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Remarks:

- Amended claims in accordance with Rule 137(2) EPC.
- The application is published incomplete as filed (Rule 68(1) EPC).

(54) **Boil-off gas re-condenser**

(57) Boil-Off Gas re-condenser comprising a vessel (15) comprises two separated zones with no interference between them:
- a re-condensing packing contact zone (11), located in a top section of the vessel (15), which houses a packing bed (7), in which Boil Off Gas, coming from a Boil Off Gas compressors discharge (14), is in contact with Liquefied Natural Gas (22), taken from the discharge of LP pumps (32), for re-condensation.

- a lower accumulation zone (12), located in a lower section of the vessel (15), which serves as a liquid hold-up drum for the HP Liquefied Natural Gas pumps, in which it is introduced the surplus of Liquefied Natural Gas (23) up to half maximum send-out via a level control valve (3),

so that the surplus of Liquefied Natural Gas (24) from half maximum send-out, bypasses the re-condenser via a flow control bypass (24):

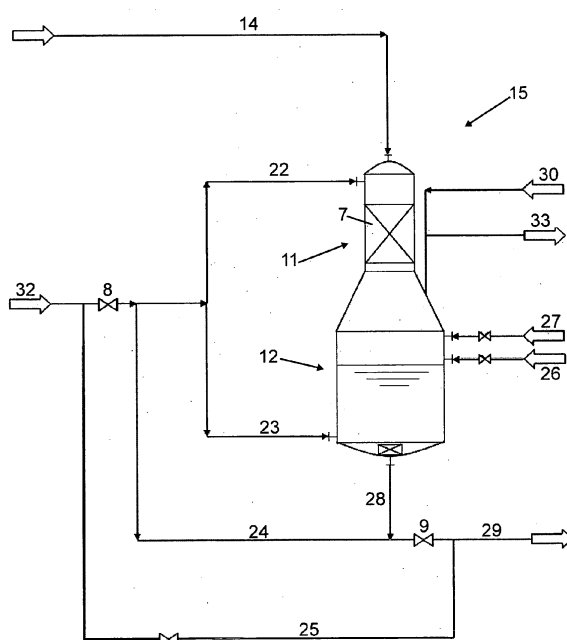


FIG. 1

Description

TECHNICAL FIELD

[0001] The mentioned invention consists of a Boil-off Gas (BOG) re-condenser for reliquefying boil-off gas generated by Liquefied Natural Gas (LNG)

BACKGROUND

[0002] A Liquefied Natural Gas receiving and re-gasification terminal serves to connect the continuous process of pressurisation, vaporisation of Liquefied Natural Gas and gas send-out, with the intermittent process of safely berthing and unloading of Liquefied Natural Gas Carriers using the buffering storage capacity of the LNG storage tanks.

[0003] In general a Liquefied Natural Gas terminal will receive Liquefied Natural Gas by carrier and store it in cryogenic state, at boiling conditions, at approximately -160 °C and slightly, above atmospheric pressures in Liquefied Natural Gas storage tanks. Liquefied Natural Gas from the Liquefied Natural Gas storage tanks is pressurized with the Low Pressure pumps and combined with re-condensed Boil Off Gas in the re-condenser. Then, Liquefied Natural Gas is pressurized by the High Pressure pumps and sent to the vaporizers, where it is vaporized at high-pressure and sent to the grid via the metering station.

[0004] Cryogenic conditions need to be maintained in the entire terminal, including the unloading lines via circulating LNG.

[0005] As result of the ambient heat in leak into the LNG storage tanks and all terminal lines, vapour is generated in the LNG storage Tanks. This vapour is called the Boil Off Gas. This BOG must be recovered in order to minimize atmospheric emissions and economical losses.

[0006] The most common way of recovering BOG is taking it from the LNG Storage Tanks via the BOG compressors, where it is compressed and sent to the BOG re-condenser for re-liquefaction and combined with the send-out flow.

[0007] The re-condenser is an apparatus where the BOG generated in the terminal is put in contact with sub-cooled LNG and is condensed, recovered and mixed with the rest of the LNG send-out flow rate.

[0008] There are two main functions a re-condenser could carry out, one of them is to recondense and recover the BOG and the other is to serve as LNG buffer giving a hold up between LP pumps and HP pumps.

[0009] Some re-condensers have both functions and others not.

[0010] Other important characteristic is the operating pressure in the re-condenser. It could be fixed in a certain value, it could be fixed but operator could vary its value, it could be variable.

