United States District Court,
N.D. California.

ASM AMERICA, INC., and Arthur Sherman,
Plaintiffs.
v.
GENUS, INC,
Defendant.
Genus, Inc,
Counterclaimant.
v.
ASM America, Inc., and ASM International, Inc,
Counterdefendants.

No. C-01-2190 EDL

Nov. 14, 2002.

Manufacturer of atomic layer chemical vapor deposition machines sued competitor for patent infringement. Construing claims, the District Court, Laporte, United States Magistrate Judge, held that: (1) "apertures" were discrete, arrangeable, openings through solid material that allowed gas to flow from one side to the other; (2) "stagnation point flow" was flow toward solid surface in which gas or fluid approaching surface divided into streams proceeding away from point at which central streamline intersected surface; (3) certain means-plus-function claim elements were invalid as indefinite; and (4) "gas flow means" claim contained sufficient structure to avoid means-plus-function treatment.

Claims construed.

See also 2003 WL 21033555.

5,294,568, 5,916,365, 6,015,590. Cited.

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ORDER RE: CLAIM CONSTRUCTION OF UNITED STATES PATENT NO. 4,798,165

LAPORTE**, United States Magistrate Judge.**

Currently before the Court is the parties' dispute over the proper construction of United States Patent No. 4,798,165 ("the '165 patent").

I. Background

Plaintiffs ASM America, Inc. and Arthur Sherman (collectively, "ASM") have filed suit against defendant Genus, Inc. ("Genus") for patent infringement. According to the complaint, ASM invents, manufactures, and sells equipment for use in making integrated circuits. ASM's products include atomic layer chemical vapor deposition ("ALCVD") machines, which are used to form exceptionally thin layers of insulating material, conducting material, and semi-conducting material using a technique generally known as Atomic Layer

Deposition ("ALD") or Atomic Layer Epitaxy ("ALE"). Genus allegedly manufactures, offers for sale, and sells ALD process and equipment in competition with ASM's ALCVD process and equipment.

ASM contends that Genus is infringing three patents: United States Patents Nos. 6,015,590 ("the '590 patent"), 5,916,365 ("the '365 patent"), and the '165 patent. ASM alleges that it owns the '590 and '165 patents, and has enforceable rights in the '365 patent. Plaintiff Arthur Sherman is alleged to be the inventor and owner of the '365 patent. ASM alleges that Genus is infringing claims 1 through 10 of the '590 patent, claims 1, 2, 3, 4, 5, 6, 9, 11, 12, 16, and 17 of the '365 patent, and claims 1, 5, 6, 7, 9, 10, and 11 of the '165 patent.

Genus has counterclaimed and alleges, among other things, that ASM is infringing one of its patents, United States Patent No. 5,294,568 ("the '568 patent").

The Court has previously construed the disputed language of the '590, '365, and '568 patents. The claim construction hearing for the '165 patent was held on September 26, 2002.

II. DISCUSSION

[1] [2] [3] The construction of a patent claim is a matter of law for the Court. Markman v. Westview Instruments, Inc., 517 U.S. 370, 372, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). As the claim language defines the scope of the claim, the claim construction analysis always begins with the words of the claim. Teleflex, Inc. v. Ficosa North America Corp., 299 F.3d 1313, 1324 (Fed.Cir.2002). The words used in the claim are interpreted in light of the intrinsic evidence, i.e., the rest of the specification and, if in evidence, the prosecution history. *Id.;* CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed.Cir.2002). The intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language. Teleflex, 299 F.3d at 1325 (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996)). Courts may also use extrinsic evidence (e.g., expert testimony, treatises) to resolve the scope and meaning of a claim. CCS Fitness, 288 F.3d at 1366.

[4] [5] [6] There is a heavy presumption that a claim term carries its ordinary and customary meaning. Teleflex, 299 F.3d at 1325 (citing CCS Fitness, 288 F.3d at 1366). "The subjective intent of the inventor when he used a particular term is of little or no probative weight in determining the scope of a claim (except as documented in the prosecution history)." Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed.Cir.1995) (*en banc*), *aff'd,* Markman, 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577; Markman, 52 F.3d at 985 (citation omitted). "Rather the focus is on the objective test of what one of ordinary skill in the art at the time of the invention would have understood the term to mean." *Id*. at 986. Dictionary definitions may establish a claim term's ordinary meaning, as long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents. CCS Fitness, 288 F.3d at 1366. "A technical term used in a patent document is interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning." Hoechst Celanese Corp. v. BP Chems, Ltd., 78 F.3d 1575, 1578 (Fed.Cir.1996).

[7] [8] [9] An accused infringer may overcome the heavy presumption that a claim term carries its ordinary and customary meaning, but he cannot do so simply by pointing to the preferred embodiment or other structures or steps disclosed in the specification or prosecution history. CCS Fitness, 288 F.3d at 1366. Neither the specification nor the title of the patent can be used to import limitations into the claims that are not found in the claims themselves. *Pitney Bowes,* 182 F.3d at 1312. While the claims must be read in view of the specification, limitations from the specification are not to be read into the claims. Teleflex, 299 F.3d at 1326.

[10] The ordinary meaning of a claim term may be overcome in at least four ways. CCS Fitness, 288 F.3d at 1366. First, the claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history. *Id*.

