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(12) # EUROPEAN PATENT APPLICATION

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(54) **Ship.**

(57) A ship comprising cargo tanks (4,5) that have a completely or approximately circular or elliptic cross sectional shape and smooth inner walls (6,7) with the cross section of the ship's hull (I3) corresponding to the shape of the cargo tank along essential portions, is characterized by the fact that the cargo tank walls (7,8) and the ship's skin (I3) are made of plate material with longitudinal braces (I5,I6), said cargo tank walls extending continuously through the entire cargo area (L) of the ship, with substantially unchanged cross sectional distance between the cargo tank wall and the skin and with the ship's skin forming an integrated continuous structure with transversal frames (I4) between said cargo tank wall (6,7) and said skin (I3), and where the longitudinal braces (I5, I6) are supported by said transversal frames (I4).

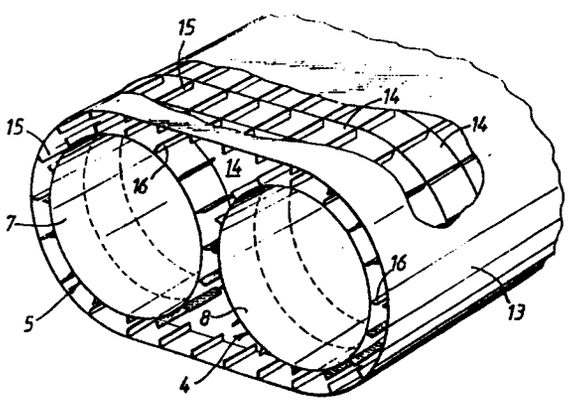

FIG. 4.

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Description

The present invention relates to a ship comprising cargo tanks that are completely or approximately circular or elliptic in cross section and have smooth inner walls, the cross section of the hull corresponding to the shape of the cargo tank in large areas.

Cargo tanks having smooth inner walls and a completely or approximately circular or elliptic cross section are known in many embodiments. By way of example, the known spherical tank freighters and tankers or bulk freighters having horizontal approximately cylindrical or slightly conical cylinder tanks may be mentioned. It is common to these known approaches that the cargo tanks are provided in a conventional hull of a ship and that the cargo tanks do not enter into the very hull structure as they do in conventional tankers.

According to the invention a completely novel ship hull concept is suggested, in which the design of the hull is determined on the basis of the design of the cargo tanks, and in which the cargo tanks are incorporated in the hull forming structural members thereof.

According to the present invention a ship as mentioned above is, thus, proposed, said ship being characterized by the fact that the cargo tank walls and the hull skin consist of plate shaped material provided with longitudinal braces, said cargo tank walls being extended continuously throughout the entire cargo area of the ship with an essentially.unchanged cross sectional area between the carco tank wall and the skin, and with the ship skin forming an integrated continuous structure provided with a transverse frame between cargo tank wall and skin, where said longitudinal bracers are supported by the transverse frame members.

Such a ship structure will provide a cargo tank showing no interior structural elements or braces, at the same time as said cargo tank will contribute efficiently to strengthen the ship both transverse and along the ship. With the present invention the advantages of shell-type structures are employed and great savings as regards consumption of materials are achieved. As to strength, advantages are achieved due to the fact that vulnerable and heavily loaded corners and sharp angles found in conventional hull cross sections are eliminated. Loads on the hull will be much more efficiently absorbed by the arcuate shapes reducing cracking to a minimum.

Said cargo tanks may be used for liquid cargo as well as for bulk cargo, e.g. grain, cement, ore, etc.

The space or spaces between the cargo tank wall and the hull skin may be used for ballast, simple kinds of cargo, or fuel.

The cargo tanks are preferably cylindrical, but they may, of course, depart from a pure cylinder shape, e.g. having the shape of a truncated cone adapted to the lines of the hull. The continuous tanc structure is suitably divided internally by transversal bulkheads, preferably in the shape of domed or vaulted.transversal bulkheads. Such vaulted transversal bulkheads may be built without braces to maintain smooth interior tank walls.

