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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ATLI BENONYSSON

Appeal 2016-000104[1]
Application 12/066,834[2]
Technology Center 3700

Before MICHAEL C. ASTORINO, KENNETH G. SCHOPFER, and ALYSSA A. FINAMORE, *Administrative Patent Judges*.

SCHOPFER, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the rejection of claims 1–4 and 6–14. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] Our decision references the Appeal Brief ("Appeal Br.," filed Feb. 17, 2015) and Reply Brief ("Reply Br.," filed Aug. 21, 2015), and the Examiner's Answer ("Ans.," mailed June 24, 2015) and Non-Final Office Action ("Non-Final Act.," mailed June 16, 2014).

[2] According to Appellant, the real party in interest is DANFOSS A/S. Appeal Br. 2.

BACKGROUND

According to Appellant:

> The invention concerns a heat exchanger with a housing having arranged in it a primary side with a primary-side flow path between an upstream connector and a downstream connector and a secondary side with a secondary-side flow path between an inflow connector and an outflow connector, wherein the primary side and the secondary side stand in heat exchange connection with one another along a heat exchange stretch with a temperature sensor being arranged in the region of the outflow connector.

Spec. ¶ 1.

REPRESENTATIVE CLAIM

Claim 1 is representative of the appealed claims and recites:

1. A heat exchanger with a housing, comprising:

a hot side with a hot-side flow path between an upstream connector connected to a heater and a downstream connector;

a cold side with a cold-side flow path between an inflow connector and an outflow connector;

wherein the hot side and the cold side stand in heat transfer connection along a heat transfer stretch;

a first temperature sensor arranged in the cold-side flow path in the region of the downstream connector for measuring a first temperature of a fluid in the cold-side flow path;

a second temperature sensor arranged in the cold-side flow path at the heat transfer stretch for measuring a second temperature of the fluid in the cold-side flow path;

wherein both the first and second temperature sensors are connected with an evaluation device;

wherein the second temperature sensor is connected with a P controller, PI controller or PID controller controlling a valve that controls the flow through the hot-side flow path in dependence on a temperature determined by the first temperature

> sensor, with the second temperature sensor having an effect on the amplification of at least one of a P, I or D control parameter of the P controller, PI controller or PID controller.

Appeal Br. 19.

REJECTIONS

1. The Examiner rejects claims 1–4, 6, and 7 under 35 U.S.C. § 103(a) as unpatentable over Weitman[3] in view of Brunner.[4]
2. The Examiner rejects claim 8 under 35 U.S.C. § 103(a) as unpatentable over Weitman in view of Brunner and Kirchberg.[5]
3. The Examiner rejects claims 9–14 under 35 U.S.C. § 103(a) as unpatentable over Weitman in view of Brunner and Helin.[6]

DISCUSSION

Obviousness over Weitman and Brunner

Appellant groups claims 1–4, 6, and 7 together and presents arguments only with respect to the rejection of claim 1. Accordingly, we discuss the rejection of claim 1 below, and claims 2–4, 6, and 7 fall with claim 1.

With respect to claim 1, the Examiner finds that Weitman discloses a heat exchanger with a housing including a first side flow path, a second side flow path, a first temperature sensor, and a second temperature sensor. Non-Final Act. 3. The Examiner acknowledges that Weitman does not disclose temperature sensors in the cold-side flow path in the heat transfer stretch or

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[3] Weitman, US 4,574,870, iss. Mar. 11, 1986.
[4] Brunner, US 3,172,462, iss. Mar. 9, 1965.
[5] Kirchberg, US 7,726,874 B2, iss. June 1, 2010.
[6] Helin et al., US 2004/0134637 A1, pub. July 15, 2004.