Second, a claim term will not carry its ordinary meaning if the intrinsic evidence shows that the patentee distinguished that term from prior art on the basis of a particular embodiment, expressly disclaimed subject matter, or described a particular embodiment as important to the invention. *Id*. at 1366-67. 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. Teleflex, 299 F.3d at 1326 (quoting Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 452 (Fed.Cir.1985)).

In contrast, when claim changes or arguments are made in order to more particularly point out the applicant's invention, the purpose is to impart precision, not to overcome prior art. Such prosecution is not presumed to raise an estoppel, but is reviewed on its facts, with the guidance of precedent.

Pall Corp. v. Micron Separations, Inc., 66 F.3d 1211, 1220 (Fed.Cir.1995) (citations omitted).

Third, a claim term also will not have its ordinary meaning if the term chosen by the patentee so deprives the claim of clarity as to require resort to the other intrinsic evidence for a definite meaning. CCS Fitness, 288 F.3d at 1367. Finally, as a matter of statutory authority, a claim term will cover nothing more than the corresponding structure or step disclosed in the specification, as well as equivalents thereto, if the patentee phrased the claim in step- or means-plus-function format. *Id*. (citing 35 U.S.C. s. 112 para. 6.)

A. Claims 1, 6, 9 and 10

The '165 patent is entitled "Apparatus For Chemical Vapor Deposition Using An Axially Symmetric Gas Flow." The first group of disputed terms appear in independent claims 1 and 6, and dependent claims 9 and 10.

Claim 1 provides:

Apparatus for deposition of material onto a substrate, comprising:

a circular substrate; and

an apparatus for directing a flow of gas carrying a deposition material perpendicular to the circular substrate, said apparatus comprising a member having a plurality of gas flow apertures passing therethrough for maintaining said flow of gas perpendicular to said substrate and creating a stagnation point flow at a center of said circular substrate, said member being disposed parallel to said circular substrate and adapted so that a distance between said apparatus and said circular substrate may be varied, said plurality of gas flow apertures being disposed in a generally circular configuration having a radius substantially equivalent to a radius of said circular substrate wherein said plurality of gas flow apertures and said circular substrate are coaxially aligned such that said flow of gas generally has an axial symmetry with respect to the center of said substrate.

('165 patent 5 :34-6 :5.)

Claim 6 provides:

Apparatus for chemical vapor deposition of materials on a substrate, comprising:

a substantially circular substrate; and

gas flow means having a plurality of apertures passing therethrough and disposed parallel to said substantially circular substrate, said plurality of apertures forming a generally circular configuration having a radius substantially equal to a radius of said substantially circular substrate and coaxially aligned therewith for producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular substrate, and maintaining a stagnation flow point at a center of said circular substrate.

('165 patent 6 :17-31.)

Claim 9 provides:

The apparatus for chemical vapor deposition of claim 6 wherein said gas flow means includes a plurality of apertures for extracting said gas without significantly altering said axial symmetry.

('165 patent 6 :39-42.)

Claim 10 provides:

The apparatus for chemical vapor deposition of claim 6 further comprising a plurality of baffles between substrate and said extracting apertures.

('165 patent 6 :43-45.)

ASM asks the Court to construe the following terms from the claims 1, 6, 9 and 10 of the '165 patent.

Disputed Claim Language	ASM's construction	Genus's construction
1. apertures passing therethrough 6. apertures passing therethrough	"Apertures passing through"-Discrete openings that pass from one side of the gas directing member to the other.	"Apertures"-Openings through a solid material which allow a gas to flow, and includes perforated plates, as well as frits and porous plates.
9. apertures 10. apertures	"Apertures"-Discrete openings.	

[11] The dispute here is whether an "aperture" is a discrete opening, such as a perforation, or whether it includes more complex openings, such as those contained in frits and porous plates. According to ASM's expert, Douglas L. Peltzer ("Peltzer"), a frit is made by packing small particles together, which creates minute, randomly distributed interstitial spaces, called pores. (Peltzer Report at 8 n. 4.) A porous plate is another term for a frit. (*Id*.) Genus' expert, William Oldham ("Oldham") agrees with Peltzer that "in a frit an opening on one side does not correspond to an opening on the other side, and that in general the gas passageways are randomly located, occasionally interconnect within the frit, and can be described as tortuous." (Oldham Rebuttal Report at 2.) A frit thus appears to be similar to a layer of sand, or a sponge; although gas can flow through it, it does not have distinct or uniform holes passing through it. Instead, it has random passageways, some that dead-end, and others that allow gas to flow from one side to the other.

The language of the patent is silent on the issue. The term "aperture" is used in two different contexts.

First, the patent describes apertures through which the gas is directed towards the substrate. (*See, e.g.,* '165 patent 3 :35, 3 :63). For ease of reference, the Court will refer to these apertures as "gas flow apertures," in accordance with the language of claim 1. (*Id*. 5:40.) The diagrams of the patent show the gas flow apertures as discrete round holes. (*Id*., Figs. 1c and 4.) The parties often refer to the apparatus containing the gas flow apertures as the "showerhead."

Second, the patent describes apertures through which the gas is removed from the chamber containing the substrate. (*See, e.g., id*. 4:14, 4:31.) For ease of reference, the Court will refer to these apertures as "extracting apertures," in accordance with the language of claim 10. (*Id*. 6:45.) The diagrams of the patent show the extracting apertures as discrete round holes leading into what probably could best be described as an L-shaped tunnel. (*Id*., Figs. 5a and 5b.)

