United States District Court,
N.D. Illinois, Eastern Division.

FINNSUGAR BIOPRODUCTS, INC,
Plaintiff.
v.
THE AMALGAMATED SUGAR COMPANY and Amalgamated Research, Inc,
Defendants.

Aug. 23, 1999.

MEMORANDUM OPINION AND ORDER

COAR**, J.**

Before this court is Plaintiff Finnsugar Bioproducts, Inc.'s ("Plaintiff" or "Finnsugar") claim of patent infringement against Defendants The Amalgamated Sugar Company and Amalgamated Research, Inc. ("Defendants" or "Amalgamated") under 35 U.S.C. s. 271 for infringement of three patents: U.S. Patent No. 4,359,430 (" '430"), U.S. Patent No. 5,127,957 (" '957"), and U.S. Patent No. 5,795,398 (" '398"). As outlined in the parties' Joint Statement of Disputed and Undisputed Jury Instructions ("Joint Statement"), the dispute involves the constructions of Claim 1 of the '430 Patent, Claim 1 of the '957 Patent, and Claims 1 and 14 of the '398 Patent. After considering the oral arguments presented at the *Markman* hearing held April 4, 1999, and the submitted papers of both parties, the court construes the claims as follows.

The Finnsugar Patents

All three patents involve technology known as "chromatographic separation." This process is used to separate different components of beet molasses from one another, allowing for the recovery of the products. (Penny Decl. para. 13). "Beet molasses" is the liquid syrup left over after the removal of "sucrose" (table sugar) through crystallization. Beet molasses contains water, sucrose, "betaine," and a number of other components. (Penny Decl. para. 13). The components of beet molasses that have the greatest commercial value are sucrose and betaine, which are used as an animal and fish feed. (Penney Decl. para. 13).

Chromatographic separation in the three patents is carried out using large, cylindrically shaped tanks, called "columns," that are filled with water and contain a "resin bed." (Penny Decl. para. 11). The resin bed consists of closely packed bead-like particles which selectively attract molecules. In a chromatographic process, a feed material, in this case molasses diluted with water, is fed into the column above the resin bed. Chromatography takes advantage of the varying physical and chemical properties of different components in the mixture to separate the components from each other. (Cleary Decl. para. 9). As the molasses flows through the resin bed, some components of the molasses move faster than others because the resin attracts some of the components more strongly than others. Thus, because of differences in molecular weight and electrical polarity, the heavier and ionized molecules travel through the resin bed faster than others. Waste components, called "rest molasses" or "raffinate," move through the resin bed faster than the other

components. (Penney Decl. para. 13). The sugar component-sucrose-moves slower than the waste components. Betaine is the slowest moving component. The waste components, sucrose, and betaine are removed after they have passed through the resin bed. (Penny Decl. para. 13).

The first patent-the '430 patent (entitled "BETAINE RECOVERY PROCESS")was granted by the United States Patent Office ("PTO") in 1982. This was the first patent issued on the use of a chromatographic separation process to separate betaine from beet molasses. The second patent-the '957 patent (entitled "METHOD FOR THE RECOVERY OF BETAINE FROM MOLASSES)was granted by the PTO in 1992. It involved the use of a "simulated moving bed chromatographic process" ("SMB") to separate the waste components, sucrose, and betaine as three separate fractions. The '957 SMB utilizes multiple columns and valve switching and allows for a continuous feed operation. (Cleary Decl. para. 11). The location where the molasses is fed into the column(s) and where the fractions are removed changes in a pattern, which simulates the moving of the bed resin. (Cleary Decl. para. 11). The third patent-the '398 patent (entitled "FRACTIONATION METHOD FOR SUCROSE-CONTAINING SOLUTIONS")-was granted in 1998. It involves the use of two separate chromatographic processes to separate three fractions. The first chromatographic process produces two components. (One of those components is routed to the second process for further separation. (DTX 3, Col. 3-6).

Finnsugar is the assignee of all three patents. Since the claims of a patent define the scope of protection to an inventor or assignee, the claims of the patents '430, '957, and '398 determine what Finnsugar can and cannot prevent Defendants from making. The parties have submitted a Joint Statement which outlines the disputed claims. The claims in dispute are Claim 1 of the '430 patent, Claim 1 of the '957 patent, and Claims 1 and 14 of the '398 patent.

Standard for Claim Construction

A patent infringement analysis requires two steps: the first is to determine the proper construction of the asserted claim; the second is to determine whether the accused method or product infringes the asserted claim as properly construed. Markman v. Westview Instruments, Inc., 52 F.3d 967, 976 (Fed.Cir.1995) (en banc), *aff'd* 517 U.S. 370 (1996). The interpretation and construction of patent claims is a matter of law and thus is properly determined by the court. Id. at 979.

"In determining the proper construction of a claim, 'the court should look first to the intrinsic evidence of record, i.e., the patent itself, including the claims, the specification, and if in evidence, the prosecution history." ' *The* Kegel Co. v. AMF Bowling, Inc., 127 F.3d 1420, 1424, 44 U.S.P.Q.2d 1123, 1127 (Fed.Cir.1997) (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996)). Such intrinsic evidence is "the most significant source of the legally operative meaning of claim language." Vitronics, 90 F.3d at 1582.