The midship frame of the new hull will have a shape resulting in good hull lines and little resistance. The new ship will have good stability when heeling over.

An advantageous embodiment of the new ship is characterized by two horizontal cylinder tanks provided side-by-side, the ship's side in cross section being shaped like semicircles about said cargo tanks before they are shaped into a bow and sternpost respectively at the ends.

The invention shall be more fully described with reference to the drawings, wherein:

Fig. I is a diagrammatic elevational view of a ship according to the invention,

Figure 2 is a top vie of said ship,

Figure 3 is a sectional view along line III-III in Figure I, shown in a larger scale,

Figure 4 is a partial perspective view of the ship according to Figure I, showing the area near sectional line III, and

Figures 5 and 6 show two further possible cross sectional shapes of the new ship.

In Figures I and 2 a ship I is shown. The ship comprises a sternpost portion 2, a bow portion 3, and a cargo area L provided between said portions. In the cargo area the ship has an essentially constant cross section. Said cross section is shown in Figure 3.

The ship's cargo area L is an integrated continous structure, in the present case comprising two horizontal cylindric tanks 4 and 5 as supporting elements of the hull 6.

Each of the cylindric tanks 4, 5 is, thus, designed as a tube shaped body 7, 8 which is closed by domed end bulkheads 9, I0 and II, I2, respectively. Said two cylindric tanks 4, 5 are placed side-by-side, as will appear from Figures I, 2, and 3, and are connected with the ship's skin I3 by transversal frames I4. The ship's skin consists of steel plates reinforced by langitudinal braces I5. The cylindric tanks 4, 5 are, correspondigly, built with steel plates welded together and reinforced by longitudinal braces I6.

It will appear, especially from Figure 3, that the cross section of the hull in large portions corresponds to the cross sectional shape of the cargo tank, the ship's sides in cross section being here shaped as semicircles about said circular cylindric cargo tanks.

In Figure 4 the structural design of the cargo area L of the ship is shown in a partial perspective view. It appears how the horizontal cylindric tanks 4, 5 are constructed as tube shaped bodies made of steel plates that are welded together and externally reinforced by longitudinal braces I6. The ship's skin I3 is constructed as a tube shaped body, made from steel plates that are welded together and internally reinforced by longitudinal braces I5. Between said skin I3 and the cargo tank walls 6, 7 transversal frames I4 are arranged supporting the longitudinal

braces I5, I6.

It will appear from Figures I - 4 that at least in the cargo area the ship is constructed with shell-type structures that are mutually reinforced and connected into an integrated continuous tube shaped structure.

The cross sectional distance between a cargo tank wall 7 or 8 and the adjacent ship's skin I3 will essentially be constant in the longitudinal direction of the ship for the extent of the cargo area L.

In Figures I and 2 it is shown how said cargo tanks may be divided internally by transversal bulkheads I7,I8. Said bulkheads are advantageously designed as semi-spherical shells and are welded to frame members I9,20 which are formed by portions of transversal frames I4 extended into the cylindrical tanks 4 and 5, respectively. The object with this is just to achieve a more advantageous welding of the transversal bulkheads I7, I8 to the supporting frames.

Figures 5 and 6 show further possible cross sectional shapes of the new ship.

In Figure 5 a cargo tank 2I with a circular cross section is shown. About said cargo tank there is a transversal frame 22 and then the skin 23 of the ship's hull. The transversal frame 22 supports longitudinal braces 24, 25 against said skin and tank wall, respectively.

The ship's hull shown in Figure 6 is constructed in the same fundamental manner as the ship's hull shown in Figure 5. The only difference is that in stead of one cargo tank in the cross section there are four cargo tanks 26, 27, 28, and 29. A transversal frame is designated 30 and longitudinal braces 3I, 32 are indicated. The location and function of these members are the same as disclosed and shown above in connection with Figure 5, and in connection with Figures I-4, respectively.

