THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 21

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte JUHA NURMI and HEIKKI HEIKKILA

Appeal No. 95-1641
Application No. 07/825,927[1]

ON BRIEF

Before SOFOCLEOUS, PAK, and WARREN, Administrative Patent Judges.

PAK, Administrative Patent Judge.

DECISION ON APPEAL

Juha Nuomi et al. (appellants) appeal from the examiner's refusal to allow claims 1 through 16. Claims 1, 5 and 13 were amended subsequent to the final office action. Claims 17 and

[1] Application for patent filed January 27, 1992.

18, the remaining claims, are said to be allowable if rewritten in independent form, including all of the limitations of their parent claims.

The subject matter on appeal is directed to a method and an apparatus for crystallizing anhydrous fructose from an aqueous solution containing fructose. This subject matter is adequately described in claims 1 and 15, which are reproduced below:

1. A large scale method for crystallizing anhydrous fructose as crystals having a mean crystal size of at least about 0.35 mm from water comprising:

(a) preparing an aqueous solution containing at least about 90% dry substance, the fructose content of the dry substance being at least about 90% by weight;

(b) seeding said aqueous solution at a temperature of 50-60°C; and

(c) cooling the seeded solution at a controlled rate in less than about 45 hours and with continous mixing effective to maintain the supersaturation of the liquid solution with respect to saturated fructose at less than a ratio of about 1.25 and the temperature difference between said solution and the cooling means is less than about 10°C.

15. A cylindrical crystallizer having a processing volume sufficient for at least about 10 cubic meters of a fructose solution in a single batch [sic:,] a heat transfer area of over about 4 m^2/m^3, and an effective means for mixing such that the temperature difference between a solution containing fructose and the cooling means is no greater than about 10°C.

The references of record relied upon by the examiner are:

Yamauchi	3,928,062	Dec. 23, 1975
Witte et al. (Witte)	4,486,395	Dec. 04, 1984

The references relied upon by appellants in the Brief are:

Forsberg	3,883,365	May 13, 1975

George A. Ferguson, Statistical Analysis in Psychology and Education, Second Edition, McGraw-Hill Book Company, 1966, pp. 95-103 and 404-405 (hereinafter referred to as "Ferguson").

Journal of Chem. Thermodynamics, Vol. 13, "Heat-capacity Measurements of Aqueous Solutions of Mono-, Di-, and Tri-saccharides Using an Isoperibol Twin Calorimeter," F. Kawaizumi et al., 1981, pp. 89 and 93-94 (hereinafter referred to as "Kawaizumi").

Krystall Und Technik, Bd. 9, H. 7, "Measuring and Calculating Heat of Crystallization," Rychly et al., 1974, pp. 799 and 808 (hereinafter referred to as "Rychly").

The appealed claims stand rejected as follows:

(1) Claims 1 through 14 under 35 U.S.C. § 103 as unpatentable over the disclosure of Yamauchi; and

(2) Claims 15 and 16 under 35 U.S.C. § 103 as unpatentable over the disclosure of Witte.

We have carefully reviewed the entire record, including all of the arguments advanced by the examiner and appellants in support of their respective positions. This review leads

us to conclude that the examiner's § 103 rejections are well-founded. Accordingly, we will sustain the examiner's § 103 rejections for essentially those reasons set forth in the Answer. We add the following primarily for emphasis.

At the outset, we note that appellants have separately argued the claims as the following groups (Brief, pages 3-18):

Group I - Claims 1 through 7 and 10 through 14;

Group II - Claims 8 and 9; and

Group III - Claims 15 and 16.

Therefore, for purposes of this appeal, the claims in each group will stand or fall with the broadest claim therein, namely claims 1, 8 and 15. 37 CFR § 1.192(c)(5) and (6) (1993).

With respect to the subject matter defined by claim 1, the examiner states that "Yamauchi discloses the claimed crystallization process except for [specifically mentioning the maintenance of] a specific temperature difference [of less than about 10°C as recited in claim 1]...". See Answer, page 3 in conjunction with claim 1. However, the examiner determines that the maintenance of "a temperature difference of less than about 10°C" includes the cooling rate of 0.2° to

1.5°C described in the Yamauchi reference. Id. In other words, Yamauchi's cooling rate, as read by one of ordinary skill in the art, teaches or describes the claimed temperature difference. We agree.

