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Dragonas et al.

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[54] **VESSEL WITH REMOVABLE SECTIONS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **114/77 R**, 114/72, 114/43.5

[51] **Int. Cl.** **B63b 3/08**

[58] **Field of Search** ..... 114/77, 72, 65 R, 56, 43.5, 114/235 R

[56] **References Cited**

UNITED STATES PATENTS

1,051,127	1/1913	L'Anglois	114/77 A
1,141,755	6/1915	Basile	114/77 A
3,417,721	12/1968	Vienna	114/43.5

FOREIGN PATENTS OR APPLICATIONS

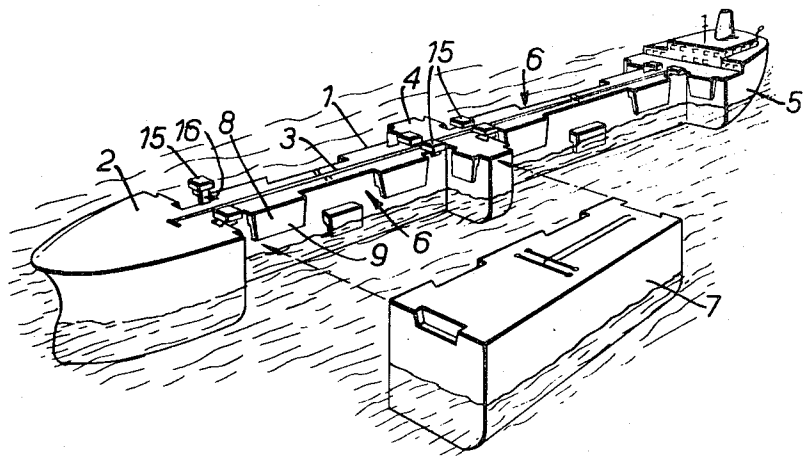
1,540,995	7/1967	France	114/43.5

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Attorney, Agent, or Firm—Brisebois & Kruger

[57] **ABSTRACT**

A vessel comprises a skeleton part carrying propulsion and steering means and comprising a bow section and a stern section connected by a spine and a plurality of container portions engageable with the skeleton part intermediate the bow and stern sections and laterally of the spine, the container portions when engaged with the skeleton part defining therewith the exterior shape of the vessel hull.

10 Claims, 8 Drawing Figures



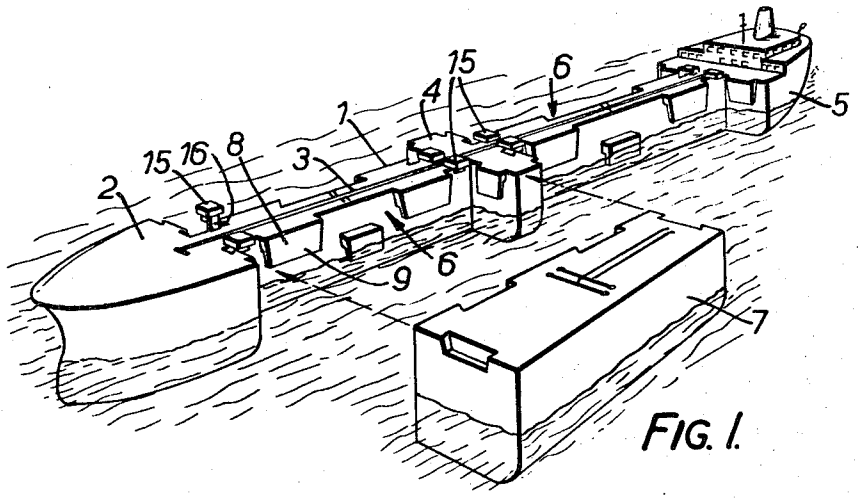


FIG. 1.

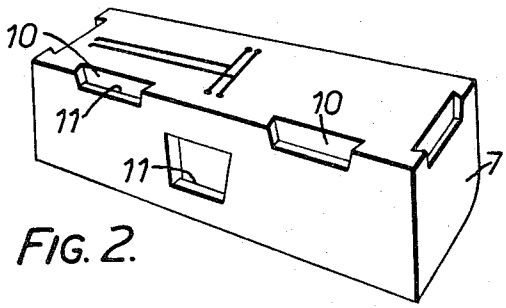


FIG. 2.

