【Technical Solution】

[22] In accordance with one aspect of the present invention, there is provided a ship comprising an engine, further comprising: a self-heat exchanger performing heat exchange with respect to boil-off gas (BOG) discharged from a storage tank; a multistage compressor compressing the BOG discharged from the storage tank and having passed through the self-heat exchanger in multiple stages; a first decompressor expanding some of the BOG compressed by the multistage compressor and having passed through the self-heat exchanger; a second decompressor expanding the other BOG compressed by the multistage compressor and having passed through the self-heat exchanger, wherein the self-heat exchanger cools the BOG compressed by the multistage compressor using the BOG discharged from the storage tank and the BOG expanded by the first decompressor as a refrigerant, and the BOG having passed through the first decompressor and the self-heat exchanger is sent to at least one of a generator and a low-pressure engine.

[23] The BOG having passed through the second decompressor and having a gas/liquid mixed phase may be sent to the storage tank.

[24] The ship may further include a second liquid/gas separator disposed downstream of the second decompressor and separating liquefied natural gas generated through reliquefaction of the BOG and gaseous BOG from each other, wherein the liquefied natural gas separated by the second gas/liquid separator is sent to the storage tank and the gaseous BOG separated by the second gas/liquid separator is sent to the self-heat exchanger.

[25] Some of the BOG having passed through the multistage compressor may be sent to a high-pressure engine.

[26] The high-pressure engine may be an ME-GI engine.

[27] The high-pressure engine may use natural gas at a pressure of about 150 to 400 bar as fuel.

[28] The BOG having passed through the first decompressor and the self-heat exchanger may be sent to at least one of a generator and a low-pressure engine.

[29] The low-pressure engine may be at least one of a DF engine, an X-DF engine and a gas turbine.

(flow b) into two flows, 4) expanding the BOG of one of the flows divided in step 3) (hereinafter referred to as 'flow c') to use the expanded BOG as the other refrigerant subjected to heat exchange with the flow b in step 2), and 5) expanding the other flow of the two flows divided in step 3), wherein the flow c used as the other refrigerant in step 4) is sent to at least one of a generator and a low-pressure engine.

[40] The method may further include: 6) separating the BOG expanded in step 5) and partially reliquefied into liquefied natural gas and gaseous BOG; and 7) sending the liquefied natural gas separated in step 6) to the storage tank and joining the gaseous BOG separated in step 6) to BOG discharged from the storage tank to be used as a refrigerant for heat exchange in step 2).

[41] Some of the BOG subjected to multistage compression in step 1) may be sent to a high-pressure engine.

[42] The flow c used as the other refrigerant in step 4) may be sent to at least one of a generator and a low-pressure engine.

[43] In accordance with another aspect of the present invention, there is provided a method including: 1) performing multistage compression with respect to boil-off gas (BOG) discharged from a storage tank (hereinafter referred to as 'flow a'); 2) subjecting the BOG subjected to multistage compression to heat exchange (hereinafter referred to as 'flow b') with the BOG discharged from the storage tank (flow a), a first refrigerant, and a second refrigerant; 3) dividing the BOG subjected to heat exchange (flow b) into two flows; 4) expanding the BOG of one of the flows divided in step 3); 5) separating the BOG expanded in step 4) into a liquid and a gas; 6) using the liquefied natural gas separated in step 5) (hereinafter referred to as 'flow c') as the first refrigerant subjected to heat exchange with the flow b in step 2); 7) using the BOG separated in step 5) (hereinafter referred to as 'flow d') as the second refrigerant subjected to heat exchange with the flow b in step 2); and 8) expanding the other flow of the two flows divided in step 3).

[44] The flow c used as the first refrigerant in step 6) and the flow d used as the second refrigerant in step 7) may be joined to each other and sent to at least one of a generator and a low-pressure engine.

[45] Some of the BOG subjected to multistage compression in step 1) may be sent to a high-pressure engine.

【CLAIMS】

【Claim 1】

A ship comprising an engine, the ship further comprising:

a self-heat exchanger performing heat exchange with respect to boil-off gas (BOG) discharged from a storage tank;

a multistage compressor compressing the BOG discharged from the storage tank and having passed through the self-heat exchanger in multiple stages;

a first decompressor expanding some of the BOG compressed by the multistage compressor and having passed through the self-heat exchanger;

a second decompressor expanding the other BOG compressed by the multistage compressor and having passed through the self-heat exchanger,

wherein the self-heat exchanger cools the BOG compressed by the multistage compressor using the BOG discharged from the storage tank and the BOG expanded by the first decompressor as a refrigerant; and

the BOG having passed through the first decompressor and the self-heat exchanger is sent to at least one of a generator and a low-pressure engine.

【Claim 2】

The ship comprising an engine according to claim 1, wherein the BOG having passed through the second decompressor and having a gas/liquid mixed phase is sent to the storage tank.

【Claim 3】

The ship comprising an engine according to claim 1, further comprising:

a second liquid/gas separator disposed downstream of the second decompressor and separating liquefied natural gas generated through reliquefaction of the BOG and gaseous BOG from each other,

wherein the liquefied natural gas separated by the second gas/liquid separator is sent to the storage tank and the gaseous BOG separated by the second gas/liquid separator is sent to the self-heat exchanger.