These diagrams of the gas flow apertures and the extracting apertures only describe preferred embodiments, however. They do not purport to describe all possible forms of apertures that could be used to practice the

invention.

ASM argues that the apertures must be discrete openings, because the specification of the '165 patent refers at one point to "discrete apertures" and describes apertures located at the apexes of equilateral triangles. (Peltzer Report at 9.) That language appears in the description of the preferred embodiment and describes the gas flow apertures:

Because of the relatively small size of the apertures 74, the magnitude of the gas velocity will generally be uniform among all of the apertures 74 as the gas passes through toward the plane of substrate 10. To reduce the effects of any granularity that can result from the use of discrete apertures, and to smooth out any irregularities in distribution of the gas, the substrate 10 can be rotated during the period of gas flow. It has been found that a generally uniform flow can be obtained when the apertures 74 are located at the apexes of equilateral triangles, and are distributed uniformly over the region of surface 71 approximately the same size as substrate 10 and axially symmetrical therewith

('165 patent 3 :65-4 :4.) On the one hand, nothing in this language expressly requires the use of discrete apertures. Instead, it points out a possible problem with the use of discrete apertures, and offers a solution: rotating the substrate. On the other hand, it also points out that one way of obtaining a generally uniform flow is to use apertures that are located at the apexes of equilateral triangles. Although this language describing a preferred embodiment does not require that apertures be located at the apexes of equilateral triangles, it does strongly suggest that "apertures" in the context of the '165 patent must be holes that are capable of being arranged into patterns.

Claims 1 and 6 also require that the apertures be arranged "in a generally circular configuration." ('165 patent 5 :47-48, 6 :22-23.) This language also requires that the apertures be arrangeable into patterns. The Court agrees with ASM that because the holes in a frit generally are dispersed randomly, they cannot be arranged in "a generally circular configuration" as required by the language of claims 1 and 6. As the patent requires that one must be able to arrange the apertures into various configurations, the Court agrees with ASM that the apertures must be discrete openings, rather than the loose, random network of openings generally found in a frit. FN1

FN1. ASM also points to the prosecution history, but to less effect. ASM does not contend that there is a definition of "aperture" in the prosecution history, but rather points to the examiner's conclusion that three prior patents (the Nishizawa, Robinson and Brandolf patents) disclosed using a plurality of gas flow apertures. (Peltzer Expert Report, Ex. N ('165 Prosecution History) at FH-0090.) ASM contends that each of those patents used a discrete opening, rather than a frit. Even if that is true, however, it proves only that discrete openings are at least one type of aperture. The issue here is not whether the "apertures" *must* be the openings in a frit, but whether they *can* be the openings in a frit.

ASM's argument that holes are not apertures unless one can pass a beam of light through them has no support in the language of the patent, however. Moreover, it contradicts Figure 5b of the patent, which clearly shows an extracting aperture with an L-shaped bend that does not pass directly through the material.

ASM also points to a memorandum, dated September 26, 1984, by Mac Robinson ("Robinson"), one of the inventors of the '165 patent. (Peltzer Report, Ex. M.) ASM contends that this memorandum demonstrates that frits cannot be used to practice the invention because they absorb too much energy and a source of particulate contamination. In that memorandum, Robinson discusses the likelihood of obtaining uniform silicon deposition when gas is introduced uniformly over the entire wafer, and states:

The gas will be injected normal to the wafer, through a fused quartz plate. Ideally, the plate should act like a porous frit. However a porous frit would absorb too much radiant energy, besides being a source of particulate contamination, so we must approximate a porous plate with an array of holes or slits.

(*Id*. at 1.) The '165 patent also mentions the possibility of using a fused quartz plate and provides that "if the substrate is to be heated, and particularly if the substrate is to be heated by optical radiation, the

apparatus containing the apertures through which the gas is introduced will generally be made of a suitable transparent material, for example, fused quartz." ('165 patent 4 :69-5 :4.) Thus, it appears that Robinson's memo is referring to a process in which the substrate is heated. Robinson concluded that a frit would not be acceptable for use in that process because it would absorb too much radiant energy. (Peltzer Report, Ex. M.) None of the '165 patent claims require that the substrate be heated, however, and the specification's use of the language "if the substrate is to be heated," suggests that it need not be heated. Even if a frit would not be acceptable for use in a process where the substrate is heated, it does not necessarily mean that it would be unacceptable for use in a process where the substrate is not heated.

Robinson also states that a porous frit would be a source of particulate contamination. Nothing in his memo suggests whether particulate contamination would be a problem only in a process where the substrate is heated, or whether it would also be a problem where the substrate is not heated. Oldham's deposition testimony, however, suggests that contamination might generally be a problem with the use of certain types of frits. Oldham was asked when he last used a frit and responded:

I don't know. I mean, I haven't thought about it. Our-the kind of business we're in is enormous emphasis on cleanliness and noncontamination and in particular sodium is a big problem. In the industry we'll do anything to keep sodium out of the processing and so you're very careful about the kind of materials you use and ordinary glasses are-are not used in our laboratory. You use only very special semiconductor grade chemicals and materials. So you don't bring the common, as I say, these common materials in. Now, if I had occasion to want a, for instance, in connection with this-with this-the matter under discussion today, there's an issue of-of gas distribution and if I had a need for a gas distribution and I decided to use a frit, I could have one made up or I could buy a high purity fused silica frit, for instance, or one of appropriate metal, but usually we've done other things.

