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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 59

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KATSUMITSU KISHIMOTO, KAZUHIKO KINTAKA and HIROYUKI YOSHINAGA

Appeal No. 1996-2215
Application No. 08/101,093

ON BRIEF

Before WINTERS, WILLIAM F. SMITH and SPIEGEL, Administrative Patent Judges.

WINTERS, Administrative Patent Judge.

DECISION ON APPEAL

This appeal is from the examiner's decision rejecting claims 25 through 36.

Claims 25, 34 and 35 are representative of the subject matter on appeal and read as follows:

25. An industrial production method for producing L-sorbose by microbial oxidation of D-sorbitol using a microorganism of the genus Gluconobacter, comprising:

a) providing a culture medium having definite components for culturing the microorganism of the genus Gluconobacter which includes at least one amino acid selected from the group consisting of glutamic acid, glutamine, alanine, serine, threonine, asparagine and aspartic acid;

b) adding D-sorbitol to the culture medium in an amount such that the concentration of D-sorbitol is maintained at or under 5% by weight of the culture medium during and after the growth phase of the microorganism;

c) pumping oxygen gas into the culture medium and monitoring the amount of dissolved oxygen in the culture medium such that the concentration of the dissolved oxygen in the culture medium is maintained in a prescribed range, the culture medium releasing an exhaust gas comprising oxygen and carbon dioxide;

d) nonadsorbently controlling the partial pressure of carbon dioxide in the culture tank by venting via a valve a portion of the exhaust gas from the culture tank, the partial pressure of carbon dioxide in the culture tank being maintained in the range from 5 to 10% by such venting; and

e) releasing to the atmosphere some of the exhaust gas which has been vented from the culture tank and recirculating the remaining exhaust gas which has been vented but not released back to the culture medium by mixing such exhaust gas, which includes carbon dioxide produced by the culture medium, with the oxygen gas prior to the oxygen gas being pumped into the culture medium, whereby L-sorbose is efficiently produced by the microbial oxidation of D-sorbitol.

34. A method for recycling exhaust gas produced by a microbiological industrial process in a culture tank, comprising:

a) carrying out the microbiological process in a culture medium in the culture tank, the exhaust gas produced by the microbiological process comprising carbon dioxide; then

b) venting some of the exhaust gas from the culture tank to maintain the partial pressure of the carbon dioxide in the culture tank within a prescribed range; and then

c) releasing to the atmosphere some of the exhaust gas which has been vented and recycling the remainder of exhaust gas, which has been vented but not released and which includes carbon dioxide, back into the culture medium in the culture tank without adsorbing carbon dioxide from such exhaust,[sic] gas whereby the microbiological process is cost effective.

35. A recycling process which comprises:

recycling an exhaust gas, which includes carbon dioxide and which is produced by a microbiological process carried out in a culture medium, back into the culture medium without adsorbing carbon dioxide from the exhaust gas and enriching with oxygen the exhaust gas which is recycled back into the culture medium.

I. REFERENCES

The references relied on by the examiner are:

Arcuri et al. (Arcuri) 4,413,058 Nov. 01, 1983

European Patent Application (Shimizu) 0092771, published Nov. 2, 1983.

Mori et al. (Mori), “High Density Production of Sorbose from Sorbitol by Fed-Batch Culture with DO-Stat,” Journal Chemical Engineering Japan, Vol. 14, No. 1, pp. 65-70 (1981).

II. REJECTIONS

Claims 25 through 36 stand rejected under 35 U.S.C. § 103 as unpatentable over Mori in view of Shimizu.

Claims 25 through 36 also stand rejected under 35 U.S.C. § 103 as unpatentable over Mori in view of Shimizu and Arcuri.[1]

We reverse both rejections.

III. BACKGROUND

1. L-sorbose, a naturally occurring ketohexose, is an important raw material in the synthesis of vitamin C. Specification, page 1, lines 8-11.

2. L-sorbose can be produced by microbial fermentation of D-sorbitol, where D-sorbitol is oxidized by microorganisms, for example, bacteria of the genus Gluconobacter. Specification, page 1, lines 11-13.

3. To save resources in conventional microbial fermentation processes, a culture exhaust gas containing a high concentration of oxygen is recovered by compressor, and

[1] This rejection was entered as a new ground of rejection in the Answer, pages 5 and 6.

reused in the culture liquid. In these processes, carbon dioxide gas generated by respiration of the microorganisms is accumulated in the exhaust gas. When the concentration of carbon dioxide is over 10%, the growth rate of the microorganisms and the rate of oxidation are strongly inhibited. Specification, page 2, line 18, through page 3, line 1.