"that the controller uses P, PI, or PID control algorithms influenced by the second temperature sensor." *Id.* at 4. However, regarding the location of the claimed temperature sensors in the cold-side flow path, the Examiner concludes that it would have been obvious to rearrange the valve and temperature sensors in the reverse configuration "in order to control for highly variable sources of cold water instead of hot (e.g. on-demand, inline water heaters) as such a rearrangement of parts would produce only expected and predictable results." *Id.* Further, the Examiner relies on Brunner as follows:

> Brunner discloses a heat exchanger wherein first (11, 9, or 53) and second (12 or 45) heat sensors (Fig. 1) are located in a flow path. The second sensor (12 or 45) is located within the heat transfer stretch (Fig. 1) in order to increase the response time of the system (Col. 1, line 61-Col. 2, line 18) and influences the parameters of a P or a PI controller (17 or 39). The signal input to a proportional-integral calculator (e.g. 39) is inherently amplified by the gain value of the proportional-integral calculator to generate the P or I control value. Therefore, the signal input (e.g. 11, 12, or 45) to the calculator (e.g. 17, 39) has an effect on the amplification of the P or I parameter (e.g. 18, 40).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the heat exchanger of Weitman with the second temperature sensor at the heat transfer stretch and P or Pl control, as taught by Brunner, in order to increase the response time and accuracy of the system during unexpected fluctuating flow or temperature input conditions.

Id. at 4–5.

Further, the Examiner finds that the equation that defines proportional-integral control includes inputs that are multiplied by a gain constant in order to generate the respective P, I, or D value. Ans. 10. Thus, because the input (e.g., the second temperature sensor reading) is multiplied

by a constant, the Examiner concludes that the input necessarily has an effect on the amplification of at least one of the P, I, or D parameter. *Id.*

As discussed below, we are not persuaded of reversible error by Appellant's arguments.

Appellant first argues that the "rejection based on Weitman is deficient" at least because Weitman's temperature sensors are not disposed in the cold-side flow path as required by the claim. Appeal Br. 12. Additionally, Appellant argues that "Weitman and Brunner do not teach or suggest that the valve in the hot-side flow path is controlled by a controller (P controller, PI controller or PID controller), as recited in claim 1." *Id.* at 13. However, the rejection acknowledges these deficiencies, and the Examiner concludes that the claimed configuration would have nonetheless been an obvious "rearrangement of parts [that] would produce only expected and predictable results." *See* Non-Final Act. 4; *see also* Ans. 7–9. Appellant's arguments here do not address this conclusion, and thus, we are not apprised of error by this argument.

Next, Appellant argues that it would not have been obvious to modify Weitman to control the hot-side flow path instead of the cold-side flow path "because such a modification would improperly change the principle of operation of the Weitman system and render Weitman's system inoperable for its intended purpose." Appeal Br. 12. In support, Appellant asserts that "Weitman's basic principle of operation is controlling the fresh water flow (*i.e.,* cold-side flow) by adjusting valve position . . . such that [the temperature relationship] is maintained at a constant." *Id.* We are not persuaded and agree with the Examiner's response. *See* Ans. 8. Further, we find that an intended purpose of Weitman is "to provide a method and

apparatus for controlling the fluid flow through a heat exchanger" to maintain operation substantially "at an optimal level . . . without the use of making direct flow measurements." Weitman col. 1, ll. 50–58. Thus, although Weitman discloses an embodiment in which the cold-side flow is controlled, Weitman is ultimately concerned with maintaining operation efficiency without making direct flow measurements. Appellant does not persuade us that Weitman's system would be inoperable with respect to this purpose if the proposed modifications were made. Rather, although Appellant points to one embodiment in which the cold-side flow is controlled, we find that the same principles of heat exchange would apply regardless of whether the hot or cold side flow is controlled based on the temperatures recorded. *See also* Weitman col. 2, ll. 33–37 ("As may be seen heat exchanger **5** in this embodiment operates in the counter-current mode, which is preferable in this embodiment, but the invention is advantageous for use with all heat exchangers.")