(Oldham Dep. 7:20-8:15.) Counsel then clarified:

Q: Okay. So just so I understand your testimony, using a glass frit would be a problem in semiconductor processing because of the potential for contamination?

A: Yeah, you have to use a special glass.

(*Id*. 8:21-24.) Although Oldham's testimony makes clear that there are special types of frits that can be used that do not pose a risk of particulate contamination, it also suggests that one of ordinary skill in the art would not normally think of using a frit to function as the gas flow apertures due to a risk of particulate contamination.

ASM also argues that frits do not have holes that pass all the way through them, and thus the holes in a frit cannot be the "apertures passing therethrough" that are required by the language of claims 1 and 6. Although it is undisputed that each hole in a frit does not necessarily pass directly through the frit, it is also undisputed that at least some holes in a frit do connect to passageways that lead all the way through the frit; otherwise, gas could not pass through a frit. Accordingly, this argument is unpersuasive.

Finally, ASM argues that apertures must be discrete holes because, although the parties dispute whether a frit contains openings that could be used as gas flow apertures, there is no dispute that a frit does not contain openings that could be used as extracting apertures. The fact that two different types of apertures are described in the patent claims is highly relevant to determining the appropriate claim construction. The Federal Circuit has held that "[u]nless the patent otherwise provides, a claim term cannot be given a different meaning in the various claims of the same patent." Georgia-Pacific Corp. v. United States Gypsum Co., 195 F.3d 1322, 1331 (Fed.Cir.1999). Nothing in the '165 patent provides or even suggests that "aperture" is defined differently when referring to the gas flow apertures than when referring to the extracting apertures. Thus, the Court must construe the term "aperture" in a way that is applicable to both the gas flow apertures and the extracting apertures.

At deposition, Oldham was asked:

Q: Now, referring to the ASM patent in suit here, the '165 patent, there was some testimony before the-the break about the use of the term "aperture" in connection with the apertures 53 that are used to extract the gas and do you have any view as to whether a person of skill in the art would think to use a frit as opposed to a through hole for extracting the gas?

A: My-yeah, I have an opinion. I don't think one would be likely to use a frit in an application like that.

(Jackson Decl., Vol. 3, Ex. E (Oldham Rebuttal Report), Ex. A (Oldham Dep.) 129:22-130:4.) There was no further explanation from Oldham on this point, but his testimony suggests that the extracting apertures cannot be the type of openings generally found in a frit.

Peltzer also explains in his expert report that frits are impractical for use in injecting gases because they clog easily as a result of having such small pores. (Peltzer Expert Report at 10, 21.) A report on improvement of the Genus 8720 reactor also concluded that "a frit-type injection plate, however, can degrade due to clogging of the fine holes ...." (Peltzer Supp. Expert Report, Ex. A (Design Analysis and Performance Improvement of the Genus 8720 Reactor: Report on Modeling of and Recommendations for Showerhead Gas Injectors) at 83362.)

Peltzer concludes that a frit is even more impractical for extracting gases, particularly in CVD, where the gases react both in the chamber and on their way out of the chamber. (Peltzer Expert Report at 21.) He states that he knows of no one in research or industry who would propose that a frit could work as an extracting aperture. (*Id*. at 21-22.) As both Peltzer and Oldham agree that a person of ordinaryskill in the art would be unlikely to use a frit as the extracting apertures, this last argument cuts against Genus' position that "apertures," as used in the '165 patent, include the type of openings found in a frit.

The Court finds most persuasive ASM's arguments that the patent language requires that apertures be able to be arranged in patterns, and that one of ordinary skill in the art would not think to use the type of openings generally found in a frit as extracting apertures. Accordingly, the Court agrees with ASM that the "apertures" of the '165 patent must be discrete openings, rather than the random passageways generally found in a frit. Accordingly, the Court construes "apertures" as follows:

Apertures are discrete, arrangeable, openings through a solid material that allow a gas to flow from one side to the other.

Disputed Claim Language	ASM's construction	Genus's construction
1. having a plurality of gas flow apertures passing therethrough	"having"-ASM contends that the term "having" does *not* require that the apertures described in Claims 1	"having"-Genus contends that "having" is a closed term, requiring that all of the apertures are disposed
6. having a plurality of apertures passing therethrough	and 6 be the only apertures in the apparatus for chemical vapor deposition.	parallel to said substantially circular substrate.

[12] ASM argues that the term "having" in claims 1 and 6 does not preclude the possibility that there are other gas flow apertures in the apparatus that are not in the configurations described by the claims. Genus contends that the term "having" requires all of the apertures to be disposed parallel to the substrate. Both parties' arguments seem to be concerned with the possibility of an apparatus in which some gas flow apertures are not parallel to the substrate. At oral argument, the parties informed the Court that Genus' device contains, in addition to the gas showerhead, a separate outer ring containing gas flow holes that point outward at a 45-degree angle.

