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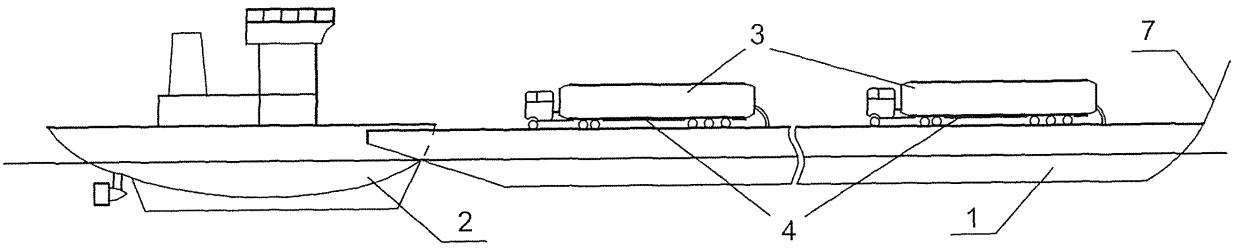
(54) TUG/BUNKER BARGE COMBINATION

(57) The invention relates to field of shipbuilding and, more specifically, to seagoing bunkering vessels intended for bunkering seagoing ships and refers to the issues of liquefied natural gas transportation and serves the purpose improve economic efficiency of the bunker barge vessel by elimination of gas vaporing in the containers and its processing, shortening the process of pressurized LNG transfer during ship bunkering, reducing gas losses at LNG loading and delivery to the bunker vessel due to significant reduction of intermediate cargo operations during LNG loading and delivery to the bunkered ship.

For this purpose the tug/bunker barge combination comprised of the specialized barge articulated to the tug by means of coupling device is equipped with liquefied natural gas containers located on the barge and the cargo system for integrating the said containers into a single installation for LNG storage and dispensing for ship bunkering, wherein *according to the invention* the LNG containers are made in the form of tanks mounted on the wheeled chassis, which are rolled onto a barge, and then sea fastened on the barge, and connected to the barge cargo system, the barge being fitted with a facility for rolling on the tanks.

Furthermore, the barge deck is adapted to allow traveling of wheeled vehicles. Moreover, the facility for rolling the tanks onto the barge is made in the form of a ramp or bridge located outside of the barge.

In this case the barge deck has thermal insulation coating aimed to prevent any damage to the deck by accidental spills of liquefied natural gas.



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Description

1. FIELD OF THE INVENTION

[0001] The invention relates to shipbuilding and, more specifically, to seagoing bunkering vessels intended for bunkering seagoing ships as well as to liquefied natural gas transportation.

2. DESCRIPTION OF PRIOR ART

[0002] The prior art discloses tug/bunker barge combination (TBC) for ship bunkering comprised of a specialized barge rigidly hitched to a tug. The barge is fitted with liquefied natural gas (LNG) containers integrated by the cargo system into a single installation for LNG storage and dispensing to the ship for bunkering - gas fueling of ship's power plants (WO 2012 074584) - prototype.

[0003] However, in case of long-term (up to several weeks) LNG storage the gas in containers on board of the bunker barge awaiting a ship for bunkering will heat up leading to gas boiling and evaporation in containers, and the gas vapors will have to be processed. In this case the warmer is the gas delivered to the bunkered ship, the shorter is the gas storage time on board the ship; moreover, in this case the transfer of such "warm" LNG becomes much more complicated due to increased gas pressure in the containers during bunkering.

[0004] Furthermore, for loading the bunker vessel with LNG from a shore-based bunkering base or LNG terminal, or from an LNG carrier it is necessary to provide an area for setting up a shore-based terminal or "mating" the bunker vessel with LNG carrier.

[0005] And finally, the LNG transfer is practically always associated with partial gas losses growing with the number of loading operations performed.

3. SUMMARY OF THE INVENTION

[0006] The claimed invention is aimed to improve economic efficiency of the bunker barge vessel by elimination of gas vaporing in the containers and its processing, shortening the process of pressurized LNG transfer during ship bunkering, reducing gas losses at LNG loading and delivery to the bunker vessel due to significant reduction of intermediate cargo operations during LNG loading and delivery to the bunkered ship.

[0007] For this purpose the tug/bunker barge combination comprised of the specialized barge articulated to the tug by means of coupling device is equipped with liquefied natural gas containers located on the barge and the cargo system for integrating the said containers into a single installation for LNG storage and dispensing for ship bunkering, wherein *according to the invention* the LNG containers are made in the form of tanks mounted on the wheeled chassis, which are rolled onto a barge, and then sea fastened on the barge, and connected to the barge cargo system, the barge being fitted with a facility for rolling on the tanks.

[0008] Furthermore, the barge deck is adapted to allow traveling of wheeled vehicles. Moreover, the facility for rolling the tanks onto the barge is made in the form of a ramp or bridge located outside of the barge.

[0009] In this case the barge deck has thermal insulation coating aimed to prevent any damage to the deck by accidental spills of liquefied natural gas.

