United States Court of Federal Claims

No. 96-166 C

(Filed: December 7, 2000)

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ZOLTEK CORPORATION,	*	Patents; Controlled surface
	*	electrical resistance carbon
Plaintiff,	*	fiber sheet product; Claim
	*	construction; Indefiniteness.
v.	*	
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THE UNITED STATES,	*	.
	*	
Defendant.	*	
	*	
* *	*	

Dean A. Monco, Chicago, IL, for plaintiff.

Gary L. Hausken, Commercial Litigation Branch, Civil Division, U.S. Department of Justice, Washington, DC, for defendant, with whom were *Vito J. DiPietro*, Director; *David W. Ogden*, Assistant Attorney General. *Thomas J. Byrnes*, Assistant Director, of counsel.

OPINION

DAMICH, Judge.

I. Introduction

This is an action alleging patent infringement pursuant to 35 U.S.C. § 1498(a). Plaintiff seeks reasonable and entire compensation for the manufacture and use of United States Patent No. Reissue 34,162 (the Re. '162 patent). The matter is before the Court on

claim construction and Defendant's motion for partial summary judgment on the issue of indefiniteness.

II. Background

The Re. '162 patent involves a method of manufacturing controlled surface resistance carbon fiber sheet products. The Re. '162 patent has 40 claims, with claims 1-22 and 33-38 written in method form and claims 23-32, 39 and 40 written in product-by-process form. Proceedings were stayed pending claim construction. Pursuant to the Court's order, the parties identified 6 terms in the claims which are in dispute. The Court ordered legal briefing of the disputed claim terms. The disputed terms appear in each of the independent claims 1, 11, 15, 33, and 40 of the Re. '162 patent. Defendant also provided a claim-by-claim analysis of the independent claims at issue. The Court's focus will be on the 6 disputed terms identified by the parties. A claim construction hearing was held at which both intrinsic and extrinsic evidence was presented. After careful consideration, the Court construes the disputed terms as discussed herein.

III. Standard for Claim Construction

Determination of claim construction, including the terms of art found therein, is a matter of law for the court to decide. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 34 USPQ2d 1321 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370, 116 S. Ct. 1385, 134 L. Ed. 2d 577, 38 USPQ2d 1461 (1996). The Federal Circuit has instructed that, "when construing a claim, a court should look first to the intrinsic evidence, i.e., the claims themselves, the written description portion of the specification, and the prosecution history." *Bell & Howell Document Management Prods. Co. v. Altek Sys.*, 132 F.3d 701, 706, 45 USPQ2d 1033, 1037 (Fed. Cir. 1997).

"The starting point for any claim construction must be the claims themselves." *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999). "[I]t is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning." *Northern Telecom, Ltd. v. Samsung Electronics Co., Ltd.*, 215 F.3d, 1281, 1293, 55 USPQ2d 1065, 1073 (Fed. Cir. 2000), quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582, 39 USPQ2d 1573, 1577 (Fed. Cir. 1996). Further, "[t]he prosecution history is often helpful in understanding the intended meaning as well as the scope of technical terms, and to establish whether any aspect thereof was restricted for purposes of patentability." *Vivid Technologies, Inc. v. American Science & Engineering, Inc.*, 200 F.3d 795, 804, 53 USPQ2d 1289, 1295 (Fed. Cir. 1999).

After considering the intrinsic evidence, the court may also "consult trustworthy extrinsic evidence to ensure that the claim construction it is tending to from the patent file is not inconsistent with clearly expressed, plainly apposite, and widely held understandings

in the pertinent technical field." *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1309, 51 USPQ2d 1161, 1168 (Fed. Cir. 1999).

IV. Claim Terms in Dispute

The parties agree that the following terms are in dispute: (1) starting material, (2) carbonizing, (3) partially carbonizing, (4) partially carbonized fibers, (5) sheet product, and (6) about 1300 degrees Centigrade.

A. "Starting Material"

Defendant contends that the "starting material" must include polyacrylonitrile (PAN). Plaintiff argues that the "starting material" need not include a single or specific starting material such as PAN. Rather, Plaintiff contends that one skilled in the art of carbon fiber processing would know that other materials could be used to practice the claimed invention as effectively as PAN.[1]

None of the independent claims expressly limits the starting material to PAN. Claim 1, the broadest independent claim, is illustrative:

> A method of manufacturing a plurality of different value controlled resistivity carbon fiber sheet products employing a carbonizable fiber starting material; said method comprising selectively partially carbonizing previously oxidized and stabilized fiber starting material for a predetermined time period in an oxygen free atmosphere within a furnace at selected temperature values within a temperature range from 370 degrees Centigrade to about 1300 degrees Centigrade by soaking the stabilized fiber starting material at the selected temperature for the predetermined period of time to provide a preselected known volume electrical resistivity to the partially carbonized fibers corresponding to that volume electrical resistivity value required to provide the preselected desired surface resistance value for the finished sheet products, and thereafter processing the partially carbonized fibers into homogeneous carbon fiber sheet products having the preselected desired surface electrical resistances.