4. To prevent the accumulation of carbon dioxide in conventional processes, the carbon dioxide gas is removed by a carbon dioxide gas removing means which employs an adsorbent, such as sodium hydroxide. Specification, page 3, lines 1-3.

5. However, there are problems using such a carbon dioxide adsorbing system, such as increased production cost due to acquisition of an adsorption column, an adsorbent, and the like, and the necessary maintenance thereof. Specification, page 3, lines 3-7.

IV. <u>EXAMINER'S REJECTIONS</u>

A. The subject matter recited in claims 25 through 33 and 36 is directed to processes for producing L-sorbose by

microbial oxidation of D-sorbitol using a microorganism of the genus Gluconobacter. The process requires the steps of (1) pumping oxygen gas into the culture medium in a prescribed concentration, the culture medium releasing an exhaust gas comprising oxygen and carbon dioxide; (2) nonadsorbently controlling the partial pressure of carbon dioxide released from the culture medium by venting a portion of the exhaust gas to maintain the partial pressure of carbon dioxide in the range from 5 to 10%; (3) releasing to the atmosphere some of the vented gas; and (4) recirculating the remaining exhaust gas, which has been vented but not released, back to the culture medium by mixing such gas with oxygen before oxygen is pumped into the culture medium.

The term “nonadsorbently controlling,” according to the disclosure in the specification, means that no adsorbent, as described in section III 4 above, is used to control the carbon dioxide partial pressure. See the specification, paragraph bridging pages 13 and 14; and page 20, lines 7-11.

B. The subject matter recited in claim 34 is directed to a process for recycling exhaust gas, which includes carbon dioxide, produced by a microbiological industrial process in a

culture tank. The process requires the steps of (1) venting some of the exhaust gas from the culture tank to maintain the partial pressure of the carbon dioxide within a prescribed range, (2) releasing to the atmosphere some of the vented exhaust gas, and (3) recycling the remaining exhaust gas, which has been vented but not released and which includes carbon dioxide, back to the culture medium <u>without adsorbing</u> carbon dioxide from such remaining exhaust gas.

C. The subject matter recited in claim 35 is directed to a process for recycling exhaust gas, which includes carbon dioxide and which is produced by a microbiological process carried out in a culture medium, back into the culture medium <u>without adsorbing carbon dioxide from the exhaust gas</u>, and <u>enriching with oxygen the exhaust gas</u> which is recycled back into the culture medium.

D. The rejection under 35 U.S.C. § 103 over Mori in view of Shimizu.

1. Mori describes a process for producing L-sorbose from sorbitol by cultivating <u>Gluconobacter suboxydans</u> in a “fed-

batch" culture in which sorbitol is fed intermittently, with a DO-stat under the condition that none of the components in the basal medium limit the growth of the microorganism and the production of sorbose. Mori, page 65, column 2, lines 18-23; and page 66, column 1, line 4, through column 2, line 10. A DO-stat is a device to keep constant the concentration of dissolved oxygen in the broth. With the use of the DO-stat, pure oxygen or oxygen gas mixed with air is supplied to the fermentor without toxicity due to excessive concentrations of dissolved oxygen. Mori, page 65, column 1, lines 12-17.

2. Mori does not describe the recited steps of (1) <u>nonadsorbently controlling</u> the partial pressure of the carbon dioxide gas produced from the fermenting bacteria, or (2) recycling the exhaust gas produced by the culture medium by <u>mixing the exhaust gas with oxygen</u> before pumping the oxygen gas into the culture medium.

3. Shimizu describes a process for culturing microorganisms using oxygen-enriched gas, where the exhaust gas of the culture medium is recycled. The process comprises

the steps of controlling the partial pressure of carbon dioxide released from fermenting bacteria by (1) venting some of the exhaust gas, (2) releasing some of the vented exhaust gas to the atmosphere, (3) passing the remaining vented exhaust gas through a carbon dioxide adsorption remover to remove carbon dioxide by adsorption, and (4) returning the exhaust gas of step (3) back to the culture medium. Shimizu, page 3, lines 18-24; page 7, lines 11-26; page 10, lines 1-3; page 10, line 23, through page 11, line 3; and Fig. 4.

4. Shimizu does not describe the recited steps of (1) <u>nonadsorbently controlling</u> the partial pressure of carbon dioxide, or (2) <u>mixing the exhaust gas with oxygen</u> before introducing the exhaust gas back to the culture medium.

5. In setting forth the rejection under 35 U.S.C. § 103, the examiner states that “the Shimizu reference is cited to show an analogous culturing technique wherein the exhaust gas is returned to the system after removing excess carbon dioxide. Even though the reference envisions adsorption of the carbon dioxide rather than its partial release out of the system . . . the effect of decreasing the amount of carbon

dioxide in the exhaust gas is the same." Answer, page 4, lines 5-12. The examiner concludes that "the claimed invention would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made especially in the absence of clear, convincing evidence to the contrary." Answer, page 4, lines 15-18.