[0010] Besides the thermal insulation coating has a covering, e.g. of perforated metal plates or metal grillages.

[0011] Making the liquefied natural gas containers as tanks on wheeled chassis to be rolled onto a barge and thereafter sea fastened and connected to the barge cargo system will increase the economic efficiency of such bunker barge by elimination of gas vaporing in the containers, shortening the process of LNG transfer during ship bunkering, reducing gas losses at LNG loading and delivery to the bunker vessel due to significant reduction of intermediate cargo operations during LNG loading and delivery to the bunkered ship.

4. BRIEF DESCRIPTION OF DRAWINGS

[0012] The substance of the invention is explained by figures, where Fig.1 shows the tug/bunker barge combination carrying tanks on wheeled chassis, Fig.2 shows the integrated cargo system of the tug/bunker barge combination with connected LNG tanks intended for subsequent bunkering (top view in Fir.1).

5. PREFERRED EMBODIMENT

[0013] The tug/LNG bunker barge combination including the specialized barge 1articulated to the tug 2 by means of coupling device (not shown in the figure), LNG containers on the barge made in the form of tanks 3 which are positioned on wheeled chassis 4 and rolled onto the barge 1. The tug/LNG bunker barge combination has the cargo system comprised of interconnected pipelines 5 with stop & connecting valves 6 intended for integration of LNG tanks 3 into a single installation for LNG storage and dispensing for ship bunkering. Tanks 3 are connectable to the cargo system.

[0014] Barge 1 is outfitted with the devices (not shown in the figure) for sea fastening of the wheeled chassis 4 mounted with LNG tanks 3 to be rolled on the barge, and a facility for rolling on the tanks 3 made as the ramp 7 located on the barge, or a shore-based loading bridge located outside the barge 1 (not shown in the figure).

[0015] The deck of barge 1 is adapted to allow travelling of wheeled vehicles, it is applied with a thermal insulation coating (not shown in the figure) intended to prevent any damage to the deck by accidental spills of liquefied natural gas.

[0016] The thermal insulation coating has a covering, e.g. of perforated metal plates or metal grillages (not shown in the figure).

6. INDUSTRIAL APPLICABILITYE

[0017] The process of ship bunkering by the claimed tug/bunker barge combination will be as follows.

[0018] Pre-filled LNG tanks 3 are rolled on the deck of barge 1 using the wheeled chassis over the ramp 7 or shore-based loading bridge (not shown in the figure), the said tanks are then sea fastened on the deck and connected with the pipelines 5 via stop & connecting valves 6 to the barge cargo systems to integrate the same into a single liquefied natural gas storage system.

[0019] The tug/bunker barge combination with the LNG tanks 3 onboard sails to the ship to be bunkered, and on approach to the same the integrated LNG system of the bunker barge is connected to the fuel system of the ship to be bunkered. For this purpose the cargo system of the bunker barge is mated with the LNG receiving system of the ship to be bunkered, and the full scope of actions for LNG transfer is performed as specified in the operational documentation of the LNG bunker barge and the bunkered gas-fuel ship.

[0020] Upon completion of the bunkering the tug/bunker barge returns to the berth where the cargo system is ventilated, thereafter the tanks 3 are disconnected from the integrated cargo system of the barge 1, released from sea fastenings and rolled off to the shore.

[0021] The claimed tug/bunker barge combination provides higher economic efficiency being an advantage as compared with its prototype.

Claims

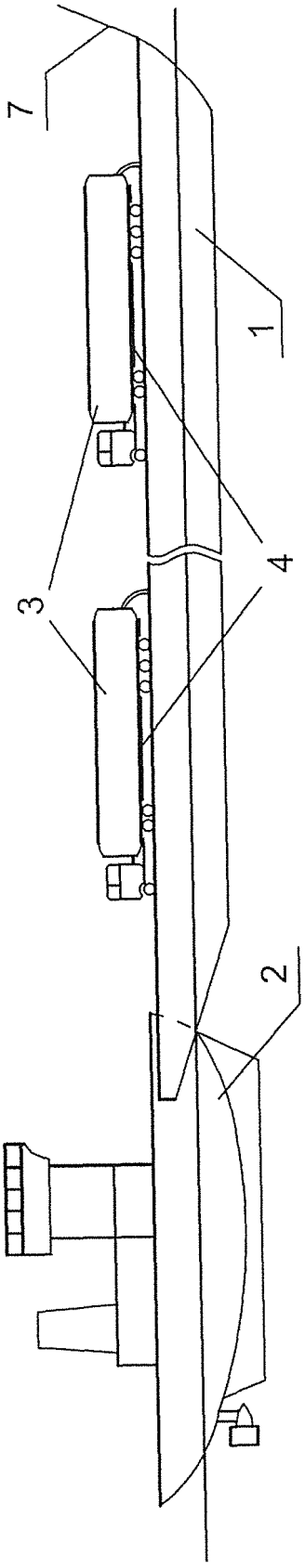
1. The tug/bunker barge combination comprised of the specialized barge articulated to the tug by means of coupling device, liquefied natural gas containers located on the barge and the cargo system for integrating the said containers into a single installation for LNG storage and dispensing for ship bunkering including pipelines with stop & connecting valves, wherein the LNG containers are made in the form of tanks which are mounted on the wheeled chassis, which are rolled onto a barge, and then sea fastened on the barge, and connected to the barge cargo system, the barge being fitted with a facility for rolling on the tanks.