[0011] There exists re-gasification terminals where re-

condensers only carry out one of the main functions described above.

[0012] A lot of re-condensers operate at fixed pressure. This implies spending a lot of energy associated cost due to compressor high duty. A re-condenser with different operating pressures shall reduce operating cost in compressors at high send-out rates by reducing its operating pressure and minimize the minimum send-out by increasing its operating pressure.

[0013] Some re-condensers reported in difficulties and instability in the pressure control.

[0014] A lot of re-condensers have big dimensions due to high hold-up times for the HP pumps. Reducing this dimension, maintaining the residence time via and operating bypass shall be a good solution.

[0015] Instrumentation is simple in some re-condensers, this lead to out of control situations.

DESCRIPTION OF THE INVENTION

[0016] The invention presented here is a two separated function re-condenser, with no interaction between the functionalities.

[0017] Furthermore it includes a controlled bypass that allows reducing the buffer or accumulation characteristic via a sophisticated instrumentation and controls described below. This results in a smaller accumulation zone.

[0018] It is a fixed pressure re-condenser, but this pressure could be changed within a range based on operator preferences. This reduces operating cost (saving energy) in compressors at high send-out rates by reducing re-condenser operating pressure and minimizes the minimum send-out by increasing re-condenser operating pressure.

[0019] The object of present invention is to provide an apparatus (and its surrounding controls) that reliquifies all the BOG generated in the terminal, mixes it with the rest of LNG send-out and that provides a hold up time between LP pumps and HP pumps. This apparatus is a vessel which comprises two separated sections with no interference between them:

- a top section which houses a packed-bed as a contact zone, in which Boil Off Gas, coming from a Boil Off Gas compressors discharge, is in contact with Liquefied Natural Gas, taken from the discharge of the LP pumps, for re-condensation.
- a lower section as an accumulation zone, which serves as a liquid hold-up drum for the HP Liquefied Natural Gas pumps, in which it is introduced the surplus of Liquefied Natural Gas up to half maximum send-out via at least one level control,

so that the surplus of Liquefied Natural Gas from half maximum send-out, bypasses the re-condenser via at least one flow control bypass valve.

[0020] The BOG re-condenser is a bi-functional sys-

tem (serves two functions) which solves the problems indicated above. These two functions are:

- Function of re-condensing the Boil Off Gas (BOG) generated in the terminal.
- Function of Liquefied Natural Gas (LNG) accumulation, giving a hold-up time for the HP pumps. It is an intermediate liquid storage between the LP pumps and the HP pumps.

[0021] These two functions are carried out in the re-condenser system, which are divided in two different parts:

a) The top section of the re-condenser houses a packed-bed in which BOG is contacted with LNG for re-condensation. The LNG is taken from the discharge of the LP pumps and the BOG is coming from the BOG compressors discharge. The re-condensation of BOG is possible because this vessel operates at higher pressure (operating pressure from 4 to 8 barg) than the LNG storage tanks. The LNG pumped from the tanks is sub-cooled at this higher operating pressure. The LNG could rise its temperature from the LP pumping temperature to the equilibrium bubble point at the recondensing pressure. All this thermal duty is used by the BOG to get cooled until its dew point and then to be re-condensed. This re-condensation is the result of a direct contact heat transfer between the two phases (both down-flow) in the packed bed. With higher operating pressure in the re-condenser, the higher bubble point temperature could be reached, and less LNG is required to re-condense the same quantity of BOG.

b) The lower section serves as a liquid hold-up drum for the HP LNG pumps. The re-condenser is elevated from floor and the skirt height together with the liquid level in the vessel (plus some sub-cooling degree) provides the required NPSH for the HP pumps.

[0022] This parts are separated in such a way that the recondensing packing contact zone is located above the lower accumulation zone. The resulting vessel has two different diameters, being the lower one of bigger dimension. The two zones are completely separated, and there is no interference between them (packing bed is not allowed to be flooded with LNG (Liquefied Natural Gas)).

[0023] LNG is feed to the vessel via three paths. The top one is used for recondensing the BOG and maintain the pressure stable. This flow is controlled either via a pressure cascade controller or via a function of the BOG real mass flow entering the re-condenser. Operator could select the way pressure is controlled.

[0024] The surplus of LNG (up to half maximum send-out) is introduced in the lower zone (accumulation one) via level control. This is a simple level control.

[0025] The surplus of LNG (from half maximum send-out) bypasses the re-condenser via flow control. This flow

control could be done either based on a function of the total LNG volumetric flow to re-condenser or via a function of the metering station send-out set point. Operator could select the way the bypass is controlled.