In Figures 5 and 6 only a few longitudinal braces are shown, and in Figures 3-4 longitudinal braces I5, I6 are shown for the whole cross section of the ship, but the number shown is much reduced as compared to the number of braces used in practice. This is done so as to avoid cluttering the drawing with too many details.

The present invention, thus, results in a ship that has several advantages as compared to existing ships with a double skin, a double bottom, and double decks, etc.

Among such advantages the following may be mentioned in view of a typical ship with a cargo volume of I00,000 m^3:

Enlarged cargo volume, enlarged ballast volume, a simplified midship frame structure, reduced weight of steel material, simple adaption of sections during construction work, reduced number of cargo tanks, maintenance of the steel, i.e. the steel structure is simplified, reduced hazard of cracking, more efficient tank cleaning and removal of gas and vapour from the cargo tanks is rendered possible, it is possible to carry pure ballast according to the MARPOL definition, and a minimum size of slop-tanks.

Totally, the new ship concept, thus, has conclusive advantages.

Claims

I. A ship comprising cargo tanks (4,5) that have a completely or approximately circular or elliptic cross sectional shape and smooth inner walls (6,7) with the cross section of the ship's hull (I3) corresponding to the shape of the cargo tank along essential portions, **characterized in** that the cargo tank walls (7,8) and the ship's skin (I3) are made of plate material with longitudinal braces (I6,I5), said cargo tank walls extending continously through the entire cargo area(L) of the ship, with substantially unchanged cross sectional distance between cargo tank wall and skin and with the ship's skin (I3) forming an integrated continuous structure with transversal frames (I4) between said cargo tank wall (6,7) and said skin (I3), where the longitudinal braces (I5, I6) are supported by said transversal frames (I4).

2. A ship as defined in claim I, **characterized in** two horizontal cylindrical tanks (4,5) provided side-by-side, the ship's sides in cross section being shaped as semicircles about said cargo tanks and towards the ends being shaped as a bow (3) and a sternpost (2), respectively.

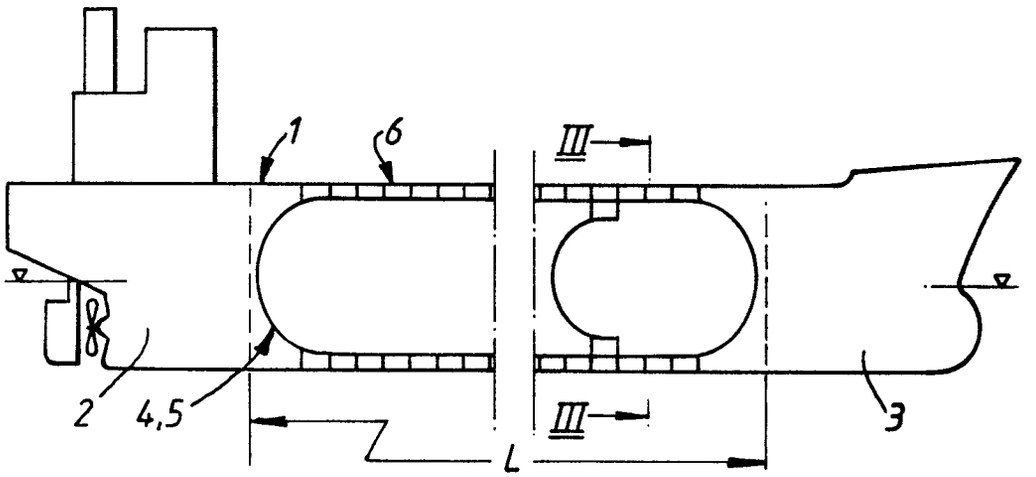

FIG. 1.

