

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

Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte ULRICH NAUMANN

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Appeal No. 2000-1638  
Application No. 08/829,699

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ON BRIEF

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Before McQUADE, BAHR and LAZARUS, Administrative Patent Judges.  
BAHR, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1,3 and 6-30. Appellant has withdrawn the appeal as to claim 2 (brief, page 2).<sup>1</sup> No other claim is pending in this application.

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<sup>1</sup> The withdrawal of the appeal as to claim 2 operates as an authorization to cancel claim 2 from the application. Manual of Patent Examining Procedure (MPEP) § 1215.03.

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BACKGROUND

The appellant's invention relates to an exchanger tube for a heat exchanger. Claim 1, the only independent claim on appeal, reads as follows:

1. An exchanger tube for a heat exchanger having a longitudinal axis, an exterior surface, and an interior surface comprising:
  - rows of primary ribs running at an angle (") with respect to the longitudinal tube axis, the primary ribs having a radial height H1 and inclined flanks;
  - rows of secondary ribs running at an angle with respect to the longitudinal tube axis, the secondary ribs having a radial height H2 and inclined flanks;
  - channels that are delimited laterally by the primary and secondary ribs; and
  - troughs that extend transversely through the primary and secondary ribs, said troughs including inclined flanks, wherein the troughs extend at an angle (( ) with respect to the longitudinal tube axis;wherein H1 is greater than H2.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

|   |                       |               |
|---|-----------------------|---------------|
| Schmidt et al. (Schmidt)                | 5,682,946             | Nov. 4,       |
| 1997                                    |                       |               |
|   | (filed Mar. 18, 1996) |               |
| Asaumi et al (Asaumi)                   | 58-8995               | Jan. 19, 1983 |
| (Japanese published patent application) |                       |               |

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Yamamoto et al. (Yamamoto) 2-161290 Jun. 21, 1990<sup>2</sup>  
(Japanese patent publication)

The following rejections are before us for review.

(1) Claims 1, 3, 6-22 and 24-30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto in view of Asaumi.

(2) Claim 23 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto in view of Asaumi, as applied to claim 1, and further in view of Schmidt.

Reference is made to the brief (Paper No. 10) and the first Office action and answer (Paper Nos. 5 and 12) for the respective positions of the appellant and the examiner with regard to the merits of these rejections.

#### OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellant's specification and claims, to the applied prior art references, and to the respective positions articulated by the appellant and the

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<sup>2</sup> English language translations of the Asaumi and Yamamoto references, prepared by the Patent and Trademark Office, are appended hereto.

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examiner. For the reasons which follow, we cannot sustain the examiner's rejections.

Yamamoto discloses an inner-worked heat transfer pipe adapted for use in both evaporation and condensation applications, such as heat-pump applications. Yamamoto discusses some of the shortcomings of prior art heat transfer pipes in achieving acceptable performance in both evaporative and condensation applications (translation, page 4). The objective of Yamamoto's invention is to offer an inner-worked heat transfer pipe that has better evaporation performance than inner-grooved heat transfer pipes in the prior art and has better condensation performance than the types of prior art heat transfer pipes discussed on page 4 of the translation.

Yamamoto's heat transfer pipe 1 comprises, on its inner surface, a series of parallel grooves 11 separated by fins 12 that have an 18° lead angle to the pipe axis and projections 13, which are 3/5 or less, preferably 1/5 to 1/2, the height of the fins 12, on the floor of the grooves 11. These projections increase surface tension inside grooves 11 and prevent coolant inside grooves 11 from escaping from the inner

walls due to coolant vapor flowing inside the pipe. As a result, the dry-out point is delayed to a higher dryness region and evaporation performance is improved. Condensation performance also is improved by increasing the heat transfer area and turbulence effect by the projections (translation, pages 7-8).

Asaumi discloses another heat exchanger pipe that can selectively perform a condensation and an evaporation in the same pipe at high performance (translation, page 1). Asaumi's heat exchanger pipe 1 is provided with spiral fins 2 on the inner surface thereof. The fins are notched (notches 4) at the intersection with a virtual spiral in the reverse direction (translation, page 3). As explained by Asaumi (translation, page 4), the spiral fins 2 increase the effective heat exchange area; however, when continuous fins 2 are used, a liquid film of condensation liquid can form in the grooves 6 between the fins. The notches 4 in the fins 2 permit the condensation liquid to quickly flow down. This improves condensation performance. However, as pointed out on page 6 of the translation, a pipe with spiral notch fins, while achieving good condensation performance, is unacceptable

for evaporation type applications. Thus, in order to improve evaporation performance of the pipe, Asaumi also provides "multiple fine rough sections at about 50 to 800  $\mu$ " between fins. These fine rough sections markedly promote "the formation of a boiling core during evaporation"<sup>3</sup> (translation, page 5). The resulting pipe, having both notch fins and fine rough sections, achieves excellent condensation and evaporation performance (translation, page 6).