[0026] As result of this scheme, the accumulation zone does exist, but is half the size of other re-condenser type due to the flow controlled bypass.

[0027] The controlled bypass control can be done based on:

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- flow control based on total LNG flow to re-condenser (combined flow of the three LNG feeds)
- based on flow control based on one or two LNG feeds,
- 15 - based on send-out flow set point, or
- based on actual measured send-out flow.

[0028] The controlled bypass can control the flow between some specific send-out rate (not exactly the half maximum send-out) up to the maximum send-out rate.

[0029] Padding gas connection, controlled vent connection (protective pressure controllers) and PSVs are located in the bottom zone. Padding gas and controlled vent working pressures are outside of the normal controlled pressure range. Level protective controller (following the same philosophy as followed in the pressure control) are also providing actions on the controlled bypass.

[0030] The boil off gas re-condenser of the invention does not have a flow control that maintains always a small LNG flow flowing to the accumulation zone to maintain always a subcooling degree in the HP pump, giving NPSH (Net Positive Suction Head). NPSH is given by re-condenser height only.

[0031] The advantages of the boil off gas re-condenser of the invention are:

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- Pressure control variable and more stable.
- No control valves in the BOG inlet.
- Operator has some flexibility in deciding the way the control strategy is to be carried out for pressure control and bypass control.
- Accumulation zone is not sized for maximum flow, it is sized for half maximum flow.
- No interaction between the recondensing and accumulation zones due to maintain them separated.

[0032] For stable operation of the BOG re-condenser, there are controlled the operating pressure; Liquefied Natural Gas (LNG) Level inside the vessel and Liquefied Natural Gas (LNG) flow rate bypassing the re-condenser.

[0033] All terminals have limitations on HHV (High Heating Value) and Wobbe Index specifications in the send-out gas to the grid. In order to adjust the quality of the send-out gas, where needed, Nitrogen is mixed with it.

[0034] Wobbe index and HHV adjustment is carried out introducing Nitrogen, in gaseous phase, liquid phase or both at a time in the re-condenser

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] The description of the different components of the system provided above is complemented with a series of drawings aimed at facilitating understanding of its structure and operation.

Figure 1 is a sketch where the main flow paths are depicted

Figure 2 is a sketch of the process control loops of the BOG re-condenser for pressure, level, and operational bypass.

[0036] In said figures the following references are indicated:

- 1.- Flow controller FC1
- 2.- Flow control quench valve FV1
- 3.- Level control valve LV
- 4.- Flow control valve FV2
- 5.- Flow controller FC2
- 6.- Level controller LC1
- 7.- Packing bed P1
- 8.- Isolation valve 1 V1
- 9.- Isolation valve 2 V2
- 10.- Pressure controller PC1
- 11.- Re-condensing packing contact zone
- 12.- Lower accumulation zone
- 13.- Pressure safety valve PSV
- 14.- BOG mass flow Fi
- 15.- Re-condenser vessel
- 16.- Padding gas control valve PV1
- 17.- Pressure control loop of padding gas PC2
- 18.- Control valve of the pressure release PV2
- 19.- Pressure control loop of the pressure release PC3
- 20.- Level controller acting in case low LNG level LC2
- 21.- Level controller acting in case high LNG level LC3
- 22.- LNG top inlet
- 23.- LNG Bottom inlet
- 24.- LNG controlled bypass line
- 25.- Maintenance bypass line
- 26.- HP pump vent line
- 27.- HP kick-back line
- 28.- LNG outlet line
- 29.- Outlet LNG line to HP pump
- 30.- Inlet Padding gas line
- 32.- LNG supply from LP pumps
- 33.- Controlled vent connection lines

DETAIL DESCRIPTION

[0037] Re-condenser design shown in Figure 1 is based on a fixed pressure re-condenser type and comprises a vessel (15) feeded by three Liquefied Natural Gas lines, in which the vessel (15) comprises two separated zones with no interference between them:

- a re-condensing packing contact zone (11), located in a top section of the vessel (15), which houses a packing bed (7), in which Boil Off Gas, coming from a Boil Off Gas compressors discharge (14), is in contact with Liquefied Natural Gas (22), taken from the discharge of LP pumps (32), for re-condensation.
- a lower accumulation zone (12), located in a lower section of the vessel (15), which serves as a liquid hold-up drum for the HP Liquefied Natural Gas pumps, in which it is introduced the surplus of Liquefied Natural Gas (23) up to half maximum send-out via a level control which comprises one level control valve (3),

so that the surplus of Liquefied Natural Gas from half maximum send-out, bypasses the re-condenser via a flow control bypass (24) which comprises one flow control bypass valve (4).