The phrase "a temperature difference of **less** than about 10°C" is interpreted as including a temperature difference of 0 to 10°C. When the temperature difference between a cooling means and a solution to be cooled is zero, no cooling is carried out since the solution and the cooling means have an identical temperature. That is, the temperature difference of 0°C translates into a cooling rate of 0°C/hour. This finding is consistent with the result that can be depicted with the heat transfer formula: Q(the amount of heat transferred)= (A(heat transferring area))x(Cp(heat transfer coefficient))x(T2-T1(the temperature difference between the solution to be cooled and the cooling means)). When T2-T1(the temperature difference) is zero, the amount of heat transferred will be zero regardless of the size of a heat transfer area (A) and the Cp number. Moreover, we note that appellants' examples obtain a cooling rate as high as 1.9°C/hour, when the claimed temperature difference is

maintained. See appellants' admission at page 5 of the Brief and the examples disclosed in the specification. Thus, we conclude that the maintenance of the claimed temperature difference of 0 to 10°C translates into a cooling rate of 0 to 1.9°C/hour which embraces the cooling rate range described in the Yamauchi reference. Note also that Yamauchi's examples 6, 7 and 8 obtain no temperature changes (temperature difference of zero). Accordingly, we find that the Yamauchi reference describes the claimed temperature difference.

Appellants argue that controlling the rate of cooling is different from maintaining the claimed temperature difference between the solution to be cooled and the cooling means. We disagree. In the first place, as indicated ***supra***, the cooling rate of the Yamauchi reference, as interpreted by one of ordinary skill in the art, teaches the claimed temperature difference. In the second place, as explained by both the examiner at page 3 and appellants at page 7 of the Brief, the rate of cooling (the amount of heat transferred) is a function of the claimed temperature difference, a heat transfer area and a heat transfer coefficient. In other words, controlling

the rate of cooling necessarily requires the maintenance of a certain temperature difference.

Appellants' reliance on the Kawaizumi and Rychly references is noted. See Brief, page 8. However, these references do not indicate that the cooling rate described in the Yamauchi reference does not translate into the claimed temperature difference. As indicated by appellants (Brief, page 8), they simply state a mere truism that "the heat capacity is very much dependent on concentration and temperature."

Appellants also argue that the Yamauchi reference does not necessarily teach maintaining "the fructose solution as a supersaturated solution." See Brief, page 14. We are not convinced by this argument. Contrary to appellants' argument, the Yamauchi reference states (col. 1, lines 54-68):

> According to the present invention, it has now been found that anhydrous fructose crystals can be obtained from aqueous solutions of fructose in high yields without forming the hemi-or dihydrate crystals if the crystallization is carried out within a certain range of fructose concentration and temperature.
>
> It has been also found that this range lies within the supersaturation area a below the point at which the hemihydrate begins to crystallize out. If

> a supersaturated solution falling within such range is seeded with crystals of anhydrous fructose and then the equilibrium between the liquid-solid phases of the system is shifted to a direction in which the degree of supersaturation of the liquid phase is enhanced, crystallization of anhydrous fructose may be achieved very satisfactorily.

The Yamauchi reference also teaches maintaining the same or similar sugar concentration in a solution (same level of saturation) as appellants' during crystallization. Compare Table 2 at columns 7 and 8 of Yamauchi with appellants' examples at pages 15-17. Thus, we conclude that the Yamauchi reference does describe the claimed level of supersaturation.

Even were we to conclude that the Yamauchi reference does not specifically mention the claimed level of supersaturation, our conclusion would not be altered. In view of the above teaching of the Yamauchi reference, we are of the view that the determination of workable or even optimum supersaturation level would have been obvious to an artisan with ordinary skill. ***See In re Woodruff***, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (Fed. Cir. 1990); ***In re Boesch***, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

Appellants appear to argue that the Yamauchi reference does not teach, nor would have suggested, the claimed fructose crystal size. Appellants, however, acknowledge that the Yamauchi reference describes fructose particles having sizes of, ***inter alia***, 0.35 mm. See Brief, page 10. Note that the claimed mean crystals size of at least **about** 0.35 mm embraces the crystal size described by the Yamauchi reference. In any event, we find that the Yamauchi reference teaches growing crystals through controlling evaporation speed. See column 8, lines 55-57. We also find that the final size of fructose crystals is determined by the size of seed crystals (the initial size of fructose crystals). That is, one of ordinary skill in the art would have reasonably expected that the use of large fructose seed crystals would have resulted in fructose crystals having larger crystal sizes, e.g., at least about 0.35 mm. Thus, we conclude that the formation of fructose crystals having the claimed particle sizes in the process of Yamauchi through employing enhanced evaporation speed and/or larger seed crystals would have been ***prima facie*** obvious to an artisan with ordinary skill. This conclusion is

consistent with appellants' acknowledgment at page 9 of the Brief that it is known to be more desirable to produce larger crystals as shown, e.g., by the Forsberg reference. With respect to appellants' reliance on Ferguson's statistical analysis it is not relevant to the present situation inasmuch as it does not take into consideration the effect of controlling evaporation speed and/or using large seed crystals. Note also that appellants improperly assume a different mean crystal size than that claimed (0.53 mm rather than 0.35 mm).

