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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PAUL MAGNUS CLARKSON,
ANDREAS JACOBUS LOUIS NIJSEN, and
JOHANNES ANTONIUS MARIA REINDERS

Appeal 2015-000157
Application 12/158,752
Technology Center 3700

Before CHARLES N. GREENHUT, JEFFREY A. STEPHENS, and
GORDON D. KINDER, *Administrative Patent Judges*.

STEPHENS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants¹ seek our review under 35 U.S.C. § 134(a) from the Examiner's Final Office Action ("Final Act.") rejecting claims 1, 3–9, 12–17, and 19, which are all the claims pending in the application. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

Claimed Subject Matter

Claim 1, reproduced below, is illustrative of the claimed subject matter.

1. An evaporative cooling device comprising:
 - a pair of heat conducting plates arranged in generally parallel relationship, spaced from each other in the perpendicular direction and comprising boundary layer disrupting formations;
 - spacing elements comprising thermally insulating material separating the plates from one another and defining primary and secondary flow channels between the plates, whereby the plates extend from the primary channels into the secondary channels;
 - a primary air supply to the primary flow channels;
 - a secondary air supply to the secondary flow channels;
 - a hydrophilic layer at least partially covering the plates in the secondary flow channels; and
 - a water distribution system to provide water to the secondary channels such that a primary air flow through the primary channels may be cooled by heat conduction along the plates to cause evaporation of the water into a secondary air flow through the secondary channels.

¹ The real party in interest is identified as OXYCOM BEHEER B.V. App. Br. 2. As Appellants did not number the pages in the Appeal Brief, we designate the title page of the brief as page 1, and number the pages consecutively therefrom.

Rejections

Claims 1, 3–9, 12–16, and 19 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Reinders (US 2004/0226698 A1, published Nov. 18, 2004) and Tada et al. (JP 58035387 A, published Mar. 2, 1983).² Final Act. 4–10; Ans. 2–8.

Claim 17 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Reinders, Tada, and Tsimerman (US 5,349,829, issued Sept. 27, 1994). Final Act. 10–11; Ans. 8–9.

ANALYSIS

We have reviewed the Examiner’s rejections in light of Appellants’ arguments (App. Br. 3–15; Reply Br. 2–17). We are not persuaded by Appellants’ arguments. We adopt as our own the findings and reasons set forth by the Examiner in the action from which this appeal is taken and set forth in the Answer (*see* Ans. 2–18). We highlight and address specific arguments and findings for emphasis as follows.

Claims 1, 3–7, 12–15, and 19

Appellants argue the rejection of claim 1 is in error (App. Br. 5–13), and do not provide separate arguments relating to claims 3–7, 12–15, and 19. We select claim 1 as representative of this group. *See* 37 C.F.R. § 41.37(c)(1)(iv).

² The Final Action cites Tada’s Figures and its English language Abstract. *See, e.g.*, Final Act. 4–6. The Examiner’s Answer also relies on an English translation of Tada (*see, e.g.*, Ans. 2–5), the accuracy of which is not disputed by Appellants.

Appellants argue the Examiner errs in not explaining why Reinders and Tada allegedly reflect an appropriate level of ordinary skill, and why the Examiner's use of prior art references to implicitly determine skill level does not impact the ultimate conclusion of obviousness. App. Br. 7. We agree with the Examiner (Ans. 10), however, that the prior art in this case reflects an appropriate level of skill. *See Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163–64 (Fed. Cir. 1985) (“A specific finding on the level of skill in the art is not, however, required where the prior art itself reflects an appropriate level and a need for testimony is not shown.”). We are not persuaded that more specific findings are required here, and Appellants do not present additional evidence as to the appropriate level of skill.

Appellants contend Tada is not analogous art to the claimed invention because Tada is a heat exchanger but not an evaporative cooling heat exchanger, and, therefore, is not in the same field of endeavor. App. Br. 7. The Examiner, however, finds that both Tada and Reinders teach fluid heat exchangers with at least two channels that provide paths for two different fluid flows. Ans. 11. The Examiner further finds that the structure of the Tada heat exchanger, “wherein plates and spacers are stacked in one direction, is similar and provides a similar result when compared to the heat exchanger in Reinders, rendering both references analogous.” Ans. 11.