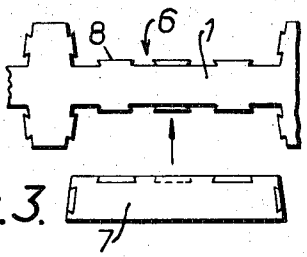


FIG. 3.

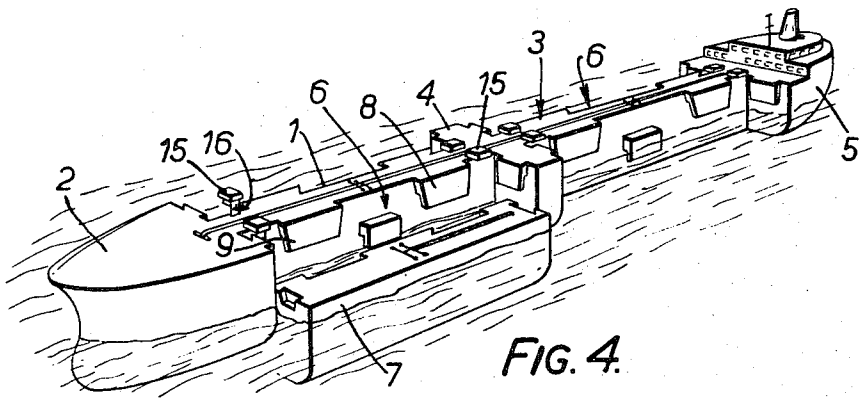


FIG. 4.

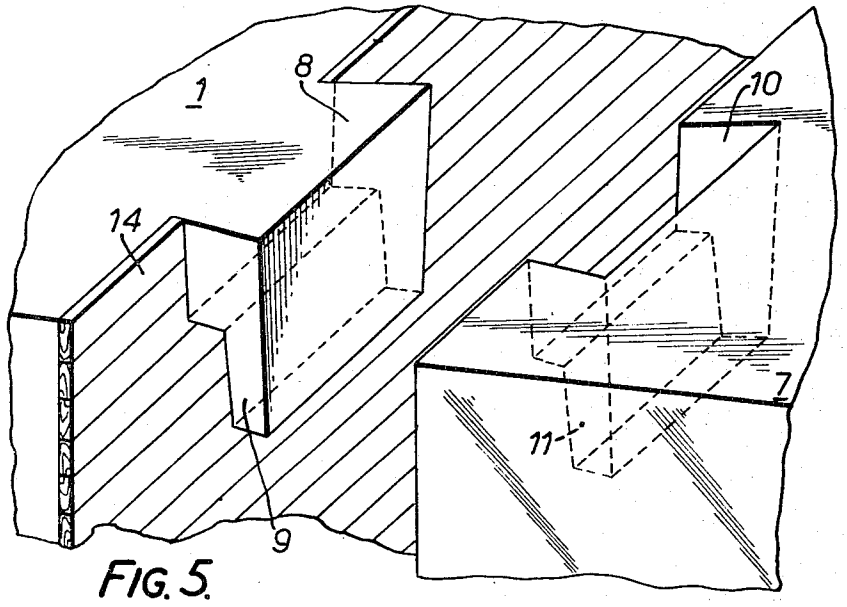


FIG. 5.

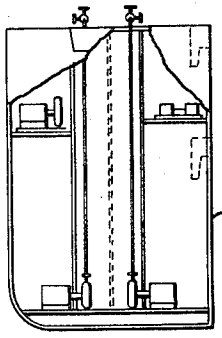


FIG. 6.

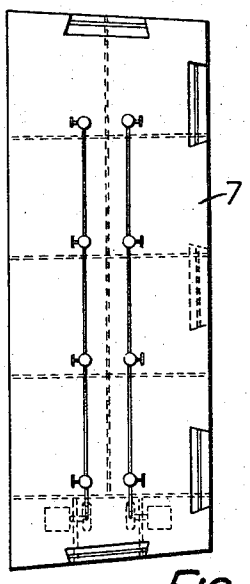


FIG. 7.

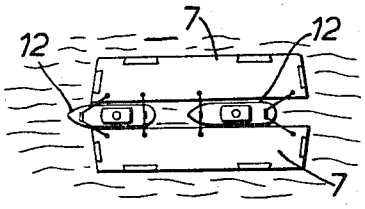


FIG. 8.

VESSEL WITH REMOVABLE SECTIONS

This invention is concerned with improvements in and relating to vessels.

The size of cargo carrying vessels and in particular tankers, hereafter called 'crude carriers', has increased very considerably in recent years to vessels of the order of 250,000 to 350,000 tons.