6. To establish a prima facie case of obviousness, all claim limitations must be taught or suggested by the prior art. See In re Royka, 490 F.2d 981, 984, 180 USPQ 580, 583 (CCPA 1974). That is not the case here. As can be seen from a review of sections IV-D2 and IV-D4 above, the examiner has not established that the combined disclosures of Mori and Shimizu would have led a person having ordinary skill in the art to the instantly claimed process.

A rejection of claimed subject matter under 35 U.S.C. § 103 in view of the combined disclosures of prior art references requires consideration of (1) whether the prior art would have suggested carrying out the claimed process to a person having ordinary skill in the art, and (2) whether the prior art would have revealed that, in so carrying out, a person having ordinary skill would have had a reasonable

expectation of success. Both the suggestion and reasonable expectation of success must be founded in the prior art, not in applicant's disclosure. See In re Vaeck 947 F.2d 488, 495, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). On this record, the examiner does not point to any reason, suggestion, or motivation stemming from the prior art which would have led a person having ordinary skill to (1) nonadsorbently control the partial pressure of carbon dioxide, and/or (2) mix the exhaust gas with oxygen before re-introducing the exhaust gas into the culture medium. Instead, the examiner impermissibly relies on hindsight in reaching the ultimate conclusion of obviousness. "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988), citing W.L. Gore & Assoc. V. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983).

7. Having determined that the examiner has not

established a prima facie case of obviousness, we find it unnecessary to discuss the Kintaka Declaration, executed August 18, 1994, which is relied on by appellants as rebutting any such prima facie case.

Accordingly, we reverse the rejection of claims 25 through 36 under 35 U.S.C. § 103 as unpatentable over Mori in view of Shimizu.

E. The rejection under 35 U.S.C. § 103 over Mori in view of Shimizu and Arcuri.

1. For the reasons previously set forth, the combined disclosures of Mori and Shimizu fail to suggest appellants' claimed process.

2. Arcuri describes releasing carbon dioxide gas to the atmosphere by venting the gas from a fermentation process for producing ethanol (column 2, lines 1-5). Arcuri discloses that carbon dioxide generated during ethanol fermentation is conducted away from the reaction zone near the point of origin of the gas (column 6, lines 15-19).

3. Arcuri does not describe the recited steps of (1) nonadsorbently controlling the partial pressure of carbon dioxide gas in the fermentation process, or (2) recycling the

vented carbon dioxide gas by mixing the vented carbon dioxide gas with oxygen before introducing said vented gas to the culture medium.

4. Therefore, Arcuri does not cure the deficiencies of Mori and Shimizu. Accordingly, we reverse the rejection of claims 25 through 36 under 35 U.S.C. § 103 as unpatentable over Mori in view of Shimizu and Arcuri.

V. CLAIM 16

Claim 16 is pending in the application. This claim, however, does not stand rejected and is not before us on appeal.

Based on the prosecution history of the application, it appears that appellants intend to cancel claim 16. On return of this application to the examining corps, appellants and the examiner should clarify the status of claim 16.[2]

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[2] Claim 16 was introduced in the amendment filed in Paper No. 29, filed Nov. 24, 1992. Appellants proposed to cancel claim 16 and add claim 17 in the amendment filed under 37 CFR 1.116(a) in Paper No. 31 filed on Jun. 3, 1993. The examiner in the Advisory action, Paper No. 32, mailed Jul. 6, 1993, indicated that the proposed amendment would be entered upon the filing of an appeal. Appellants filed a continuation under 37 CFR § 1.62 on Aug. 3, 1993. Appellants did not request entry of the proposed amendment in Paper No. 31, but instead filed a preliminary amendment in Paper No. 36. In that amendment, appellants canceled claims 4-5, 7-12 and “17," and added claims 18-25. Since

(continued...)

VI. CONCLUSION

In conclusion, we reverse the rejections of claims 25 through 36 under 35 U.S.C. § 103 as unpatentable over Mori in view of Shimizu, and over Mori in view of Shimizu and Arcuri.

REVERSED

SHERMAN D. WINTERS Administrative Patent Judge	)	
WILLIAM F. SMITH Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
CAROL A. SPIEGEL Administrative Patent Judge	)	

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[2](...continued)
claim 17 was not entered, it was not proper to cancel it. In subsequent responses, appellants did not refer to claim 16. See Paper No. 39 filed Mar. 4, 1994, Paper No. 48 filed Nov. 21, 1994, and Brief, Paper No. 52, filed Feb. 21, 1995.

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