Next, Appellant argues "that Weitman and Brunner do not teach or suggest that the second temperature sensor has an effect on the amplification of at least one parameter . . . of the controller . . . that controls the valve in the hot-side flow path." Appeal Br. 13. In particular, Appellant disagrees with the Examiner's finding that the input signal to the proportional-integral calculator in Weitman is "inherently amplified by the gain value of the proportional-integral calculator to generate the P or I control value." *Id.* (quoting Non-Final Act. 5). Appellant "submits that there is no reason why the signal input . . . must ***necessarily*** be amplified by a gain value of the proportional-integral calculator to generate the P or I control value." *Id.* at 14. The Examiner responds that the second temperature is input into the

equation that defines proportional-integral-derivative control and that all of the inputs are modified by a gain constant (i.e., amplified) in order to generate the P, I, or D value. Ans. 10. Thus, because the second temperature is modified by the gain constant, the second temperature input necessarily has an effect on the amplification of the P, I, or D control parameter. We note that Appellant does not respond to the Examiner's findings on this issue, and we find that a preponderance of the evidence supports the Examiner's position. Thus, we are not persuaded of error by Appellant's argument.

Finally, we note that Appellant raises arguments in the Reply Brief that were not previously raised. Without further explanation from Appellant, we find that those arguments could and should have been raised in the Appeal Brief. In particular, Appellant alleges for the first time in the Reply Brief that each of the rejections before us are based on impermissible hindsight. *See* Reply Br. 4–10. We decline to consider those arguments here as Appellant has not shown good cause for presenting them in the Reply Brief for the first time. *See* 37 C.F.R. § 41.41(b)(2).

Based on the foregoing, we are not persuaded of reversible error with respect to the rejection of claim 1. Accordingly, we sustain the rejection of claim 1. We also sustain the rejection of claims 2–4, 6, and 7, which fall with claim 1.

Obviousness over Weitman, Brunner, and Kirchberg

With respect to claim 8, the Examiner finds that Weitman discloses a method as claimed except that Weitman does not disclose temperature sensors in the heat transfer stretch and an evaluation device determining a temperature difference between the two flow paths. Non-Final Act. 6. With

respect to the location of the temperature sensors, the Examiner relies on Brunner as follows:

> Brunner discloses the placement of temperature sensors along the heat transfer stretch in heat exchangers (Figs. 1 and 2) in order to increase the response time of the controlling device(s) (Col. 1, line 61–Col. 2, line 18).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the first and/or second temperature sensor of Weitman at the heat transfer stretch, as taught by Brunner, in order to allow for a more responsive control algorithm.

Id. Regarding the evaluation device, the Examiner relies on Kirchberg as follows:

> Kirchberg discloses an evaluation device which utilizes a temperature difference calculated between two flow paths of a heat exchanger (Col. 4:40-42) in order to detect fouling of the device (e.g. abstract).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the temperature difference between the two flow paths of Weitman in order to detect fouling in the device.

Id.

As discussed below, we are not persuaded of reversible error by Appellant's arguments.

First, Appellant argues that the proposed combination, including the proposal that Weitman's temperature sensors be moved to the heat transfer stretches based on Brunner, "would improperly change the principle of operation of the Weitman system and render Weitman's system inoperable for its intended purpose." Appeal Br. 15. Appellant reiterates that "Weitman's basic principle of operation is controlling the fresh water flow . . . by adjusting valve position . . . such that [the temperature relationship] is

maintained at a constant." *Id.* Appellant asserts that this is accomplished by measuring temperature at both cold and warm water inlets and outlets, and not at the heat transfer stretches. *Id.* However, we find that Appellant does not adequately explain why measuring the temperatures at different locations would improperly change the principle of operation of Weitman. In particular, we are not persuaded that the same general principles for maintaining a constant temperature relationship would not apply if the locations of the temperature measurements were changed. Further, as found above, the intended purpose of Weitman is "to provide a method and apparatus for controlling the fluid flow through a heat exchanger" to maintain operation substantially "at an optimal level . . . without the use of making direct flow measurements." Weitman col. 1, ll. 50–58. As discussed above, we are not persuaded by Appellant's argument that this intended purpose would be defeated by the proposed modification.

