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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TERRY D. TURNER, BRUCE M. WILDING,
MICHAEL G. MCKELLAR, DENNIS N. BINGHAM,
and KERRY M. KLINGLER

Appeal 2018-002401
Application 13/528,246
Technology Center 3700

Before KENNETH G. SCHOPFER, AMEE A. SHAH, and
ROBERT J. SILVERMAN, *Administrative Patent Judges*.

SHAH, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), the Appellant¹ appeals from the Examiner’s final decision to reject claims 1–3, 5, 6, 12, 16–18, 21, and 30–36, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as “Battelle Energy Alliance, LLC.” Appeal Br. 2.

CLAIMED SUBJECT MATTER

The Appellant's invention "relate[s] to the compression and liquefaction of gases and, more specifically, the liquefaction of natural gas employing a refrigerant path separate from a process stream." Spec. ¶ 3.

Claims 1 and 17 are the independent claims. Claim 1 is illustrative of the subject matter on appeal and is reproduced below (with added bracketing for reference):

1. A method of liquefying natural gas, the method comprising:

[(a)] cooling a compressed gaseous refrigerant stream of a refrigerant loop in a channel of a heat exchanger to form a partially gaseous refrigerant stream comprising a gaseous phase and a liquid phase;

[(b)] separating the gaseous phase from the liquid phase in a separation vessel downstream of the channel of the heat exchanger to form a gaseous refrigerant side stream and a liquid refrigerant stream;

[(c)] expanding the gaseous refrigerant side stream in an expansion device downstream of the separation vessel;

[(d)] combining the expanded, gaseous refrigerant side stream with the liquid refrigerant stream in a mixer downstream of the expansion device to form another partially gaseous refrigerant stream; and

[(e)] directing the another partially gaseous refrigerant stream into another channel of the heat exchanger downstream of the mixer prior to modifying a temperature of the another partially gaseous refrigerant stream to extract heat from a natural gas process stream of a natural gas processing path fluidly separate from the refrigerant loop to liquefy at least a portion of the natural gas process stream and form a gaseous refrigerant stream.

Appeal Br. 40 (Claims App.).

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Prevost et al. ("Prevost")	US 5,701,761	Dec. 30, 1997
Wilding et al. ("Wilding")	US 2011/0094263 A1	Apr. 28, 2011
Turner et al. ("Turner")	US 2011/0094262 A1	Apr. 28, 2011

REJECTIONS

Claims 1–3, 5, 6, 12, 16–18, 21, and 30–36 stand rejected under 35 U.S.C. § 112(a) or 35 U.S.C. § 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement.

Claims 1–3, 5, 6, 12, and 16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Prevost.

Claims 1, 17, 18, 21, and 30–32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Prevost in view of Wilding.

Claims 33–36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Prevost in view of Wilding and further in view of Turner.

Claims 1–3, 5, 6, 12, 16–18, 21, and 30–32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wilding in view of Prevost.

Claims 33–36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wilding in view of Prevost and further in view of Turner.

OPINION

Written Description

The Examiner rejects the claims for having insufficient support in the disclosure to show that, at the time of the invention, the Appellant had

possession of limitation (e) of “directing the another partially gaseous refrigerant stream into another channel of the heat exchanger downstream of the mixer *prior to modifying a temperature of the another partially gaseous refrigerant stream* to extract heat from a natural gas process stream.” Final Act. 2–3.

The Appellant directs attention to Figure 1 of the Specification as showing

the NG liquefaction plant . . . is *free of* additional apparatuses (e.g., heating/cooling apparatuses) intervening between the mixer 176 and the another channel of the primary heat exchanger 120 in the flow path of the at least partially gaseous refrigerant stream 166', one of ordinary skill in the art at the time of the invention would recognize that the at least partially gaseous refrigerant stream 166' may be directed from the mixer 176 into another channel of the primary heat exchanger 120 *prior to modifying a temperature thereof*.

