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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PAUL THEO ALERS and FREDERIK JAN VAN DIJK

Appeal 2014-008765
Application 13/119,456
Technology Center 3700

Before MICHAEL C. ASTORINO, CYNTHIA L. MURPHY, and
MATTHEW S. MEYERS, *Administrative Patent Judges*.

MURPHY, *Administrative Patent Judge*.

DECISION ON APPEAL

The Appellants¹ appeal under 35 U.S.C. § 134 from the Examiner's rejections of claims 1–16. We have jurisdiction over this appeal under 35 U.S.C. § 6(b).

We AFFIRM.

¹ The Appellants identify the real party in interest as “Shell Oil Company.” (Appeal Br. 2.)

STATEMENT OF THE CASE

The Appellants' invention "relates to a method of cooling a hydrocarbon stream, and an apparatus therefor." (Spec. 1, ll. 1–2.)

Illustrative Claim

1. A method of cooling a hydrocarbon stream in a heat exchanger, comprising at least the steps of:

(a) providing a hydrocarbon stream;

(b) heat exchanging the hydrocarbon stream in a first heat exchanger against at least a first refrigerant stream having a first refrigerant stream flow rate, to provide a cooled hydrocarbon stream having a hydrocarbon stream flow rate and at least one return refrigerant stream;

(c) inputting a first set point for the first refrigerant stream flow rate; and

(d) adjusting the first refrigerant stream flow rate and the hydrocarbon stream flow rate until the set point is achieved, wherein:

(d1) if the first set point is greater than the first refrigerant stream flow rate, then the hydrocarbon stream flow rate is increased before the first refrigerant stream flow rate is increased;

(d2) if the first set point is less than the first refrigerant stream flow rate, then the first refrigerant stream flow rate is decreased before the hydrocarbon stream flow rate is decreased; and

(d3) if the hydrocarbon stream flow rate decreases, then the first refrigerant stream flow rate is decreased.

References

Elion	US 6,725,688 B2	Apr. 27, 2004
Paradowski	US 6,898,949 B2	May 31, 2005
Hoshino	JP 58-069320	Apr. 25, 1983

Rejections

The Examiner rejects claims 1–9 and 13–16 under 35 U.S.C. § 103(a) as unpatentable over Elion and Hoshino. (Final Action 2.)

The Examiner rejects claims 10–12 under 35 U.S.C. § 103(a) as unpatentable over Elion, Hoshino, and Paradowski. (Final Action 9.)

ANALYSIS

Independent Claim 1

Independent claim 1 is directed to a method comprising the step of “adjusting [a] refrigerant stream flow rate and [a] hydrocarbon stream flow rate until [a] set point is achieved.” (Appeal Br. Claims App.) The Examiner finds that Elion discloses a hydrocarbon-cooling system wherein refrigerant and hydrocarbon flow rates are adjusted to achieve a set point. (*See* Final Action 2–3.) The Examiner explains that, in Elion’s system, the hydrocarbon flow rate is adjusted “constantly in response to” the measured flow rate of the refrigerant which also “changes constantly” as it is adjusted to “achieve the set point.” (Answer 10.)

The Appellants argue that the temperature of Elion’s hydrocarbon stream “is controlled **after** the set point of the refrigerant stream has been reached” and hence “[t]he set point of the refrigerant stream of Elion is reached without adjustment to the [hydrocarbon] stream flow rate.” (Appeal Br. 4, emphasis added.) We are not persuaded by this argument because it is not supported by Elion’s disclosure. Elion discloses concurrent iterative adjustments of the refrigerant flow rate (to reach the set point) and hydrocarbon flow rate (to maintain a certain temperature). (*See* Elion, col. 4, ll. 31–36, col. 5, ll. 9–24; *see also* Answer 9.) Thus, Elion teaches that its

hydrocarbon flow is adjusted while (not merely after) its refrigerant flow rate is being iteratively adjusted to achieve the set point.

Independent claim 1 also recites that “if the hydrocarbon stream flow rate decreases, then the [] refrigerant stream flow rate is decreased.”

(Appeal Br., Claims App.) The Examiner finds that this occurs in Elion.

(See Final Action 3.) The Examiner explains that “[i]f there is a malfunction or sudden and unexpected decrease in the hydrocarbon flow rate, it would be nonsensical for a plant operator to continue providing the same refrigeration capacity to the heat exchanger.” (Answer 11.)

