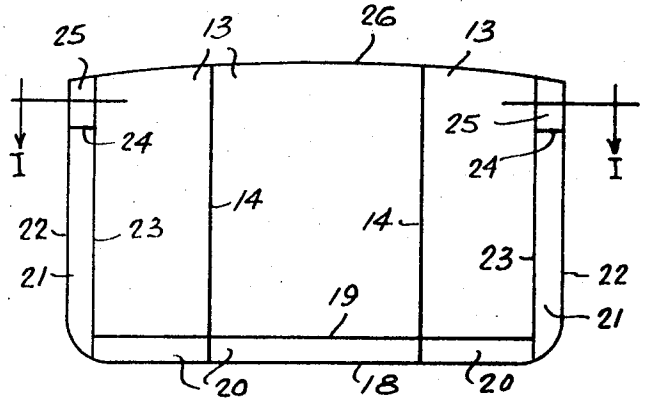


Fig. 2.
PRIOR ART

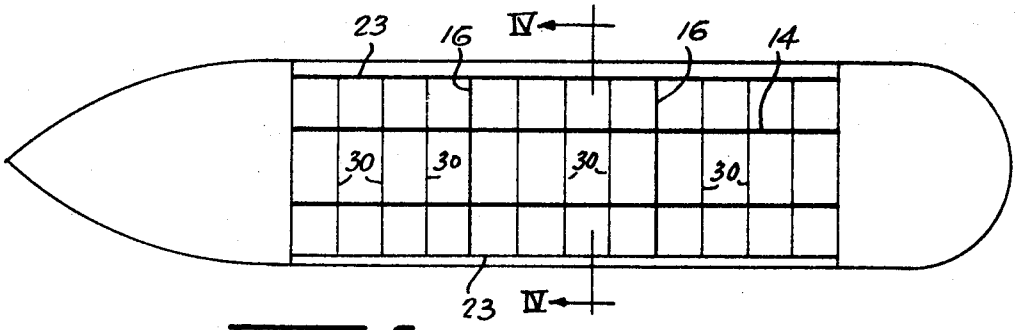


Fig. 3.