Appeal Br. 11. The Appellant also directs attention to paragraph 25 of the Specification as providing

support[] that the at least partially gaseous refrigerant stream 166' may be directed from the mixer 176 and into another channel of the primary heat exchanger 120 prior to modifying a temperature thereof (e.g., without modifying the temperature of the at least partially gaseous refrigerant stream 166' by way of additional heating/cooling apparatuses intervening between the mixer 176 and the another channel of the primary heat exchanger 120).

Id. at 11–12 (emphasis omitted).

To satisfy the written description requirement under 35 U.S.C. § 112(a), the specification must “reasonably convey[] to those skilled in the art that the inventor had possession” of the claimed invention as of the filing date. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir.

2010) (en banc). An adequate description does not require any particular form of disclosure or that the Specification recite the claimed invention *in haec verba*, but must do more than render the claimed invention obvious. *Id.* at 1352. As stated in *Ex parte Parks*, however, adequate written description “does not require literal support for the claimed invention.” *Ex parte Parks*, 30 USPQ2d 1234, 1236 (BPAI 1993) (emphasis omitted). As such, “a lack of literal support does not, in and of itself, establish a prima facie case for lack of adequate descriptive support” *Id.* (emphasis omitted). “Rather, it is sufficient if the originally-filed disclosure would have conveyed to one having ordinary skill in the art that an appellant had possession of the concept of what is claimed.” *Id.*

The Examiner agrees that Figure 1 of the Specification depicts stream 166' flowing directly from mixer 176 to heat exchanger 120 without any intervening apparatuses modifying the stream's temperature. Ans. 3. And paragraph 25 of the Specification discusses stream 166' flowing from mixer 176 to heat exchanger 120 without any specific description of an intervening apparatus. When considering Figure 1 in combination with paragraph 25, we agree with the Appellant that one of ordinary skill in the art would recognize that the claim recites a positive limitation to what is invented (*see* Appeal Br. 13), i.e., the limitation of “prior to modifying” refers to prior to a modification in temperature caused by an apparatus or device, as opposed to any natural heat gain or loss due to outside temperatures (*see* Reply Br. 3–4).

The Examiner is correct that the Specification does not specifically discuss that partially gaseous stream 166' is sent directly to heat exchanger 120 without any intervening apparatuses performing a modification in temperature and that there may be some natural modification in temperature

to stream 166' during flow to the heat exchanger due to heat gain or loss as it flows through a pipe. *See* Ans. 3. However, we agree with the Appellant that one of ordinary skill in the art would understand that “the as-filed [S]pecification supports that *the* at least partially gaseous refrigerant stream 166' (i.e., *as opposed to a thermally modified variation thereof* formed through heat transfer from or to an ‘outside environment’) exiting the mixer 176 may be directed into the primary heat exchanger 120.” Reply Br. 4. When considering the Specification as whole, we find the Specification reasonably conveys to one of ordinary skill in the art that the Appellant had possession of directing stream 166' into another channel of heat exchanger 120 downstream of mixer 176 prior to modifying a temperature of stream 166'.

Based on the foregoing, we do not sustain the written description rejection of the claims.

Obviousness

Prevost

The Appellant contends that the Examiner’s rejection of claim 1 is in error because:

Prevost does not teach or suggest, “directing the another partially gaseous refrigerant stream into another channel of the heat exchanger downstream of the mixer *prior to modifying a temperature of the another partially gaseous refrigerant stream* to extract heat from a natural gas process stream of a natural gas processing path fluidly separate from the refrigerant loop to liquefy at least a portion of the natural gas process stream and form a gaseous refrigerant stream,” as recited in independent claim 1[, limitation (e)].

Appeal Br. 21; *see also id.* at 22–28. Specifically, the Appellant argues that the Examiner has not adequately explained how one of ordinary skill in the

art would find it obvious to combine Prevost's embodiments as depicted in its Figures 2 and 3 to reach the claimed invention. *See id.* at 26–28. We agree.