The Appellants argue that “there is no indication that a decrease in the flow rate of the hydrocarbon stream of Elion would trigger a decrease in the flow rate of the refrigerant stream.” (Appeal Br. 4.) We are not persuaded by this argument because the Appellants do not adequately address why one of ordinary skill in the art would not appreciate that Elion’s hydrocarbon-cooling system could and should respond to a sudden/unexpected decrease in hydrocarbon (e.g., during a transition period to a set point) with a remedial decrease in refrigerant. As noted by the Examiner, “[t]he refrigerant flow has no independent purpose aside from cooling the hydrocarbon stream.” (Answer 11.)

Independent claim 1 further recites that “if the first set point is greater than the first refrigerant stream flow rate, then the hydrocarbon stream flow rate is increased before the first refrigerant stream flow rate is increased.”

(Appeal Br. Claims App.) In other words, the hydrocarbon leads and the refrigerant lags if the set point requires an increase in flow rates. The Examiner determines that it would have been obvious, in view of Hoshino, to modify Elion’s system to lead/lag in this manner for the benefit of

minimizing energy consumption. (*See* Final Action 4–6.) The Examiner explains that one of ordinary skill in the art would reasonably expect this modification to ensure that, during a transition, “the refrigerant flow rate is never at any point excessive.” (Answer 18.)

The Appellants argue that Hoshino is not analogous art. (*See* Appeal Br. 8–12.) We are not persuaded by this argument because the Appellants’ invention addresses “problems associated with the cooling of a hydrocarbon stream” (Spec. 3, ll. 3–5) and the Specification indicates such cooling entails control of hydrocarbon and refrigerant flow rates (*see e.g., id.*, 18, ll. 22–26). We agree with the Examiner that Hoshino is pertinent to the problem of “controlling the flow rate of two fluids wherein the controller must maintain a ratio between the flow rates of the fluids.” (Answer 15.) And a reference is analogous art if it “is reasonably pertinent to the particular problem with which the inventor is involved.” *In re Bigio* 381 F.3d 1320, 1325 (Fed. Cir. 2004).

The Appellants also advance several arguments as to why the Examiner errs in determining that it would have been obvious to modify Elion in view of Hoshino. (*See* Appeal Br. 12–17.) We are not persuaded these arguments because they are premised primarily upon the particular elements and the specific steps disclosed by Hoshino. As noted by the Examiner, the focus should instead be on “what the combined teachings of the references would have suggested to those of ordinary skill in the art.” (Answer 17.) Indeed, the Examiner “need not seek out precise teachings directed to the specific subject matter of the challenged claim” as “the inferences and creative steps that a person of ordinary skill in the art would

employ” can be taken into account. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 419 (2007).

Here, the Examiner’s findings establish that Hoshino teaches a controller wherein the flow rate of a first fluid (i.e., air) and the flow rate of a second fluid (i.e., fuel) are adjusted to achieve a set point. (*See* Final Action 5–6.) The Examiner’s findings also establish that Hoshino teaches inverse lead/lag orders are possible when adjusting flow rates to achieve a set point, namely, the first fluid can lead and the second fluid can lag (i.e., in one switch position) or, alternatively, the second fluid can lead and the first fluid can lag (i.e., in another switch position). (*See* Answer 16–19.) Thus, the Examiner’s findings establish that Hoshino teaches that, when adjusting two fluids to achieve a set point, inverse lead/lag orders can both be considered for the transition period.

As indicated above, independent claim 1 recites that, if an increase in flow rates is necessary to achieve a set point, the hydrocarbon leads and the refrigerant lags. The Examiner finds that, in Elion, the inverse occurs: the refrigerant leads and the hydrocarbon lags. (*See* Answer 15.) The Examiner’s proposed modification of Elion’s system “merely involve[s] a change in the order of lead/lag during the transition period.” (*Id.* at 18.) In other words, one of ordinary skill would consider both Elion’s disclosed lead/lag order and the inverse lead/lag order for the transition period.

The Appellants present arguments regarding Hoshino’s combustion process, the respective positions of Hoshino’s change-over switch, and the criteria Hoshino applies when changing over the switch from one position to the other. (*See* Appeal Br. 5–8; *see also* Reply Br. 2–3.) However, none of these details detract from a finding that Hoshino teaches that inverse lead/lag

orders can be considered when transitioning two fluids to achieve a set point. As such, the Appellants' arguments do not persuasively challenge the Examiner's position that one of ordinary skill in the art would infer, from the teachings of Hoshino, that an inverse of Elion's lead/lag order would be a creative step worth considering.