When examining the claim, the court should first look at the "ordinary and customary" meaning of the words. *Id*. However, claims must be read in view of the specification of which they are a part. Markman, 52 F.3d at 979. The purpose of this review is "to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning." Vitronics, 90 F.3d at 1582. The specification is a written description of the product or process which is clear and complete enough so that a person of "ordinary skill in the art" can understand the parameters of the patent. Smithkline Diagnostics, Inc. v. Helena Labs. Corp., 859 F.2d 878, 882 (Fed.Cir.1988). In construing the meaning of the claim language, the specification acts as a dictionary which explains the invention and defines the terms used in the claims. Vitronics, 90 F.3d at

1582. However, although the specification is to be considered in construing a claim, its role is a limited one. Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 867 (Fed.Cir.1985). The specification cannot "enlarge, diminish, or vary" the limitations in the claims. Markman, 52 F.3d at 976. Using the specification as a dictionary to define particular words and phrases in a claim, which is proper, should not be confused with reading limitations into a claim from the specification "wholly apart from any need to interpret what the patentee meant by particular words or phrases." Lifescan Inc. v. Home Diagnostics Inc., 37 U.S.P.Q.2d 1595, 1598 (Fed.Cir.1996).

The final piece of intrinsic evidence to review is the prosecution history of the patent. The prosecution history contains the entire record of the prosecution of the patent claim before the patent office, including any representations made by the patent holder about the scope of the claim. The court has broad power to look as a matter of law to the prosecution history in order to ascertain the true meaning of the language used in the patent claims. Markman, 52 F.3d at 979. "The prosecution history limits the interpretation of claims so as to exclude any interpretation that may have been disclaimed or disavowed during prosecution in order to obtain claim allowance." Standard Oil Co. v. American Cyanamid Co ., 774 F.2d 448, 452 (Fed.Cir.1985). However, although the prosecution history can and should be used to understand the language used in the claims, like the specification, it cannot "enlarge, diminish, or vary" the limitations in the claims. Markman, 52 F.3d at 976.

Extrinsic evidence also may be used in claim construction. Vitronics, 90 F.3d at 1582. Extrinsic evidence consists of all evidence external to the patent and its prosecution history, including expert and inventor testimony, dictionaries, and treatises. Markman, 52 F.3d at 979. This evidence may be helpful to explain scientific principles, the meaning of technical terms, and terms of art that appear in the patent and prosecution history. *Id* . It is useful "to show what was then old, to distinguish what was new, and to aid the court in the construction of the patent." *Id*. However, when "an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term," it is "improper to rely on extrinsic evidence." Vitronics, 90 F.3d at 1583. Extrinsic evidence is to be used for the court's understanding of the patent, not for the purpose of varying or contradicting the terms of the claims. Markman, 52 F.3d at 979.

Finally, the duty of the court is to determine the meaning of the claims at issue. In the exercise of that duty, the court has an independent obligation to determine the meaning of the claims, notwithstanding the views asserted by the adversary parties. *Exxon Chemical Patents Inc. v. Lubrizol Corp.,* 64 F.2d 1553, 1554 (Fed.Cir.1995) (citing Markman, 52 F.3d 967)). The court's task is not to decide which of the adversaries is correct. *Id*. Instead, the court must independently assess the claims, the specification, and if necessary the prosecution history, and relevant extrinsic evidence, and declare the meaning of the claims. *Id*.

Analysis

A. The '430 Patent

The language of Claim 1 states:

"A process for recovering betaine from molasses which comprises:

(a) diluting the molasses to provide a diluted molasses having a solids content within the approximate range of 25-50%,

(b) providing a chromatographic column of a salt of a polystryrene sulfonate cation exchange resin cross-

coupled with from about 2 to about 12 weight percent of divinylbenzene, the resin being of uniform particle size and having a mean particle size within the range of about 20 to 400 U.S. mesh,

(c) submerging the column of resin in water,

(d) introducing the diluted molasses in uniform supply to the resin surface at the top of the column,

(e) eluting the molasses from the column with water to provide an eluate, and

(f) recovering from the downstream side of the resin bed a fraction which consists principally of betaine."

(Dft's Ex. DTX 1, Col. 12 ('430 Patent)). (Emphasis added to highlight the terms in dispute).

1. "to provide an eluate"

The first phrase disputed by the parties in their Joint Statement is "to provide an eluate." (Joint Stmt. p. 2). Plaintiff advocates a dictionary definition of "eluate," which means the "washings obtained by eluting." (Joint Stmt. p. 2). Thus, "to provide an eluate" means to provide the washings obtained by eluting. (Joint Stmt. p. 2). On the other hand, Defendants interpret the phrase to mean "to provide several fractions from the column, including at least a non-sugar fraction, a sugar fraction, and a betaine fraction ." (Joint Stmt. p. 2). For support of their interpretation, Defendants refer to the specification. The relevant language states:

"On elution with water, there is recovered from the column as eluate, a first nonsugar fraction, a second sugar-containing fraction, and a third fraction consisting principally of betaine." (DTX 1, col. 2/ln. 63-66).

Plaintiff is mainly concerned that adopting Defendants' proposed jury instruction on the meaning of this phrase would suggest to the jury that there is a requirement of *recovering* three fractions. (*Markman* Hearing Tpt. p. 186). However, Defendants' construction does not impose this requirement. Rather, "to provide an eluate" only means "to *provide* several fractions ...;" the fractions do not necessarily have to be *recovered*. (Joint Stmt. p. 2) (emphasis added). The claim language only requires that the resultant eluate from the "eluting of the molasses from the column with water ..." in step (e) consists of several fractions. (DTX 1, Col. 12/ln. 38-40). The specification describes these fractions as a nonsugar fraction, a sugar-containing fraction, and a betaine fraction. (DTX, Col.2/ln.63-66). As consistent with the claim language and the specification, the court construes the phrase "to provide an eluate" to mean "to provide several fractions from the column, including at least a nonsugar fraction, a sugar fraction, and a betaine fraction." (Joint Stmt. p. 2).