Apart from structural considerations, one of the principal difficulties in enlarging the size of crude carriers to the region of 1,000,000 tons and over is the time consumed in cargo handling for a vessel of this size by the use of conventional pumping methods. In addition, very large crude carriers, which will be referred to as VLCCs, of the proposed size are physically too large for the shipyards and docking facilities presently provided in most parts of the world.

According to the present invention there is provided a vessel comprising a skeleton part carrying propulsion and steering means, a plurality of container portions, and means for releasably engaging the container portions with the skeleton part, the container portions when engaged with the skeleton part defining therewith the exterior hull shape of the vessel.

Such a vessel may be used for various cargoes, such as solids, liquids and gases, but is particularly intended as a crude carrier.

Further features and advantages of the present invention will appear from the following description of some embodiments, given by way of example only, reference being had to the accompanying drawings, in which:

FIG. 1 is a perspective view of the skeleton part of a vessel and a cargo container detached therefrom;

FIG. 2 is a perspective view of a cargo container;

FIG. 3 is a plan view of a part of the skeleton part and of a container;

FIG. 4 is a perspective view of a vessel in process of attachment of a loaded cargo container;

FIG. 5 is an enlarged perspective view of a part of the skeleton part and a part of a cargo container;

FIGS. 6 & 7 are a plan and a partial vertical section through a cargo container part showing the oil pumps and power units for their operation, and

FIG. 8 is a plan view of two cargo container parts being towed by two tugs.

The vessel comprises a skeleton part 1 having a bow section 2, a spine 3, an intermediate or midships section 4 and a stern section 5. This skeleton part houses the power unit, steering gear, main services, navigation gear, accomodation, ballast tanks, bunkers, etc.

The skeleton part defines a number of 'berths' 6 in each of which a cargo container part or caisson 7 can be received. Means provided to engage the caissons 7 with the skeleton part 1 comprise lugs 8 on the skeleton part having tongues 9, the lugs being engageable in recesses 10 in the caissons wherein the tongues 9 can engage in cavities 11 in the caissons upon relative vertical movement of each caisson 7 and the skeleton part 1.

In FIG. 1 four berths 6 are shown in the skeleton part 1 but six or more may be provided.

The vessel of FIG. 1 is envisaged as over 2,000 ft. in length and having four caissons of 250,000 tons capacity each. Where more than four caissons are envisaged, they are of lesser capacity to achieve a like total.

In operating the vessel, the caissons are loaded by conventional means at the cargo loading point. For liquid cargoes their manifolds are connected by means of flexible pipes and couplings, or by connection to rigid metal flow booms.

The loaded caissons 7 are moved to the location of the skeleton part which generally does not enter the harbour or oil dock facility, by means of tugs, FIG. 8 showing an example of two caissons 7 being moved by two tugs 12, to be further described. The caissons 7 are moved into the berths 6 in the skeleton part, the sequence being immaterial as the caissons are identical. The caissons, being fully loaded, have a deep draught. When all caissons are provisionally in situ with the lugs 8 aligned with recesses 10, the skeleton part is ballasted. As it is lowered, the tongues 9 which have a wedge section, start to engage in the cavities 11 which are wedge-shaped as shown in FIG. 5. The tongues 9 guide the caissons 7 through the ultimate stages of alignment in the berths 6 in the skeleton part 1. When the caissons 7 are in position with their decks flush with the deck of the skeleton part, they are positively locked thereto by locking means shown diagrammatically at 15, which are carried by the skeleton part on, for example, stems 16 which are hydraulically movable vertically. The locking means may have lugs engageable in recesses in the caissons and may provide locking in both directions of movement of a caisson 7 relative to the skeleton part 1. They can also include a facility to adjust the position of a caisson when one of its ends gets out of height alignment during the attachment process by providing a vertical thrust component on the caisson 7 relative to the skeleton part 1 or this component may be provided by power operated pads carried by the skeleton part and bearable on suitable surfaces of the caisson 7.

Instead of attaching all caissons simultaneously, as described above, one or several caissons 7 can be attached at a time. If the operation has to be done repeatedly, the skeleton part 1 is ballasted and deballasted repeatedly as required. If, for example, a single caisson at the bow end is to be attached, the skeleton part 1 may be ballasted down by the stern. The resulting misalignment in the horizontal plane is corrected in the attachment process by the wedge shaped tongues 9 and slots 11 which have a gradually increasing cone action which "levers" the caisson into position, and by the pads. The inevitable "bumps" against the hull of the skeleton part are taken up by a wooden or resilient surface layer 14 (FIG. 5) on the skeleton part 1.