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[1] The parties agree that one skilled in the art would have at least a bachelor's degree in chemical engineering or chemistry. Tr. at 6. One skilled in the art would also have a working knowledge of the characteristics and uses of cellulosic, pitch and acrylic carbon fiber precursors, the characteristics of carbon fiber, the pyrolization processes used in making carbon fiber and processes for making carbon fiber sheet products. *Id*. at 5. *See also Def. ['s] Br*. at 5.

Re. '162 patent, col. 8, ll. 42-66.

However, Defendant argues that the inventor defined "starting material" in the "Summary of the Invention" portion of the specification, so that the starting material must include PAN. Specifically, in col. 2, ll. 61-63 it states, "The starting carbonizable material used in practicing the invention consists essentially of polyacrylonitrile (PAN)." Because this definition appears in the "Summary of the Invention," Defendant argues that it applies to the invention as a whole.

"'Consisting essentially of' is a transition phrase commonly used to signal a partially open claim in a patent." *PPG Industries v. Guardian Industries Corp.*, 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353 (Fed. Cir. 1998). "By using the term 'consisting essentially of' the drafter signals that the invention necessarily includes the listed ingredients and is open to unlisted ingredients that do not materially affect the basic and novel properties of the invention." *Id*.[2] Thus, if Plaintiff had defined "starting material" in this way, it would seem to require that the starting material include PAN.

The Court disagrees that Plaintiff has defined "starting material" in this way. The plain language of the claims when read in light of the specification resolves the issue. Independent claim 1 requires "employing a carbonizable fiber starting material." The language of the claim does not specify a certain type of "starting material" other than it must be "carbonizable." Re. '162 col. 8, l. 44. Claim 1 further requires that the "starting material" is "previously oxidized and stabilized." *Id*. at col. 8, ll. 49-50. Dependent claim 3 adds the limitation that the "starting carbonizable material consists essentially of polyacrylonitrile (PAN)." As has been noted, the phrase "consists essentially of" does not appear in any of the independent claims in the Re. '162 patent.

When an inventor uses different words or phrases in separate claims, the claims are presumed to have different meanings and scope so that limitations stated in dependent claims are not to be read into the independent claim from which they depend. *Karlin Technology, Inc. v. Surgical Dynamics, Inc*., 177 F.3d 968, 971. *See also Comark Communications Inc. v. Harris Corp*., 156 F.3d 1182, 1187, 48 USPQ2d 1001, 1005 (Fed. Cir. 1998); *Transmatic, Inc. v. Gulton Indus., Inc*., 53 F.3d 1270, 1277, 35 USPQ2d 1035, 1041 (Fed. Cir. 1995). Therefore, the Court begins with the presumption that Dependent claim 3 which adds the limitation that the "starting carbonizable material consists essentially of polyacrylonitrile (PAN)" cannot be read into independent claim 1 because it would render claim 3 superfluous. Again, because the phrase "consists essentially of" does not appear in the independent claims, the claims are not so limited.

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[2] The use of "consisting essentially of" is a term of art used in the drafting of claim elements. *See PPG Industries*, 156 F.3d at 1352 (independent claim contained the "consisting essentially of" language. *See also In Application of Herz*, 537 F.2d 549 (1976) ("consisting essentially of" language used in claim 9 of patent; *Application of Bhogaraju v. Janakirama-RAO*, 317 F.2d 95, 137 USPQ 893 (C.C.P.A. 1963) (drafter used "consisting essentially" language in claim 1 and claim 11).

Does the specification define "starting material"? The Federal Circuit has repeatedly stated that the claims must be read in light of the specification. *Markman v. Westview Instruments, Inc*. (1995), 52 F.3d 967, 979, 34 USPQ 2d 1321 (Fed. Cir. 1995) (en banc). The Federal Circuit further stated:

> For claim construction purposes, the [written] description may act as a sort of dictionary, which explains the invention and may define terms used in the claims. As we have often stated, a patentee is free to be his own lexicographer. The caveat is that any special definition given to a word must be clearly defined in the specification. The written description part of the specification itself does not delimit the right to exclude. That is the function and purpose of the claims.