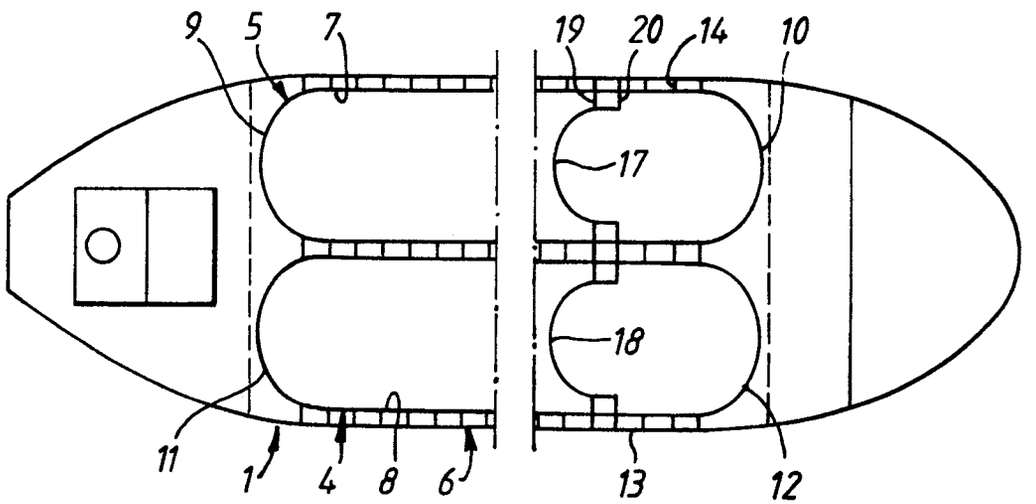

FIG. 2.

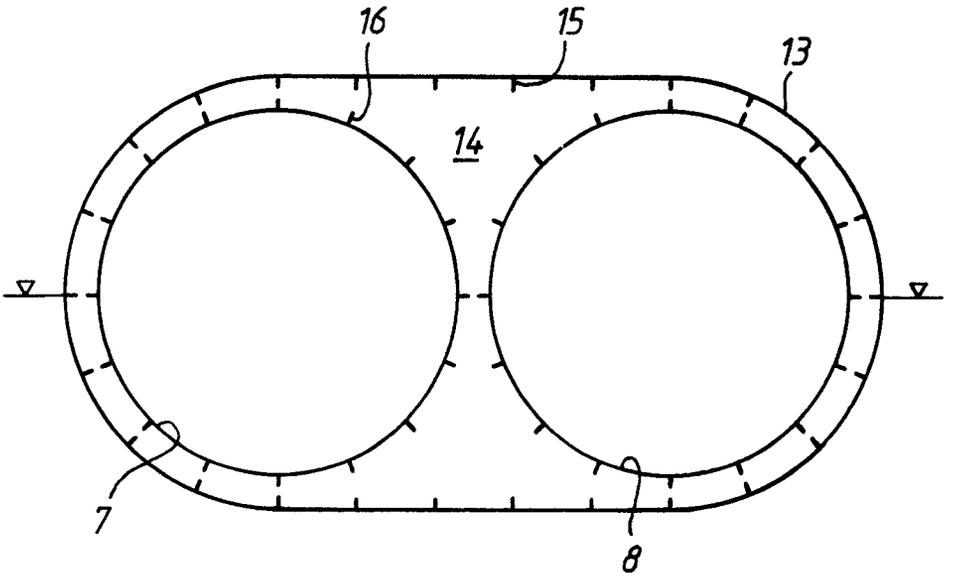

FIG. 3.

