The opinion in support of the decision being entered today was not written
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Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte AHARON M. EYAL

Appeal No. 2001-0697
Application No. 09/125,033

HEARD March 5, 2002

Before WILLIAM F. SMITH, GRIMES, and GREEN, Administrative Patent Judges.

GRIMES, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-27, all of the claims in the application. Claims 1, 21, and 22 are representative and read as follows:

1. A process for the production of a condensation product selected from the group consisting of an amide and an ester of a carboxylic acid from an organic compound selected from the group consisting of organic compounds carrying a hydroxyl group and organic compounds carrying an amine group and from a concentrated medium resulting from fermentation, said medium containing a salt of said acid, said salt being selected from the group consisting of a sodium salt, a calcium salt and mixtures thereof and said medium being at a pH of at least the pKa of said acid, said process comprising:

(a) reacting said medium with said organic compound and with CO_2, said CO_2 functioning in said reaction to displace the carboxylate anion from said sodium and calcium carboxylic salts, whereby said condensation product and a salt selected from the group consisting of sodium carbonate, sodium bicarbonate, calcium carbonate, calcium bicarbonate and mixtures thereof are formed; and,

(b) separating said condensation product from the reaction mixture formed in step a.

21. The process of claim 1, wherein a condensation catalyst is used in the reaction.

22. The process of claim 21, wherein said catalyst is an enzyme.

The examiner relies on the following references:

Walkup et al. (Walkup I)	5,071,754	Dec. 10, 1991
Walkup et al. (Walkup II)	5,252,473	Oct. 12, 1993
Lund et al. (Lund)	5,733,750	Mar. 31, 1998
Cockrem et al. (Cockrem)	WO 93/00440	Jan. 07, 1993

March, “Reactions,” Advanced organic chemistry reactions mechanisms, and structure, 2nd ed., pp. 363-365 (1977)

Claims 1-21 and 23-27 stand rejected under 35 U.S.C. § 103 as obvious in view of the combined disclosures of March, either of Walkup I or Walkup II, and Cockrem.

Claim 22 stands rejected under 35 U.S.C. § 103 as obvious in view of the combined disclosures of March, either of Walkup I or Walkup II, Cockrem, and Lund.

We reverse.

Background

Carboxylic acids, such as lactic acid, are commonly produced by fermentation of a carbohydrate-containing substrate by microorganisms. See the specification, pages 1-3. As the desired carboxylic acids build up, however, they acidify the medium and inhibit the activity of the fermenting microorganisms. Therefore, a base is added to maintaining the pH at an optimal level. "More concentrated medium resulting from fermentation is obtained but said medium contains the salt of the acid rather than the free acid." Id., page 1. Typically, a strong mineral acid is then added to displace the carboxylic acid from the salt and the desired carboxylic acid is purified by esterification and distillation. "The purified ester can then be used as such or be hydrolysed to recover pure lactic acid." Id., page 2.

The specification discloses a process of producing lactic acid esters or amides that eliminates the need to use a strong mineral acid to convert the carboxylic acid salt to free carboxylic acid. The disclosed process begins with a fermentation medium containing the sodium or calcium salt of a carboxylic acid. This medium is combined with an organic compound containing either a hydroxyl group (to form an ester) or an amine group (to form an amide) and CO_2. The CO_2 is disclosed to displace the sodium or calcium from the carboxylic acid salt, forming sodium or calcium carbonate and/or bicarbonate, and allowing the carboxylic acid to react with the organic group to form the desired product, the carboxylic acid ester or amide. See the specification, pages 4-5 ("The present

invention applies CO_2 as a displacing acid which is surprising as CO_2 is about 7 orders of magnitude weaker than sulfuric acid used [in the prior art] and also much weaker than carboxylic acids.”). See also pages 13-14.

Discussion

The examiner rejected claims 1-21 and 23-27 as obvious in view of the combined teachings of March, either of Walkup I or Walkup II, and Cockrem. She cited March as teaching that “esterification of carboxylic acids with alcohols is well known.” The Walkup patents (which have the same specification) are cited for disclosing a process similar to that of the instant claims, but using ammonia to control the pH of the fermentation medium, rather than a sodium- or calcium-containing base, thus producing ammonium lactate salt in the medium. the examiner cites Cockrem as teaching “production of lactic acid and lactic acid esters from fermentation broths . . . using bases such as ammonia, calcium carbonate, calcium hydroxide or sodium hydroxide.” Examiner’s Answer, page 4. The examiner concluded that

> [i]t would have been obvious to the ordinary artisan that any salt of any carboxylic acid would be useful in the esterification of said acid with an alcohol. . . . Cockrem et al. teach the specific salts recited by the claimed invention. . . . It would also have been obvious to the ordinary artisan to use a sodium or calcium base in neutralizing the fermentation broth with the production of the sodium or calcium salt of the acid present in said broth and to use said salt(s) in the esterification process as taught by Walkup et al. with the reasonable expectation that the reaction would run to completion with the production of an ester of said acid as taught by the prior art.

Examiner’s Answer, pages 4-5.

Appellants argue that

> [t]he Examiner, by equating ammonium lactate with sodium lactate and calcium lactate, substitutes the carboxylate salts of strong bases for the ammonium lactate (a carboxylate salt of a weak base) in Walkup to arrive at her conclusion of obviousness. This is improper because Walkup uses a catalytic amount of a weak acid with a carboxylate salt of a weak base. It is contrary to well known scientific principles to equate a weak acid with a strong acid and assert that each would react similarly with a carboxylate salt of a strong base.

Appeal Brief, page 4. Appellants also argue that Walkup teaches away from substituting a sodium- or calcium-containing base for ammonia because Walkup's process "is driven to completion by liberation of ammonia . . . [whereas] neither sodium nor calcium can be liberated as gases, like ammonia." Reply Brief, page 2.

"The PTO has the burden under section 103 to establish a prima facie case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) (citations omitted). "There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination." In re Oetiker, 977 F.2d 1443, 1447, 24 USPQ2d 1443, 1446 (Fed. Cir. 1992). An adequate showing of motivation to combine requires "evidence that 'a skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would

select the elements from the cited prior art references for combination in the manner claimed.'" Ecolochem, Inc. v. Southern Calif. Edison Co., 227 F.3d 1361, 1375, 56 USPQ2d 1065, 1075 (Fed. Cir. 2000) (quoting In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1456 (Fed. Cir. 1998)).

Having considered the record, we agree with Appellants that the cited references do not provide the required motivation to substitute a sodium- or calcium-containing base (e.g., sodium hydroxide or calcium hydroxide) for the ammonia used in Walkup's process. Walkup discloses that the yield of lactic acid ester is "limited by the conversion of ammonium lactate to lactic acid and NH_3." Column 6, lines 40-41. This conversion can be shifted toward the products "with the removal or reaction of the NH_3 that is released from the ammonium lactate. The CO_2 effectively does this by reacting with NH_3. Surprisingly, the CO_2 in solution also provides sufficient acidity to catalyze the formation of the ester." Column 6, lines 41-48.

Walkup also speculates that "[a] possible explanation of the mechanism of CO_2 in the above process may stem from CO_2 and aqueous NH_3 forming a rather unstable compound (ammonium bicarbonate, NH_4HCO_3). . . . Further, ammonium lactate itself is rather unstable as evidenced by the odor of NH_3 over heated, concentrated ammonium lactate solutions. Excess CO_2 at pressure in the process of the invention probably makes the ammonium bicarbonate more stable at higher temperatures, and shifts the equilibrium toward the ammonium bicarbonate salt. . . . Thus, the more stable bicarbonate plus excess CO_2 may be

allowing more NH_3 to evolve from the unstable ammonium lactate, and leave more lactate ions for reaction with the alcohol to form the ester." Column 8, lines 23-36.

The record contains no evidence that the properties which are put forward by Walkup as important to the success of the ammonia-using method—instability of the lactate salt and stabilization of the bicarbonate salt by CO_2 —would have been expected in a similar process using, e.g., sodium hydroxide or calcium hydroxide to maintain the pH of the fermentation medium. That is, there is no evidence that sodium lactate or calcium lactate are unstable (like ammonium lactate) nor is there evidence that CO_2 stabilizes sodium bicarbonate or calcium bicarbonate. Thus, there is no basis in the record to expect that substitution of a sodium- or calcium-containing base for Walkup's ammonia would provide the same benefits observed by Walkup.

Therefore, the evidence does not support the examiner's position that it would have been obvious to "use a sodium or calcium base in neutralizing the fermentation broth with the production of the sodium or calcium salt of the acid present in said broth and to use said salt(s) in the esterification process taught by Walkup." Examiner's Answer, pages 4-5. The examiner has pointed to nothing else in the references that would have motivated the skilled artisan to combine a sodium- or calcium-containing base with Walkup's process. Since the cited references would not have motivated those skilled in the art to modify the known

process in such a way as to produce the claimed process, they do not support a prima facie case of obviousness.

The examiner also rejected claim 22 under 35 U.S.C. § 103 as obvious in view of the same references applied to claims 1-21 and 23-27, additionally combined with Lund. As discussed above, the cited references do not support a prima facie case of obviousness with respect to independent claim 1. Lund was cited by the examiner simply for disclosing an enzyme catalyst for the esterification reaction. Lund teaches nothing that would have motivated those skilled in the art to substitute a sodium- or calcium-containing base for the ammonia used by Walkup. Therefore, the rejection of claim 22 suffers from the same deficiency as the rejection of claims 1-21 and 23-27, and is reversed for the same reason.

Summary

The cited references do not provide the required reason, suggestion, or motivation to modify the known process as required by the claims. The

references therefore do not support a prima facie case of obviousness. The rejection under 35 U.S.C. § 103 is reversed.

REVERSED

WILLIAM F. SMITH Administrative Patent Judge	))))) BOARD OF PATENT
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