[0038] This re-condenser has the option to select the pressure set point by the operator in the range of 4 to 8 barg. This set point pressure will be selected based on gas send out flow rate. The desired pressure is controlled with LNG flow to top part of re-condenser.

[0039] The operating pressure range (in this case described from 4 to 8 barg) could vary based on client and operator requirements.

[0040] The pressure of the re-condenser could be set from the lowest value of 4 barg at high send-out rates to the maximum value, 8 barg, with minimum send-out rates.

[0041] If the pressure in the re-condenser is low, more LNG flow is required to recondense the same quantity of BOG than the required flow at higher pressure. When high send-out rate is required, the pressure in the re-condenser could be lowered because there is no LNG flow limitation (we are far from the minimum send-out) to the contact top section. This is desirable because the BOG compressors require less working duty at low discharge pressure, saving energy.

[0042] High pressure (8 barg) is set in the re-condenser during minimum send-out requirement. Also during minimum send-out requirements, the BOG generation is higher, because the liquid level in the LNG storage tanks is going-down very slowly.

[0043] When send-out rates are higher than minimum send-out rate, pressure in the re-condenser could be set between 4 and 8 barg.

[0044] The re-condenser is provided with a padding gas entry from the vaporisers send out, upstream of metering station. This padding gas allows for maintaining the re-condenser pressure at a minimum value. This flow is controlled by a pressure control loop acting on a control valve. In a holding mode of operation, with high send-out rates, the BOG generation in the terminal could be close to zero. Then, the BOG compressors will stop. The re-condenser pressure will go down and the padding gas must be required.

[0045] The re-condenser is provided also with a direct

controlled vent connection back to the LNG Storage Tanks. This is to prevent high pressure in the re-condenser and prevents the PSV to open. This release is controlled with a pressure control loop acting on a control valve.

[0046] At least one pressure safety valve (13) is the last re-condenser protection against overpressure. Two pressure safety valves could be also fitted, one in operation and the other in spare, to facilitate on-line maintenance of one of these valves. These valves are mechanically interlocked, one is interlocked closed and the other open. Each valve is designed for the complete release flow.

[0047] BOG re-condenser inlet and outlet lines description is shown in Figure 1 in which the main flow paths are depicted, to follow the description:

LNG top inlet for re-condensation (22)

[0048] In the top part of the re-condenser is introduced the required sub-cooled LNG to re-condense all the BOG, reaching the equilibrium. This flow is controlled to maintain the desired pressure inside (from 4 to 8 barg).

BOG inlet to the top for re-condensation (14)

[0049] In the top part of the re-condenser is also introduced the BOG from the BOG compressors to be re-condensed.

LNG bottom inlet to the re-condenser (23)

[0050] When the send out rate is higher than the required flow in the top section, the remaining LNG is supplied to the bottom re-condenser section up to more or less half of maximum send-out. The bottom hold up part of the re-condenser is to be calculated in seconds (between 15 and 60 seconds) of the half maximum send-out associated LNG flow.

LNG controlled bypass (24)

[0051] If send-out rates are also higher than half the maximum send-out LNG flow associated, the remaining of the send-out flow bypasses the re-condenser. This could be done by using a controlled bypass (control valve required).

[0052] The controlled bypass control is done based on flow control based on total LNG flow to re-condenser (combined flow of the three LNG feeds)

Maintenance bypass (25)

[0053] This bypass is provided to put out of service the re-condenser and keep working the terminal. This bypass is located outside the isolation valves (8 and 9).

LNG outlet (28)

[0054] This line connects the outlet of the re-condenser with the suction of the HP pumps (29).

HP pumps vent line (26)

[0055] This line connects the vent lines from the HP pumps to the re-condenser.

HP pumps kick-back line (27)

[0056] This line connects the kick-back lines from the HP pumps to the re-condenser. This line could contain two phase flow.

Padding gas connection (30) and controlled vent connection (33)

[0057] The padding gas line (30) connects the outlet of the vaporisers (upstream of the metering station) with the re-condenser on low pressure operation. This allows entering LNG from the send-out to keep the pressure in the vessel in a minimum value.

[0058] The controlled vent connection line (33) connects the re-condenser with the LNG Storage Tanks on high pressure control. This prevents the pressure to increase in the vessel by opening the control valve, venting to the BOG header.