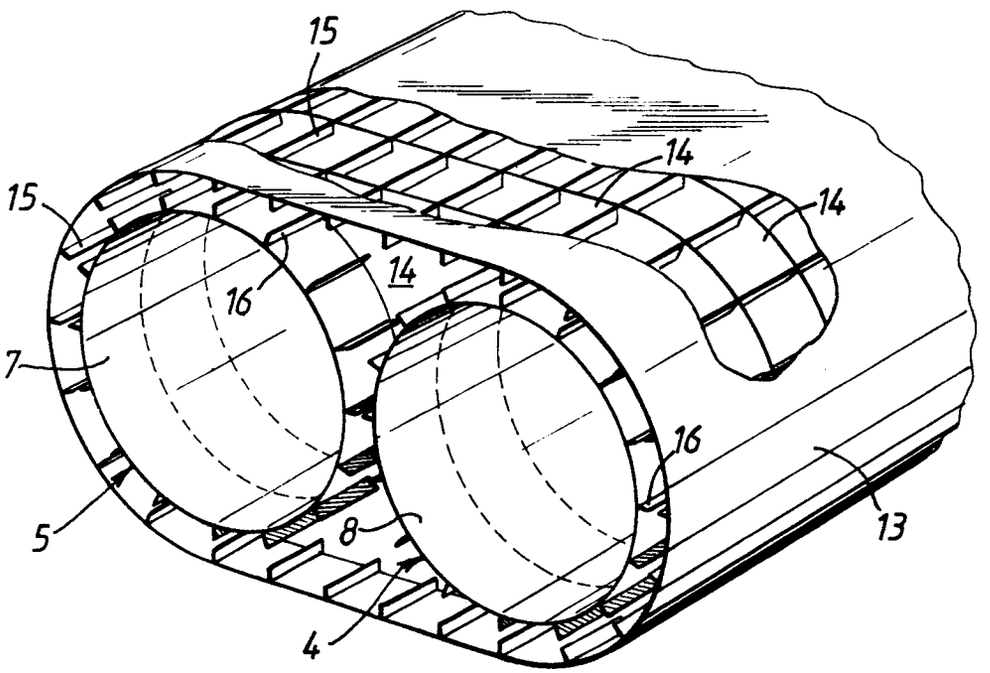

FIG. 4.

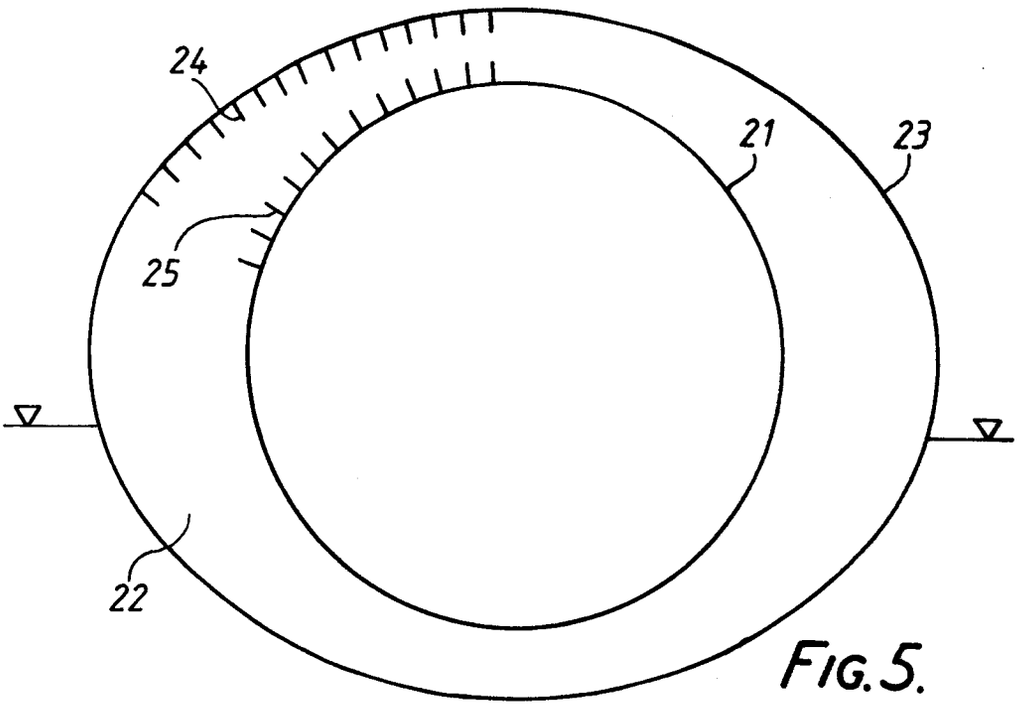

FIG. 5.