2. "the downstream side of the resin bed"

The next disputed term is "the downstream side of the resin bed." (Joint Stmt. p. 2). Defendants submit the following definition:

"... the side of the resin bed from which the flow of material exists after it passes through the resin bed recited in step (b). If the column of resin is standing vertically (that is, up and down), the downstream side is the bottom of the column of resin." (Joint Stmt. p. 2).

Plaintiff interprets the phrase to simply mean "the side of the resin bed from which the flow of material exits after it passes through the resin bed." (Joint Stmt. p. 2). The court agrees with Plaintiff that the

additional definition that "the downstream side is the bottom of the column of resin" is not required by the claim language. (Joint Stmt. p. 2). The plain construction of the phrase simply means "the side of the resin bed from which the flow of material exits after it passes through the resin bed." (Joint Stmt. p. 2; Penney Decl. para. 29). This interpretation is consistent with the ordinary and customary meaning of the term "downstream." (Penney Decl. para. 29). Furthermore, this interpretation does not compromise Defendants' proposed construction because so long as the flow of material *exits* at the "bottom" of the column, then that side is properly referred to as the "downstream side;" there is no need to additionally define the "downstream side" as the "bottom" of the column.

3. "fraction which consists principally of betaine**"**

Next, the parties dispute the meaning of "fraction which consists principally of betaine." (Joint Stmt. p. 3). Plaintiff interprets the phrase to mean that "a commercially significant component of the fraction is betaine." (Joint Stmt. p. 3). Defendants disagree and submit that the phrase means "a fraction of sufficiently high purity of betaine on a dry solids concentration basis that it is ready for commercial crystallization." (Joint Stmt. p. 3). For support, Defendants refer to the specification which describes the process as illustrated in Figure 1. (*Markman* Hearing Tpt. pp. 220-22; DTX 1, Col. 3/ln. 39-41). Figure 1 diagrams the production of betaine and illustrates the fraction characterized as the "fraction which consists principally of betaine" to undergo crystallization. (DTX 1, Fig. 1). However, Defendants are attempting to insert a limitation on the claim that is not required by the claim language. It does not necessarily follow that because Figure 1 portrays the betaine fraction undergoing crystallization that the fraction must be "a fraction of sufficiently high purity of betaine on a dry solids concentration that it is ready for *commercial crystallization*." (Joint Stmt. p. 3) (Emphasis added). So long as the "fraction which consists principally of betaine" can undergo crystallization and produce anhydrous betaine crystals by the process described in the specification, Plaintiff's construction conforms with the claim language and is not varied by the specification. Thus, the court defines the phrase to mean "a fraction consisting of a commercially significant amount of betaine such that the fraction will not materially affect the characteristics of processes described in Figure 1 of the '430 patent."

4. Limitation to a Batch Method

Finally, Defendants advocate that the construction of Claim 1 necessarily describes the operation of a batch method. (Joint Stmt. p. 3). Defendants propose the following construction:

"The terms 'the column of resin' in step (c), 'the resin surface at the top of the column' in step (d), 'the column' in step (e), the 'the resin bed' in step (f), all refer to the same 'chromatographic column of ... resin' recited and described in step (b) of Claim 1. This meaning is consistent with the operation of a batch method." (Joint Stmt. p. 3).

While Plaintiff does not dispute the fact that the '430 patent discloses a batch process or that steps (b) through (f) all refer to the same column, Plaintiff argues that the language of Claim 1 does not limit the claim to a batch process. (*Markman* Hearing Tpt. pp. 189-90). Thus, the issue is whether or not the language of Claim 1 precludes the use of some other process other than a batch method. (*Markman* Hearing Tpt. p. 189).

The court will not limit the construction of Claim 1 to only the operation of a batch method because this is not required by the claim language. The claim language only requires that *a* column of resin is used in the process described in the claim and that the *same* column is used as it is referred to in steps (b) through (f).

This is undisputed. Defendants offer evidence from the prosecution history of the '957 patent (a subsequent patent to the '430 patent) which documents the applicants' statements to the PTO in their prosecution of the '957 patent which characterized the '430 patent (cited as prior art) as utilizing a batch method. However, this subsequent file history of a separate, unrelated patent is extrinsic evidence FN1 and cannot create limitations to the claims of the present patent when the claim language sufficiently defines their scope. Vitronics, 90 F.3d at 1583. It may be true that the utilization of only *one* column in chromatographic separation as it is described in Claim 1 is consistent with a batch method, but specifically defining a process *as* a batch method is more limiting than simply describing the process in a claim may be consistent with the operation of a batch method. While it is unclear at this point what difference, if any, specifically defining Claim 1 as a batch process will make, the claim language simply does not require this and, accordingly, the court finds that it is not necessary to so define the claim. It is plainly clear from the claim language that "the column" as it is referred to in steps (b) through (f) all refer to the *same* "chromatographic column of ... resin" recited and described in step (b) of Claim 1.

FN1. Defendants cite Jonsson v. The Stanley Works, 903 F.2d 812, 818 (Fed.Cir.1990) for the proposition that admissions in related patent applications can be used to interpret terms of the subject patent. However, although *Jonsson* involved external file history (prosecution history of the '251 patent) of the subject patent (the '912 patent), the facts of *Jonsson* materially differs from those of the present case. The Federal Circuit found the fact that "the '912 patent [was] the result of a *continuation-in-part* application from the original '008 patent, which led to the '251 patent," to be particularly "relevant to an understanding of [the disputed term] as that term is used in the '912 patent." (Emphasis added) *Id*. at 818. In the present case, the '957 patent was filed *after* the '430 patent and the two patents are unrelated patents.