We agree with the Examiner that Tada is analogous because it is in the field of fluid heat exchangers. Moreover, the similarity in structures between Tada and evaporative cooler heat exchangers, resulting in the use of two fluid flows across different sections of the outside of the heat exchanger, further supports the Examiner's finding that Tada is analogous art to the

claimed invention. Appellants' contention that, in Reinders, "a single flow of air passes forward and . . . backwards along both sides of a heat exchanger" (Reply Br. 8 (citing Reinders ¶ 30)) does not apprise us of error in this finding. Reinders teaches that air flow 11 passing over the primary surface 4 of the enthalpy exchanger "should be split and partially returned over the secondary surface 6." Reinders ¶ 30. Reinders refers to the airflow returned over the secondary surface as "secondary air flow 13." *Id.* Thus, although the two air flows in Reinders' evaporative cooler are in fluid communication, they are considered two air flows because they flow over two different surfaces with different roles in the heat exchange process, as in Tada.

Appellants argue the horizontal surfaces of Reinders' fins 14 cannot be the "pair of heat conducting plates arranged in generally parallel relationship" recited in claim 1 because claim 1 "requires that the primary and secondary channels be defined between the parallel plates" (App. Br. 8). Appellants contend the Examiner's rejection does not address this claim limitation, and that, in Reinders, only a single flow passes through each pair of horizontal plates. *Id.*

We agree with the Examiner (Ans. 12–14) that Appellants' argument regarding Reinders alone does not apprise us of error in the rejection because "one cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references." *In re Keller*, 642 F.2d 413, 426 (CCPA 1981). The Examiner finds Reinders teaches an evaporative cooling device with pairs of heat conducting plates, i.e., the top horizontal surfaces of fins 14 shown in Figure 1. Final Act. 4. Figure 1 of Reinders is reproduced below:

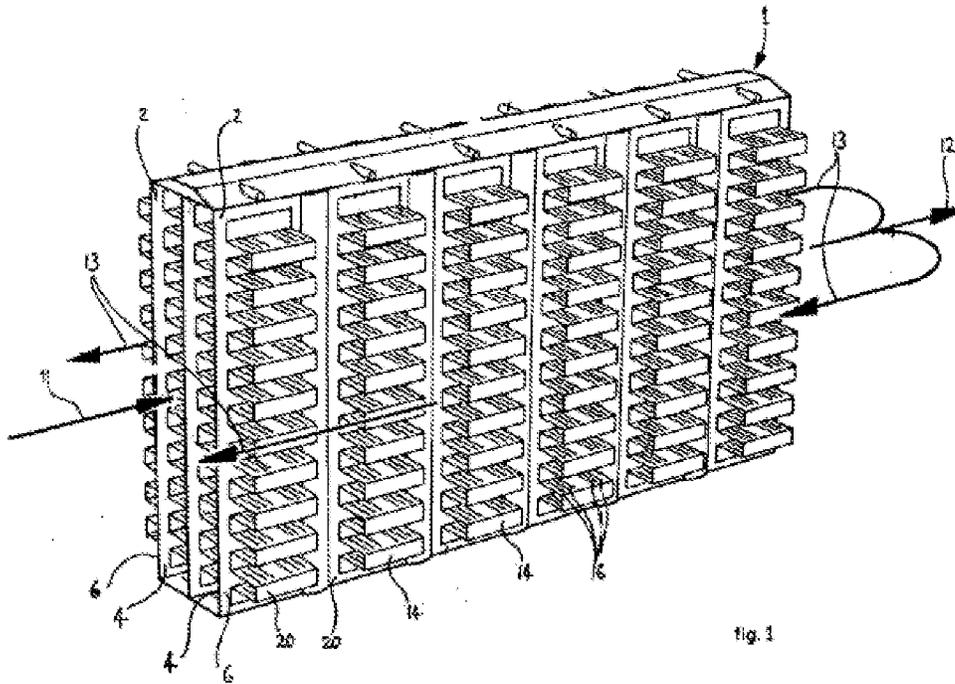


Figure 1 depicts an enthalpy exchanger.

As shown in Figure 1, fins 14 are formed as corrugated strips and attached to wall 2. *See* Reinders ¶ 27. Air flow 11 passes over the fins on primary surface 4 on the inside of wall 2, and secondary air flow 13 passes over the fins on secondary surface 6 on the outside of wall 2. *Id.* ¶¶ 26, 30. The Examiner finds Reinders does not teach that the plates extend from the primary flow channels into the secondary flow channels, as recited in claim 1. Final Act. 6. The Examiner relies on Tada for this claim limitation, and finds one of ordinary skill in the art would have modified Reinders to “have the plates extend from the primary channels into the secondary channels, as taught by Tada, in order to reduce the cost of manufacturing, improve the strength of the overall heat exchanger and produce the heat conducting plates in one piece instead of combining several smaller pieces.” Final Act. 6.