[0059] Figure 2 shows the process control loops of the BOG re-condenser for pressure, level, and operational bypass.

a) Re-condenser pressure control

[0060] The BOG re-condenser operates in a fixed pressure mode. The operator selects the desired operating pressure of the BOG re-condenser between 4 to 8 barg. Other operating pressure range could be done based on client requirements. The pressure in the BOG re-condenser is controlled via flow controller (1) (Flow Controller). The flow controller (1) manipulates LNG quench valve (2) which supplies LNG to the packing bed (7) section of the BOG re-condenser, the packing bed (7) consisting either in a random packing or a structured packing. The pressure in the BOG re-condenser can be as low as 4 barg during periods of high send-out flow and as high as 8 barg during periods of minimum send-out rate.

[0061] The pressure in the BOG re-condenser can be controlled via either a feed-forward pressure control loop or via feed-back pressure control loop. The preferred system can be selected by the operator.

a.1) Feed-forward re-condensation/pressure control

[0062] The main function of the flow controller (1) controlling the flow rate of sub-cooled LNG to the top is to

keep the BOG re-condenser at a fixed pressure and to operate in a stable operating region.

[0063] The set-point of the flow controller (1) is derived from a function of a specific factor and the measured mass BOG flow (14) that enters into the re-condenser. This specific factor is the result from a function of the desired operator pressure set point, the measured pressure in the vessel and a temperature correction for both LNG and BOG. Once the operator introduces the pressure set point, depending on the BOG flow, the LNG flow is calculated and set to the LNG flow controller (1) as set point. The pressure set-point can be adjusted by the operator to achieve the desired operating pressure of the BOG re-condenser.

[0064] - This type of control is quicker than using only a pressure cascade feed-back control over the LNG flow controller (1).

a.2) Feed-back re-condensation/pressure control

[0065] The main function of the pressure controller (10) is controlling the required fixed pressure in the BOG re-condenser. The pressure controller operates via a cascade control loop, re-setting the set-point of the LNG flow controller (1) to keep the BOG re-condenser at the desired pressure.

a.3) Protective pressure control

[0066] During the re-condenser operation the following protective pressure controls are available:

- The re-condenser is provided with a padding gas (30) entry from the vaporisers send out, upstream of metering station. This padding gas (30) allows for maintaining the re-condenser operating pressure at a minimum pressure set point (lower than 4 barg). This flow is controlled by a pressure control loop (17) acting on a padding gas control valve (16).
- The re-condenser is provided also with a controlled vent connection to the BOG header. This is to prevent high pressure (higher than 8 barg) in the re-condenser and prevents the pressure safety valve (13) to open. This release is controlled with pressure control loop (19) acting on a control valve (18). This is achieved with the separated pressure control loop (19).

[0067] However, only one pressure controller either for padding gas (30) as well as for the pressure release can be included.

b) Re-condenser level control

[0068] The level in the re-condenser bottom section is controlled using level controller (6) which manipulates the LNG bottom inlet valve (3) (also two level control valves (3) can be included). If the level rises, the level

controller (6) closes the valve (3). If the level drops the response of the level controller is vice versa.

[0069] Protective level controllers are installed for protection against low and high level:

- In case of low level, a level controller (20) reduces the HP send-out flow to keep the level, closing the vaporisers inlet control valves, overriding the signal from metering station.
- In case of high level a protective level controller (21) will override via a selection processes the signal to the LNG bottom inlet valve (3), LNG controlled bypass control valve (4) (also two flow control bypass valves can be included) and to the LNG top flow control quench valve (2), closing them if necessary

c) Re-condenser bypass control

[0070] This operating bypass is located between the BOG re-condenser isolation valves (8 and 9). The bottom section has been sized for an LNG flow rate equivalent to half maximum send-out. When the send-out through the LNG terminal exceeds this value the LNG will be sent via an operational bypass to the suction header of the HP pumps.

[0071] A flow controller (5) in the operational bypass receiving its set point cascaded from the overall terminal send-out set point will open the bypass valve (4) if the send-out flow rate exceeds the half maximum send-out rate. Also it is possible to use the total LNG flow rate to the re-condenser to control this bypass by a function. The operator will decide the control to be used.