The Examiner finds that Prevost, in the embodiment depicted in Figure 3, “teaches all the limitations as disclosed above including modifying temperature of the another partially gaseous refrigerant stream (10) [by passing the stream through HE1] prior to sending the stream (10) into another channel of the heat exchanger HE2.” Final Act. 5; Ans. 5–6. However, the Examiner also cites to Prevost's separate embodiment as depicted in Figure 2 to show that “liquefying a natural gas using a single exchanger, and sending a combined expanded gaseous refrigerant (9) and liquid refrigerant (6, 7, and 8) back to the single heat exchanger (prior to any modification to the combined refrigerant stream) is also well known.” Final Act. 5; *see also* Ans. 6. Specifically, the Examiner finds that Prevost's Figure 2 teaches

liquefying a natural gas using a single exchanger (E1), by sending a combined expanded gaseous refrigerant [9] and liquid refrigerant [6, 7, and 8] (*which is a stream equivalent to the another partially gaseous refrigerant stream 10/11 of fig. 3*) back to the single heat exchanger (prior to any modification to the temperature of the combined refrigerant stream).

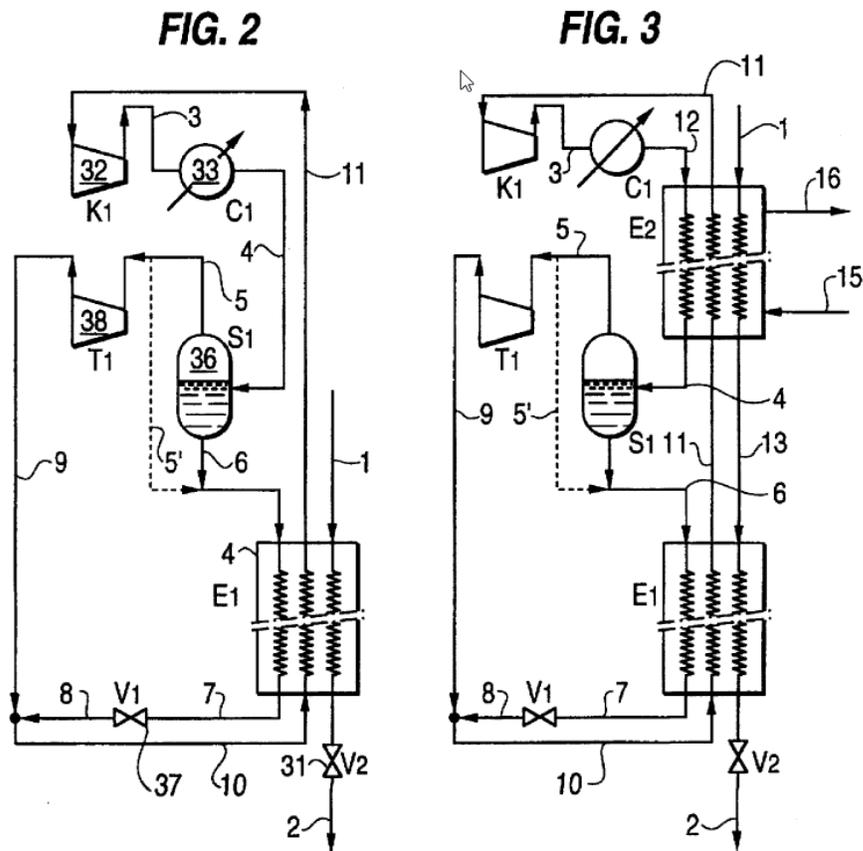
Ans. 6. And, the Examiner determines:

it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the natural gas liquefaction process of Prevost by using a single heat exchanger as taught by fig. 2 of Prevost in order to minimize cost by avoiding the use of multiple heat exchangers to liquefy the natural gas, since it has been held that combining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness and involves only routine

skill in the art, *Boston Scientific v. Cordis Fed. Cir.* 2009 [554 F.3d 982].

Final Act. 5; Ans. 6.

Prevost's Figure 2 and 3, reproduced below, depict methods for liquefy pressurized natural gas.



The differences between the two figures are the additional steps added in Figure 3, including the cooling step added between condenser C_1 and separator S_1 via heat exchanger E_2 , the recycled vapor mixture from heat exchanger E_1 passing to exchanger E_2 via pipe 11, and the pressurized natural gas cooled by exchanger E_2 fed via pipe 13 to exchanger E_1 to undergo a second cooling phase. *See* Prevost, col. 6, l. 59–col. 7, l. 18.