On completion of the loading operation, deck pipe lines on the caissons are coupled to those on the deck of the skeleton part, connecting all tanks to the ship's pumping system as in a conventional tanker. The ship can therefore be ballasted as required by transferring cargo from one tank to another.

It is of course desirable for all caissons 7 to be attached simultaneously because this saves the maximum amount of time. Whether this can be done depends on the availability of the number of tugs required for simultaneous operation, on the tranquillity of the sea, and on the skill of the various operators.

Discharge of the cargo is effected in a like manner. The locking means 15 are released and the skeleton part 1 is de-ballasted until the caissons are free of the tongues 9 so that the caissons can be towed away. It is likewise possible to detach one or several caissons only, by anchoring the caissons which are not to be detached, to the skeleton part, with sufficient freedom to allow for the rise of the skeleton part during de-

ballasting. These caissons thus remain semicaptive in such a position that they lock again automatically when the skeleton part is re-ballasted.

Caissons which are delivered for discharge are at once replaced by empty caissons, if there is insufficient time to discharge and return the caissons. Advantageously, sufficient numbers of caissons are provided for the necessary number of caissons to be ready at the discharging or loading place, to effect the exchange without waiting for the loading and/or discharging charging operation to be completed. As crude oil traffic on a large scale operates generally between one loading facility in the East and one or several refinery docks in Europe, appropriate arrangements can be made. In operation, loaded caissons are provided at one end and empty caissons at the other, so that the loading and discharge time does not cause standstill of the skeleton part. It is expected that this system will result in a faster turnaround of the vessel which will produce important operational economies.

Referring again to FIG. 8, this shows a special method which could be used to propel two caissons by two tugs, employing special tackle in the form of bridles. In this configuration, caissons can be transported quite conveniently over long distances. The configuration would be used primarily for the purpose of transporting caissons from one loading or discharge point to another, for operational purposes.

Positioning of the caissons in the last stage, that is after the tugs have pushed the caisson into approximate position inside the berth, is effected by ropes and winches. The skeleton part is provided with two deck winches (not shown) at every berth which serve to pull the caisson close to the skeleton part and to regulate its longitudinal position. If the operation is to be performed at the optimum level of efficiency (simultaneously for all caissons), close co-operation between all winch operators (who would also control the hydraulic pads) is required. To facilitate this process, computerized controls for the pads, winches and the ballasting pumps may be used and including sensing elements such as electric eye cells, which continuously compare the deck levels of the skeleton part with those of each caisson, and proximity feelers which indicate whether both ends of each caisson are within tongue-engagement distance. At the appropriate moment, and after all adjustments at the winches have been performed under computer control, the skeleton part is lowered by ballasting. During this stage, it is the task of the winch operators (or of the computer) to take up the slack as the distance between the caisson decks and the skeleton part deck diminishes.

An elaborate computer is not required but a simple control system which will prevent the supervisor on the bridge lowering the ship until all winch operators report that all caissons are in correct pre-locking alignment.

It will be noted that the berths have tongues **9** on all three sides. The transversely positioned tongues **9** have the secondary purpose of transferring those stresses which are normally taken up by the hull of a ship, to the hull of the caisson.

The caisson system changes the basic construction of the ship radically from that of conventional tankers. At present, VLCCs are constructed as all ships have been in the past. Stresses are primarily carried by a multitude of girders (keelsons) in the bottom of the ship. Tankers have fewer interior frames and stringers than other types of ships because their interior is pre-eminently empty of all structures, except for the bulkheads which divide the tanks. In enlarging tankers from the established size of 75,000 to over 200,000 tons (the present VLCCs), the longitudinal stiffening of the structure became of paramount importance. During trial runs, this part of the structure is generally checked by strain gauges.

The skeleton part of the ship described herein has a comparatively narrow spine or centre section which could accommodate only a comparatively small number of conventional girders. On the other hand, the elongated and narrow centre section lends itself very well to the accommodation of a substantial box girder with cross braces which will have greater stability than the ordinary profiled girders. The stress calculations for this type of box girder are more akin to structural engineering than to naval architecture, and the indications are that this form of rectangular "backbone" will furnish the rigidity which is required for a vessel of the proposed length which may easily bridge a number of wave troughs and may be temporarily less supported on several points of the structure. A floating bridge girder may be used, the narrow edge of which forms the keel, supported by a rudimentary bow and stern section. The latter contains all machinery (as in conventional tankers), and the "backbone" accommodates all auxiliary ballast tanks, bunkers and slop tanks, and also processing facilities for the dirty ballast.