B. The '957 Patent

The language of Claim 1 states:

"A method for the recovery of betaine and sucrose from beet molasses as substantially separate product fractions during the same cycle of a chromatographic simulated moving bed system having at least three chromatographic columns connected in series and adapted for the flow of liquids in a single direction through the columns, said cycle comprising

[1] a molasses feeding step comprising feeding a molasses feed solution into one of said columns and substantially feeding eluent water into another of said columns, followed by the two following steps either one or several times;

[2] an eluent water feeding step comprising feeding water into one of said columns, and

[3] a circulation step comprising circulating said molasses feed solution and said water through said columns,

wherein product fractions are eluated during said molasses-feeding step, said eluent water feedings step, or both said product fractions selected from the group consisting of a rest molasses fraction, a betaine fraction, and a sucrose fraction, wherein each of said product fractions are recoverable during said cycle."

(DTX 2, Col. 10) (brackets inserted) (emphasis added to highlight the terms in dispute).

1. "during the same cycle of a chromatographic simulated moving bed system"

The first dispute involves the phrase "during the same cycle of a chromatographic simulated moving bed system." (Joint Stmt. p. 5). Plaintiff asserts that no definition is needed here, but alternatively, Plaintiff would accept an interpretation that the phrase means "that the three product fractions are recovered during the cycle defined in the claim." (Joint Stmt. p. 5). Defendants, however, are concerned that this construction would cover a system where the fractions are recovered using two stages of columns (as opposed to single-state separation, i.e. a single series of columns). (*Markman* Hearing Tpt. p. 228). Thus, Defendants advocate an interpretation that the phrase means that "the three product fractions are recovered *simultaneously* from the same series of columns of the system ..." (Emphasis added) (Joint Stmt. p. 7). For support, Defendants refer to Figure 1 of the '957 patent which diagrams the recovery of all three product fractions from the same series of columns. (DTX 2, Fig. 1). Additionally, Defendants point to the prosecution history of the '957 patent wherein the applicants represented to the PTO that "Applicants' process *simultaneously* recovers *three* fractions from molasses: rest molasses, sucrose and *betaine*." (DTX 13 at 2) (original underline emphasis).

The court finds that the claim language plainly states that the patent teaches "a method for the recovery of betaine and sucrose from beet molasses as substantially separate product fractions *during the same cycle* of a chromatographic simulated moving bed system ..." (DTX 2, Col. 10) (emphasis added). In the Examiner's Statement of Reasons for Allowance, the Examiner explained that "[n]one of the prior art of record teaches ... a method for recovering betaine and sucrose *as substantially separate product fractions* during the same cycle of a chromatographic simulated moving bed system ..." (DTX 15 at 2) (emphasis original). The plain language of the claim clearly explains that *the three product fractions are recovered during the same cycle* of a SMB system, which is what the Examiner found to be novel. Furthermore, the specification (Figure 1) illustrates the recovery of the three product fractions from *the same series of columns* of a SMB system. Thus, the court construes the disputed phrase to mean "the three product fractions are recovered from the same series of columns during the same cycle defined in the claim." So long as the three product fractions are recovered *during the same cycle of the SMB process* from the *same series of columns,* the construction is consistent with the claim language and the specification. Adding the word "simultaneously" to the construction, as suggested by Defendants, is thus extraneous.

2. The phrase concerning the SMB system

The next dispute concerns many of the separate terms in the phrase "a chromatographic simulated moving bed system having at least three chromatographic columns connected in series and adapted for the flow of liquids in a single direction." (DTX 2, Col. 10). Defendants propose separate definitions for the terms "a chromatographic simulated moving bed system," "a system having at least three chromatographic columns connected in a single series for the flow of liquids in a single direction," and "connected in series." (Joint Stmt. pp. 5-6). However, the court agrees with Plaintiff that a separate definition is not needed for each disputed term because examining the phrase as a whole automatically resolves the ambiguity resulting from viewing each disputed term independently. Therefore, the court will interpret the phrase as a whole.

The main issue of dispute concerning the aforementioned terms is how a simulated moving bed ("SMB") system operates as it is described in the claim. (*Markman* Hearing Tpt. pp. 32-34; Joint Stmt. pp. 5-6). As previously discussed, a SMB system involves the simulation of a moving bed to allow for a continual feed operation by utilizing multiple columns, and necessarily multiple resin beds, and valve switching. The simulation of the moving of the resin bed is accomplished by changing the pattern of where the molasses is

fed into the columns and where the fractions are removed. Essential to the SMB system is the use of multiple columns. As described in the claim, the columns are "connected in series and adapted for the flow of liquids in a single direction through the columns." (DTX 2, Col. 10). As explained by Dr. W. Roy Penney (Plaintiff's Expert), "the loop [in a SMB system] is formed by piping successive columns in series to form a closed circuit containing all the columns in series." (Penney Decl. para. 16).

With this background in mind, the court construes the phrase "a chromatographic simulated moving bed system having at least three chromatographic columns connected in series and adapted for the flow of liquids in a single direction through the columns" to describe "multiple columns that form a SMB system as it is used in the claim such that all the columns in the system are connected in series so as to form a loop." A separate definition for each of the aforementioned terms is not necessary. This construction is reinforced by the specification, wherein, regardless of the number of columns depicted in the examples, the examples illustrate that all the columns are connected in series to form a SMB system. (DTX 2, Fig. 1 (example of a SMB system having four columns connected in series); DTX, Fig. 2 (example of a SMB system having eight columns connected in series). Furthermore, this construction is consistent with how one with ordinary skill in the art would interpret columns connected in series in a SMB system. (Penney Decl. para. 16).

