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(54) **BOIL OFF GAS RELIQUEFYING APPARATUS AND LNG SUPPLY SYSTEM PROVIDED WITH THE SAME**

(57) Provided is a boil off gas reliquefying apparatus which is applicable to new and existing liquefied natural gas tanks, and attains an extremely inexpensive investment cost.

A boil off gas reliquefying apparatus has a first line (L10), a first heat exchanger (10) for heat-exchanging BOG, a first return line (L12) that is branched from the first line (L10) in the first heat exchanger, and joins an intermediate position of a compression process line, an expander (13) that expands BOG which passes through a part of the first heat exchanger (10), a booster (14) that pressurizes BOG which is expanded by the expander (13) to pass through the first heat exchanger (10), a second heat exchanger (11) for heat-exchanging BOG which passes through the first heat exchanger (10), at least one expansion valve (16) for subjecting BOG which passes through the second heat exchanger (11) to free expansion to perform reliquefaction, and a gas-liquid separator (12) that separates BOG expanded by the expansion valve (16) into BOG and LNG.

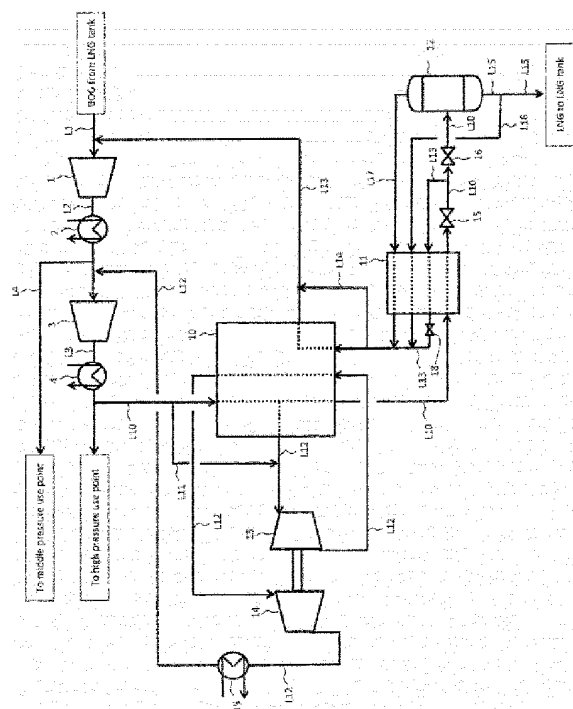


FIG. 1A



EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	DE 101 08 905 A1 (LINDE AG [DE]) 5 September 2002 (2002-09-05) * figure 2 *	3,4	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 September 2019	Examiner Göritz, Dirk
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 5, 6(completely); 4(partially)

A BOG reliquefying apparatus comprising a first line, a first heat exchanger for heat-exchanging BOG, a first return line that is branched from the first line in the first heat exchanger, and joins an intermediate position of a compression process line, an expander that expands BOG which passes through a part of the first heat exchanger, a booster that pressurizes BOG which is expanded by the expander to pass through the first heat exchanger, a second heat exchanger for heat-exchanging BOG which passes through the first heat exchanger, at least one expansion valve for subjecting BOG which passes through the second heat exchanger to free expansion to perform reliquefaction, and a gas-liquid separator that separates BOG expanded by the expansion valve into BOG and LNG. The apparatus further comprising a second return line that is branched from the first line at an upstream position with respect to at least the one expansion valve, passes through the second heat exchanger, then passes through a part or a whole of the first heat exchanger, and joins an upstream position of the compression process line.

2. claims: 3(completely); 4(partially)

A BOG reliquefying apparatus comprising a first line, a first heat exchanger for heat-exchanging BOG, a first return line that is branched from the first line in the first heat exchanger, and joins an intermediate position of a compression process line, an expander that expands BOG which passes through a part of the first heat exchanger, a booster that pressurizes BOG which is expanded by the expander to pass through the first heat exchanger, a second heat exchanger for heat-exchanging BOG which passes through the first heat exchanger, at least one expansion valve for subjecting BOG which passes through the second heat exchanger to free expansion to perform reliquefaction, and a gas-liquid separator that separates BOG expanded by the expansion valve into BOG and LNG. The apparatus further defines that the expander is a first expander and the booster is a first booster which is disposed in a branch line joining the first line at an upstream position with respect to the first heat exchanger, and further comprises a second expander that is branched from the first return line before joining the compression process line, passes through the first heat exchanger once or a plurality of times, is disposed in a second return line joining an upstream position of the compression process line, and expands the BOG which passes through a part of the first heat exchanger and a second booster that is disposed in the branch line,



**LACK OF UNITY OF INVENTION
SHEET B**

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

further pressurizes the B0G, and is driven by the second expander.

**ANNEX TO THE EUROPEAN SEARCH REPORT
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