Next, Appellant argues that the Examiner erred in concluding "that it would have been obvious to determine a temperature difference between the primary-side flow path and the secondary-side flow path as recited in claim 8 based on the teachings of Kirchberg." Appeal Br. 15. In support, Appellant asserts that Kirchberg only determines a temperature difference at the inlet and outlet and not by means of sensors at the heat transfer stretch. *Id.* We are not persuaded of error because Appellant argues only that Kirchberg individually does not show measuring temperatures at the heat transfer stretch to determine a temperature difference, whereas the rejection relies on the combined teachings of Weitman, Brunner, and Kirchberg to show that the determination of a temperature difference based on measurements taken at the heat transfer stretch would have been obvious.

Based on the foregoing, we are not persuaded of error in the rejection of claim 8. Accordingly, we sustain the rejection of claim 8.

Obviousness over Weitman, Brunner, and Helin

With respect to this rejection, Appellant raises arguments only with respect to claim 9. *See* Appeal Br. 16–18. Accordingly, we discuss only claim 9 below, and claims 10–14 fall therewith.

With respect to claim 9, the Examiner relies on the findings set forth above with respect to claim 1 and acknowledges that the combination of Weitman and Brunner does not disclose that the heat exchanger is formed from at least three bent sheets forming a honeycomb structure. Non-Final Act. 7. With respect to this claim requirement, the Examiner finds that Helin discloses a heat exchanger with the claimed structure, and the Examiner concludes that it would have been obvious to use such a structure with the combined teachings of Weitman and Brunner. *Id.* (citing Helin Figs. 5–7).

As discussed below, we are not persuaded of reversible error by Appellant's arguments regarding this rejection.

Here, Appellant first argues that although Brunner teaches measuring temperature in the heat transfer stretch, Brunner does not teach that the sensors are disposed inside the flow paths at the heat transfer stretch. Appeal Br. 16–17. Appellant asserts that "[p]lacing the temperature sensor inside the cold-side flow path at the heat transfer stretch makes access to the temperature sensor more difficult, which makes manufacturing and repairing the heat exchanger more difficult." *Id.* at 17. We are not persuaded of error. First, we note that Appellant provides no evidence showing that the placement of temperature sensors in the heat transfer stretch makes

manufacturing and repair more difficult. Attorney argument is not evidence. Second, although Brunner may not explicitly disclose that the temperature sensors are disposed inside the flow paths, Brunner does disclose that the temperature within the heat transfer stretch is measured. It is not clear to us how the temperature could be measured without placing a sensor within the flow path in the heat transfer stretch.

Next, Appellant argues that it would not have been obvious to move the temperature sensors in Weitman to the heat transfer stretch inside a honeycomb structure as claimed because moving the sensors "would require boring through the plates or other alternative manufacturing techniques which would make manufacture of the heat exchanger more difficult." Appeal Br. 17. We are not persuaded. Again, Appellant provides no evidence that the proposed modification would create manufacturing difficulties. Rather, we agree with the Examiner that the alleged difficulty does not appear to be significantly more difficult than placing the sensors in a pipe along some other portion of the heat transfer stretch or along the inlet and outlet pipes. *See* Ans. 13. Further, the fact that the process of manufacturing might be difficult is not alone sufficient to show that the modification would not have been obvious. *See id.*

Based on the foregoing, we are not persuaded of error with respect to the rejection of claim 9. Accordingly, we sustain the rejection of claim 9. We also sustain the rejection of claims 10–14, which fall with claim 9.

CONCLUSION

We AFFIRM the rejections of claims 1–4 and 6–14 for the reasons discussed.

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