Appellants argue that the Yamauchi reference does not teach a large scale process. See Brief, page 13. To determine the meaning of "large scale", we have consulted the specification. Nowhere does the specification, however, define the meaning of "large scale". Accordingly, we have given it the broadest reasonable meaning based on its ordinary usage. ***See In re Paulsen***, 30 F.3d 1475, 1479,31 USPQ2d 1671, 1674 (Fed. Cir. 1994); ***In re Zletz***, 893 F.2d 319, 321, 13 USPQ2d 1320, 1321-22 (Fed. Cir. 1989). Having given the broadest reasonable meaning to the phrase "large scale", we agree with

the examiner that the examples in the Yamauchi reference constitute "large scale" processes within the meaning of the claims. Even if we were to interpret "large scale" to mean "commercial-scale" as appears to be asserted by appellants (see Brief, page 16), our conclusion would remain the same since the Yamauchi reference suggests that its process can be employed on "a commercial scale". See column 3, lines 32-33. Note also that appellants acknowledge the existence of "prior art large scale processes". See Brief, page 13.

In spite of the fact that the Yamauchi reference, a U.S. patent, is entitled to a statutory presumption of validity and that an enabling disclosure is a prerequisite to validity under 35 U.S.C. § 112, first paragraph (***Cf. In re Spence***, 261 F.2d 244, 246, 120 USPQ 82, 83 (CCPA 1958)), appellants take the position that the Yamauchi reference is not enabling with respect to a large scale process. In support of their position, appellants refer to page 4-21 of *Perry's Chemical Engineer's Handbook* (6th ed.), which is said to provide:

> It has been generally accepted that the design of a commercial-scale chemical reactor, which is the heart of a chemical plant, cannot be accomplished by

> a purely theoretical approach alone. See Brief, page 16.

Appellants, however, have not supplied a copy of this document to support appellants' position. Having considered appellants' unsupported position, we are convinced that appellants have not met their burden of proof. In the first place, a mere attorney argument is insufficient to establish that the Yamauchi reference is not enabling with respect to a large scale process. ***See In re Pearson***, 494 F.2d 1399, 1405, 181 USPQ 641, 646 (CCPA 1974) (an argument of counsel in a brief cannot take the place of evidence in the record). In the second place, the quote referred to by appellants does not indicate that Yamauchi's crystallization process cannot be carried out in a "large-scale" or a "commercial-scale" based on the Yamauchi disclosure which includes more than a "purely theoretical approach". In the third place, the quote referred to by appellants does not indicate that the design of a commercial-scale crystallizer cannot be accomplished by **those skilled** in the art particularly in view of the state of the art known at the time the application was filed.

With respect to claim 8, we agree with the examiner that the determination of workable or even optimum heat transfer surface area would have been obvious to an artisan with ordinary skill since the amount of heat transfer is known to be affected by the size of a heat transfer area (Q=(A)(Cp)(T2-T1)). ***Woodruff***, 919 F.2d at 1578, 16 USPQ2d at 1936-37; ***Boesch***, 617 F.2d at 276, 205 USPQ at 219. We find that the size of a heat transfer area is a known result effective variable. Note also Witte, column 1, lines 29-52.

Appellants argue that the claimed process imparts surprising and unexpected results, i.e., larger crystal sizes, faster cooling rates, larger productivity and more reliability, thus rebutting the ***prima facie*** case of obviousness established by the examiner. See Brief, pages 9-14. Having carefully reviewed the examples in the specification and the examples in the Yamauchi reference, we are not convinced that appellants have met their burden of demonstrating unexpected results. ***See In re Geisler***, 116 F.3d 1465, 1469-70, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); ***In re Heyna***, 360 F.2d 222, 228, 149 USPQ 692, 697 (CCPA 1966).

Although the results for appellants' examples and Yamauchi's examples are different, we find that appellants have not demonstrated that the difference are unexpected. Indeed, appellants do not aver anywhere in the specification that the demonstrated results in the specification are unexpected. Nor do appellants proffer any such averments through declarations or affidavits under 37 CFR § 1.132. The only reference to unexpected results is an argument by appellants' counsel at pages 9-14 of the Brief. As noted in ***Geisler***, 116 F.3d at 1471, 43 USPQ2d at 1366, "naked attorney argument is 'insufficient to establish unexpected results.'"

