to a cryogenic temperature in the reliquefaction apparatus including a refrigeration cycle, and the reliquefied BOG is returned to the cargo tank.

In the case of a conventional LNG carrier equipped with a DFDE propulsion system, BOG is consumed in such a manner that it is supplied as fuel to the DFDE after treating BOG by only a BOG compressor and heating, without installing the reliquefaction facility. Therefore, when an amount of fuel necessary for an engine is smaller than a generation amount of BOG, there is a problem that BOG is burnt in a gas combustion unit (GCU) or is vented to atmosphere.

Even though a conventional LNG carrier equipped with a reliquefaction facility and a low-speed diesel engine can treat BOG through the reliquefaction facility, the control of the entire system is complicated due to the operation complexity of the reliquefaction facility using nitrogen gas, and a considerable amount of power is consumed.

Consequently, there is a need for continuous research and development of systems and methods for efficiently treating liquefied gas, including BOG generated naturally from the cargo tank.

DISCLOSURE

TECHNICAL PROBLEM

~~The~~Embodiments of the present invention ~~has been made in an effort~~ seek to solve the above problems and is directed to a liquefied gas treatment system and method for a vessel, which includes a cargo tank storing LNG, and an engine supplied with the LNG stored in the cargo tank and using the LNG as fuel, wherein the BOG generated in the cargo tank and the LNG stored in the cargo tank are used in the engine as fuel, thereby achieving the efficient use of liquefied gas.

TECHNICAL SOLUTION

According to an aspect of the present invention, there is provided a liquefied gas

cylinders and is supplied as fuel to the sub engine.

The BOG generated in the cargo tank and forcibly vaporized LNG may be supplied to and compressed by the compressor and are supplied as fuel to at least one of the main engine and the sub engine.

When the LNG stored in the cargo tank is supplied to the sub engine, a heavy hydrocarbon component may be separated from the LNG so as to adjust a methane number of the LNG to a value necessary for the sub engine.

BOG, which is not supplied as fuel to the main engine and the sub engine among BOG compressed by the compressor, may be liquefied by exchanging heat with BOG that is discharged from the cargo tank and transferred to the compressor.

ADVANTAGEOUS EFFECTS

According to embodiments of the present invention, all BOG generated during the transportation of cargo (that is, LNG) in the LNG carrier can be used as the fuel of the engine, or may be reliquefied, be returned to the cargo tank and be stored therein. Therefore, an amount of BOG consumed in the GCU or the like can be reduced or removed. Furthermore, BOG can be treated by reliquefaction, without using separate refrigerants such as nitrogen.

Therefore, according to the liquefied gas treatment system and method in embodiments of the present invention, BOG generated from the cargo tank can be reliquefied without installing a reliquefaction apparatus consuming a large amount of energy and requiring excessive initial installation cost, thereby saving energy consumed in the reliquefaction apparatus.

In addition, according to the liquefied gas treatment system and method in embodiments of the present invention, a part of compressed BOG after pressurizing BOG discharged from a cargo tank can be supplied to a high pressure gas injection engine (that is, a propulsion system) as fuel. The remaining compressed BOG can be cooled with cold energy of BOG after discharge from the cargo and before compression, and returned to the cargo

tank.

In addition, in the liquefied gas treatment system and method according to embodiments of the present invention, since it is unnecessary to install the reliquefaction apparatuses using separate refrigerants (that is, nitrogen-refrigerant refrigeration cycle, mixed-refrigerant refrigeration cycle, or the like), facilities for supplying and storing the refrigerants need not be separately installed. Consequently, it is possible to save initial installation cost and operation cost for configuring the entire system.

In addition, according to the liquefied gas treatment system and method in embodiments of the present invention, when BOG cooled and liquefied in the heat exchanger after compression is decompressed by the expander, wasted energy can be reused because energy can be generated during expansion

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic configuration diagram illustrating a liquefied gas treatment system for a vessel according to a first embodiment of the present invention.

FIG. 2 is a schematic configuration diagram illustrating a liquefied gas treatment system for a vessel according to a second embodiment of the present invention.

FIGS. 3 and 4 are schematic configuration diagrams illustrating liquefied gas treatment systems for a vessel according to modifications of the second embodiment of the present invention.

FIG. 5 is a schematic configuration diagram illustrating a liquefied gas treatment system for a vessel according to a third embodiment of the present invention.

FIG. 6 is a schematic configuration diagram illustrating a liquefied gas treatment system for a vessel according to a fourth embodiment of the present invention.

FIGS. 7 and 8 are schematic configuration diagrams illustrating liquefied gas treatment systems for a vessel according to modifications of the fourth embodiment of the present invention.

FIG. 9 is a schematic configuration diagram illustrating a liquefied gas treatment