Claims

1. Boil-Off Gas re-condenser comprising a vessel feeded by Liquefied Natural Gas, characterized because the vessel (15) comprises two separated zones with no interference between them:

- a re-condensing packing contact zone (11), located in a top section of the vessel (15), which houses a packing bed (7), in which Boil Off Gas (14), coming from a Boil Off Gas compressors discharge, is in contact with Liquefied Natural Gas (22), taken from the discharge of LP pumps (32), for re-condensation.
- a lower accumulation zone (12), located in a lower section of the vessel (15), which serves as a liquid hold-up drum for the HP Liquefied Natural Gas pumps, in which it is introduced the surplus of Liquefied Natural Gas (23) up to half maximum send-out via a level control which comprises at least one level control valve (3),

so that the surplus of Liquefied Natural Gas from half maximum send-out, bypasses the re-condenser via

a flow control bypass (24) which comprises at least one flow control bypass valve (4).

2. Boil-Off Gas re-condenser according to previous claims wherein the re-condenser comprises two isolation valves (8, 9) 5

3. Boil-Off Gas re-condenser according to claim 2 wherein the re-condenser comprises one flow control bypass valves (4) located between the two isolation valves (8, 9) 10

4. Boil-Off Gas re-condenser according to claims 1-2 wherein the re-condenser comprises two flow control bypass valves (4). 15

5. Boil-Off Gas re-condenser according to claim 1 wherein the re-condenser comprises at least one pressure safety valve (13). 20

6. Boil-Off Gas re-condenser according to claim 5 wherein the re-condenser comprises at least one pressure safety valve not connected to the vessel (15). 25

7. Boil-Off Gas re-condenser according to previous claims wherein the re-condenser comprises two level control valves (3). 30

9. Boil-Off Gas re-condenser according to previous claims wherein the re-condenser comprises at least one padding gas control valve (16) and at least one control valve for the pressure release (18). 35

10. Boil-Off Gas re-condenser according to previous claims wherein the re-condenser comprises a pressure control comprising a pressure controller loop (17) for padding gas (30) and pressure controller loop (19) for the pressure release. 40

11. Boil-Off Gas re-condenser according to claims 1-9 wherein the re-condenser comprises only one pressure controller loop either for padding gas (30) as well as for the pressure release. 45

12. Boil-Off Gas re-condenser according to previous claims wherein the re-condenser comprises an adjustable pressure set-point acting over a flow controller (1) derived from a function of the desired operator pressure set point, the measured pressure in the vessel (15) and a temperature correction for both LNG and BOG, and from the measured mass BOG flow (14) that enters into the re-condenser. 50

Amended claims in accordance with Rule 137(2) EPC.

1. Boil-Off Gas re-condenser system comprising a vessel (15) fed by Liquefied Natural Gas and Boil Off Gas, which comprises a re-condensing packing contact zone (11), located in a top section of the re-condenser vessel (15), which houses a packing bed (7), and a lower accumulation zone (12), located in a lower section of the vessel (15), as two separated zones with no interference between them, **characterized** because the boil-Off Gas re-condenser system comprises:

- a Liquefied Natural Gas inlet (22) arrange to the top section of the vessel (15)
- a Boil Off Gas inlet (14) arrange to the top section of the vessel (15),
- a Liquefied Natural Gas surplus inlet (23), of not required Liquefied Natural Gas flow in the top section of the vessel (15), arrange to the lower accumulation zone (12) located in a lower section of the vessel (15), and
- a controlled Liquefied Natural Gas bypass (24) configured such that the surplus of Liquefied Natural Gas from half maximum send-out, bypasses the re-condenser,

the vessel (15) being configured such that when Liquefied Natural Gas is introduced by the Liquefied Natural Gas inlet (22) and Boil Off Gas is introduced by the Boil Off Gas inlet (14), both phases down-flow in the packed bed (7) for direct contact heat transfer between them for re-condensation.

2. Boil-Off Gas re-condenser system according to claim 1 wherein it comprises a vessel bottom level controller (6) and at least one surplus Liquefied Natural Gas bottom inlet valve (3) controlled by the level controller (6). 40

3. Boil-Off Gas re-condenser system according to claims 1 and 2 wherein the controlled Liquefied Natural Gas bypass (24) comprises at least one flow control bypass valve (4). 45

4. Boil-Off Gas re-condenser system according to previous claims wherein it comprises a padding gas entry (30) and a controlled vent connection (33). 50

5. Boil-Off Gas re-condenser system according to claim 4 wherein the padding gas entry comprises at least one control valve (16) and the controlled vent connection (33) comprises at least one control valve (18). 55

6. Boil-Off Gas re-condenser system according to claim 5 wherein the padding gas entry (30) compris-

es a pressure controller loop (17) and the controlled vent connection (33) comprises a pressure controller loop (19).