52 F.3d at 979, 34 USPQ2d at 1329-30 (internal citations omitted). The Court concludes that this is not a case where the inventor defined a term in the specification. The sentence at issue which is found in the "Summary of the Invention" reads, "The starting carbonizable material used in practicing the invention consists essentially of polyacrylonitrile (PAN)." Re. '162 col. 2, ll. 61-63. Here, the inventor has simply provided a summary of the dependent claims and the specific examples in the best mode. The inventor has not provided a special definition of a "carbonizable starting material."[3] Thus, the "starting material" is not limited to that which "consists essentially of PAN."

B. "Carbonizing"

The invention in the Re. '162 patent is described in terms of a method of manufacturing homogeneous "partially carbonized" carbon fibers. Thus, in order to understand what partial carbonization and partially carbonized fibers are, one must first define carbonization.

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[3] Compare this case with *Cultor Corp.*, where the Federal Circuit affirmed a district court's holding that the claims were limited to a definition contained in the specification. 2000 WL 1363712 at *3 (Fed. Cir. 2000). In that case, the specification contained the following description, "As used herein, the expression 'water-soluble polydextrose' (also known as polyglucose or poly-D-glucose) specifically refers to the water-soluble polydextrose prepared by melting and heating dextrose (also known as glucose or D-glucose), preferably with about 5-15% by weight of sorbitol present, in the presence of a catalytic amount (about 0.5 to 3.0 mol. %) of citric acid." *Id.* at *2.

Unlike the present case, in *Cultor Corp*., the inventor's selection of the words, "as used herein" and "the expression . . . specifically refers to" signal to one skilled in the art that the inventor has chosen to define a particular term. The phrase at issue in this case contains no such language.

During the claim construction hearing, the parties resolved the dispute concerning the term "carbonizing." The parties stipulated to the following definition of carbonization which the Court accepted: Carbonization is a process which involves heat treatment in an inert atmosphere which eliminates or removes all elements other than carbon.

C. "Partially Carbonizing" and "Partially Carbonized Fibers"

The claimed invention involves the correlation between single fiber resistivity for a partially carbonized starting material fiber and the electrical surface resistance of a sheet layer incorporating the partially carbonized fiber.[4] But the parties dispute what the terms, "partially carbonizing" and "partially carbonized fibers," mean. These two terms are interrelated and will be discussed together. Claims 1, 11, and 15 are almost identical in describing "partial carbonization." Independent claim 1 provides in pertinent part:

> selectively partially carbonizing previously oxidized and stabilized fiber starting material for a predetermined time period in an oxygen free atmosphere within a furnace at selected temperature values within a temperature range from 370 degrees Centigrade to about 1300 degrees Centigrade by soaking the stabilized fiber starting material at the selected temperature for the predetermined period of time to provide a preselected known volume electrical resistivity to the partially carbonized fibers corresponding to that volume electrical resistivity value required to provide the preselected desired surface resistance value for the finished sheet products, and thereafter processing the partially carbonized fibers into homogeneous carbon fiber sheet products having the preselected desired surface electrical resistances.

Re. '162 patent, col. 8, ll. 42-66. Independent claim 33, varies slightly in wording, it provides in pertinent part:

> partially carbonizing previously oxidized and stabilized fiber starting material by subjecting it to a heat-soak treatment within a preselected temperature range for a predetermined time period in an oxygen-free atmosphere within a furnace and, either before or after the partial carbonizing step, processing the fibers into a desired product form;

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[4] *See* Re. '162, col. 8, ll. 56-66 ". . . a preselected known volume electrical resistivity to the partially carbonized fibers corresponding to that volume electrical resistivity value required to provide the preselected desired surface resistance value for the finished sheet products."

> . . . and wherein the temperature is within the range of about 370 degrees Centigrade to about 1300 degrees Centigrade for a predetermined time period dependent principally upon the mass of the homogeneous partially carbonized sheet product.

Id. at col. 11, l. 51– col. 12, l. 12. Independent claim 40 provides in pertinent part:

> a partial carbonizing treatment designed to provide the resultant desired predetermined surface electrical resistance to the end product by being heated for a predetermined period of time at temperature values ranging between about 370 degrees Centigrade and about 1300 degrees Centigrade to provide a known preselected electrical volume resistivity to the partially carbonized fibers corresponding to that required to provide the preselected desired surface electrical resistance for the finished sheet products.

Id. at col. 12, ll. 46-55.

Plaintiff argues that a fiber is "partially carbonized" if it is not fully carbonized. Plaintiff contends that the Re. '162 patent describes the demarcation between fully and partially carbonized fibers in terms of the electrical characteristics of the fibers.

In contrast, Defendant argues that "partially carbonized" is specifically defined in the independent claims as carbonization within the temperature range of 370 degrees Centigrade to about 1300 degrees Centigrade.[5]

The Court concludes that according to the invention partial carbonization of a fiber starting material occurs within the temperature range of about 370 degrees Centigrade to about 1300 degrees Centigrade for the purpose of achieving a preselected volume electrical resistance corresponding to that required to provide the preselected desired surface resistance for the finished sheet product.