3. "product fractions"

Next, Defendants wish to define the term "product fractions" to mean "a rest molasses fraction, a betaine fraction, and a sucrose fraction." (Joint Stmt. p. 6). The court agrees with Plaintiff that a separate definition for the term "product fractions" is not needed here. The claim language explicitly states "a method for the recovery of betaine and sucrose ... as substantially separate product fractions" and "... said product fractions selected from the group consisting of a rest molasses fraction, a betaine fraction, and a sucrose fraction ..." (DTX 2, Col. 10). Clearly, when one reads the claim in its entirety, it is clear that the "product fractions" referred therein consist of "a rest molasses fraction, a betaine fraction, and a sucrose fraction." (DTX 2, Col. 10).

4. Steps of the cycle

The claim interpretation next turns to the specific steps of the cycle. The parties dispute the terms "followed by," "a molasses feeding step," "an eluent water feeding step," and "a circulation step." (Joint Stmt. pp. 6-8). The dispute primarily involves whether the three steps must follow one another in a sequence or whether some steps may occur during other steps. Defendants advocate a construction of the claim which interprets the three steps of the cycle as sequential such that only one of the three steps can occur during that step. For example, Defendants suggest that while a molasses feeding step is occurring, the eluent water step and the circulation step cannot also take place. (*Markman* Hearing Tpt. p. 229). Thus, Defendants define the terms "followed by" and "following" to mean that "each circulation step and each eluent water feeding step occurs after the end of a molasses feeding step, and does not occur during any molasses feeding step." (Joint Stmt. p. 6). Plaintiff's only concern is that Defendants' definition "may mean that only *one* each of [the eluent water feeding step and the circulation step] follows the molasses feeding step." (*Markman* Hearing Tpt. p. 193). Plaintiff refers to claim language that states "... followed by the two following steps *either one or several times*." (DTX 2, Col. 10) (emphasis added). Accordingly, Plaintiff submits that the terms "followed by" and "following" mean that "one or more eluent water feeding steps and one or more circulation steps occur after the end of a molasses feeding step." (Joint Stmt. p. 6).

The specification clearly describes the operation of the three steps as to resolve any ambiguity in the claim language. All of the examples (Examples 1-4) referred to in the specification describe step 1 as the molasses

feeding step. Then the subsequent steps comprise of a series of the circulation and eluent water feeding steps occurring alternatively. For instance, Example 3 illustrates the following sequence: step 1-the molasses feeding step; step 2-circulation step; step 3-eluent water feeding step; step 4-circulation step; step 5-eluent water feeding step; step 6-circulation step; step 7-eluent water feeding step; and steps 8 through 14 simply repeat the cycle with step 8 as the molasses feeding step. (DTX 2, Col. 8). The specification, thus, describes a process where the circulation and eluent water feeding steps occur after a molasses feeding step.

Each of the circulation and eluent water feeding steps that do occur, however, do not have to immediately follow a molasses feeding step because the claim language provides that the circulation and eluent water feeding steps may occur "either one or several times" following a molasses feeding step. (DTX 2, Col. 10). Hence, as illustrated in Example 3, the circulation and the eluent water steps each occurred three times after the first molasses feeding step before the next molasses feeding step took place. (DTX 2, Col. 8). In light of the specification, the court finds that rather than defining the terms "followed by" or "following," the claim language itself most unambiguously describe the sequence of the steps. The court adopts the following construction to resolve all ambiguity concerning the sequence of the three steps in question should any arise:

"The cycle of a chromatographic SMB system described in Claim 1 begins with a molasses feeding step (as it is described in the claim) followed by the circulation and eluent water feeding steps (as they are described in the claim). Each of the circulation and eluent water steps occurs separately and may occur one or several times before the cycle begins again with a molasses feeding step. No two steps occur at the same time."

Next, the parties dispute the proposed definitions for each of the three steps. Again, the primary issue of dispute here involves whether or not any of the steps can occur at the same time as some other step. The above construction resolves this point of contention; "[n]o two steps occur at the same time." Plaintiff argues, however, that although the examples show that the steps occur separately, "the patent read as a whole would support that [the circulation or the eluent water feeding step and the molasses feeding step] could occur simultaneously." (Hearing Tpt. pp. 195-96). The court disagrees. As discussed above, the claim language describes the three steps as separate, discrete steps that occur separately. (DTX 2, Col. 10) ("said cycle comprising a molasses feeding step [with description] followed by the two following steps ...; an eluent water feeding step [with description], and a circulation step [with description]"). Furthermore, the specification similarly describes the steps as occurring separately. (DTX 2, Col. 5/ln. 18-25) (" *After* the [molasses feeding step which requires the simultaneous feeding of molasses feed and water], *the circulation of the solutions contained in the columns is started*. The circulation of the solutions is continued ... *until* a new batch of feed solution and/or eluent water can be fed again.") (Emphasis added). In addition, in the applicants' amendment to the '957 patent application, they describe the cycle as comprising of steps in "sequential order." (DTX 10 at 6).