The language of the claims, however, does not require that the gas flow apertures be parallel to the substrate. In claim 1, the apparatus must be capable of directing the gas flow perpendicular to the substrate. ('165 patent 5 :37-39.) Claim 1 describes the apparatus as "comprising a member having a plurality of gas flow apertures passing therethrough for maintaining said flow of gas perpendicular to said substrate ... said member being disposed parallel to said circular substrate[.]" (*Id*. 5:39-42.) Thus, the *member* containing the

apertures must be disposed parallel to the substrate, but there is no requirement that the apertures themselves be parallel to the substrate. An aperture through a solid substance is a three-dimensional hole, containing an input, a tunnel through the solid substance, and an output. The apparatus must be capable of directing the gas flow perpendicular to the substrate, which would seem to require that the output of the gas flow apertures be disposed parallel to the substrate, but there is no requirement that the input of the gas flow apertures also be parallel to the substrate. As Genus points out in another part of their argument, apertures that are in a "Y" formation may start out at an angle, but nonetheless direct the gas downwards perpendicular to the substrate.

Claim 6 contains similar language requiring that there be an apparatus comprising "gas flow means having a plurality of apertures passing therethrough and disposed parallel to said substantially circular substrate, said plurality of apertures forming a generally circular configuration[.]" (*Id*. 6:17-23.) This language at first appears to be ambiguous, as it is not immediately clear whether the gas flow means must be disposed parallel to the substrate, or whether the gas flow apertures are disposed parallel to the substrate. When this language was added to the claim, however, the inventors stated that the language was added "to positively recite and claim the features of the gas flow means or apparatus as being disposed parallel to the surface of the substrate," which clarifies that it is the gas flow means that must be parallel to the substrate. ('165 Prosecution History at 0053.)

In claim 6, as in claim 1, the gas flow must be directed perpendicular to the substrate ('165 patent 6 :26-29), which suggests that perhaps the outputs of the gas flow apertures also must be parallel to the substrate. Again, however, there is no requirement that the input of the gas flow apertures be parallel to the substrate.

Thus, Genus' argument that "all of the apertures are disposed parallel to said substantially circular substrate" is not well taken. Even if one assumes that by using the phrase "all of the apertures," Genus intended to refer only to the gas flow apertures, Genus' argument does not distinguish between the input and output of the gas flow apertures.

ASM appears to be arguing for the possibilities that: (1) gas may also flow into the chamber from some source other than the gas flow apertures in the showerhead; and (2) that some of the gas flow apertures need not be parallel to the substrate. Claims 1 and 6 both require an apparatus "comprising" a substrate and either "an apparatus for directing a flow of gas" (claim 1) or a "gas flow means" with certain characteristics. ('165 patent 5 :34-37; 6:17-20.) The parties agree that the term "comprising" is an open term which creates a presumption "that the recited elements are only a part of the device, that the claim does not exclude additional, unrecited elements." Crystal Semiconductor Corp. v. TriTech Microelectronics Int'l Inc., 246 F.3d 1336, 1348 (Fed.Cir.2001). There is no argument here to rebut that presumption. Thus, the use of the term "comprising" does not preclude an apparatus that also uses an additional gas flow apparatus or means that is not parallel to the substrate or in which the outputs of the gas flow apertures in that additional gas flow apparatus are not parallel to the substrate.

Determining whether the claims permit any of the gas flow apertures to be non-parallel to the substrate requires that the Court determine what the inventors meant by the term "having." The Federal Circuit has stated that the term "having" can make a claim open, but does not convey the open-ended meaning as strongly as the term "comprising." Crystal Semiconductor, 246 F.3d at 1348. Use of the term "having" does not create a presumption that the body of the claim is open. *Id*. The Court must examine the claim in its full context in order to determine whether the use of the term "having" limits the claim to its recited elements. *Id*.

The claims do not expressly require that the either the input side or the output side of the apertures be parallel to the substrate. What is required is that the apparatus containing the apertures be parallel to the substrate, and that the gas flow be perpendicular to the substrate. Whether this can be accomplished with some additional number of gas flow apertures that are not parallel to the substrate and/or are not contained in the showerhead seems to be to be a question of fact that is better reserved for briefing on infringement. At this juncture, as a matter of claim construction, the Court finds that the term "having" does not preclude the possibility that the apparatus may have gas flow apertures other than those described in the claims. As the gas flow apertures described in the claims are associated with the performance of particular processes,

however, any additional gas flow apertures must not be necessary to perform the processes described in the claims, and also must not interfere with those processes.

Disputed Claim Language	ASM's construction	Genus's construction
1. maintaining said flow of gas perpendicular to said substrate	The initial vector of the velocity is directed perpendicular to the substrate.	No construction required.

[13] The dispute here seems to be whether the flow of gas must be perpendicular to the substrate all the way to the surface of the substrate, or whether only the initial flow of the gas need be perpendicular to the substrate. Claim 1 requires that there be an "apparatus comprising a member having a plurality of gas flow apertures passing therethrough for maintaining said flow of gas perpendicular to said substrate and creating a stagnation point flow at a center of said circular substrate ...." ('165 patent 5 :39-43.) The plain meaning of this language is that the apertures must be positioned so that they always create a flow of gas that is directed perpendicular to the substrate, and the gas must approach the substrate so that it creates a stagnation point flow at the center of the circular substrate. A person of ordinary skill in the art would not read this language to require that the gas flow must always be precisely perpendicular all the way to the surface of the substrate; at some point close to the surface of the substrate, the substrate will act like a wall and deflect the flow of gas. As Peltzer states in his expert report,

The flow is directed toward (more specifically, perpendicular to) to the substrate initially as it exits from the gas flow apertures, but the streamlines soon begin to curve. Indeed, the nature of stagnation point flow is that the gas approaching the substrate divided into streamlines that become parallel, rather than perpendicular to the substrate, and proceed away from the central streamline.