Figure 3 of Tada is reproduced below:

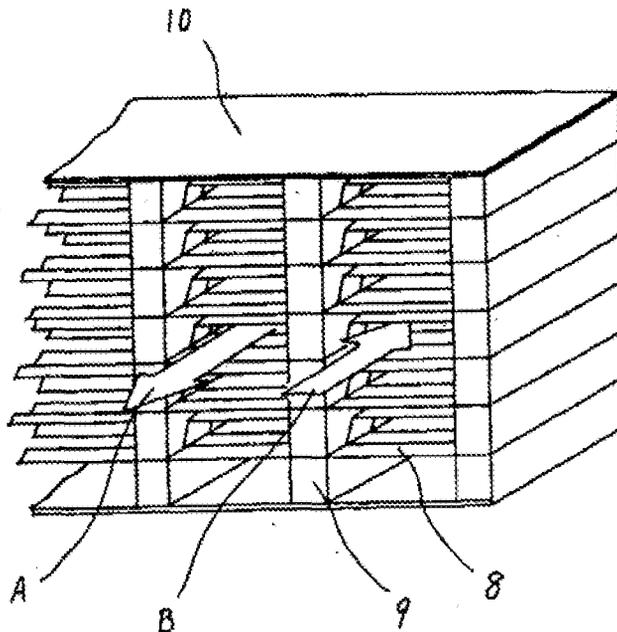


Figure 3 depicts an embodiment of Tada's plate fin type of heat exchanger. Tada 6.

We agree with the Examiner (Final Act. 6; Ans. 12) that Tada's Figure 3 shows heat transfer plates 8 extend from the primary flow channels into the secondary flow channels (flows A and B in Figure 3), as recited in claim 1. Thus, contrary to Appellants' argument (App. Br. 8), the Examiner has considered claim 1's limitation that primary and secondary flow channels are defined between a pair of plates, and we agree with the Examiner's findings that the combination of Reinders and Tada teaches this limitation.

Appellants also contend that the plates in Reinders are not separated from each other by thermally insulating material. App. Br. 10. Again, however, Appellants' argument does not address the Examiner's rejection, which is based on a combination of Reinders and Tada. *See* Final Act. 5–6. For the “thermally insulating material” limitation of claim 1, the Examiner relies on Tada's teaching that “a material having a poor thermal conductivity

can be used for the spacing member 9” (Tada Abstract), which separates Tada’s plates. Final Act. 5 (citing Tada Abstract); *see also* Ans. 14. Accordingly, Appellants’ arguments regarding Reinders alone do not apprise us of error in the rejection.

Appellants argue that “[t]he horizontal portions of the fins of Reinders cannot teach the claimed plates, since they do not extend into the two channels and the hydrophilic surface in Reinders cannot therefore extend to the spacer.” App. Br. 11. As discussed above, the Examiner’s rejection relies on Tada for teaching plates that extend from the primary channels into the secondary channels. In addition, claim 1 does not recite that the hydrophilic layer extends to the spacer, and recites only a hydrophilic layer “at least partially covering the plates in the secondary flow channels.” Appellants’ argument is, therefore, not commensurate in scope with claim 1, and does not apprise us of error in the rejection.

Appellants also argue the Examiner fails to provide a convincing line of reasoning. In particular, Appellants contend that: (1) “[t]he Examiner’s conclusion of obviousness is devoid of any supporting articulated reasoning with rational underpinning” (App. Br. 11); (2) modifying Reinders based on Tada changes the principle of operation of Reinders (*id.* at 11–12); and (3) modifying Reinders based on Tada renders Reinders’ device inoperable (*id.* at 12–13). As discussed further below, Appellants’ arguments do not apprise us of error in the rejection of claim 1.