The second issue of dispute involves the meaning of "feeding into one of the columns" as described in the molasses feeding step and the eluent water feeding step. (Joint Stmt. pp. 7-8). As discussed previously, the SMB system in the '957 patent consists of multiple columns connected in series by piping to form a loop. At the entrance of each column, there is an entrance pipe that is joined by a re-circulation line (looping pipe), a molasses feed pipe (marked 19 in Fig. 1), and a water feed pipe (marked 20 in Fig. 1). (DTX 2, Fig. 1). Defendants submit that "feeding into one of the columns does not include feeding into a re-circulation line." (Joint Stmt. pp. 7-8). Plaintiff argues that "feeding into one of the columns" as it is described in both steps merely means that the molasses (in the molasses feeding step) or water (in the eluent water feeding step) is "introduced into one of the columns in some manner." (Joint Stmt. pp. 7-8). The court finds that neither interpretation accurately reflects the claim language and the specification.

The claim language, in light of the specification, requires that the molasses feeding step feed a molasses feed solution into one of the columns from a container of diluted molasses (container 17 in Fig. 1). (DTX 2, Fig. 1). Similarly, the eluent water feeding step must feed water into one of the columns from a container of water (container 18 in Fig. 1). (DTX 2, Fig. 1). The claim language describes the molasses feeding step as "comprising feeding a molasses feed solution ..." and the eluent water feeding step as "comprising feeding water ..." (DTX 2, Col. 10). Accordingly, the specification describes "a first container 17 ... which contains diluted molasses fed to a preselected column via a molasses feed pump 22 into a molasses feed pipe 19" and "a second container 18 which contains water ... fed to a preselected column via a water feed pump 23 into a water feed pipe 20." (DTX 2, Col. 4). However, a re-circulation line joins with the molasses feed pipe (19) and the water feed pipe (20) into a single entrance pipe prior to entering each column. (DTX2, Fig.1). Thus, it is possible that recirculation fluids (however minimal) remaining in the looping pipe from the flow of a previous step may also enter the column along with the diluted molasses from the molasses container (during a molasses feeding step) or along with water from the water container (during an eluent water step).

With the above clarifications in mind, the court adopts the following constructions. The term "a molasses feeding step" means "the feeding of a molasses feed solution from a molasses feed pipe into one of said columns and substantially feeding eluent water from a water feed pipe into another of said columns. The feeding of the molasses feed solution and the eluent water may or may not include fluids in the re-circulation lines leftover from previous steps." The term "an eluent water feeding step" means "the feeding of water from a water feed pipe into one of said columns without the simultaneous feeding of a molasses feed solution as described in the molasses feeding step. The feeding of the eluent water may or may not include materials in the re-circulation lines leftover from previous steps." The term "a circulation step" means "the circulation of the molasses feed solution and water through all the columns that comprise the SMB system. The circulation step itself does not occur during any molasses feeding step or any eluent water feeding step, although materials in the re-circulation lines leftover from previous steps may or may not circulate while a molasses feeding step or an eluent water feeding step is occurring."

5. "wherein product fractions are eluated"

In addition, the parties dispute the phrase "wherein product fractions are eluated." Defendants interpret the phrase to mean that "the product fractions are *recovered* from the columns connected in series." (Emphasis added) (Joint Stmt. p. 8). In contrast, Plaintiff's defines the phrase to mean that "the product fractions are *removable*." (Emphasis added) (Joint Stmt. p. 8). The court agrees with Plaintiff that the claim language does not necessarily require that the product fractions be recovered. The claim states "... wherein product fractions are eluated during the molasses feeding step, [the] eluent water feeding step, or both ... wherein each of said product fractions are *recoverable* during said cycle." (Emphasis added) (DTX 2, Col. 10). The claim language describes that the product fractions, which consist of a rest molasses fraction, a betaine fraction, and a sucrose fraction, are separated from the molasses feed solution as it flows through the columns during both the molasses feeding step and the eluent water step such that these product fractions are "recoverable." Performing a process that allows something to be recoverable does not necessarily mean that it *must* be recovered. Thus, that the specification and the prosecution history describe actual recovery of the product fractions does not necessarily require that they must be recovered. The Federal Circuit has stated that "[w]here a specification does not *require* a limitation, that limitation should not be read from the specification into the claims." (Emphasis original) Specialty Composites v. Cabot Corp., 845 F.2d 981, 987 (Fed.Cir.1988). Because the claim explicitly uses the word "recoverable," the court will adopt this language.

Accordingly, "wherein product fractions are eluated" means "that the product fractions are separated from the molasses feed solution such that they can be recovered." In the same vein, "wherein each of said product fractions are recoverable during said cycle" means that "at least one each of the three product fractions is recoverable during the same cycle."

6. The fractions

Next, Plaintiff disputes Defendants' proposed instructions regarding the meaning of the terms "a rest molasses fraction," "a betaine fraction," and "a sucrose fraction." Defendants advocate definitions of the terms that include purity ranges. For example, Defendants submit that "a sucrose fraction" means "a product fraction that is substantially separate from the other two fractions ... and from all other components in the beet molasses. Its purity on a dry solids basis would vary from about 80% to about 95% sucrose when using beet molasses containing about 60% of sucrose and 4.5% of betaine on a dry solids basis. (Joint Stmt. p. 10). For support of this interpretation, Defendants refer to the specification wherein the purity ranges of the fractions are described. (DTX 2, Col. 5./ln. 50-68; Hearing Tpt. p. 233). The court agrees with Plaintiff that the terms as described in the claim language do not need to be defined with purity ranges.