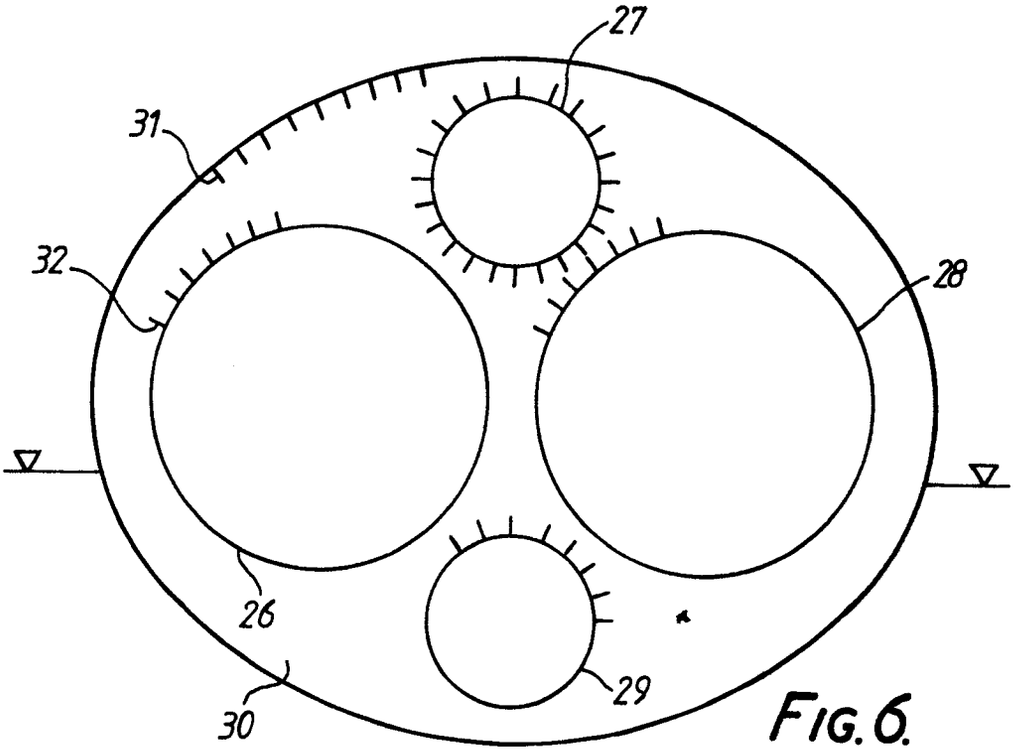

FIG. 6.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 85 0276

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB-A- 885 298 (J.M.M. FAYREN) * Page 1, lines 9-21,33-44,45-50,72-89; page 2, lines 13-24; figures 1,3 *	1,2	B 63 B 25/00 B 63 B 25/12
A	FR-A- 326 222 (M. KNAPP) * Page 1, lines 23-31; page 3, lines 1-11; figures 1-3 *	1,2	
A	MARINE ENGINEERS REVIEW, June 1978, pages 27,29, London, GB; C.P. BENNET: "A new proposal for LNG transport: pressurized at intermediate temperature" * Page 29, lines 25-39; figure 2 *	1,2	
A	FR-A- 754 275 (M.J. DE KLERK) * Page 2, lines 14-50; figures 1-3 *	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.4) B 63 B
A	FR-A-1 114 057 (R. LEROUX et CHANTIERS DUBIGEON) * Page 2, abstract; figures 1,3 *	1,2	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-01-1987	VISENTIN, M.

CATEGORY OF CITED DOCUMENTS

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