7. Boil-Off Gas re-condenser system according to claim 5 wherein it comprises a pressure controller loop, either for padding gas entry (30) as well as for the controlled vent connection (33). 5

8. Boil-Off Gas re-condenser system according to previous claims wherein it comprises a maintenance bypass (25) configured such that Liquefied Natural Gas bypasses the recondenser to put out of service the re-condenser and keep working the terminal. 10

9. Boil-Off Gas re-condenser according to claim 1 wherein it comprises at least one pressure safety valve (13). 15

10. Boil-Off Gas re-condenser system according to previous claims wherein it comprises a Liquefied Natural Gas flow controller (1) and an adjustable pressure setpoint acting over the flow controller (1) derived from a function of the desired operator pressure set point, the measured pressure in the vessel (15) and a temperature correction for both LNG and BOG, and from the measured mass BOG flow that enters into the re-condenser via the BOG inlet (14). 20 25

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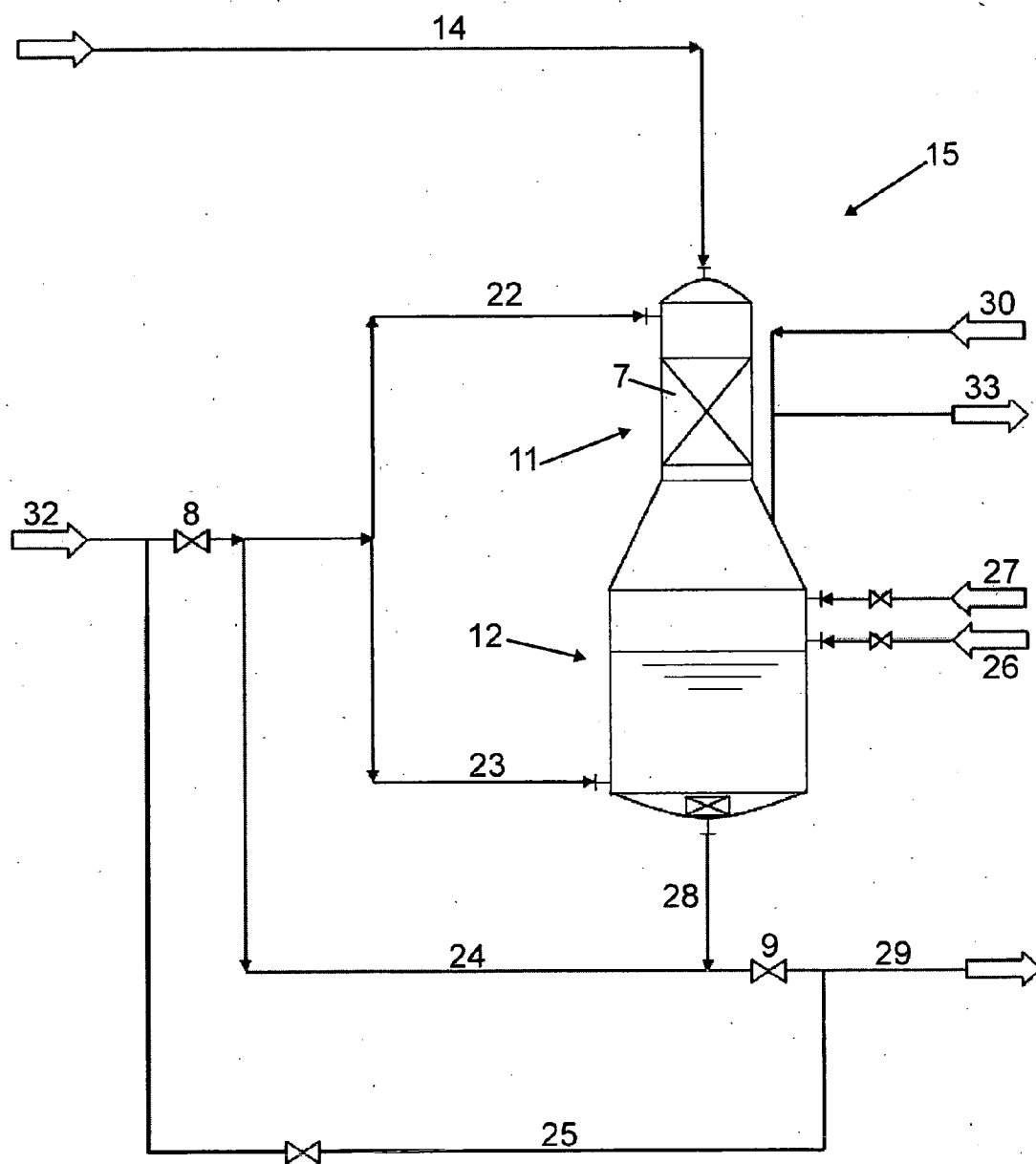