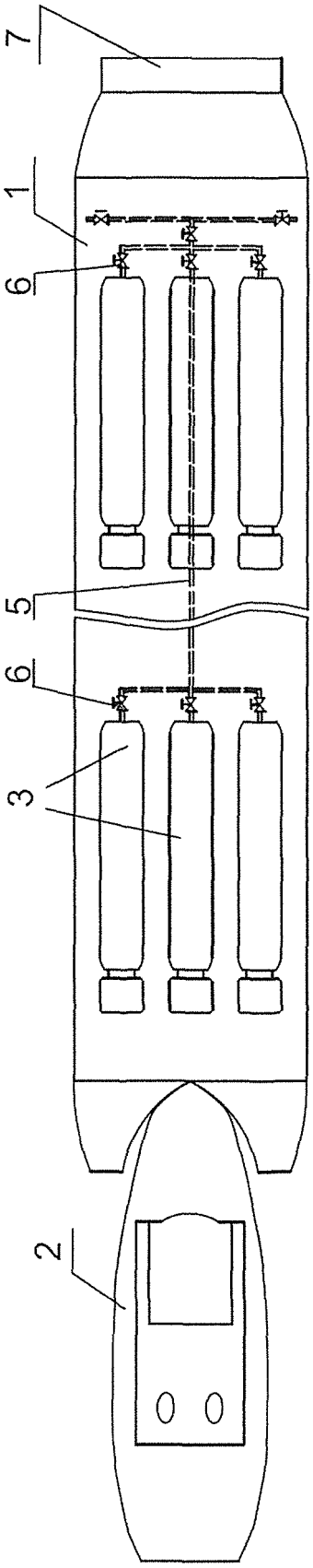
2. The tug/bunker barge combination of Claim 1, wherein a facility for rolling on the tanks is made as the ramp located on the barge, or a shore-based loading bridge located outside the barge 1.

3. The tug/bunker barge combination of Claim 1, wherein the deck of barge is adapted to allow travelling of wheeled vehicles.

4. The tug/bunker barge combination of Claim 1, wherein the barge deck is applied with thermal insulation coating aimed to prevent any damage to the deck by accidental spills of liquefied natural gas.

5. The tug/bunker barge combination of Claim 4, wherein the thermal insulation coating has a covering, e.g. of perforated metal plates or metal grillages.


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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

B63B 25/08 *(2006.01)* ***B63B 21/56*** *(2006.01)*
B63B 27/34 *(2006.01)* ***B63B 35/00*** *(2006.01)*
B63B 35/28 *(2006.01)*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B63B 25/08, 25/12, 25/16, 25/00, 27/34, 27/30, 27/00, 35/28, 35/44, 35/00, 21/56, 21/62, 21/00, 38/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSearch (RUPTO internal), Espacenet, Information Retrieval System of FIPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
D,A	WO 2012/074584 A1 (ARGENT MARINE MANAGEMENT, INC. et al.) 07.06.2012, abstract, the claims, fig. 1-7	1-5
A	SU 1189733 A (MANUILOV M.I.) 07.11.1985, the claims, fig. 1-4	1-5
A	RU 115309 U1 (GOSUDARSTVENNOE OBRAZOVATELNOE UCHREZHDENIE VYSSHEGO PROFESSIONALNOGO OBRAZOVANIA "SARATOVSKY GOSUDARSTVENNY TEKHNICHESKY UNIVERSITET") 27.04.2012, abstract	1-5
A	KR 20120135180 A (SAMSUNG HEAVY IND) 12.12.2012, abstract, fig. 1-8	1-5

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search	Date of mailing of the international search report
15 September 2014 (15.09.2014)	16 October 2014 (16.10.2014)
Name and mailing address of the ISA/ RU	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 2014/000432

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to claim No.
A	RU 121487 U1 (FEDERALNOE BIUDZHETNOE OBRAZOVATELNOE UCHREZHDENIE VYSSHEGO PROFESSIONALNOGO OBRAZOVANIA "SANKT-PETERBURGSKY GOSUDARSTVENNY UNIVERSITET VODNYKH KOMMUNIKATSY") 27.10.2012, the claims, p. 4, para. 2 (from the top), fig. 1	1-5
A	RU 69481 U1 (MALKO VITALY NIKOLAEVICH) 27.12.2007, abstract, fig. 1-4	1-5
A	RU 2203197 C2 (DEN NOSHKE STATS OLESELSKAP A.S.) 27.04.2003, the claims, fig. 1-7	1-5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2012074584 A **[0002]**