(Peltzer Expert Report at 12.) This is illustrated in figure 3 of the '165 patent, which shows that:

The gas 11 initially has a generally uniform velocity directed perpendicular to the entire surface of the substrate 10. The solid substrate, as the gas 11 approaches the substrate, causes the velocity vector to become parallel to the surface of substrate 20 and flow away from the axis of symmetry.

('165 patent 3 :45-51.) Although this language appears in the description of the preferred embodiment, it describes what would happen whenever a perpendicular flow of gas is directed at a solid surface.

Genus has no counter-argument, but contends that ASM is rewriting the claim language by containing that "maintaining said flow of gas perpendicular to said substrate" only requires that the initial direction of the gas flow be perpendicular to the substrate. Genus' argument ignores the context of the claim language. By requiring that the *apertures* maintain the flow of gas perpendicular to the substrate, the claim language simply requires that the gas flow apertures always direct the flow of gas in an initial direction that is perpendicular to the substrate. Moreover, the summary of the invention provides that "a gas, introduced at a preselected distance from a circular substrate, has an *initial* uniform velocity toward the substrate."('165 patent 2 :45-47 (emphasis added).)

As ASM points out, the disputed language, "maintaining said flow of gas perpendicular to said substrate," was not in claim 1 as originally drafted. ('165 Prosecution History at 98.) The claim was amended to add the phrase "said apparatus further having means for varying a distance between said apparatus and said substrate and maintaining said flow of gas perpendicular to said substrate." (*Id*. at 40.) The inventors explained that:

Claim 1 has been amended to incorporate the feature of a means for varying the distance between the substrate and the apparatus while maintaining at all varied distances the perpendicularity of the gas flow relative to the substrate surface.

(*Id*. at 42.) The claim language later was amended further, but the Court agrees with ASM that the purpose of adding the "maintaining" language was to ensure that varying the distance between the gas flow apparatus and the substrate would not change the perpendicularity of the gas flow when it first exits the gas flow apparatus.

Thus, the Court agrees with ASM's proposed construction. ASM's definition uses the phrase "the initial vector of the velocity," however, which is not a phrase that is likely to elucidate matters for the lay jury. FN2 Instead, the Court construes "maintaining said flow of gas perpendicular to said substrate" to mean that "the gas flow apertures always direct the flow of gas in an initial direction that is perpendicular to the substrate."

FN2. It is undisputed that velocity contains two elements: direction and speed. At oral argument, the parties agreed that instead of using scientific terms like "velocity vector" and "magnitude of the velocity vector" to construe the claims, the Court could use "direction of the flow" for "velocity vector," and "speed of the flow" for "magnitude of the velocity vector" in order to make it easier for the jury to understand the claims.

Disputed Claim Language	ASM's construction	Genus's construction
1. stagnation point flow	Stagnation point flow is flow toward a solid surface in which the gas or fluid approaching the surface	As used in the claim the phrase is not subject to any reasonably definite meaning which would allow one
6. stagnation flow point	divides into streams proceeding away from the point at which the central streamline intersects with the surface. This point is called the "stagnation point."	skilled in the art to determine with reasonable efforts if such a flow is present in a given reactor.

[14] Genus' expert, Oldham, agrees with ASM's expert, Peltzer, that "stagnation point flow" is a well-known theoretical concept in fluid dynamics that is "generally understood to refer to flow toward a solid surface in which the gas or fluid approaching the surface divides into streams proceeding away from the point at which the central streamline intersects the surface." (Oldham Rebuttal Report at 4.) FN3 The parties' experts also agree that to create a stagnation point flow, the gas need not flow at a uniform speed. (Oldham Expert Report at 3 ("Said [stagnation point flow] need not be perpendicular, of uniform velocity, or from a source of a particular size."); Peltzer Rebuttal Report at 4-5 ("The flow need not be uniform in *magnitude* for stagnation point flow to occur.").)

FN3. The parties' arguments do not distinguish between "stagnation point flow" (claim 1) and "stagnation flow point" (claim 6). "There is no dispute, therefore, that a 'stagnation flow point' is a characteristic of stagnation point flow." (Genus Opp. Brief at 11.)

The parties disagree whether stagnation point flow requires that the gas flow be directed perpendicular to a surface. Oldham states that the flow "need not be perpendicular[.]" (Oldham Expert Report at 3.) In the previous paragraph, however, he states that "[b]asic texts describe the classic stagnation flow point at the center of a flow as resulting from a flow field starting at infinity and striking an infinite plane orthogonally." *Id*. (citing F. Rosenberger, *Fundamentals of Crystal Growth I*.) The Oxford English Dictionary defines "orthogonally" as "at right angles." In fact, Rosenberger contains a diagram, very similar to Figure 3 of the '165 patent, which shows a gas flow which is initially perpendicular to a surface and then all but the centermost point of the flow curves away as it approaches the surface. (Oldham Expert Report, Ex. C, Rosenberger at 258, fig. 5.8.) Rosenberger states that " *Stagnation flow,* as depicted in two dimensions in Fig. 5.8 occurs when a fluid stream impinges on a wall at right angles to it and flows away radially in all directions." *Id*. Oldham provides no support for his contention that stagnation point flow can also occur when the gas flow is not directed perpendicular to a surface. The Court agrees with ASM that "[t]he fact that stagnation point flow requires an initially perpendicular flow is clear from the Rosenberger text cited by Dr. Oldham." (Peltzer Rebuttal Report at 5.) Peltzer states that if the flow is not perpendicular, it "would not divide into streams proceeding away from the point where the central streamline intersects with the surface, as they do in stagnation point flow." (*Id*.) Instead, "all of the streamlines would flow either to the left or to the right." (*Id*.)

Accordingly, the Court finds that the ordinary meaning of "stagnation point flow" is a flow toward a solid surface in which the gas or fluid approaching the surface divides into streams proceeding away from the point at which the central streamline intersects the surface. In order to achieve a stagnation point flow, the direction of the flow initially must be perpendicular to the surface.

Genus argues that the patent specification and prosecution history taken together demonstrate that the term "stagnation point flow" is not being used in the patent claims in its ordinary sense. Genus contends, that as used in the '165 patent, the term "stagnation point flow" is not subject to any reasonably definite meaning.

The patent specification itself provides two definitions of "stagnation point flow." First, it provides:

Referring next to FIG. 3, a cross-sectional view in a plane containing the axis of symmetry of the flow of the gas 11 as it approaches the substrate 10 is shown. The gas 11 initially has a generally uniform velocity directed perpendicular to the entire surface of substrate 10. The solid substrate, as the gas 11 approaches the substrate, causes the velocity vector to become parallel to the surface of substrate 20 and flow away from the axis of symmetry. At one point 21 on the axis of symmetry, generally referred to as the stagnation point, there is theoretically no flow of gas. The axially symmetric gas flow resulting from uniform gas flow toward a surface is generally referred to as stagnation point flow.

('165 patent 3 :43-55.) It also provides:

The chemical vapor deposition of material on the semiconductor substrate is the result of a flow of gas along the surface of the semiconductor substrate 10, the flow of gas being generally constrainted [sic] to have axial symmetry. This flow configuration is generally known as stagnation point flow.

('165 patent 4 :33-38.) There is some ambiguity in this language, because "velocity" includes the concepts of both speed and direction. Thus, "generally uniform velocity directed perpendicular to the entire surface" could mean either "generally uniform direction" or "generally uniform speed and direction." As Figure 3 illustrates only the direction of the gas flow, however, the Court finds that the phrases "generally uniform velocity" and "uniform gas flow toward a surface" in this portion of the specification describe the direction of the gas flow, rather than the speed of the gas flow, which Figure 3 does not purport to illustrate. This interpretation is confirmed by the prosecution history, in which the inventors stated that these lines of the specification explain that "a stagnation point flow is achieved only where the velocity vector of the gas flow is uniformly directed perpendicular to the substrate." ('165 Prosecution History at 53-54.) Thus, the definitions of "stagnation point flow" found in the specification, read in context, are essentially identical to the ordinary definition of "stagnation point flow."

Genus' argument largely rests on statements found in the prosecution history, which it contends demonstrates that the inventors did not use "stagnation point flow" in its ordinary sense. Genus contends that these statements demonstrate that the inventors were concerned with uniform speed of the gas flow, as well as uniform direction of the gas flow, in creating a stagnation flow point. Because the parties agree that uniform speed of gas flow is not necessary to create a stagnation point, Genus contends that the inventors used the term "stagnation point" in a non-standard manner.

The original claims in the patent application that led to the '165 patent made no mention of stagnation point flow. The relevant portion of claim 1, as originally filed, claimed only an "apparatus for directing a flow of gas carrying the deposition material perpendicular to the semicircular substrate, said flow of gas generally having an axial symmetry with respect to a center of said substrate." ('165 Prosecution History at 0014.) The relevant portion of original claim 11, which became claim 6 of the'165 patent, claimed a "gas flow means for producing a flow of gas having axial symmetry across said circular substrate." (*Id*.)

The patent examiner rejected those claims as obvious in light of two prior art patents (Brunner and Bergfelt), which the patent examiner believed disclose apparatuses for chemical vapor deposition of a material on a substrate comprising a device for directing a flow of gas carrying the deposition material perpendicular to the surface. (*Id*. at 35-36.) The examiner also rejected those claims as obvious in light of another patent (Huffman), without explaining precisely why the claims of the '165 patent were obvious in

light of that patent. (*Id*. at 36.)

In response, the inventors amended claim 1 by adding a requirement that the apparatus have a "means for varying a distance between said apparatus and said substrate and maintaining said flow of gas perpendicular to said substrate." (*Id*. at 0040.) The inventors amended claim 11 (the current claim 6) by adding a requirement that the gas flow have "a substantially uniform magnitude of velocity directed perpendicular to" the substrate. (*Id*.) The examiner again rejected the claims, based on the same three prior art references. (*Id*. at 0048-49.)