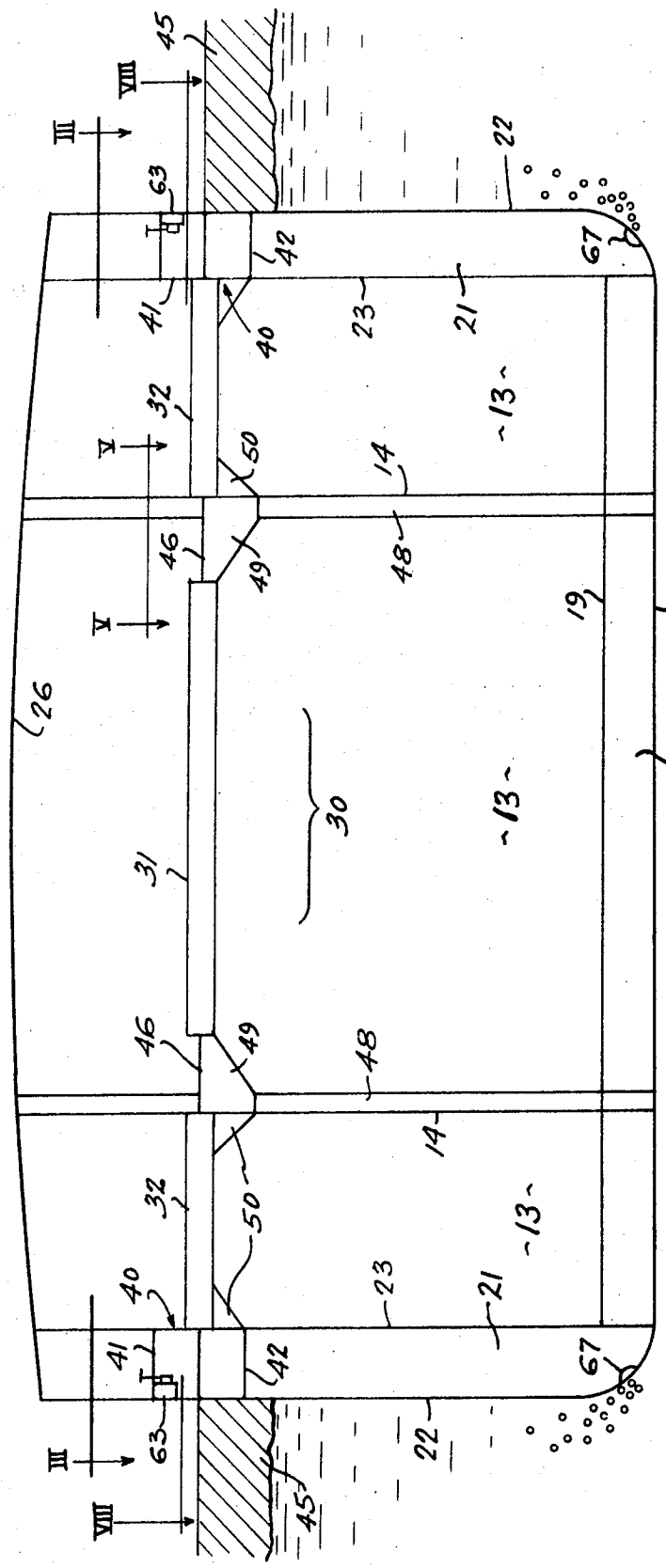

45
VIII
III
63
22
42
67
41
40
23
21
32
V
50
14
13
46
49
48
19
18
26
30
31
20

FIG. 4.

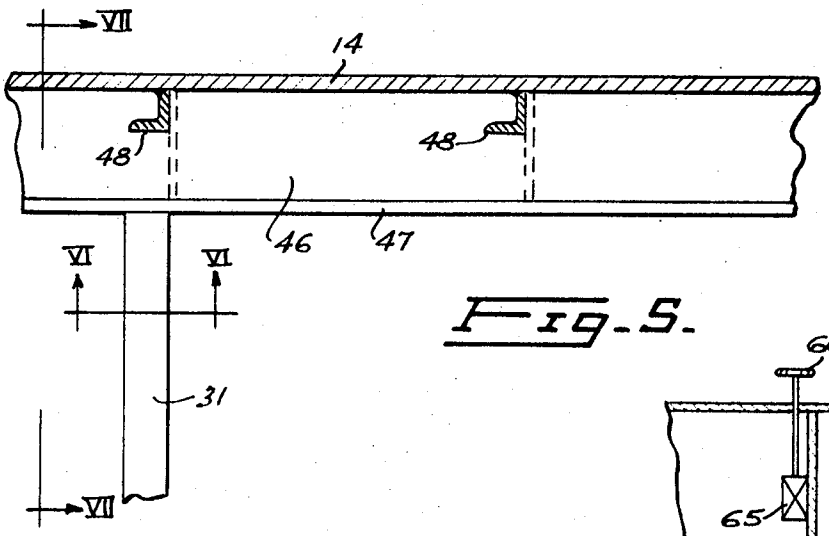


Fig. 5.

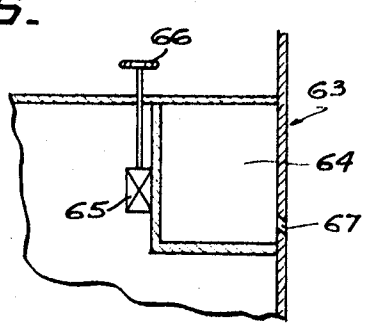


Fig. 9.

