

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

---

*Ex parte* KARINE BRAND, ANDREAS KNOEPFLER,  
ANDREAS BEUTLER and RONALD LUTZ

---

Appeal 2006-1847  
Application 10/295,813  
Technology Center 3700

---

Decided: March 6, 2007

---

Before WILLIAM F. PATE III, TERRY J. OWENS, and  
MURRIEL E. CRAWFORD, *Administrative Patent Judges*.

WILLIAM F. PATE III, *Administrative Patent Judge*.

DECISION ON APPEAL  
STATEMENT OF THE CASE

This is an appeal from the final rejection of claim 25 and the examiner's refusal to allow claims 1, 4-7, 9-13 and 20 as amended after final rejection. These are all of the claims remaining in the application.

The claimed invention is directed to a heat exchanger tube with integral outer fins and an integral interior structure made up of small pyramids or frustums.

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

1. A heat exchanger tube comprising plain ends, at least one structured area on the outside of the tube and inside of the tube, having the following characteristics:

- a) integral outer fins extending helically over the outside of the tube;
- b) integral inner fins extending axis-parallel or helically at a helix angle  $\alpha = 0$  to  $70^\circ$ , measured against an axis of the tube, with primary grooves on the inside of the tube;
- c) the inner fins being intersected by secondary grooves extending at a helix angle  $\beta$  measured against the tube axis;
- d) the secondary grooves extending with respect to the inner fins at an angle of intersection in a range of  $60^\circ$  to  $85^\circ$ ;
- e) the depth T of the secondary grooves being at least 20% of a fin height H of the inner fins; and
- f) the density of intersecting points of the primary and secondary grooves being in a range of 90 to 250 intersecting points/cm<sup>2</sup>.

The references of record relied upon by the examiner as evidence of obviousness are:

Chiang	5,332,034	Jul. 26, 1994
Suzuki	5,992,513	Nov. 30, 1999
Bandai	JP 57-26394	Feb. 12, 1982
Tsuzaki	JP 62 255794	Nov. 07, 1987

Claims 1, 4-7, 9-13 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzaki in view of Chiang and Suzuki.

Claim 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzaki in view of Chiang and Suzuki and further in view of Bandai.

#### ISSUES

Appellants argue that there is no motivation to combine the teachings of Chiang and Suzuki with that of Tsuzaki. Appellants further argue that none of the applied prior art teaches the density of intersecting points or notches in a range of 90 to 250 intersecting points per square centimeter. On the other hand, the Examiner argues that the particular parameters claimed in the independent claims are result effective variables clearly recognized by the prior art as subject to optimization. Therefore, according to the Examiner, it would have been obvious for an artisan with ordinary skill to develop workable or even optimum ranges for these result effective variables.

Accordingly, the sole issue for our decision is whether the Examiner has established a prima facie case of obviousness of the claims on appeal.

## FINDINGS OF FACT

We agree with Appellant that Suzuki discloses a heat transfer pipe with integral outer fins and integral inner fins extending helically at a helix angle measured against the tube axis with primary grooves on the inside of the tube and secondary grooves at a second helically angle measured against the tube axis as illustrated in Figure 1. Apparently, the primary and secondary grooves have the same depth and result in a uniform structure as shown in Figure 4. The secondary grooves extend in an opposite direction compared to the primary grooves. Suzuki does not disclose the exact values for the parameters claimed in the independent claims.

All of the references cited by the examiner evince a recognition in the art that the inner structured area of a heat exchanger tube should beneficially break up the boundary layers near the tube wall and provide greater surface area for heat exchange contact. On the other hand, the structured area on the inner wall of the tube must not result in an inordinate increase in the flow resistance.

It is the examiner's finding, discussed on pages 6 and 7 of the Answer that the Chiang reference teaches that the helix angle  $\alpha$  of the inner fin, the angle  $\gamma$  of the secondary grooves with respect to the primary grooves, and the depth of the secondary grooves are result effective variables well known in this art for optimization of heat exchange in heat exchanger tubes.

The examiner further finds that Suzuki discloses that the height of the ribs or fins, the depth of the secondary grooves relative to the fin height and the angle of secondary grooves are result effective variables. The examiner

therefore finds that every claimed range recited in claim 1 is found to be known in the prior art to be result effective, and the characterization or the optimization of these parameters is routine experimentation that would have been obvious to one of ordinary skill at the time the invention was made. The examiner further states that the fact that Chiang and Suzuki disclose overlapping ranges for at least some of the parameters claimed further buttresses his finding that the parameters are result effective variables.

Finally, Bandai is cited to show crossing or secondary grooves which extend in the same direction as the primary grooves relative to the tube axis. According to Bandai, this results in an improvement of the balance of the condensing property and evaporation property of the heat exchange tube.

#### PRINCIPLES OF LAW

“A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the pertinent art.” *In re Kahn*, 441 F.3d 977, 985, 78 USPQ2d 1329, 1334-35 (Fed. Cir. 2006) citing 35 U.S.C. § 103(a) (2000); *Graham v. John Deere Co.*, 383 U.S. 1, 13-14, 148 USPQ 459, 467 (1966). “The ultimate determination of whether an invention would have been obvious is a legal conclusion based on underlying findings of fact.” *Id.* (citing *In re Dembicza*k, 175 F.3d 994, 998, 50 USPQ2d 1614, 1616 (Fed. Cir. 1999)).