Appellants’ contention regarding the lack of articulated reasoning focuses on the Examiner’s finding that Tada’s primary air flow may be cooled by heat induction along the plates “in order to cause evaporation of the water into a secondary air flow” (Final Act. 5) through the secondary

channel. *See* App. Br. 11. In view of the Examiner’s Answer, we do not interpret this finding to constitute the Examiner’s reasoning for modifying Reinders in view of Tada.³ Ans. 14–15. We understand the Examiner’s rejection to instead rely on additional reasoning contained in the Final Action. *Id.* For example, the Examiner reasons that one of ordinary skill in the art would have extended Reinders’ plates into both channels, as in Tada, “in order to reduce the cost of manufacturing, improve the strength of the overall heat exchanger and produce the heat conducting plates in one piece instead of combining several smaller pieces.” Final Act. 6; *see also* Final Act. 2. The Examiner also finds one of ordinary skill in the art would have been motivated to use Tada’s structure because Tada teaches effecting heat exchange between heat transmitting fluids A and B “through a single sheet of the heat-transmitting plate 8, so that the problem of an increase of heat resistance generated in conventional plate fin type heat exchangers due to defective bonding between component parts can be eliminated” (Tada Abstract). Ans. 15. Appellants’ arguments do not apprise us of error in the rejection because they do not address the additional reasoning by the Examiner, with which we agree.

Appellants argue the modification of Reinders proposed in the rejection amounts to replacing the entire heat exchanger of Reinders, and thus cannot be viewed as a mere modification and would alter the principle of operation of Reinders. App. Br. 11. The principle of operation identified by Appellants is a balance between thermal heat transfer and latent heat

³ In essence, the Examiner finds that extending Reinders’ plates into both channels, as in Tada, would cool the primary air flow by heat conduction along the plates to cause evaporation of the water into the secondary air flow, as required by claim 1. *See* Final Act. 5.

transfer resulting from the proportion of the secondary surface that is coated by a water-retaining layer compared to the uncoated surface area. App. Br. 12 (citing Reinders ¶ 29). Appellants contend this principle would be altered by using insulated spacers as in Tada because direct thermal transfer will not occur through the insulated spacers. *Id.*

We do not agree with Appellants that the modification of Reinders changes the “basic principles” under which it was designed to operate. *In re Ratti*, 270 F.2d 810, 813 (CCPA 1959); *see also In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (considering a device’s “high level ability” in affirming the Board’s determination that modification of the prior art would not affect its “overall principle of operation”). We agree with the Examiner that Reinders’ basic principle of operation as an evaporative cooling device is retained because evaporation by heat conduction still occurs via the horizontal plates instead of the vertical plates. Ans. 15–16. In other words, changing the plates to more effectively transfer heat from one side of the wall to the other instead of relying on the walls themselves to transfer heat does not affect the overall principle of operation.

We are not persuaded that the features of Reinders relied on by Appellants constitute its “basic principles” more than many other aspects of the reference, and, if we were to consider all features of Reinders to be the “basic principles” under which it operates, no modification under § 103(a) would be permitted under any circumstance. In addition, the Examiner finds that the heat transfer balance discussed in Reinders would not change because one of ordinary skill in the art would know to place the hydrophilic layers in the modified heat exchanger on the horizontal plates in the secondary flow channel, rather than on the insulated walls. Ans. 16.

Accordingly, Appellants' argument that modification of Reinders in view of Tada changes Reinders' principle of operation does not apprise us of error in the rejection.

Appellants contend that modifying Reinders renders it inoperable because "the outer surfaces of Tada are of a thermally insulating material," and, therefore, "spraying a hydrophilic layer on the outer surfaces of Tada, and wetting said outer surfaces, as is necessary for operation of the Reinders device, would have no effect in the heat exchange." App. Br. 13.

Appellants contend that, at a minimum, it would be necessary to arrange a water source and distribution to reach any elements in Tada intended for heat extraction, and that it would be necessary to cover, at least partially, the elements in Tada intended for heat extraction with a hydrophilic layer. *Id.* Thus, Appellants conclude, "replacing the structure of Reinders with that of Tada would, at a minimum, require significant alteration of the resulting device in order to achieve operability." *Id.*

"The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Moreover, the Supreme Court has recognized that "in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 420 (2007).

Appellants do not present persuasive evidence that modifying Reinders' plates to extend through the walls and to be separated by insulated spacers,

as taught by Tada, would require significant adaptation of Reinders' coating and water distribution teachings. In any event, we are not persuaded that such modifications would be beyond the level of one of ordinary skill in the art. *See Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007) ("Leapfrog presents no evidence that the inclusion of a reader in this type of device was uniquely challenging or difficult for one of ordinary skill in the art.") (citing *KSR*, 550 U.S. at 420–21).

