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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/580,977	11/06/2012	Sivert Vist	0312-0138PUS1	4422

127226 7590 06/24/2020

BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road
Suite 100 East
Falls Church, VA 22042-1248

EXAMINER
KING, BRIAN M

ART UNIT	PAPER NUMBER
3763	

NOTIFICATION DATE	DELIVERY MODE
06/24/2020	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SIVERT VIST, TORE LØLAND, MORTEN SVENNING, and SILJA ERIKSSON GYLSETH

Appeal 2019-001275
Application 13/580,977
Technology Center 3700

Before JENNIFER D. BAHR, DANIEL S. SONG, and BENJAMIN D. M. WOOD, *Administrative Patent Judges*.

WOOD, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's July 14, 2017 Non-Final Action rejecting claims 19–21. *See* Non-Final Act. 1. Claims 1–18 have been canceled. Appeal Br., Claims App. 1. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] "Appellant" refers to the applicant as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Statoil Petroleum AS. Appeal Br. 1.

CLAIMED SUBJECT MATTER

The claims are directed to a method of operating a liquefied natural gas (LNG) plant during turndown. Claim 19, reproduced below, is illustrative of the claimed subject matter:

> 19. A method for operation of a liquefied natural gas (LNG) plant, wherein the plant comprises:
>
> an inlet for receiving natural gas;
>
> a CO_2 removal unit;
>
> a drying and mercury-removal unit;
>
> a pre-cooling or refrigeration unit;
>
> a liquefaction unit;
>
> an end flash or N_2 stripping unit; and
>
> an LNG storage tank;
>
> wherein natural gas enters at the inlet, flows along a flow path through the CO_2 removal unit, the drying and mercury-removal unit, the pre-cooling or refrigeration unit, the liquefaction unit and end flash or N_2 stripping unit in tum and is stored as liquefied natural gas in the LNG storage tank and is stored as liquefied natural gas in the storage tank;
>
> the plant further comprising an LNG pump connected to the end flash or N_2 stripping unit; and
>
> an LNG vaporizer connected to the LNG pump;
>
> the method comprising the steps of:
>
> removing LNG from the end flash or N_2 stripping unit;
>
> passing the removed LNG through the LNG pump, to pump the removed LNG to a pressure of about 5–10 MPa;
>
> passing the pressurized LNG to the LNG vaporizer to vaporize the pressurized LNG so that the pressurized LNG is transformed to gas phase; and
>
> re-admitting the vaporized LNG to the flow path at a point downstream of the inlet and upstream of the liquefaction unit; and
>
> wherein the method is carried out during turndown of the LNG plant, when the LNG storage tank is full or when there is an interruption in supply of natural gas through the inlet, and the method is carried on until the LNG can be loaded from the LNG

storage tank, or the supply of natural gas at the inlet is recommenced.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Newton	US 4,675,037	June 23, 1987
Kimble	US 2003/0177785 A1	Sep. 25, 2003
Turner	US 2007/0107465 A1	May 17, 2007
Martinez	US 2009/0282865 A1	Nov. 19, 2009
Coyle	US 2010/0011663 A1	Jan. 21, 2010

REJECTION

Claims 19–21 are rejected under pre–AIA 35 U.S.C. § 103(a) as unpatentable over Kimble, Coyle, Newton, Turner, and Martinez.

OPINION

Independent claim 19 recites a method for operating an LNG plant during turndown (reduced production) of the plant, comprising the steps of removing LNG from the end flash or N_2 stripping unit, recirculating it through a LNG pump and vaporizer, and re-admitting the vaporized LNG back to the natural-gas flow path downstream of the inlet and upstream of the liquefaction unit. Appeal Br., Claims App. 1–2. According to the Specification, recirculating LNG in this manner avoids having to shut the plant down—thus saving time for re-start of the plant and wear of the plant during shut-down and re-start—when full production is not possible because natural gas supply is interrupted or storage for LNG is not available. Spec., 1:20–2:7. Claim 19 specifically recites that the claimed method "is carried out during turndown of the LNG plant, when the LNG storage tank is full or when there is an interruption in supply of natural gas through the inlet, and

the method is carried on *until* the LNG can be loaded from the LNG storage tank, or the supply of natural gas at the inlet is recommenced." Appeal Br., Claims App. 2 (emphasis added). There does not appear to be any dispute that performing the claimed method "until the LNG can be loaded from the LNG storage tank, or the supply of natural gas at the inlet is recommenced," means that the method is not performed when those conditions are met.

The Examiner finds that Kimble teaches most of the limitations of claim 1, including an inlet; a liquefaction unit; an LNG pump connected to an end flash unit; an LNG vaporizer connected to the LNG pump; and the steps of removing LNG from the end flash unit, passing the removed LNG to the LNG vaporizer to vaporize the pressurized LNG so that the pressurized LNG is transformed to gas phase, and re-admitting the vaporized LNG to the flow path at a point downstream of the inlet and upstream of the liquefaction unit. Non-Final Act. 5. The Examiner acknowledges, however, that Kimble does not teach, *inter alia*, that "the method is carried out during turndown of the LNG plant." *Id.* at 7 (citing Kimble ¶¶ 42–43, 45–46, Abstract, Fig. 4). The Examiner therefore turns to Newton for this limitation.