The plain language of the claims resolves the issue. Each of the independent claims provides that partial carbonization occurs within the temperature range of 370 degrees Centigrade to about 1300 degrees Centigrade. Claim 1 is illustrative. Specifically, claim 1 defines partially carbonizing as soaking the starting material for a predetermined time at a temperature selected within the temperature range of 370 degrees Centigrade to about 1300 degrees Centigrade in order to provide a preselected known volume electrical

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[5] Plaintiff in its opening brief argued that the temperature range of 370° to about 1300° C is exemplary for PAN and that one skilled in the art would know how to adjust that temperature range for other starting materials. *See Pl. ['s] Br*. at 6. However, during the claim construction hearing, Plaintiff changed its argument and contended that the temperature range was not limited to PAN but was related to carbonizable starting materials. *See Tr*. at 72.

resistivity. Re. '162 patent, col. 8, ll. 53-57. Similarly, claim 40 describes "partial carbonizing treatment" in terms of "being heated for a predetermined period of time at temperature values ranging between about 370 degrees Centigrade and about 1300 degrees Centigrade." *Id*. at col. 12, ll. 46-51. Accordingly, the claim language provides that partial carbonization of a carbonizable starting material occurs within the temperature range of about 370 degrees Centigrade to about 1300 degrees Centigrade.

The reissue prosecution history supports the Court's claim construction. In a sworn declaration dated April 20, 1992, Mr. Zsolt Rumy, President of Zoltek Corporation stated:

> The method and product claims should have been amended at the time of submission of the Affidavits . . . to include the further limitation to the effect that the partial carbonization of the fiber starting materials is conducted at temperature values within the range from 370°C to 1300°C and different from those required for a single carbon fiber filament to produce a comparable linear electrical resistivity value in the single carbon fiber filament.

See J2 at 165. Furthermore, the word "partially" was added during the reissue application in an effort to clarify the process of carbonization. During the reissue prosecution, Mr. Rumy further stated:

> Throughout the specification and claims, the term "carbonizing" has been used to correctly and understandably (to one skilled in the art) to describe certain processing steps. A more definitive term which would improve readability and understanding of the description by persons of lesser skill is "partially carbonizing." Therefore to improve readability and to enable persons of lesser skill to more easily understand the description and claims, the more specific term "partially carbonizing" has been inserted at a number of points in the description and claims in place of the more general term "carbonizing."

See J2 at 162. In sum, the intrinsic evidence supports the Court's claim construction that "partially carbonizing" is limited to the temperature range of about 370 degrees Centigrade to about 1300 degrees Centigrade.

D. Sheet Product

The claims of the Re. '162 patent require the partially carbonized fibers to be incorporated into a "sheet product." In practicing the invention, one skilled in the art is trying to obtain a preselected surface electrical resistance of the sheet product by controlling the partial carbonization of the single carbon fiber within the specified

temperature range. The essence of the invention is the relation between the partial carbonization of the single carbon fiber and the electrical resistivity of the sheet product which incorporates the partially carbonized single fibers. Thus, the Court must construe the term "sheet product." Claim 1 in pertinent part provides:

> . . . soaking the stabilized fiber starting material at the selected temperature for the predetermined period of time to provide a preselected known volume electrical resistivity to the partially carbonized fibers corresponding to that volume electrical resistivity value required to provide the preselected desired surface resistance value for the finished sheet products, and thereafter processing the partially carbonized fibers into homogeneous carbon fiber sheet products having the preselected desired surface electrical resistances.

Re. '162 patent, col. 8, ll. 42-66.

Plaintiff contends that the term "sheet" has not been redefined from its conventional meaning. Plaintiff argues that "sheet" means a broad, relatively thin surface, layer, or covering like a sheet of ice.[6] Plaintiff claims that the patent does not limit the end product to a particular shape, or manner for physically shaping the final product. Plaintiff asserts that the significance of a "sheet" form is that it has a broad exposed area which has a measurable surface resistance attributable to the partially carbonized fibers from which it is made.

In contrast, Defendant contends that the patent's use of the term "sheet product" is limited to integral sheets, i.e., those sheets capable of independent existence which do not require a substrate to maintain the integrity of that product. Defendant argues that products such as paints and coatings are not enabled by the specification and therefore are not within the patent. Defendant argues that the scope of the claims cannot exceed that which is enabled in the patent.

In construing terms of the patent, the Court must always look first to the language of the claims. Claim terms are given their ordinary meaning unless it is clear that the inventor intended to use them differently. *See National Recovery Technologies v. Magnetic Separation Systems, Inc.*, 166 F.3d 1190, 1195, 49 USPQ2d 1671, 1675 (Fed. Cir. 1999).