Moreover, in relation to Appellants' arguments that modifying Reinders changes its principle of operation and renders it inoperable, we have considered the changes necessary to modify Reinders in light of the Examiner's specific findings as to why one of skill in the art would have been motivated to modify the reference. We agree with the Examiner's findings and reasoning as to motivation, as discussed above. We also agree with the Examiner (Ans. 17) that one of ordinary skill in the art would have modified Reinders in view of the benefits identified by the Examiner, which Appellants do not meaningfully address. Accordingly, we agree with the Examiner's conclusion of obviousness based on the underlying factual findings.

For the reasons discussed above and by the Examiner, we are not apprised of error in the Examiner's rejection of claim 1 under 35 U.S.C. § 103(a) as unpatentable over Reinders and Tada. Thus, we sustain the rejection of claim 1, and, for the same reasons, the rejection of claims 3–7, 12–15, and 19, which are not argued separately.

Claims 8 and 9

Claim 8 depends from claim 5, and recites that “the direction of flow in the primary channels is counter to the flow in the secondary channels and generally perpendicular to a main plane of the plates.” Appellants contend that the Examiner fails to point out the parts of Reinders that refer to a vertical direction of flow. App. Br. 14. Appellants contend that the overall flows 11, 12, and 13 in Reinders flow in a direction that is parallel to the horizontal surfaces of fins 14. *Id.* Appellants acknowledge Reinders’ teaching of louvers 16, but argue Reinders’ disclosure relating to louvers 16 “is limited to the effect of the louvers of providing an increase in the surface area available for heat transfer.” *Id.* (citing Reinders ¶ 17). According to Appellants, “[i]t is understood that the louvers 16 will have a local effect of causing flow to pass through a respective fin but Reinders is silent regarding any property of the louvers 16 that would cause a flow in a secondary channel to be perpendicular to the plane of fins 14.” *Id.* Similarly, for claim 9, Appellants argue Reinders does not teach that a flow is perpendicular with respect to a flow in a secondary channel, because Reinders shows flows 11, 12, and 13 flow in parallel manner with respect to each other. *Id.*

Appellants’ arguments regarding claims 8 and 9 do not apprise us of error in the rejection. The Examiner finds “[a] certain amount of both primary and secondary flows 11 and 13 [in Reinders] is conveyed through the louvers 16, which is perpendicular to said flows.” Ans. 17. We agree with this finding because louvers are angled slats that would cause a fluid medium flowing over the fins to flow through the slats and direct it in a direction that is perpendicular to the main plane of the plates. Appellants’ emphasis on flows 11, 12, and 13 illustrated in Reinders, and the

characterization of flow through the louvers as a “local effect” (App. Br. 14), fails to explain why one of ordinary skill in the art would not expect some flow through the louvers. We note also that Appellants do not present an interpretation of claims 8 and 9 that would preclude flow through louvers 16 from meeting the disputed limitations of these claims, even if there is flow in other directions also.

Accordingly, for the reasons discussed above and by the Examiner, we are not apprised of error in the Examiner’s rejection of claims 8 and 9 under 35 U.S.C. § 103(a) as unpatentable over Reinders and Tada. Thus, we sustain the rejection of claims 8 and 9.

Claim 16

Claim 16 depends from claim 1 and recites that “an outlet from the primary channels is in fluid connection with an inlet to the secondary channels whereby at least part of the flow through the primary channels may be subsequently directed through the secondary channels.” As with claim 1, Appellants argue the flows referred to in the rejection of claim 16 are not defined between a pair of generally parallel heat conducting plates. App. Br. 15. As discussed above in connection with claim 1, Appellants’ argument does not apprise us of error in the rejection because it does not address the Examiner’s rejection, which is based on a combination of Reinders and Tada. In addition, the Examiner finds Reinders’ primary flow 11 is split and returned through the secondary channel as the secondary flow 13. Ans. 18 (citing Reinders ¶ 30). We agree with the Examiner that Reinders thus teaches the additional limitations of claim 16.

Accordingly, for the reasons discussed above and by the Examiner, we are not apprised of error in the Examiner's rejection of claim 16 under 35 U.S.C. § 103(a) as unpatentable over Reinders and Tada. Thus, we sustain the rejection of claim 16.

Claim 17

Appellants do not present arguments relating specifically to claim 17, which depends from claim 1. For the same reasons as claim 1, we sustain the rejection of claim 17 under 35 U.S.C. § 103(a) as unpatentable over Reinders, Tada, and Tsimerman.

DECISION

We affirm the Examiner's decision to reject claims 1, 3–9, 12–17, and 19.

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

AFFIRMED