The skeleton part alone of the ship is designed to be seaworthy in the absence of one or several caissons, but its performance is considerably impaired by increased drag. In closed configuration (with all the caissons in situ), the ship should perform as well as a conventional ship, although there will be small gaps between the caissons and the skeleton part. These gaps, which set up resistance, may be avoided or closed by overlapping plates or elastic seals.

It will be evident that the above described system can also be applied to ordinary cargo carriers and not only to tankers. In this application, the containerization containers themselves form part of the ship.

Finally, the ship has certain advantages in avoiding pollution. One of the principal objections to increases in the present size of tankers is the enormous increase in comtamination which would occur if the ship meets with an accident. In a caisson-type ship, this danger is minimized because those caissons which are not affected by the accident can be set loose and can be subsequently recaptured and towed away. In all probability, in a serious accident oil pollution would be restricted to the contents of one caisson.

Therefore, this ship, in case of collision, stranding or fire, does not present the hazard to the entire ship and/or cargo as does the conventional ship and therefore will reflect favourably on insurance premiums.

This ship allows quick turn around because cargoes can be left at one port while the remaining cargo is taken to the next port of discharge. This is particularly important in the case of cryogenic cargoes.

This ship may reduce the port charges due to reduction in gross tonnage.

This ship can, if desired, eliminate the discharging of cargoes by the ship's crew. Instead shore crews can handle the discharging of cargoes.

This ship allows the drydocking and repairs of the hull to be done with the minimum of delay to the ship.

We claim:

1. A vessel comprising:

a. a skeleton part carrying propulsion and steering means, comprising a bow section and a stern section connected by a spine and defining a plurality of recesses between the bow and stern sections and said spine, each said recess being open at its top and bottom and laterally of said vessel;

b. a plurality of individually floatable container portions;

c. means for releasably engaging said container portions in said recesses intermediate said bow and stern sections and laterally of said spine, said means comprising downwardly extending stationary tongue means on said skeleton part and upwardly opening cavity means on said container portions, said tongue means being engageable in said cavity means by relative vertical movement of said skeleton part and said container portions; and

d. means for controlling the buoyancy of said skeleton part;

and wherein said container portions, when engaged with said skeleton part, define therewith the exterior hull surface of the vessel.

2. A vessel according to claim 1 including an intermediate section extending laterally from said spine intermediate said bow and stern sections and defining therewith berths for said container portions defined on three sides by said skeleton part, said releasable engaging means being positioned to couple a said container portion to said skeleton part on the three sides of a said berth.

3. A vessel comprising:

a. a skeleton part carrying propulsion and steering means and defining a plurality of recesses each of which is open at its top and bottom and laterally of the vessel;

b. a plurality of individually floatable container portions; and

c. means for releasably engaging said container portions in said recess defined by said skeleton part;

said container portions when engaged with said skeleton part defining therewith the exterior hull shape of the vessel.

4. A vessel according to claim 3 wherein said skeleton part comprises a bow section and a stern section connected by a spine, said container portions being releasably engageable with the skeleton part between the bow and stern sections and laterally of the spine.

5. A vessel according to claim 4 including an intermediate section extending laterally from said spine intermediate said bow and stern sections and defining therewith berths for said container portions defined on three sides by said skeleton part, said releasable engaging means being positioned to couple a said container portion to said skeleton part on the three sides of a said berth.

6. A vessel according to claim 3 wherein said releasable engaging means comprise stationary tongue means and cavity means on said skeleton part and each said container portion.

7. A vessel according to claim 6 wherein said tongue and cavity means are interengageable by relative vertical movement.

8. A vessel according to claim 7 wherein said tongue and cavity means are wedge-shaped in the vertical direction to facilitate interengagement.

9. A vessel according to claim 8 wherein each said tongue means extends downwardly from a lug mounted on said skeleton part and each said cavity means opens upwardly into a recess in a said container portion in which said lug is positioned when said releasable engaging means are engaged.

10. A vessel according to claim 3 wherein said skeleton part is provided with means operable to control the buoyancy thereof.

* * * * *