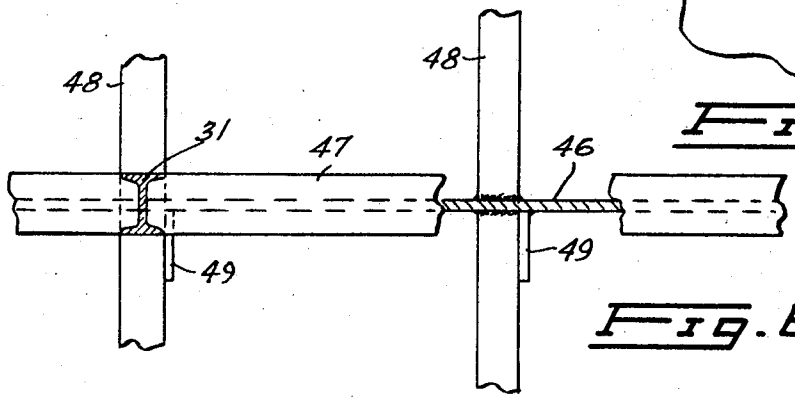


Fig. 6.

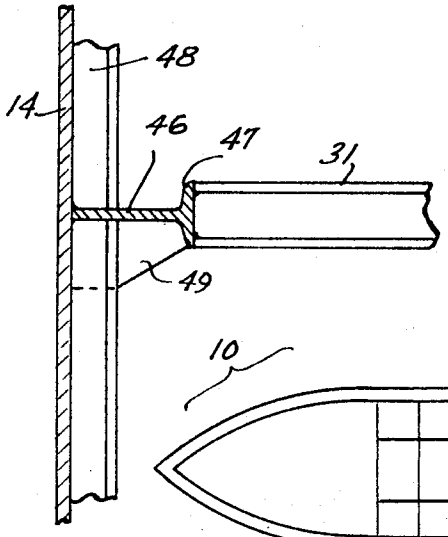


Fig. 8.

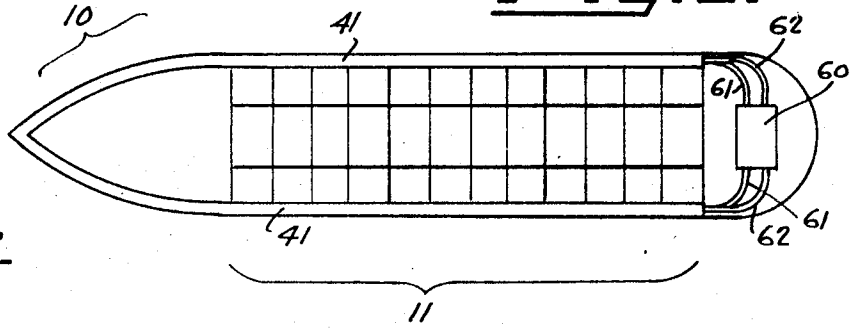


Fig. 7.

SHIP CONSTRUCTION

This invention relates to improvements in ship construction, and more particularly to large ships (20,000 tons and up) of the so-called "bulk carrier" type, that is to say a ship, the cargo carrying portion of which consists of tanks or other open spaces that are not subdivided by horizontal decks, i.e. so-called "between decks." Oil tankers are an important example of such ships, as also are grain carriers, ore vessels and container ships.

One object of the present invention is to improve the construction of such bulk carriers in a manner calculated to improve their ability to resist high transverse pressures applied against the sides of the hull, as may typically be experienced in an ice field. Oil finds in the Arctic have given rise to an increasing need for tankers to traverse ice fields, either with an ice-breaking bow attached to the vessel itself, or in the wake of a separate ice-breaking vessel, and the ice pressures that can build up against the hull are therefore playing an increasing important part in ship design.

Another feature of the present invention is applicable to all ships; not only to "bulk carriers."

Various features of the invention are illustrated by way of example in the accompanying drawings. It is to be understood that the many specific features described are not intended to limit the broad scope of the invention, which scope is defined in the appended claims. In the drawings:

FIG. 1 is a much simplified view from above of the interior arrangement of a conventional bulk carrier, taken approximately on the line I—I in FIG. 2;

FIG. 2 is a transverse section taken on the line II—II in FIG. 1;

FIG. 3 is a view similar to FIG. 1 but showing a construction according to the invention;

FIG. 4 is a transverse section taken on the line IV—IV in FIG. 3;

FIG. 5 is a section on the line V—V in FIG. 4;

FIG. 6 is a section on the line VI—VI in FIG. 5;

FIG. 7 is a section on the line VII—VII in FIG. 5;

FIG. 8 is a view similar to FIG. 3 but taken at a lower horizontal plane, i.e. substantially along the plane indicated at VIII—VIII in FIG. 4; and

FIG. 9 shows an enlarged fragment of a part of FIG. 4.