The Appellants contend that Hoshino's controller does not minimize energy consumption in the manner described by the Examiner, that Elion's modified system would not minimize energy consumption in the same manner as Hoshino, and/or that Elion's modified system would not minimize energy consumption at all. (*See* Appeal Br. 12, 13, 15, 17.) However, the Appellants do not persuasively challenge the Examiner's position that the proposed lead/lag order in Elion's modified hydrocarbon-cooling system would reduce the refrigerant required during the transition period. (*See* Answer 18.) We agree with the Examiner's implication that one of ordinary skill in the art would expect such a reduction in refrigerant to translate into a reduction in energy consumption (*see* Advisory Action 3) and the Appellants do not offer any technical reason as to why it would not.

The Appellants also assert that the Examiner "fails to identify any prior art recognizing a problem with excess energy consumption" and "absent any identified problems," it would not have been obvious to make modifications to a system that has already undergone "a balanced consideration of design factors." (Appeal Br. 14, 15.) But we agree with the Examiner that one of ordinary skill in the art would have considered a modification "relating to reducing the energy consumed by the system" (Advisory Action 3) even if such an objective was not expressly discussed in the prior art references. As for issues relating to system balance, as noted by

the Appellants, “the set point, and not the modification of flow rates, determines the ‘stable’ operation for a prolonged period of time.” (Appeal Br. 12.)

Insofar as the Appellants otherwise argue that the Examiner errs in determining that the method recited in independent claim 1 would have been obvious over the combined teachings of Elion and Hoshino, we are not persuaded by these arguments.

Thus, we sustain the Examiner’s rejection of independent claim 1 under 35 U.S.C. § 103(a) as unpatentable over Elion and Hoshino.

Independent Claim 14

Independent claim 14 is directed to an apparatus “for operating a heat exchanger” comprising a “flow setter” that provides a “set point signal,” a “low selector” that transmits the lowest of the set point signal and a hydrocarbon flow signal to a refrigerant flow controller, and a “high selector” that transmits the highest of the set point signal and a refrigerant flow signal to a hydrocarbon flow controller. (Appeal Br., Claims App.) The Examiner determines that Elion in view of Hoshino teaches such an apparatus for operating a heat exchanger. (*See* Final Action 7–8.)

The Appellants argue that “[f]or reasons analogous to those asserted above, it is non-obvious to modify Elion in view of Hoshino.” (Appeal Br. 17.) As discussed above, we are not persuaded by the Appellants’ position that that the Examiner errs in this regard. The Examiner’s findings sufficiently support a determination that it would have been obvious to modify Elion’s system so that the hydrocarbon leads and the refrigerant lags if the set point requires an increase in flow rates.

The Appellants also argue that Hoshino does not teach the low selector and/or the high selector required by independent claim 14. (*See* Appeal Br. 17–18.)

We are not persuaded by this argument because the Examiner’s rejection is based upon “what the combined teachings of the references would have suggested to those of ordinary skill in the art.” (Answer 17.) The Appellants acknowledge that Hoshino shows a high selector that controls the flow rate of a leading fluid and a low selector that controls the flow rate of a lagging fluid. (*See e.g.*, Appeal Br. 6.) And we agree with the Examiner’s implication that it would have been obvious for Elion’s modified system to use a high selector to control the flow rate of the leading fluid (i.e., hydrocarbon) and a low selector to control the flow rate of the lagging fluid (i.e., refrigerant). (*See e.g.*, Final Action 8.)

Thus, we sustain the Examiner’s rejection of independent claim 14 under 35 U.S.C. § 103(a) as unpatentable over Elion and Hoshino.

Dependent Claims 2–13, 15, and 16

The Appellants do not argue these claims separately (*see* Appeal Br. 18) and so they fall with independent claims 1 and 14.

Thus, we sustain the Examiner’s rejection of claims 2–9, 13, 15 and 16 under 35 U.S.C. § 103(a) as unpatentable over Elion and Hoshino; and we sustain the Examiner’s rejection of claims 10–12 under 35 U.S.C. § 103(a) as unpatentable over Elion, Hoshino, and Paradowski.

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DECISION

We AFFIRM the Examiner's rejections of claims 1–16.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED