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United States Court of Appeals for the Federal Circuit

01-1101

EASTMAN CHEMICAL COMPANY,

Plaintiff/Counterclaim Defendant-
Appellee,

and

TOMEN AGRO, INC.,

Counterclaim Defendant-Appellee,

and

VALENT U.S.A. CORPORATION,

Counterclaim Defendant-Appellee,

v.

BASF AKTIENGESELLSCHAFT,

Defendant/Counterclaimant-
Appellant,

and

BASF CORPORATION,

Defendant-Appellant.

DECIDED: September 17, 2002

Before GAJARSA, Circuit Judge, FRIEDMAN, Senior Circuit Judge, and LINN, Circuit Judge.

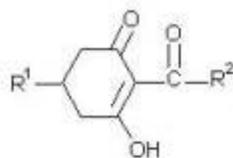
GAJARSA, Circuit Judge.

This is an appeal from a decision by the United States District Court for the Eastern District of Tennessee granting the plaintiffs, Eastman Chemical Company (“Eastman”), Tomen Agro, Inc. (“Tomen”), and Valent U.S.A. Corporation (“Valent”) (collectively “plaintiffs”), summary judgment of noninfringement of U.S. Patent No. 5,118,856 (“the ’856 patent”) assigned to BASF Aktiengesellschaft and BASF Corporation (collectively “BASF”). Because the district court did not err in concluding that Eastman’s process could not infringe BASF’s patent as a matter of law, we affirm.

BACKGROUND

A. The Patent Prosecution

BASF is the assignee of the ’856 patent, directed to a process for producing certain cyclohexanedione derivatives. The patent claims particular cyclohexanedione derivatives known as “triones.” Triones have the following chemical structure:

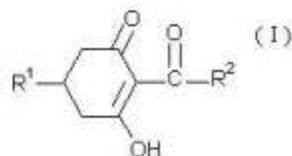


where “R” represents substituent groups.

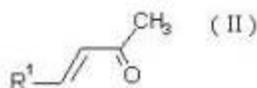
The ’856 patent teaches a process of forming cyclohexanedione derivatives using five specific steps: a cyclization, a distillation, an acylation, a rearrangement, and a hydrolysis and decarboxylation.

The patented process allows multiple reaction steps to be carried out in the same initial solvent, thereby eliminating isolations, purifications, and solvent swaps between steps. The '856 patent has three claims. Claim 1 states in pertinent part:

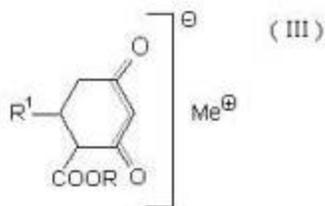
1. In a process for the preparation of cyclohexanedione derivatives of the formula I



. . . by reaction of an alpha-beta unsaturated ketone with a dialkyl malonate in the presence of a solvent, which process includes the addition of a base, a decarboxylation step, a hydrolyzation step and an acylation step, the improvement comprising: the reaction of an α,β -unsaturated ketone of the formula II



with a dialkyl malonate in the presence of a base to give the alkoxy carbonylcyclohexenolone or its salt (III)



and acylation, hydrolysis and decarboxylation of (III), . . . the process steps comprising

- (a) reacting the α,β -unsaturated ketone (II) in the presence of a base, with the dialkyl malonate in a solvent from which the alcohol liberated from the malonate can be distilled off,
- (b) distilling to eliminate the alcohol,
- (c) reacting the salt of the alkoxy carbonylcyclohexenolone with a carboxylic acid halide having the structural formula $R^2\text{COHal}$, where R^2 is alkyl of not more than 6 carbon atoms to form a product,
- (d) treating the product of step (c), where appropriate, after removal of excess acyl halide, with an acylation catalyst, to form a further product, and

(e) hydrolyzing and decarboxylating the product of step (d) to form the compound of formula I.

'856 Patent, col. 7 l. 29 to col. 8 l. 29 (emphasis added). The differences between independent claims 1 and 2 are not relevant to this appeal. The only other claim in the patent, claim 3, depends from claim 2.

During prosecution, the patent was rejected multiple times before it ultimately issued. The first time the claims were rejected, they were rejected because, *inter alia*, the “salt of the intermediate of compound (III) is not defined in the claims or the specification.” (emphasis in original). In the same rejection, the examiner found the claims obvious in light of Sawaki et al., U.S. Patent No. 3,950,420 (“Sawaki”), which discloses the same basic process, and Murtha et al., U.S. Patent No. 4,115,204 (“Murtha”), which discloses a process for isolating alcohol from its azeotrope by extractive distillation. In response the applicants attached the declaration of Dr. Richarz, one of the inventors, explaining that the applicant’s process is different from the prior art because unlike the application, the Sawaki prior art requires the intermediates to be isolated, which is a significant disadvantage. The applicants further argued that one skilled in the art would have no trouble practicing the invention based on the disclosure.

The application was again rejected because most of the earlier grounds for rejection had not been corrected, and the examiner did not find Dr. Richarz’s explanation sufficient to overcome the obviousness rejection. In response, the applicant amended the specification and claims. The claims were again rejected for many of the same reasons, including that the “salt of the intermediate compound (III) is not defined in the claims or the specification” and that the claims were unpatentable over Sawaki and Murtha. The applicant redrafted the claims and attached a declaration of co-inventor Dr. Reissenweber. The claims were again rejected as being unpatentable over Sawaki and Murtha. In response, applicants amended their claims and explained that “[i]n the third step of the process, the reaction product (III) from the first step, absent alcohol, is reacted with an acid halide at a temperature of from 40-200°C, preferably 80-160°C to give a mixture of esters (Va and Vb).” (emphasis added). In addition, applicants filed a declaration from Dr. Kaczmarek, explaining that the reaction disclosed in the application results in a higher yield than the prior art and is simpler because there is no need to isolate an

intermediate. In addition, Dr. Kaczmarek explained that Sawaki requires an additional base for the acylation step. As support for his conclusion that the process is distinctly superior to the prior art, his declaration includes the following statements:

2. The novel process is much simpler, because there is no need to isolate an intermediate. The process of Sawaki et al. requires an expensive isolating operation at the cyclohexanedione stage.
3. Sawaki et al. require an additional base (pyridine at the same time serving as solvent) for the acylation step, which means additional expense for the subsequent isolation of the product of value, since the pyridine has to be removed either by distillation or extraction.

The examiner rejected the claims again, asserting that the Kaczmarek declaration was not helpful because the claims are sufficiently broad in scope so as not to distinguish over the prior art. After further interactions, the Examiner, during an interview, recommended that the applicant put the claims in Jepson format. The interview summary states: “[t]he Examiner indicated that applicants file a continuing application, place the claims in Jepson form, and list the perceived differences of steps 2-4 of original claim one or steps (b), (c) and (d) of claim 2 as the improvement. If applicants follow this constructive suggestion of the undersigned examiner, he will allow the case on reconsideration.” At that point, the applicant canceled the old claims and submitted newly drafted claims in Jepson form. The examiner in a final rejection, rejected the new claims on the ground that inter alia, they were obvious in light of Sawaki. Applicants thereafter amended the claims again, in a way not relevant to this appeal, and they were allowed.

B. The Patent Litigation

Eastman filed a complaint for declaratory judgment alleging that it did not infringe the '856 patent. BASF counterclaimed, alleging infringement. BASF also filed third party claims of infringement against Tomen and Valent. BASF asserts that Eastman and Tomen make the trione using the infringing process, and that Valent sells a herbicide whose active ingredient is made using a trione obtained from Eastman or Tomen.

The district court held a Markman hearing and issued a Markman order. It made several findings of fact as part of its Markman order. Eastman Chem. Co. v. BASF Aktiengesellschaft, No. 2:97-CV-450, slip. op. at 8-13 (E.D. Tenn. Sept. 14, 2000) (claim construction memorandum). The findings relevant for our purposes were that the reaction in step (a) may produce an alkoxy carbonylcyclohexenolone (a neutral compound) or its salt, that a person of ordinary skill in the art would recognize formula III as the salt of the alkoxy carbonylcyclohexenolone and not the neutral compound, that acid halides are different from acid anhydrides, that a person of ordinary skill in the art would most likely avoid using a carboxylic acid halide to acylate the neutral alkoxy carbonylcyclohexenolone compound, that alcohol will react with the carboxylic acid to the detriment of the reaction if it is not removed before the addition of the carboxylic acid halide during step (c), and that the only method for removing alcohol taught in the '856 patent is distillation and use of another method for removing alcohol would eliminate one of the claimed benefits of the invention, namely not having to use an auxiliary base. Id. at 12-13.

In light of these factual findings, the district court interpreted a total of eight claim terms including the terms “distilling to eliminate the alcohol,” “the formula (III),” “the salt” as in step (c) of claim one, and “carboxylic acid halide.” Id. The court construed the term “distilling to eliminate alcohol” to mean that virtually all of the alcohol, from whatever source it is derived, must be removed by the distillation in step (b). Id. at 16. It arrived at this conclusion because all the alcohol must be removed before step (c), no other method for removing alcohol is taught by the patent, and any other method would frustrate one of the benefits of the invention, namely, that an auxiliary base is not needed. Id. at 16-17.

The district court construed the term “formula (III)” to represent only the metal salt of the alkoxy carbonylcyclohexenolone formed by the reaction that takes place in step (a), basing its decision on expert testimony and the claim language, which suggests that “(III)” modifies “salt” and not the neutral compound. Id. at 18. The district court found further support in steps (c)–(e), which refer to the acylation, hydrolysis and decarboxylation of (III), because it is the salt and not the neutral compound that is acylated by reacting it with the carboxylic acid halide. Id.

The district court construed the term “the salt,” as used in the phrase “reacting the salt of the alkoxy carbonylcyclohexenolone” in step (c), to refer to the salt of the alkoxy carbonylcyclohexenolone produced in step (a). It concluded this from the declaration of Dr. Richarz, a co-inventor who represented that the salt reacted in step (c) is the same as that formed in step (a). Id. at 11-12. He stated:

The [claimed process] avoids all these disadvantages. None of the intermediates involved need be isolated. The end product can be isolated simply by filtration. A vital advantage is the use of an inert solvent, by means of which the methanol formed in the first stage is easily removable, thus permitting direct acylation of the sodium salt formed, without having to use an auxiliary base.

Id. at 12. In construing the term “the salt,” the district court also relied on the rules of patent drafting promulgated by the Patent and Trademark Office, which state that the words “the” and “said” cannot be used unless the term modified by them has been previously defined. Id. at 20. The district court concluded that in this case the term “the salt” referred to the earlier term “salt (III)” which the district court construed to be limited to the salt form of the product in step (a). Therefore, “the salt” in step (c) was previously defined in the claim as the product of step (a). Id. BASF conceded that the term “carboxylic acid halide” did not literally include acid anhydrides, and the district court did not further define the term. Id.

After the Markman hearing, Eastman, Tomen, and Valent filed motions for summary judgment of noninfringement. In its grant of summary judgment, the district court explained the Eastman process as described by BASF’s expert, Dr. Harris, construing the evidence in the light most favorable to BASF, the non-movant. Eastman Chem. Co. v. BASF Aktiengesellschaft, No. 2:97-CV-450, slip. op. at 6 (E.D. Tenn. Oct. 31, 2000) (“Summary Judgment Memorandum”). In Eastman’s process, an α,β -unsaturated ketone is reacted with dialkyl malonate in the presence of base. This is performed using toluene as the solvent. Id. The sodium salt of the alkoxy carbonylcyclohexenolone is produced. Id. Eastman then adds water and aqueous hydrochloric acid to neutralize the reaction mixture. The product is the neutral alkoxy carbonylcyclohexenolone compound with a free hydroxy group. Id. at 6-7. Water and hydrochloric acid are added to create a two-phase system, and the aqueous layer is removed, including any remaining salt, leaving the organic layer. Id. at 7. The methanol is removed from the organic layer,

through a combination of decantation and distillation. Then propionic anhydride, a carboxylic acid anhydride that functions as the acylating agent, is added along with a catalyst, dimethylaminopyridine (“DMAP”). This forms C-acylated esters, which are then hydrolyzed and decarboxylated to give the end product, the trione. Id. Dr. Harris explained that the addition of DMAP to the mixture containing the neutral cyclohexenolone yields a cyclohexenolone salt, but not the same salt that is formed in step (a) of the patent. Among other differences, the salt formed by Eastman is not a metal salt. Id. at 16.

Eastman argued that it was entitled to summary judgment because it does not meet two limitations in step (c) of the ’856 patent. It asserts that it does not use a carboxylic acid halide and does not react the salt of the alkoxycarbonylcyclohexenolone. Id. at 8. It uses propionic anhydride as its acylating agent, instead of a carboxylic acid halide, and it reacts the neutral form of the alkoxycarbonylcyclohexenolone in step (c). BASF asserted that Eastman meets the literal requirements of step (c), and in the alternative, that Eastman infringes under the doctrine of equivalents. Id. at 10-11.

The district court granted the plaintiffs’ motions for summary judgment of noninfringement. In so doing, however, the district court discussed each of the five steps of the ’856 patent and whether Eastman’s process met each one. It found that the record would support a finding that Eastman literally met step (a), the cyclization step, of the ’856 patent. Id. at 11-12. As for step (b), the distillation step, the district court first found that Eastman’s process does not literally infringe, because under the court’s claim construction “distilling to eliminate the alcohol” means that literally all of the alcohol must be removed by distillation. Id. at 12-13. However, BASF’s expert explained that in Eastman’s process most of the alcohol is removed by decantation prior to the distillation. Id. at 12. Therefore, no reasonable juror could find literal infringement of step (b). The district court said, however, that by giving BASF the benefit of the doubt, this issue could not be resolved on summary judgment because there was a question of fact about whether Eastman’s process for removing alcohol is equivalent to the distillation-only method taught in the ’856 patent. Id. at 13-14. With respect to steps (d), the rearrangement, and (e), the hydrolysis and decarboxylation, the district court concluded that the evidence, when viewed in the light most favorable to BASF, would support a finding of infringement.

Id. at 14-15.

As for step (c), the acylation step, on which Eastman focused in its assertions of noninfringement, the district court concluded that Eastman's process does not literally infringe step (c) of the '856 patent, and that BASF is precluded as a matter of law from asserting equivalence that would include Eastman's process. Id. at 15. With respect to literal infringement of step (c), the district court explained that in its claim construction it interpreted "the salt" in step (c) to mean the metal salt of the alkoxy carbonyl cyclo-hexenolone formed during step (a) and represented by formula (III). Eastman acylates a salt in step (c), but not the salt formed in step (a). Instead, it acylates a different salt, one formed from the neutral form of the alkoxy carbonyl cyclo-hexenolone produced in step (a). Id. at 15-16. This salt is also not a metal salt. The district court concluded that because Eastman produces a chemically distinct salt, and not the salt represented in formula (III), it does not literally meet the limitations of step (c) of the '856 patent. Id. at 16. Moreover, the district court concluded that since under its claim construction "carboxylic acid halide" does not literally cover "acid anhydrides," because the two compounds have different chemical structures and reactive properties, Eastman cannot literally infringe step (c) through its use of the acid anhydride. Id.

The district court also concluded that under the dedication doctrine BASF was precluded as a matter of law from using the doctrine of equivalents to show that the anhydride used by Eastman was equivalent to the carboxylic acid halide claimed in step (c). Id. at 16-17. The court found that the use of acid anhydrides as acylating agents was disclosed in the specification as relevant prior art and was therefore dedicated to the public because it was described in the written description but not claimed. Id. at 17.

The district court also relied on a second basis for precluding BASF from asserting equivalence for step (c). The court explained that the evidence, when viewed in the light most favorable to BASF, does not offer any support for the conclusion that Eastman's process represents only an insubstantial variation on the process disclosed in the '856 patent. Id. at 20. The '856 patent claimed a specific acylation reaction between the metal salt of formula III produced in a step (a), with a carboxylic acid halide. The district court found that the language of the claim limits the reaction to one involving

precisely the identified reactants, because during prosecution of the patent, BASF relied on the reaction in step (c) between the product of step (a) and a carboxylic acid halide as a basis for distinguishing its invention. Id. at 20-23. The district court explained that the doctrine of equivalents cannot be used to entirely vitiate an essential claim limitation and BASF could not use it to read out the limitations in the claims, id. at 17, 23. The court concluded that Eastman's process does not include the reaction described in step (c), and reading the patent to include Eastman's process would allow BASF to read limitations out of the claims. Id. The court found that Eastman does not, at any point, react the metal salt produced during step (a), or its equivalent, with a carboxylic acid halide or other acylating agent. Id. at 24. The court concluded that Eastman could not infringe as a matter of law. Since the parties had agreed that the liability of Tomen and Valent hinged on the question of Eastman's infringement, the district court, in granting summary judgment of noninfringement to Eastman, also granted summary judgment of noninfringement to Tomen and Valent. Id. BASF appeals the grant of summary judgment. We have jurisdiction over the appeal pursuant to 28 U.S.C. § 1295(a)(1) (2000).

STANDARD OF REVIEW

This court reviews a grant of summary judgment de novo. Summary judgment is appropriate only where there is no genuine issue of material fact and the moving party is entitled to judgment as a matter of law. Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 247 (1986). In determining whether there is a genuine issue of material fact, the district court must view all evidence in the light most favorable to the non-movant. Matsushita Elec. Indus. Co. v. Zenith Radio Corp., 475 U.S. 574, 587 (1986).

Claim interpretation is an issue of law which this court reviews de novo. Markman v. Westview Instruments, Inc., 52 F.3d 967, 970-71, 34 USPQ2d 1321, 1322 (Fed. Cir. 1995) (en banc), aff'd, 517 U.S. 370 (1996); Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456, 46 USPQ2d 1169, 1172 (Fed. Cir. 1998) (en banc). Determining the limitations on the doctrine of equivalents is a question of law which we review de novo. Texas Instruments Inc. v. United States Int'l Trade Comm'n, 988 F.2d 1165, 1173, 26 USPQ2d 1018, 1025 (Fed. Cir. 1993).

DISCUSSION

On appeal, BASF argues that the district court erred in its claim construction of the distillation step, in requiring that all of the alcohol be removed by distillation. BASF also argues that the district court misconstrued the phrase “the salt” in the acylation step to mean the salt of the alkoxy carbonylcyclohexenolone produced in step (a). In addition, BASF argues that the district court incorrectly denied it the opportunity to prove infringement under the doctrine of equivalents in step (c) because it argues that the use of anhydrides was not dedicated to the public. Finally, BASF argues that the district court erred in denying it the opportunity to prove infringement under the doctrine of equivalents in step (c) on the basis of the all-elements rule.

1. Claim Construction of “the Salt”

BASF argues that the district court incorrectly held that the term “the salt” in step (c) is limited to “the salt of the alkoxy carbonylcyclohexenolone produced in step (a),” which “is represented by formula (III).” BASF further argues that the claims specifically contemplate the difference between the neutral alkoxy carbonylcyclohexenolone, its salt, and its specific metal “salt (III).” As a result, BASF urges us to conclude that the district court’s construction was incorrect because the product of step (a) may be the neutral alkoxy carbonylcyclohexenolone or its salt (III), and therefore one of ordinary skill in the art would understand that if one arrived at step (c) with such a salt, that same salt could be acylated, but if one arrived at step (c) with a neutral compound, it could be converted to a suitable salt of the alkoxy carbonylcyclohexenolone for the acylation in step (c) using standard techniques which were well known in the art. BASF argues that this is the only way to read the claim without reading out the recitation that the product of step (a) can be a neutral compound. BASF further asserts that under its reading “the salt” has an antecedent basis because it refers to the salt form of alkoxy carbonylcyclohexenolone as opposed to the neutral form, explaining that it is a salt form which must be acylated at step (c), whether it be a salt formed at step (a), a salt formed after step (a) from a neutral compound formed at step (a), or a second salt reformed by substituting one cation for another cation in a first salt formed at step (a).

We agree with the district court that the intrinsic evidence indicates that the term “the salt” refers to “salt (III),” the product of step (a). A plain reading of the claims shows that the term refers to the salt earlier described. The claim itself describes the “acylation, hydrolysis and decarboxylation of (III).” ’856 patent, col. 8 l. 11. BASF’s strongest argument to the contrary is that as a result of this construction, the neutral compound formed in step (a) is meaningless. However, no other construction of the term “the salt” is feasible given that the word “the” must have an antecedent basis. See Process Control Corp. v. HydReclaim Corp., 190 F.3d 1350, 1356-57, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999) (noting the importance of an antecedent basis in claim construction). BASF’s proffered construction that “the salt” refers to the salt form in general, does not address this concern because it would conflate “the salt” with the term “a salt,” and would render meaningless the word “the.” Furthermore, there is no mention in the patent of the process of converting the neutral form to the salt, or the process of reforming a salt with a different cation. There is certainly no enabling disclosure for these processes, suggesting that the patentee did not contemplate that the term “the salt” would include salts formed in a manner not taught in step (a). See In re Goodman, 11 F.3d 1046, 1050, 29 USPQ2d 2010, 2013 (Fed. Cir. 1993) (“[T]he specification must teach those of skill in the art ‘how to make and how to use the invention as broadly as it is claimed’”) (citing In re Vaeck, 947 F.2d 488, 496, 20 USPQ2d 1438, 1445 (Fed. Cir. 1991)).

We therefore affirm the district court’s construction of “the salt.” It is undisputed that Eastman does not acylate the salt (III) produced in step (a), but rather converts the neutral compound of step (a) into a salt and acylates that salt.

2. Infringement under the Doctrine of Equivalents

Although we rely on a different ground, we affirm the district court’s holding that Eastman cannot infringe under the doctrine of equivalents as a matter of law. In distinguishing its claims from the Sawaki prior art, seeking to overcome rejections, BASF repeatedly argued to the PTO that its method avoids the necessity of an additional isolation step. Eastman’s process requires an additional aqueous extraction, prior to the distillation step.

Arguments made during prosecution, if sufficient to evince a clear and unmistakable surrender of subject matter, may estop an applicant from recapturing that surrendered matter under the doctrine of equivalents. Sextant Avionique v. Analog Devices, Inc., 172 F.3d 817, 828 n.3, 49 USPQ2d 1865, 1872 n.3 (Fed. Cir. 1999). "Unmistakable assertions made by the applicant to the Patent and Trademark Office (PTO) in support of patentability, whether or not required to secure allowance of the claim, also may operate to preclude the patentee from asserting equivalency between a limitation of the claim and a substituted structure or process step. Application of this test requires, in each case, examination of the prosecution history taken as a whole." Texas Instruments, 988 F.2d at 1174, 26 USPQ2d at 1025 (citations omitted).

In this case BASF clearly and unmistakably surrendered processes that require additional isolation steps. In his declaration to the PTO, Dr. Richarz explained the disadvantages of the Sawaki prior art and then stated that "[t]he process claimed in Application Serial No. 603,240 avoids all these disadvantages. None of the intermediates involved need be isolated. The end product can be isolated simply by filtration." (emphasis added). Likewise, Dr. Kaczmarek explained in his declaration to the PTO that "[t]he novel process is much simpler, because there is no need to isolate an intermediate. The process of Sawaki et al. requires an expensive isolating operation at the cyclohexanedione stage." He further stated that "Sawaki et al. require an additional base (pyridine, at the same time serving as solvent) for the acylation step, which means additional expense for the subsequent isolation of the product of value, since the pyridine has to be removed either by distillation or extraction."

BASF distinguished the Sawaki prior art by asserting that its process did not require an additional isolation step, which would be costly. As this was a clear and unmistakable surrender of this subject matter, BASF cannot recapture it under the doctrine of equivalents. Eastman's process requires an additional isolation step, an aqueous extraction prior to the distillation step. Therefore, the district court did not err in precluding BASF from asserting that Eastman's process is equivalent.

CONCLUSION

Because Eastman does not infringe the '856 patent literally or under the doctrine of equivalents,

we affirm the district court's grant of summary judgment of noninfringement to Eastman. Furthermore, since the parties agree that if Eastman does not infringe, Tomen and Valent do not infringe, we affirm the district court's grant of summary judgment of noninfringement to Tomen and Valent.

AFFIRMED

COSTS

Costs to appellees.