【Claim 4】

The ship comprising an engine according to claim 1, wherein some of the BOG having passed through the multistage compressor is sent to a high-pressure engine.

【Claim 5】

The ship comprising an engine according to claim 4, wherein the high-pressure engine is an ME-GI engine.

【Claim 6】

The ship comprising an engine according to claim 4, wherein the high-pressure engine uses natural gas at a pressure of about 150 to 400 bar as fuel.

【Claim 7】

The ship comprising an engine according to claim 1, wherein the low-pressure engine is at least one of a DF engine, an X-DF engine and a gas turbine.

【Claim 8】

The ship comprising an engine according to claim 1, wherein the low-pressure engine uses natural gas at a pressure of about 6 to 20 bar as fuel.

【Claim 9】

The ship comprising an engine according to claim 1, wherein the low-pressure engine uses natural gas at a pressure of 55 bar as fuel.

【Claim 10】

The ship comprising an engine according to claim 1, wherein the generator

uses natural gas at a pressure of about 6 to 10 bar as fuel.

【Claim 11】

The ship comprising an engine according to claim 1, wherein the multistage compressor compresses the BOG to a critical pressure or more.

【Claim 12】

The ship comprising an engine according to claim 11, wherein the multistage compressor compresses the BOG to a pressure of about 100 bar or more.

【Claim 13】

The ship comprising an engine according to claim 3, further comprising:

a valve controlling a flow amount of the gaseous BOG separated by the second gas/liquid separator and sent to the self-heat exchanger.

【Claim 14】

The ship comprising an engine according to claim 1, further comprising:

a heater disposed on a line along which the BOG having passed through the first decompressor and the self-heat exchanger is sent to the generator.

【Claim 15】

The ship comprising an engine according to claim 1, further comprising:

a first gas/liquid separator separating gaseous BOG and liquefied natural gas generated by partial reliquefaction through compression by the multistage compressor, cooling by the self-heat exchanger, and expansion by the first decompressor,

wherein the self-heat exchanger cools the BOG compressed by the multistage compressor using the BOG discharged from the storage tank, the liquefied natural gas separated by the first gas/liquid separator, and the BOG separated by the first gas/liquid separator as a refrigerant.

【Claim 16】

The ship comprising an engine according to claim 15, wherein the liquefied natural gas separated by the first gas/liquid separator and having passed through the self-heat exchanger and the BOG separated by the first gas/liquid separator and having passed through the self-heat exchanger are joined to each other and sent to at least one of a generator and a low-pressure engine.

【Claim 17】

A method comprising:

1) performing multistage compression with respect to boil-off gas (BOG) discharged from a storage tank (hereinafter referred to as 'flow a'),

2) subjecting the BOG subjected to multistage compression to heat exchange (hereinafter referred to as 'flow b') with the BOG discharged from the storage tank (flow a) and another refrigerant,

3) dividing the BOG subjected to heat exchange (flow b) into two flows,

4) expanding the BOG of one of the flows divided in step 3) (hereinafter referred to as 'flow c') to use the expanded BOG as the other refrigerant subjected to heat exchange with the flow b in step 2), and

5) expanding the other flow of the two flows divided in step 3),

wherein the flow c used as the other refrigerant in step 4) is sent to at least one of a generator and a low-pressure engine.

【Claim 18】

The method according to claim 17, further comprising:

6) separating the BOG expanded in step 5) and partially reliquefied into liquefied natural gas and gaseous BOG; and

7) sending the liquefied natural gas separated in step 6) to the storage tank and joining the gaseous BOG separated in step 6) to BOG discharged from the storage tank to be used as a refrigerant for heat exchange in step 2).

【Claim 19】

The method according to claim 17, wherein some of the BOG subjected to multistage compression in step 1) is sent to a high-pressure engine.

【Claim 20】

A method comprising:

1) performing multistage compression with respect to boil-off gas (BOG) discharged from a storage tank (hereinafter referred to as 'flow a');

2) subjecting the BOG subjected to multistage compression to heat exchange (hereinafter referred to as 'flow b') with the BOG discharged from the storage tank (flow a), a first refrigerant, and a second refrigerant;

3) dividing the BOG subjected to heat exchange (flow b) into two flows;

4) expanding the BOG of one of the flows divided in step 3);

5) separating the BOG expanded in step 4) into a liquid and a gas;

6) using the liquefied natural gas separated in step 5) (hereinafter referred to as 'flow c') as the first refrigerant subjected to heat exchange with the flow b in step 2);

7) using the BOG separated in step 5) (hereinafter referred to as 'flow d') as the second refrigerant subjected to heat exchange with the flow b in step 2); and

8) expanding the other flow of the two flows divided in step 3).

【Claim 21】

The method according to claim 20, wherein the flow c used as the first refrigerant in step 6) and the flow d used as the second refrigerant in step 7) are joined to each other and sent to at least one of a generator and a low-pressure engine.

【Claim 22】

The method according to claim 20, wherein some of the BOG subjected to multistage compression in step 1) is sent to a high-pressure engine.