Newton teaches a system for reliquefying boiloff vapors from an LNG storage container on an LNG tanker caused by heat leakage into the LNG storage container. Newton, 1:12–14, 26–28, Fig. 2. Newton's system may experience reduced vapor flow due to, e.g., "reduced storage container liquid inventory during a tanker return journey." *Id.* at 2:23–28. Newton discloses that "[i]n order to prevent the problems of shutdown and restart of the reliquefier, it is proposed to artificially provide a constant load to the reliquefier by revaporization of the condensed vapor." *Id.* at 2:30–33; *see*

also id. at 2:37–39 ("The use of [our] revaporizer in the present invention is useful in preventing shutdown of the reliquefier at lower loadings.").

According to the Examiner, "[w]hen [Newton's revaporization process] is not needed, the control valve (31) is closed" to stop redirecting LNG through the revaporizer. *Id.* (citing Newton, 4:37). The Examiner determines that it would have been obvious to one of ordinary skill in the art to operate Kimble's LNG recirculation process during turndown "to prevent the problems of shutdown and restart of the liquefier by artificially providing a constant load to the system." *Id.* The Examiner acknowledges that Kimble's process for recirculation LNG provides some of the refrigeration to the LNG plant during normal operation, but "in Kimble the refrigeration provided by the vaporization of the LNG can be compensated for by the addition of other refrigeration cycles." *Id.* (citing Kimble ¶ 47).

Appellant responds that Kimble's system recirculates LNG not during turndown, but to provide a portion of the coolant during normal "steady state" plant operation. Appeal Br. 7–8. Appellant asserts that:

> [S]ome of the produced and cooled PLNG [pressurized liquefied natural gas] is taken from a separation tank 80 and is passed through heat exchangers 71 and 61 (as a refrigerant) to provide some of the cooling of the natural gas flowing through the cooling side of those heat exchangers from the source of Feed Gas. Therefore, heat is transferred via the heat exchanger from the feed gas to the already-liquefied gas. This is done to reduce the cost of the refrigeration system and reduce the weight of the liquefaction system to make it more suitable for offshore applications. . . . Whilst this "refrigerant" gas is finally recirculated back to the separation tank, this is purely incidental; its use as a refrigerant is not reliant upon this.

Id. at 8 (citing Kimble ¶ 5). Appellant further contends that "[a]lthough Kimble briefly discusses that additional refrigeration cycles, heat exchangers and expanders can be combined with the liquefaction system . . . the recirculation of the PLNG as a refrigerant to provide a portion of the cooling is a fundamental aspect of the disclosed system of Kimble." *Id.*

In response to Appellant's argument that Kimble's LNG recirculation is used to provide refrigeration to aid in liquefying natural gas during normal plant operation, and therefore would not be terminated when the plant is not in turndown as claim 19 requires, the Examiner asserts that "Kimble considers having additional liquefaction systems including additional refrigeration cycles to aid in liquefying the natural gas." Ans. 13. According to the Examiner, "[t]he systems as discussed by Kimble as being additional are alone capable of producing LNG as they are standalone systems and as such, one could use them instead of using that in Kimble to produce the necessary PLNG and then use the method of Newton to maintain conditions during start-up and turndown in the used liquefaction system." *Id.* at 14.

We do not sustain this rejection. As noted above, claim 19 requires that its method be performed during turndown caused by insufficient supply of feed gas or insufficient storage capacity for processed LNG, but ceases when those conditions are not met (i.e., it would not be performed under normal operating conditions). Kimble's LNG recirculation process, on which the Examiner relies, is used to provide a portion of the cooling of the feed gas during normal plant operation. Kimble ¶¶ 42–46. The Examiner determines that, based on Newton's use of a "revaporizer" during turndown operations, as well as Kimble's suggestion that one of ordinary skill in the

art "could add additional refrigeration cycles, heat exchangers and expanders to the embodiments discussed above," it would have been obvious to discontinue use of Kimble's LNG recirculation process during normal operation. We do not consider these teachings as sufficient to render obvious the cessation of a process under conditions for which it was designed to operate. Newton may have suggested maintaining Kimble's LNG recirculation during turndown, but not its cessation when not in turndown. Kimble's teaching that "additional" refrigeration cycles may have been used does not amount to a teaching that the LNG recirculation system would not be used. This is particularly true given that the purpose of using recirculated LNG to assist with cooling is to reduce the cost and weight of cooling systems in offshore LNG plants. Kimble ¶ 5. It would be contrary to this goal to have a system that assists in cooling but is not used. Even if the Examiner is correct that the systems that Kimble refers to are "standalone" systems that "are alone capable of producing LNG," Kimble does not teach using them as standalone systems, but only as "additional" systems.

CONCLUSION

The Examiner's rejection is reversed.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
19–21	103	Kimble, Coyle, Newton, Turner, Martinez		19–21

REVERSED