We also find that appellants have not established that the showing in the specification examples is reasonably commensurate in scope with the degree of protection sought by claims 1 and 8 on appeal. ***In re Kulling***, 897 F.2d 1147, 1149, 14 USPQ2d 1056, 1058 (Fed. Cir. 1990); ***In re Grasselli***, 713 F.2d 731, 743, 218 USPQ 769, 778 (Fed. Cir. 1983). While the showing is limited to a two stage crystallization process involving specific reaction conditions and seed particles having specific sizes, the claims are not so limited. We find

no reasonable basis in the record for concluding that single stage crystallization processes involving materially different reaction conditions and seeds encompassed by appellants' claims 1 and 8 would behave as a class in the same manner as the specific two stage crystallization process shown in the specification. ***See In re Lindner***, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972).

With respect to apparatus claim 15, the examiner states (Answer, pages 3 and 4):

> Witte, et al. teach a continuously working crystallizer in the shape of an oblong vessel. The crystallizer comprises both mixing and cooling means. The mixing means are described as scrapers having the dual function of preventing crystals from adhering to the cooling surface and of stirring the liquid enclosed between two discs. See col. 2, line 1 to col. 5, line 3 of Witte, et al. Although Witte, et al. do not disclose any dimensions or characteristics of the crystallizer, as claimed by Appellants, such dimensions are deemed apparatus optimizations based upon the available space (e.g., a warehouse) in which the apparatus can be assembled and employed. Further, the characteristics are deemed apparatus optimizations based on the desired degree of crystallization.

In response, appellants only argue (Brief, page 17) that:

> Claim 15 recites "an effective means for mixing." Saturated fructose solutions are quite

> viscous, See Yamauchi at col. 7, 1. 60-64, and one of ordinary skill would understand "an effective means for mixing" in the context of claim 15's crystallizer or "fructose solution" to be a means suitable for mixing a viscous fructose solution. But Witte expressly states that their apparatus is <u>not</u> suitable for such solutions. Col. 2, 1. 1-3. ("The invention . . . is suited for solutions of low viscosity.")

We are not persuaded by appellants' argument. We do not agree with appellants that "Witte expressly states that their apparatus is not suitable for [viscous] solutions." Appellants' interpretation of Witte's statement regarding suitability of its apparatus in low viscosity solutions is not well taken. Witte clearly states that conventional crystallizing apparatuses useful for highly viscous solutions were not useful for low viscosity solutions. See column 1. Witte solves this by providing a crystallizer which will be useful for low viscosity solutions. See column 2, lines 1-3. Nowhere does Witte state that its crystallizer is not useful for high viscosity solutions. Rather, we find that the tenor of Witte would have indicated to one of ordinary skill in the art that its crystallizer, including a mixing means therein, would be useful for high viscosity solutions as well. Note also that appellants have not demonstrated that the

suitability of mixing means for high viscosity solutions causes the difference between the structures of the mixing means described in Witte and the claimed mixing means.

Thus, having considered all of the evidence of record, it is our determination that the evidence of obviousness, on balance, outweighs the evidence of nonobviousness proffered by appellants. Hence, we agree with the examiner that the claimed subject matter as a whole would have been obvious to one of ordinary skill in the art in view of the applied prior art. Accordingly, we affirm the examiner's decision rejecting claims 1 through 16 under 35 U.S.C. § 103.

As a final point, we note that apparatus claim 18 merely defines a mixer in a functional term. If the mixer described in Witte has the same general shape as appellants' mixer or is capable of operating in the claimed manner, the burden shifts to appellants to show that Witte's mixer does not inherently possess the functionally defined limitation of their claims. ***See, e.g., In re Schreiber***, 128 F.3d 1473, 1478, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997); ***In re Casey***, 370 F.2d 576, 580, 152 USPQ 235, 238 (CCPA 1967). Upon return of this

application, the examiner is advised to determine whether Witte's mixer has the same general shape as appellants' mixer or is capable of operating in the claimed manner. In other words, the examiner must consider whether the patentability of the subject matter of claim 18 is affected by the Witte reference.

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

AFFIRMED

MICHAEL SOFOCLEOUS Administrative Patent Judge	)	
CHUNG K. PAK Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
CHARLES F. WARREN Administrative Patent Judge	)	

lp

Appeal No. 95-1641
Application No. 07/825,927

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APJ SOFOCLEOUS

APJ WARREN

DECISION: AFFIRMED
Send Reference(s): Yes No
or Translation (s)
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