FIG. 1

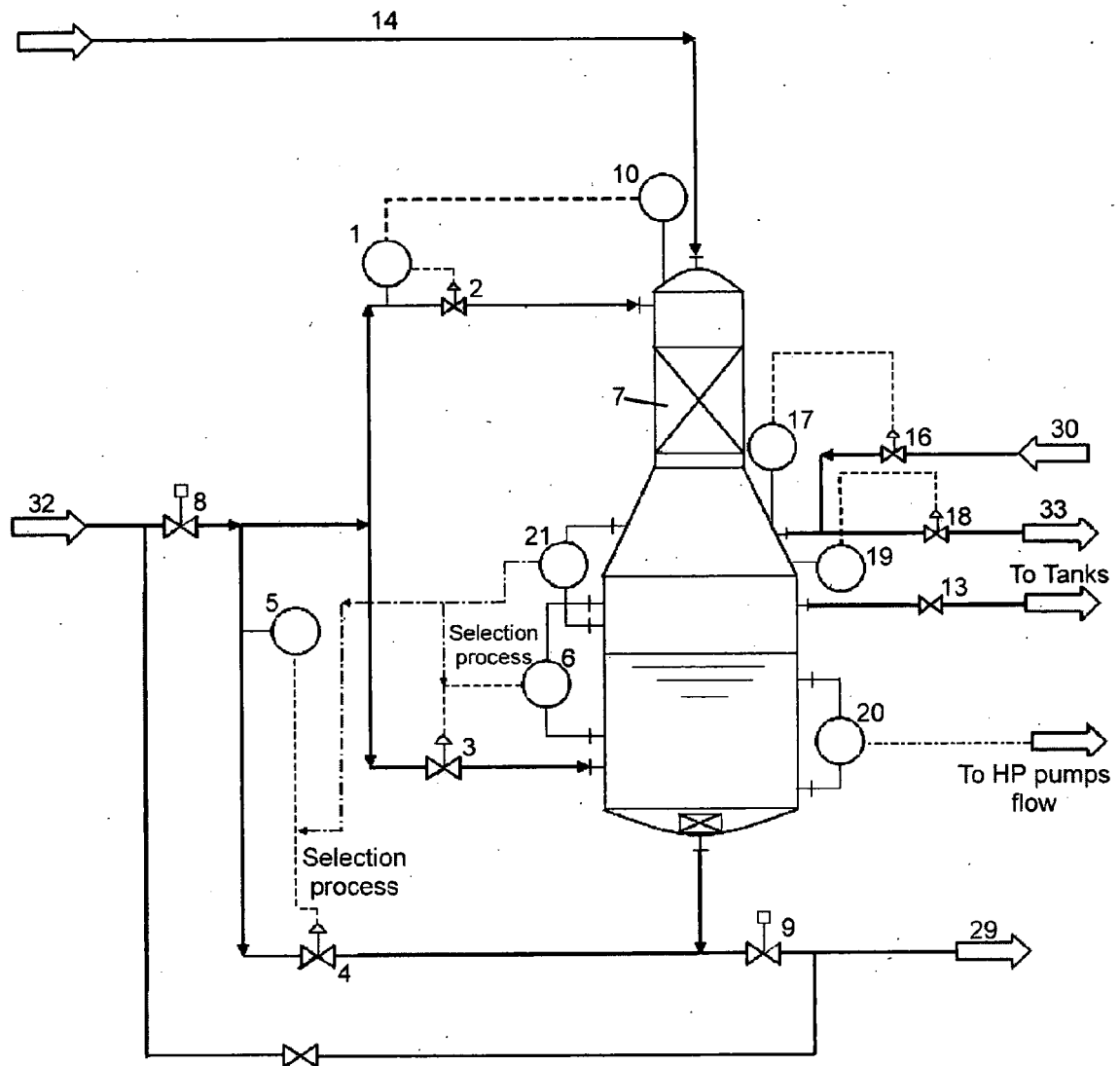


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 10 38 0045

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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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 August 2010	Examiner Nicol, Boris
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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