First, the language in the specification that Defendants refer to for support does not *require* that each product fraction to have a certain purity range. For example, the specification states "the sucrose content of the sucrose fraction obtained by the method of the present invention *may* vary from about 80% to about 95% ... These values, however, *do not represent actual limits* of the performance of the new methods; they are *mere examples* ..." (DTX 2, Col.5/ln. 50-60). Moreover, the Federal Circuit has stated that "[o]rdinarily a claim element that is claimed in general descriptive words, where a numerical range appears in the specification and in other claims, is not limited to the numbers in the specification or other claims." Specialty Composites, 845 F .2d at 987.

In the present case, the claim language describes the terms in general descriptive words. When numerical ranges are described in the specification, they are not constructed as limits but as examples. Accordingly, the court construes the three terms in dispute as follows: "a rest molasses fraction" means "a product fraction that is separate from the other two fractions (the sucrose fraction and betaine fraction);" "a betaine fraction" means "a product fraction that is substantially separate from the other two fractions (the sucrose fraction and the rest molasses fraction);" and "a sucrose fraction" means "a product fraction that is substantially separate from the other two fractions (the betaine fraction and the rest molasses fraction). (Joint Stmt. pp. 9-10).

7. "molasses feed solution"

Finally, the parties dispute the term "molasses feed solution." (Joint Stmt. p. 7). This dispute involves the same issue as above, the inclusion of numerical limitations in the construction of the term. As previously discussed, numerical limitations should not generally be read into a claim from which it is absent. Specialty Composites, 845 F.2d at 987. This is true even if the specification may describe a numerical range in its discussion of the disputed term. *Id*. Thus, the court interprets the term "molasses feed solution" without the numerical limitation as prescribed in Defendants' proposed instruction. The term "molasses feed solution" means "beet molasses which is diluted with water." (Joint Stmt. p. 7).

C. The '398 Patent

1. Claim 1

The language of Claim 1 states:

A method for separating sucrose and a dissolved component from a beet-derived sucrose-containing material comprising the steps of:

fractionating a beet-derived sucrose-containing material in a first loop by a chromatographic simulated moving bed process to produce at least a first fraction and a second fraction said second fraction comprising sucrose and a dissolved component selected from the group consisting of betaine, inositol, raffinose, galactinol, serine and amino acide; and

fractionating a stream comprising said second fraction in a second loop by chromatographic fractionation to produce at least a third fraction and a fourth fraction, said third fraction comprising sucrose, said fourth fraction comprising of sucrose and said dissolved component, said third fraction comprising a higher percentage concentration by weight sucrose on a dry substance basis than said second and fourth fractions, said fourth fraction comprising a higher percentage concentration by weight on a dry substance basis of said dissolved component than said second fraction, and said second loop being different than said first loop.

(DTX 3, Col. 14) (emphasis added to highlight disputed terms).

a. "separating"

First, the parties dispute whether or not the term "separating" should be defined. (Joint Stmt. p. 12). Plaintiff asserts that no definition is needed. Alternatively, Plaintiff would accept the ordinary meaning of "separating" to mean "to isolate from a mixture, to divide into constituent parts." (Joint Stmt. p. 12 (quoting from Webster's Dictionary)). Defendants argues that a definition is needed and would accept Plaintiff's proposed definition. Since this particular patent, as is the other two patents, involve processes used to separate the components of beet molasses, the court finds it helpful to provide a definition of the term "separating" to the jury. Both parties agree to the dictionary definition of the term, and the court adopts this proposed instruction.

b. The first, second, third and fourth fractions

Second, the parties contest the interpretations of the terms "first fraction" and "second fraction." The parties agree on the definition of "second fraction," that it "must include some sucrose-the claim does not specify how much-and it also must include a 'dissolved component.' The dissolved component must be a component of the molasses other than the sucrose." (Joint Stmt. p. 13). With this definition in mind, Defendants state that the "first fraction" must be "a fraction produced by the first loop that (1) is distinct from the 'second fraction,' that is, it is not of a composition that meets the definition of the second fraction, and (2) is not a betaine fraction." (Joint Stmt. p. 12). Plaintiff disagrees with this interpretation and submits that the "first fraction" "may include any components of the molasses. The first fraction may include any of the components of the beet-derived sucrose-containing material." (Joint Stmt. p. 12).

From a review of all the intrinsic evidence, the court disagrees with Defendants' proposed instruction. The claim language describes a process wherein sucrose is separated from a dissolved component from a feed solution of a beet-derived sucrose-containing material. This process occurs over two stages, using two distinct loops for two separate fractionations. The first loop fractionates the initial feed solution into two fractions, a "first fraction" and a "second fraction." At this stage, certain materials that will not proceed onto the second loop are separated from the solution. The "second fraction," comprising sucrose and a dissolved

component, is the fraction the undergoes the fractionation at the second loop. It is essential for the patent that the second loop fractionation separates the "second fraction" into a "third fraction," mainly a sucrose fraction, and a "fourth fraction," comprising of sucrose and said dissolved component. Thus, the second fractionation acts to further purify sucrose and said dissolved component from the "second fraction."

Defendants' interpretation emphasizes that the first fraction cannot be a betaine fraction. For support, Defendants refer to the prosecution history wherein it describes how the method improves "both betaine and sucrose recovery by utilizing a secondary purification of the betaine fraction from the molasses fraction." (DTX 40 at 4). In addition, Defendants point to examples in the patent wherein the first fraction was not betaine. (DTX 3). However, Defendants ignore important language in the specification which states:

"The invention is particularly suitable for the recovery of sucrose and betaine from beet molasses. Therefore, the following description of the invention specifically refers to the recovery of sucrose and betaine, but the invention is not so limited. Instead of, or in addition to betaine, any other dissolved organic substance may be similarly recovered by adjusting the process conditions and parameters to suit the separation in question, which can be achieved easily by those skilled in the art."