The ship of FIGS. 1 and 2 is assumed to be a conventional oil tanker having a bow or fo'castle portion **10**, a cargo portion **11** and an engine room and control portion **12** at the stern. The present invention is concerned primarily with the cargo portion **11** which, in the conventional tanker, may typically be divided into a number of tanks **13** divided from each other by longitudinal bulkheads **14**, and transverse bulkheads **16**. A double bottom **18**, **19** defines water ballast tanks **20**. Wing tanks **21** are similarly formed between the hull **22** and the bulkheads **23** defining the outer sides of the cargo tanks **13**. Apart from the small decks **24** that define walkways **25** extending along the sides of the vessel, there are no horizontal decks between the upper deck **26** and the bottom **19**.

The ship will be fitted with the necessary inlet and outlet pipes for the tanks, valves, pumps and other usual ancilliary equipment. Such equipment has been omitted from the drawings as not germane to the present invention.

According to the present invention the vessel is strengthened by the addition of a series of transverse, horizontal strut assemblies **30** (FIGS. 3 and 4) extending the full distance across the vessel from one lateral bulkhead **23** to the other, and located longitudinally intermediate the transverse bulkheads **16**, as best seen in FIG. 3. Referring to FIG. 4, each strut assembly **30** will be seen to consist of a central strut member **31** extending between the bulkheads **14**, and two side strut members **32** extending between the bulkheads **14** and **23**.

At the ends of the strut assemblies **30**, the ship's sides are strengthened by horizontal, longitudinally extending beams **40**. The beams **40** may take any convenient form calculated to resist bending forces. One convenient such form is the double box beam construction shown, this construction being composed of a pair of rectangular members **41**, **42** that can simultaneously serve as ducts for hot water, for the purpose more fully explained below. These beams **40** assist the ship's sides in resisting ice pressure and are, in turn, themselves supported at spaced locations by the strut assemblies **30**. It will be noted that the beams **40** and the strut assemblies **30** are located at or about the load water level where the forces exerted by ice **45** is to be expected to be a maximum.

As FIG. 5 to 7 also help to illustrate, each central strut member **31** is connected to a bulkhead **14** by means of a longitudinally extending T-shaped stringer **46**, the flange **47** of which is secured to the strut member **31** itself, which latter may take the form of an I-beam as shown, or of any other convenient beam section that will be strong as a column in resisting compressive forces, e.g. an H beam or a circular beam. The bulkhead **14** is strengthened at intervals by L-shaped stiffeners **48**, and each strut member **31** will be located in alignment with a stiffener **48**. A bracket plate **49** provides further support for the stringer **46** and stiffener **48** at the end of each strut member **31**. The side strut members **32** may also conveniently take the form of I-beams, and will be seen to be connected to the bulkheads **14** and **23** by means of further brackets **50**. All these structural parts will be welded or riveted together by conventional techniques, no attempt having been made to show such welds or rivets in the drawings.

FIG. 8 demonstrates diagrammatically how hot sea water that has been used in the conventional way to cool the engines **60** is conveyed by pipes **61** to one or other of the ducts **41**, **42** at each side of the ship. Additional hot water can, if required, be introduced into the pipes **61**. This additional hot water could be obtained from the ship's cargo heating system, Butterworthing or other tank cleaning system, or any other source of heat. This hot water flows from the engines the full length of the cargo section **11** of the ship and preferably also for much of the bow section **10**, in, say, the ducts **42**, and then is turned back at the bow to return to the engines along ducts **41** and pipes **62**. By the time it reaches the engines again it will have lost most of its heat and will be suitable for recirculation through the cooling ducts of the engines, although, if preferred, this water can be discharged overboard, with fresh sea water being drawn in through the sea boxes for cooling the engines.