In assessing whether subject matter would have been non-obvious under § 103, the Board follows the guidance of the Supreme Court in *Graham v. John Deere Co.* 383 U.S. at 17, 148 USPQ at 467. The Board determines “the scope and content of the prior art,” ascertains “the

differences between the prior art and the claims at issue,” and resolves “the level of ordinary skill in the pertinent art.” *Id.* (citing *Dann v. Johnston*, 425 U.S. 219, 226, 189 USPQ 257, 261 (1976)) (quoting *Graham*, 383 U.S. at 17, 148 USPQ at 467). “Against this background, the Board determines whether the subject matter would have been obvious to a person of ordinary skill in the art at the time of the asserted invention.” *Id.* (citing *Graham*, 383 U.S. at 17, 148 USPQ 467). In making this determination, the Board can assess evidence related to secondary indicia of non-obviousness like “commercial success, long felt but unsolved needs, failure of others, etc.” *Id.*, 383 at 17-18, 148 USPQ at 1335; *accord In re Rouffet*, 149 F.3d 1350, 1355, 47 USPQ2d 1453, 1455-56 (Fed. Cir. 1998). “We have explained that to reject claims in an application under section 103, an examiner must show an unrebutted *prima facie* case of obviousness. ‘On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.’” *Id.* (citing *Rouffet*, 149 F.3d at 1355, 47 USPQ2d at 1455).

Moreover, it is well settled that, generally speaking, it would have been obvious for an artisan with ordinary skill to develop workable or even optimum ranges for result-effective parameters. *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980); *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Woodruff*, 919 F.2d 1575, 1577, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990). The courts have found exceptions to this rule in cases where the results of optimizing a variable, which was known to be result effective, were unexpectedly

good. *See In re Waymouth*, 499 F.2d 1273, 182 USPQ 290 (CCPA 1974); and *In re Saether*, 492 F.2d 849, 181 USPQ 36 (CCPA 1974).

## ANALYSIS

In our minds, this case turns upon the single evidentiary issue that the Appellants have not challenged or rebutted the Examiner's findings of fact that the parameters listed in clauses b and d through f of claim 1 and the last four clauses of claim 25 are result effective variables. The Examiner made findings on pages 6 and 7 of the Answer that *prima facie* establish these variables are recognized in the prior art as result effective. Evidently, the Appellants concur with these findings. Certainly, the Appellants never mention this issue or respond to the examiner's findings on this issue in either the Brief or Reply Br. Since the Examiner's findings are unchallenged in any respect, the burden shifts to the Appellants to provide evidence that the exact values for the claimed parameters produce a result that is unexpectedly good. Appellants have not provided such evidence in the specification or in declarations furnished to the Examiner. Appellants have not relied upon Figure 5 of their Drawings for such evidence for good reason. There is simply not enough explanatory material in the specification to know exactly what has been tested. Specifically, the "standard inner structure" has not been specified.

We further concur with the Examiner that the ranges claimed for the parameters in claim 1 and 25 are, for the most part, overlapped by the prior art. There appears to be controversy with respect to whether the prior art overlaps Appellants' claimed range with respect to the number of notches per square centimeter. Be that as it may, we agree with the Examiner that

any overlap of any of the claimed ranges is additional evidence of the result effective nature of the variables specified in appellant's independent claims, and that one of ordinary skill would have found it obvious to optimize the inner structure of the heat conduction pipe. In the event that the Examiner's latest calculations are also found to be in error, we merely point out that an overlap of all ranges is not required under the Examiner's premise that the claimed parameters are result effective. *See Woodruff*, 919 F.2d at 1577, 16 USPQ2d at 1936 (Fed. Cir. 1990). In *Woodruff*, three of the four claimed parameters were overlapped by the prior art, while one fell outside the range of the prior art. Presumably that is the situation here.

#### CONCLUSION OF LAW

Given the unrebutted result effective variable findings with respect to the parameters in the independent claims, it is our conclusion of law that the subject matter of claims 1, 4, 6, 7, 9-13, 20 and 25 on appeal would have been obvious from the applied prior art as mere optimizations of well recognized result effective variables.

#### NEW GROUND OF REJECTION UNDER 37 C.F.R. § 41.50(b)

Although the Examiner refers to claim 5 at 13 in the Answer, the Examiner fails to include a rejection of this claim which includes the prior art teaching of Bandai in the collective teachings of the references.

Accordingly, we hereby enter a rejection under 35 U.S.C. § 103 of claim 5 as unpatentable over Tsuzaki in view of Chiang, Suzuki and Bandai.

Appeal 2006-1847  
Application 10/295,813

Appellants are apprised of the two options under 37 C.F.R. § 41.50(b) with respect to further action on this new ground:

37 CFR § 41.50 (b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

(1) Reopen prosecution. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner . . . .

(2) Request rehearing. Request that the proceeding be reheard under § 41.52 by the Board upon the same record

#### ORDER

The rejections of claims 1, 4, 6, 7, 9-13, 20 and 25 are affirmed.

A new ground of rejection has been entered against claim 5 under 37 C.F.R. § 41.50(b).

Appeal 2006-1847  
Application 10/295,813

**AFFIRMED-IN-PART; 37 C.F.R. § 41.50(b)**

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).

vsh

FLYNN, THIEL, BOUTELL & TANIS, P.C.  
2026 RAMBLING ROAD  
KALAMAZOO MI 49008-1631