(DTX 3, Col. 4/ln. 19-27). The specification clearly states that the invention is not limited to the examples so described. Moreover, the Federal Circuit has stated that "[w]hat is patented is not restricted to the example, but is defined by the words in the claims if those claims are supported by the specification." Specialty Composites, 845 F.2d at 987.

Since the claim language does not define the "first fraction" as a fraction that is not a betaine fraction, the court adopts the following constructions. The "first fraction" is "the fraction distinct from the 'second fraction' in that it does not undergo a second fractionation at the second loop. The first fraction may include any of the components of the beet-derived sucrose-containing material." (Joint Stmt. p. 12). The "second fraction" "must include some sucrose-the claim does not specify how much-and it also must include a 'dissolved component.' The dissolved component must be a component of the molasses other than sucrose." (Joint Stmt. p. 13).

With the claim language that describes the operation of the two-stage fractionation process of Claim 1 in mind, the Court defines the following disputed terms as follows. The "third fraction" means "a fraction produced by the second loop that has a higher concentration by weight sucrose on a dry substance basis than the 'second fraction' and the 'fourth fraction." The "fourth fraction" means "a fraction produced by the second loop that has a higher concentration by weight on a dry substance basis of a dissolved component other than the 'second fraction." ' The claim language supports these two interpretations and does not require additional limitations, as suggested by Defendants. (Joint Stmt. p. 14). The claim language, as discussed above, requires that the second fractionation constitute a further purification step of the components in the beet-derived sucrose-containing material. The fact that the proposed constructions requires that the "third fraction" to have a higher concentration by weight sucrose on a dry substance basis than the second and fourth fractions and that the "fourth fraction" to have a higher concentration by weight on a dry substance basis of a dissolved component other than the "second fraction" sufficiently reflects a further purification of sucrose and said dissolved component from the original feed solution.

2. Claim 14

The language in Claim 14 states:

"A method for processing a beet-derived sucrose-containing material, comprising the steps of:

fractionating a beet-derived sucrose-containing material in a first fractionator into at least two fractions, one of said fractions comprising a greater percentage of a dissolved component selected from the group consisting of betaine, inositol, raffinose, galactinol, serine, and amino acid;

fractionating a stream comprising said dissolved component from said first fractionator in a second fractionator into a fraction comprising sucrose and another fraction comprising a greater percentage of said dissolved component than each of said fractions from said first fractionator; and

said fractionators comprising a series of columns, beds, or parts thereof, said second fractionator having at least one column, bed, or part thereof, separate and distinct from said first separator."

(DTX 3, Col. 14-15) (Emphasis added to highlight disputed terms).

a. "processing"

The first dispute involves whether or not the term "processing" should be defined. Defendants propose a definition that "processing means producing fractions of sufficient purity that they are at least ready for refinement to commercial products." (Joint Stmt. p. 15). Plaintiff asserts that no definition is needed. Although the court agrees with Defendants that a definition may be necessary because Claim 14 describes "a method for processing," the court finds Defendants' interpretation unnecessarily restrictive. (DTX 3, Col. 14). The court construes the term "processing" to mean "producing fractions from a beet-derived sucrose-containing material utilizing the steps described in the claim." This definition describes the term as it is used in the language of the claim.

b. "comprising a greater percentage of a dissolved component"

Second, the parties dispute the phrase "comprising a greater percentage of a dissolved component." The dispute involves whether or not the phrase is an indefinite term. (Joint Stmt. p. 15). This issue, as stated by the court during the *Markman* hearing, is to be resolved in a separate motion. (*Markman* Hearing Tpt. p. 209).

c. "fraction comprising sucrose"

The next disputed term is "fraction comprising sucrose." Defendants submit that the phrase means "a fraction produced by the second separator that is sufficiently high in concentration of sucrose (also known as purity) so that it is at least ready for refinement into a commercial product." The court finds that the limitations in Defendants' proposed definition are not required by the claim language. The claim only requires that the second fractionator fractionate "a stream comprising said dissolved component from the first fractionator" into "a fraction comprising sucrose and another fraction comprising a greater percentage of said dissolved component than each of said fractions from said first fractionator." (DTX 3, Col. 15). Thus, so long as the "fraction comprising sucrose" includes sucrose and that the fraction separated from the "fraction comprising sucrose" has a greater percentage of said dissolved component than the fractions from the first fractionator, the requirements of the claim language have been met. The court construes "fraction comprising sucrose" to mean "a fraction that includes sucrose and may also include other dissolved components." (Joint Stmt. p. 16).

d. "another fraction"

Finally, the parties dispute the phrase "another fraction comprising a greater percentage of said dissolved component than each of said fractions from said first fractionator." Again, using the same analysis of the claim language as above, the phrase means "a fraction produced by the second fractionator in addition to the 'fraction comprising sucrose,' defined above, with a greater percentage of the dissolved component than each of the fractions from the first fractionator." (Joint Stmt. p. 16). Defendants' added requirement that "this fraction must be sufficiently high in concentration of dissolved component (also known as purity) so that it is at least ready for refinement into a commercial product" finds no support in the express language of the claim. In addition, the specification and the prosecution history do not vary the language of the claim.

Conclusion

After consideration of the arguments of both parties presented during the *Markman* hearing along with the court's independent examination of the claims, the specifications, and the prosecution files of the '398, '957, and '430 patents, the court properly construes the disputed terms as they are constructed above.

N.D.Ill.,1999.
Finnsugar Bioproducts, Inc. v. Amalgamated Sugar Co.