To the extent the Examiner finds that Prevost's Figure 3 teaches limitation (e) of directing the another partially gaseous stream 10/11 to another channel of heat exchanger E₂ (of limitation (a)) prior to a modification of the temperature of stream 10/11 (*see* Final Act. 5; Ans. 5), this finding is unsupported. Figure 3 shows that the mixture fed via pipe 10 is sent through exchanger E₁, where it is cooled, i.e., the temperature is modified, prior to being sent back to exchanger E₂ via pipe 11. *See also* Appeal Br. 21.

The Examiner's determination that the combination of Prevost's embodiments of Figures 2 and 3 teaches limitation (e) (*see* Final Act. 5; Ans. 6) is also inadequately supported. The Examiner determines that it would have been obvious to modify the double heat exchanger method of Figure 3 with Figure 2's single heat exchanger. *Id.* The Examiner does not explain how the limitations of claim 1 would still be met when removing one heat exchanger from Figure 3. The Examiner explains that if exchanger E₂ is removed, then the cooled pressurized natural gas that is in pipes 6, 7, and 8 is sent back to exchanger E₁ via pipe 10. Ans. 6. However, the Examiner notably does not rely solely on Figure 2 for teaching claim 1, and it is not clear how removing exchanger E₂ modifies the embodiment of Figure 3 to still have a separator downstream of E₁, as recited in limitation (b). *See* Appeal Br. 23. In other words, the Examiner does not adequately explain what the end result would be of removing exchanger E₂ from the embodiment of Figure 3 or how one of ordinary skill in the art would understand how the combination meets the claim as a whole.

Thus, based on the record before us, we are persuaded of Examiner error, and we do not sustain the obviousness rejection over Prevost of

claim 1 and of claims 2, 3, 5, 6, 12, and 16, which fall with claim 1.
37 C.F.R. § 41.37(c)(1)(iv).

Prevost and Wilding

For the rejection under 35 U.S.C. § 103(a) of claims 1, 17, 18, 21, and 30–32 as obvious over Prevost in view of Wilding, and for the rejection under 35 U.S.C. § 103(a) of claims 1–3, 5, 6, 12, 16–18, 21, and 30–32 as obvious over Wilding in view of Prevost, the Examiner relies on the combination of Prevost’s Figures 2 and 3 to teach limitation (e) of claim 1, similarly recited in independent claim 17. *See* Final Act. 7–9, 16–18; Ans. 9 (“since the examiner does not relied on Wilding to teach the above argued claim limitation [(e)], therefore the argument by the appellant is moot”); 10 (relying on response for rejection of claim 1 as obvious over Prevost). Thus, for the same reasons we do not sustain the rejection of claim 1 as obvious over Prevost, we also do not sustain the obviousness rejections of claim 1, 17, 18, 21, and 30–32 over Prevost in view of Wilding and of claims 1–3, 5, 6, 12, 16–18, 21, and 30–32 as obvious over Wilding in view of Prevost.

Prevost, Wilding, and Turner

The Examiner’s rejects claim 33–36, which ultimately depend from independent claim 17, as obvious over Prevost, Wilding, and Turner. Turner does not cure the deficiencies of claim 17 regarding Prevost as discussed above. Thus, for the same reasons we do not sustain the rejection of claim 17 as obvious over Prevost and Wilding, we also do not sustain the obviousness rejections of claim 33–36 over Prevost, Wilding, and Turner.

CONCLUSION

The Examiner's decision to reject claims 1-3, 5, 6, 12, 16-18, 21, and 30-36 is not sustained.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1-3, 5, 6, 12, 16-18, 21, 30-36	112(a)	Written Description		1-3, 5, 6, 12, 16-18, 21, 30-36
1-3, 5, 6, 12, 16	103	Prevost		1-3, 5, 6, 12, 16
1-3, 5, 6, 12, 16-18, 21, 30-32	103	Prevost, Wilding		1-3, 5, 6, 12, 16-18, 21, 30-32
33-36	103	Prevost, Wilding, Turner		33-36
Overall Outcome				1-3, 5, 6, 12, 16-18, 21, 30-36

REVERSED