In this case independent claim 1 does not provide a description of what constitutes a "sheet product." Claim 1 does not provide a method for processing the partially carbonized fibers into any particular form of a sheet product. Claims 5 and 6, which depend from claim 1, describe two methods of processing the partially carbonized fibers into sheet products in the form of carbon fiber paper. *See* Re. '162 patent, col. 9, ll. 9-47. Dependent claim 9 provides a method of processing partially carbonized fiber material into yarn and

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[6] Plaintiff finds support for this definition in Random House Webster's College Dictionary (2nd Ed. 1997).

thereafter weaving the partially carbonized yarn into a sheet product in the form of fabric. *Id*. col. 9, ll. 58-61. It is clear that claim 1 is broader than claims 5, 6, and 9. The doctrine of claim differentiation precludes the Court from reading limitations appearing in dependent claims 5, 6, and 9 into claim 1. Thus, claim 1 contains broad language which does not in any way limit sheet products to only paper or fabric.

Independent claim 11 describes a method for processing the partially carbonized fibers into sheet products in the form of knitted or woven fabric. Independent claim 15 describes a method for processing the partially carbonized fibers into sheet products having the form of paper. Therefore, the claims instruct that the term "sheet products" includes but is not limited to such things as paper and woven or knitted fabric.

The Court must examine the specification to determine whether the inventor has specially defined the term "sheet product." *See Johnson Worldwide Assoc. Inc., v. Zebco Corp.*, 175 F.3d 985, 990, 50 USPQ2d 1607, 1610 (1999). The Court concludes that the term "sheet product" is used in its ordinary sense in the patent. Nowhere in the patent has the inventor given sheet product a special meaning. Rather, the inventor has provided examples of methods of creating a sheet product. The patent, however, is not limited to only those methods. The Court disagrees with Defendant's contention that Plaintiff has implicitly defined sheet product to those things which do not require a substrate to maintain their integrity.[7]

Claim 1 requires that the sheet product have a preselected desired surface resistance.[8] This is achieved through partially carbonizing a carbonizable starting material

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[7] Defendant contends that the prosecution history also supports its position because it argues that the examiner believed that the invention was limited to papers and textile sheets. *See* J3.178. Defendant argues that in the original '395 patent, the sheet product was described as "having the form of nonwoven paper or woven or knitted fabric sheet products." *See* J2.137. Defendant contends that this was later amended without explanation. The portion of the reissue prosecution history referenced is vague and the Court does not agree with Defendant's conclusion. The prosecution history does not contain any clear statements which limit the scope of "sheet product" to paper or fabric. On the contrary, it appears that in allowing the amendment, the examiner believed that Plaintiff was entitled to broader coverage. Note that in the '395 patent, claim 1 included the following language: "thereafter processing the carbonized fibers into desired electrical resistivity carbon fiber sheet products *having the form of non-woven paper or woven or knitted fabric sheet products* having preselected desired surface electrical resistivities" (emphasis added). Compare this with claim 1 of the Re. '162 patent: "thereafter processing the partially carbonized fibers into homogeneous carbon fiber sheet products having the preselected desired surface electrical resistances."

[8] Claim 1 also includes the term "homogeneous." Words in a patent are given their ordinary meaning unless it is clear that the patentee intended to use them differently. *National Recovery Technologies*, 166 F.3d at 1195. "Homogeneous" is used in its ordinary sense in the patent. Here, claim 1 requires "homogeneous" carbon fiber sheet products. "Homogeneous" means uniform in

at a preselected temperature within the range of 370 degrees Centigrade to about 1300 degrees Centigrade in order to provide the preselected known volume electrical resistivity to the partially carbonized fibers. Thus, one skilled in the art is taught that a desired surface electrical resistance can be obtained by controlling the partial carbonization of a fiber starting material within the temperature range of 370 degrees Centigrade to about 1300 degrees Centigrade. When the claim is read in light of the specification, one realizes that the essence of the invention lies in the relationship between the partial carbonization of the single fiber within the specified temperature range and the relative position of the fibers to each other in the sheet. *See Fig. 4 of Re. '162 patent*. Thus, whether the sheet product is capable of independent existence is not a crucial factor. The specification of the patent enables one skilled in the art to fabricate sheet products with a desired surface resistivity.