The examiner finds that Yamamoto discloses the invention recited in appellant's claim 1 with the exception of the recited troughs.<sup>4</sup> According to the examiner,

[i]t is well known in the art of such textured surface tubes to cross cut through spirally extending ribs to form turbulence generating interruptions, breaking up laminar flow and improving heat transfer efficiency (see Asaumi et al).<sup>5</sup> Thus, it would have been obvious to one of ordinary skill in the art to provide such cross cut troughs in the spirally ribbed tube of Yamamoto et

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<sup>3</sup> We understand the "boiling core" alluded to by Asaumi to be nucleation sites for promoting or permitting nucleate boiling.

<sup>4</sup> The fins 12 respond to the recited "primary ribs" and the projections 13 respond to the recited "secondary ribs."

<sup>5</sup> We find no express disclosure of such a function of the notches or cross-cuts in Asaumi. Rather, as discussed above, the stated function of the notches appears to be condensation liquid drainage.

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al. for improved performance [first Office action, pages 3-4].

Appellant points out on page 3 of the brief that the stated purpose of Yamamoto's invention is to strengthen surface tension on the inner face of the tube to prevent coolant held inside the grooves from escaping from the inner walls and argues that cross-cutting (notching) the grooves as taught by Asaumi would necessarily attenuate the desired surface tension of the grooves and radically alter the desired flow pattern. According to appellant, the modification proposed by the examiner would result in a device which would not act as Yamamoto intended. Thus, appellant urges that the examiner's rejection is grounded in "an impermissible exercise of hindsight." After carefully reviewing the combined teachings<sup>6</sup> of Yamamoto and Asaumi, we find ourselves in agreement with appellant.

The examiner asserts, in essence, that a person of ordinary skill in the art at the time of appellant's invention

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<sup>6</sup> The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. See In re Young, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991) and In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).

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would have appreciated from the teachings of Asaumi the condensation-enhancing benefits of cross-cuts or reverse-spiral notches in heat transfer pipes having fins and grooves on their inner surface, such as the one taught by Yamamoto (answer, page 4). Even accepting the examiner's assertion, however, such a person would also have inferred from Asaumi's teachings (translation, page 6) that the provision of such notches or cross-cuts through the fins and/or projections of Yamamoto's pipe would adversely affect the evaporation performance of Yamamoto's pipe. In particular, the provision of the notches would appear to facilitate escape of liquid coolant from the grooves in an evaporation application, an effect which Yamamoto seeks to prevent.

It is clear from the teachings of Yamamoto that Yamamoto is primarily concerned with improving the evaporation performance of the heat transfer pipe and that the arrangement disclosed therein (in particular, the provision of projections in the grooves between the fins) improves both evaporation performance and condensation performance. Moreover, Yamamoto teaches that inner crossed-grooved pipes have unbalanced evaporation and condensation performance (translation, page

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4). Thus, it is not apparent to us why one of ordinary skill in the art, in the absence of appellant's disclosure, would have been motivated to modify the Yamamoto pipe in an attempt to improve condensation performance, a mode in which Yamamoto's pipe is not recognized in the art as being deficient, by adding a feature which both Yamamoto and Asaumi appear to recognize would be deleterious to the evaporation performance of the Yamamoto pipe.

In light of the above, it is our opinion that the prior art evidence relied upon by the examiner does not justify a conclusion that the subject matter of claim 1 as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. Accordingly, we cannot sustain the examiner's rejection of claim 1, or claims 3, 6-22 and 24-30 which depend from claim 1, as being unpatentable over Yamamoto in view of Asaumi.

With regard to rejection (2), the deficiency noted above finds no cure in the teachings of Schmidt. Therefore, we shall also not sustain the examiner's rejection of claim 23, which depends from claim 1, as being unpatentable over Yamamoto in view of Asaumi and Schmidt.

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CONCLUSION

To summarize, the decision of the examiner to reject claims 1, 3 and 6-30 under 35 U.S.C. § 103 is reversed.

REVERSED

|                             |   |                 |
|-----------------------------|---|-----------------|
| JOHN P. McQUADE             | ) |                 |
| Administrative Patent Judge | ) |                 |
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|                             | ) | BOARD OF PATENT |
| JENNIFER D. BAHR            | ) | APPEALS         |
| Administrative Patent Judge | ) | AND             |
|                             | ) | INTERFERENCES   |
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| RICHARD B. LAZARUS          | ) |                 |
| Administrative Patent Judge | ) |                 |

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