The more elevated ones of the ship's sides ducts, i.e. the ducts **41**, may also be fitted with bleed boxes **63** extending along the full extent of such ducts. These are shown in FIGS. 4 and 9 and comprise longitudinally extending continuous or segmented ducts **64** that can be supplied with hot water from the main ducts **41** by means of one or more valves **65** each controlled from a handwheel **66** located in one of the walkways, or remotely controlled from other convenient locations. Run-off orifices **67** are formed in the hull **22** from the ducts **64** at spaced locations along the cargo and bow sections **11** and **10**, whereby hot water in the ducts **64** can be caused to bleed down the outside of the hull to assist in lubrication of the same and to cause a measure of melting of the ice immediately adjacent the hull.

Another feature of the vessel shown in FIG. 4 is the provision of a series of holes **67** through which air from a compressor-reservoir system (not shown) can be expelled and thus caused to bubble up the side of the hull. This expedient is especially useful when the vessel is stationary, say tied up at a wharf, for preventing undue formation and build up of ice against the hull.

This latter feature and the features of providing at least one duct extending down each side of the ship at or about the load water level for the conveyance of heated water to transfer some of this heat to the hull to assist in melting ice external to the hull, as well as the feature of bleeding hot water from such duct down the outside of the hull, are not limited to ships of the bulk carrier type. These features are useful in all ships called upon to enter ice fields or likely to encounter ice in harbors and inland waterways.

It should be mentioned that the invention is equally applicable to the same class of vessel as illustrated, but with the propelling machinery in a compartment amidships and a pair of cargo portions separated by this central compartment.

Use of the double walled construction, represented by the spacing between the bulkheads **23** and hull **22** and between the bottoms **18, 19**, provides added protection against potential pollution of the sea by the ship's cargo (especially if this should be oil) and also added protection for the ship itself against the taking in of sea water in large quantities, should the outer hull be damaged.

I claim:

1. A ship of the bulk carrier type having a cargo carrying portion and comprising

a. a beam structure extending uninterruptedly along each side of said cargo carrying portion at approximately the load water line for strengthening the hull against external ice pressure thereagainst, and

b. a plurality of strut assemblies extending transversely across the ship at longitudinally spaced intervals at the level of said beam structures for interconnecting said structures in a manner resistant to external ice pressure against the hull,

c. wherein each said beam structure comprises a box beam defining a duct,

d. the ship including means for generating heated water and for conveying said heated water along said duct for heating the hull in the vicinity of the load water line.

2. A ship according to claim **1**,

e. including a bow portion forward of said cargo carrying portion,

f. and means forming a continuation of said duct for conveying said heated water to said bow portion for heating the hull at said bow portion in the vicinity of said load water line.

3. A ship according to claim **1**, including means connected to said duct for discharging heated water therefrom down the outside of the hull from a location above the load water line.

4. A ship of the bulk carrier type having a cargo carrying portion and comprising

a. a beam structure extending uninterruptedly along each side of said cargo carrying portion at approximately the load water line for strengthening the hull against external ice pressure thereagainst, and

b. a plurality of strut assemblies extending transversely across the ship at longitudinally spaced intervals at the level of said beam structures for interconnecting said structures in a manner resistant to external ice pressure against the hull,

c. wherein each said beam structure comprises a box beam defining two ducts,

d. the ship including means for generating heated water and for conveying said heated water from said generating means in a first direction along one such duct and subsequently in the other direction along the other such duct for heating the hull in the vicinity of the load water line.

5. A ship including

a. a hull,

b. a mechanism for generating heated water,

c. a duct extending along the sides of the hull in the vicinity of the load water line,

d. means for conveying heated water from said mechanism along said duct for heating the hull in the vicinity of said load water line, and

e. means connected to said duct for discharging heated water therefrom down the outside of the hull from a location above the load water line.

* * * * *