Defendant has also failed to persuade the Court that paints, pastes and coatings are not enabled by the specification. The Federal Circuit has stated:

> In order to satisfy the enablement requirement of § 112, paragraph 1, the specification must enable one of ordinary skill in the art to practice the claimed invention without undue experimentation. Thus, with respect to enablement the relevant inquiry lies in the relationship between the specification, the claims, and the knowledge of one of ordinary skill in the art. If, by following the steps set forth in the specification, one of ordinary skill in the art is not able to replicate the claimed invention without undue experimentation, the claim has not been enabled as required by § 112, paragraph 1.[9]

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structure or composition throughout. This definition is consistent with the specification. The specification provides that "sheet products are homogeneous in nature because they are comprised only of partially carbonized fiber material and require no insulating elements such as glass fiber in order to adust [sic] the surface resistance of the sheet products to a desired surface resistance value." Re. '162, col. 2, ll. 7-11. The prosecution history is also informative. *See* J2.115 (". . . the resulting products of applicant's novel method of manufacture, as originally disclosed, are indeed composed only of partially carbonized products and include no unfired components such as glass filament used in the prior art to adjust surface resistance of fully carbonized or partially carbonized products.")

[9] 35 U.S.C. § 112 ¶ 1 provides:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

National Recovery Technologies v. Magnetic Separation Systems, Inc., 166 F.3d 1190, 1196, 49 USPQ 2d 1671, 1676 (Fed. Cir. 1999). Although enablement is a requirement for validity, claims are not properly construed if the meaning or scope given to a claim leads to its invalidity. *See Wang Laboratories, Inc. v. America Online, Inc.*, 197 F.3d 1377, 53 USPQ 2d 1161, 1165 (Fed. Cir. 1999).

The specification may enable the practice of an invention as broadly as it is claimed without describing that invention. *See Application of DiLeone*, 436 F.2d 1404, 1405, 168 USPQ 592, 593 (CCPA 1971). In this case, it is irrelevant that the inventor did not include specific examples of sheet products using paints, coatings or pastes. Examples are not necessary to satisfy the enablement requirement. *See Borkowski* 422 F.2d 904, 910, 164 USPQ 642, 646 (CCPA 1970). "A patent applicant is not required . . . to predict every possible variation, improvement or commercial embodiment of his invention." *Phillips Petroleum Co. v. U.S. Steel Corp*., 673 F. Supp. 1278, 1292, 6 USPQ2d 1065, 1074 (D. Del 1987), aff'd, 865 F.2d 1247, 9 USPQ2d 1461 (Fed. Cir. 1989). If one skilled in the art is able to use the teachings of the Re. '162 Patent to make paints, pastes or coatings which form a sheet when applied to a surface and which have a preselected desired surface resistance, without undue experimentation, the person is practicing the invention according to the Re. '162 Patent.

The Court concludes that sheet product means a broad, relatively thin surface, layer, or covering in which the partially carbonized fibers are in a fixed physical configuration in relation to each other. Because the essence of the invention is the relationship between the properties of the single fiber and final sheet product, any medium can be used to obtain the configuration of the partially carbonized fibers. Anything that allows the fibers to lay in such a position that their overall resistivity is increased when the sheet is formed is covered by the patent. Thus, the sheet can be formed by one painting, spraying or spreading it on a substrate, as long as the partially carbonized fibers are in a relative position to each other as they would be in fabric or paper. The importance of the sheet product is that it allows one to translate the resistivity of the fiber into measurable surface resistivity.

V. Indefiniteness

A. Introduction

Defendant moves for partial summary judgment with respect to independent claims 1, 11, 15, 33, and 40 of the Re. '162 patent because it claims the term "about 1300 degrees Centigrade" is indefinite. Defendant also contends that claim 33 is invalid because the claim embodies a nonsensical method of operation.

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35 U.S.C. § 112 ¶ 1.

B. "About 1300 degrees Centigrade"

The independent claims provide that a carbonizable starting material is partially carbonized within the temperature range of about 370 degrees Centigrade to about 1300 degrees Centigrade. Defendant argues that "about 1300 degrees Centigrade" is indefinite because it fails to adequately apprise the public of the upper limit of the range. Defendant presents essentially two arguments. First, Defendant contends that the upper limit of the range "about 1300 degrees Centigrade" is an arbitrary limitation because carbonization of oxidized PAN fibers occurs at temperatures well over 1300 degrees Centigrade and products carbonized at temperatures both above and below 1300 degrees Centigrade were known in the prior art. Second, Defendant contends neither the specification, prosecution history, nor prior art establish what constitutes the upper limit of "about 1300 degrees Centigrade." Thus, Defendant argues that the patent does not give an indication how far above 1300 degrees Centigrade a user may carbonize without infringing.

In response, Plaintiff contends that the temperature point of "about 1300 degrees Centigrade" is as precise as the art allows. Plaintiff argues that "about 1300 degrees Centigrade" is the point at which the change in electrical resistivity for a carbonizable starting material diminishes substantially so that a further increase in temperature has such a diminished effect upon the electrical resistivity for the fiber as to be insignificant for most uses. Plaintiff contends that the patent examiner found "about 1300 degrees Centigrade" to be a reasonable quantification of the temperature point at which fibers become fully carbonized according to the Re. '162 patent.

The Court concludes that the term "about 1300 degrees Centigrade" when read in light of the specification is sufficiently clear to apprise a person skilled in the art of the scope of the invention. Thus, the Court rejects Defendant's contention that the term "about 1300 degrees Centigrade" is indefinite.

Section 112, ¶ 2, states:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. § 112, ¶ 2. Whether a claim is indefinite under 35 U.S.C. § 112, ¶ 2 is a question of law. *Personalized Media LLC v. Int'l Trade Comm*, 161 F.3d 696, 702-03, 48 USPQ2d 1880, 1886 (Fed. Cir. 1998) (citing *North Am. Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 1579, 28 USPQ2d 1333, 1339 (Fed. Cir. 1993)). "A determination of claim indefiniteness is a legal conclusion that is drawn from the court's performance of its duty as the construer of patent claims." *Personalized Media*, 161 F.3d at 705. "The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification. If the claims read in light of the specification

reasonably apprise those skilled in the art of the scope of the invention, § 112 demands no more." *Miles Lab., Inc. v. Shandon, Inc.*, 997 F.2d 870, 875, 27 USPQ2d 1123, 1126 (Fed. Cir. 1993) (internal citations omitted).

Defendant relies heavily on *Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd.*, 927 F.2d 1200, 18 USPQ 2d 1016 (Fed. Cir. 1991) in which the Federal Circuit affirmed a district court ruling of indefiniteness of the term "at least about 160,000" international units per absorption unit (IU/AU). The Court held the claims invalid because it found that the term "about" failed to advise one skilled in the art of the "mean value" between the prior art value of 128,620 IU/AU and the "mean specific activity level of 160,000" that would constitute infringement. *Id.* at 1218. The district court reasoned that use of the term "about" coupled with the form of measurement used, which the court found to be imprecise, failed to distinguish the invention over "the close prior art." *Id*. at 1217 (citing 13 USPQ2d at 1787). The "at least about 160,000" language was added after the examiner rejected "at least 120,000" which the examiner found was anticipated by the prior art. *Id*. at 1218.[10]

The present case is distinguishable from *Amgen*, a case that involved a patent for DNA sequences encoding Erythropoietin (EPO). Unlike the present situation, because *Amgen* had close prior art, the court required more precision when considering the technological scope given to the term "about." The Court does not agree with Defendant's contention that a precise limit must always be attached to the term "about." *See Modine*, 75 F.3d at 1554 ("Although it is rarely feasible to attach a precise limit to 'about' the usage can usually be understood in light of the technology embodied in the invention.") The Court's determination of the "technological scope" that should be given to the term "about" is dependent on the context of the use of the term and the precision or significance of the measurements used. *See Modine Manufacturing Co. v. United States International Trade Commission*, 75 F.3d 1545, 1554, 37 USPQ2d 1609, 1615 (Fed. Cir. 1996). Thus, the inquiry is heavily fact dependent. The term "about" must be given a reasonable scope and it must be viewed by the Court as it would be understood by persons skilled in the field of the invention. *Id*. at 1554 citing *Andrew Corp. v. Gabriel Electronics, Inc*. 847 F.2d 819, 821-22, 6 USPQ2d 2010, 2013 (Fed. Cir. 1988).

The present situation is distinguishable from *Amgen* based on the context of the use of the term "about." Unlike this case, "at least about 160,000" represented a theoretical specific activity level as opposed to a workable method for actually obtaining what was claimed. *Amgen*, 927 F.2d at 1216. The EPO had an actual value of 83,000 IU/AU. *Id*. The inventor then doubled the 83,000 to arrive at the theoretical specific activity of "at least about 160,000 IU/AU." *Id.* The court noted, "that procedure, while possibly valid as a

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[10] Moreover, the Federal Circuit stated that the claims would also be invalid without the limitation of "about" and cautioned that its ruling was not precluding the future use of the term "about" in claims. *Amgen*, 927 F.3d at 1217.

means for estimating the specific activity of a pure sample, does not establish that GI had a workable method for actually obtaining the pure material that it claimed." *Id*. Because the inventor in *Amgen* was estimating, there was no support in the specification or prosecution history for "at least about 160,000."

In this case, figure 4, which is found in the specification, illustrates the relationship between a partially carbonized fiber and the electrical surface resistance of a carbon fiber sheet product. The graph is based on empirical rather than theoretical data. Here the inventor is attempting to quantify a result achieved. The Court recognizes that the essence of the invention is the ability to obtain the desired resistivity by controlling the carbonization of a single fiber within the temperature range of about 370 degrees Centigrade to about 1300 degrees Centigrade. In the present case, the novelty is not the point at which carbonization of a fiber occurs. What is novel is the relationship between controlling the carbonization of the single fiber within the specified range and then incorporating that into a usable final sheet product.

The Court concludes that "about 1300 degrees Centigrade" is definite. The upper limit of "about 1300 degrees Centigrade" is the point at which no appreciable change in electrical resistivity occurs for a carbonizable starting material so that a further increase in temperature has no appreciable effect upon the electrical resistivity for the fiber as to be insignificant for most uses according to the invention. When one skilled in the art reads the claims in light of the specification, they will be reasonably apprised of the scope of the invention.

C. Claim 33

Independent claim 33 provides:

> A method of manufacturing homogeneous controlled surface resistance carbon fiber sheet products which exhibit a predetermined surface electrical resistance from a carbonizable fiber starting material, the method comprising partially carbonizing previously oxidized and stabilized fiber starting material by subjecting it to a heat-soak treatment within a preselected temperature range for a predetermined time period in an oxygen-free atmosphere within a furnace and, either before or after the partial carbonizing step, processing the fibers into a desired product form; characterized in that the surface electrical resistance of the resulting finished product is time / temperature controlled during the partial carbonizing step so as to provide a predesigned electrical volume resistivity to the resultant partially carbonized fibers corresponding in value to a known preselected electrical volume resistivity value required to provide the preselected desired surface resistance for the finished carbon fiber sheet products; and wherein the temperature is within the range of about 370 degrees Centigrade to about 1300 degrees Centigrade for a

predetermined time period dependent principally upon the mass of the homogeneous partially carbonized sheet product.

Defendant contends that claim 33 is invalid for indefiniteness because the claim fails to point out how one skilled in the art would control the surface resistance of the final product. In short, Defendant argues because claim 33 is nonsensical, it is invalid.

In response, Plaintiff argues that the claim as written is clear and valid.[11]

Defendant relies on *Process Control Corp. v. Hyderclaim Corp.*, 190 F.3d 1350, 52 USPQ2d 1029 (Fed. Cir. 1999) for the proposition that this Court should invalidate claim 33 because it contains a nonsensical method of operation. The case is inapposite. In *Process Control*, the claim was susceptible to only one meaning. *Id*. at 1356. The Court concluded that the claim embodied an inoperable method and found the claim invalid because it failed to comply with the utility and enablement requirements. *Id*. at 1359.[12]

The Court rejects Defendant's argument that claim 33 is indefinite. "When claims are amenable to more than one construction, they should when reasonably possible be interpreted so as to preserve their validity." *Modine Mfg. Co.*, 75 F.3 at 1557. Although, the claim may be interpreted as Defendant suggests, the Court construes the claim as to maintain its validity. The claim as written apprises one skilled in the art of its scope when read in light of the specification. The claim teaches that the desired surface resistance of the carbon fiber sheet product is obtained by controlling the partial carbonization of the carbonizable staring material so as to provide the electrical volume resistivity value to the partially carbonized fibers. The artisan is taught that the starting material can be partially carbonized and then incorporated into a sheet product, or a sheet product can be formed prior to partially carbonizing the fibers within the sheet product. The principle taught is that the desired surface electrical resistance is obtained by controlling the partial carbonization of the starting material within the temperature range of about 370 degrees Centigrade to about 1300 degrees Centigrade to provide the corresponding electrical volume resistivity to the partially carbonized fibers to achieve the desired surface resistance for the sheet product. Because one skilled in the art is apprised of the scope of the claim, the claim is definite.

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[11] Plaintiff in its reply brief argued that the only logical reading of the claim is that the partial carbonization step is carried out before the fibers are processed into the desired product form. *See Pl. ['s] Reply Br.* at 21-22. During the claim construction hearing, however, Plaintiff changed its position and argued that the claim as written is valid. *See Tr. at 240.*

[12] The Federal Circuit noted that the parties discussed whether the properly construed claim "makes no sense" in the context of indefiniteness and claim construction. *Process Control*, 190 F.3d at 1358. The Court decided that it was more appropriate to consider the parties' arguments of the claims "making no sense" as "raising issues of utility (and operability) under 35 U.S.C. § 101 and enablement under 35 U.S.C. § 112, ¶ 1 on appeal." *Id*.

VI. Conclusion

Defendant's motion for partial summary judgment with respect to independent claims 1, 11, 15, 33, and 40 of the Re. '162 patent for indefiniteness is DENIED.

It is hereby adjudged that the disputed claim terms shall be construed as discussed in this opinion.

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EDWARD J. DAMICH
Judge