The inventors attempted to amend claims 1 and 11 again. (*Id*. at 0051-52.) The proposed amendments to claim 1 added the requirements that there be a plurality of gas flow apertures for creating a stagnation point flow at the center of the substrate, and that the gas flow member be parallel to the substrate. (*Id*. at 0052.) The proposed amendments to claim 11 added the language "having a plurality of apertures passing therethrough and disposed parallel to said substantially circular substrate" and "maintaining a stagnation flow point at a center of said circular substrate." (*Id*.) The inventors explained that:

a stagnation point flow is achieved only where the velocity vector of the gas flow is uniformly directed perpendicular to the surface of the substrate. Upon reaching the substrate surface, the perpendicular velocity vector is re-directed horizontally and radially outward from the central point of the susceptor with uniform velocity. The uniform velocity of the horizontal and radial gas flow vectors establishes a point of no gas flow, or a stagnation point flow, at the center of the susceptor.

As described by the present application, creation and maintenance of the stagnation point flow can only be achieved by having and maintaining a uniform gas flow velocity vector perpendicular to the surface of the susceptor. The resulting radial gas flow vector is horizontal and passes across the substrate surface permitting uniform deposition of the chemical vapor deposition materials onto the substrate surface.

('165 Prosecution History at 53-54.)

The inventors also stated that:

While Brunner and Bergfelt appear to disclose a substrate orientation which is in direct opposition to the gas flow source, there is no disclosure of an apparatus, as in the present invention, to insure that the gas flow velocity is uniform and perpendicular to the substrate surface, thereby creating a stagnation point gas flow at the center of the substrate. At no point in Brunner or Bergfelt is there disclosed a similar apparatus, as in the present invention, having a plurality of gas flow apertures which impart uniformity to the gas flow velocity and insure a perpendicular flow vector relative to the substrate surface. The pertinent sections of the Brunner and Bergfelt disclosures cited by the Examiner merely teach a general orientation of the substrate relative to the gas flow.

(*Id*. at 0054-55.) As Peltzer points out, the Brunner patent discloses fixtures for imparting complex motion to the substrate during coating operations, so that the substrate can be pivoted to any angle in relation to the gas flow. (Peltzer Rebuttal Report at 6, and Ex. A (Brunner patent No. 3,889,632) 2 :11-12, 3 :33-35, 4 :28-32.) In the Bergfelt patent, the gas flow is distributed to multiple substrates at a variety of angles that appear never to be perpendicular to the substrate. (*Id*., and Ex. B (Bergfelt patent No. 4,222,345) Fig. 1.)

The inventors also sought to distinguish Huffman:

[I]t is crucial, according to the present invention, that the gas flow have a substantially uniform velocity vector directed perpendicular to the substrate surface. According to the express teaching of Huffman et al. the gas flow cannot be directed perpendicularly to the substrate with the offset nozzle arrangement disclosed therein.

('165 Prosecution History at 57.) Huffman discloses an offset gas flow nozzle that distributes gas to an offcenter portion of a rotating substrate. (Peltzer Rebuttal Report, Ex. C (Huffman patent No. 3,745,969) at Fig. 3, 1:62-2:6, and 4:29-60.) Peltzer agrees with the inventors that the Huffman invention does not flow

gas perpendicularly toward the substrate, and instead discloses a gas flow nozzle that distributes gas in an angle corresponding to the angle of the nozzle, which is 40 degrees in the preferred embodiment. (Peltzer Rebuttal Report at 6, and Ex. C. (Huffman patent No. 3,745,969) at Fig. 3 and 4:44-48, 5:64-67.)

The inventors thus attempted to distinguish Brunner, Bergfelt, and Huffman by arguing that those inventions, unlike the invention of the '165 patent, did not require a perpendicular flow of gas towards the substrate. Genus instead focuses on the inventors' use, in this portion of the prosecution history, of phrases such as "the gas flow velocity is uniform and perpendicular to the substrate surface" and "apertures which impart uniformity to the gas flow velocity and insure a perpendicular flow vector relative to the substrate surface." Genus contends that these phrases demonstrate that the inventors were concerned with uniform *speed* of the gas flow, as well as uniform *direction* of the gas flow, in creating a stagnation flow point.

The Court agrees that there is some ambiguity in the language used by the inventors. The key point of the inventors' argument to the patent examiner in this section of the prosecution history, however, is that the prior art (Brunner, Bergfelt and Huffman) does not disclose an apparatus that requires perpendicular flow so that a stagnation flow point occurs. Any other statements by the inventors in this section of the prosecution history that arguably might be interpreted as suggesting that uniform speed of gas flow is also necessary are not clear enough to demonstrate that the inventors were using an unusual definition of "stagnation point flow." *See* CCS Fitness, 288 F.3d at 1366 (noting that a claim term will not be construed in accordance with its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history).

Genus also argues that later statements in the prosecution history again demonstrate that the inventors used a non-standard definition of "stagnation point flow." After the amendment just discussed, the patent examiner again rejected claims 1 and 11 for the same reasons, and also because the amendment to add the "stagnation point flow" limitation raised new issues. ('165 Prosecution History at 60-61.) The inventors ultimately filed a continuation of the prior patent application, apparently with the new amendments to claims 1 and 11. (*Id*. at 78; *see id*. at 95-96.) Claims 1 and 11 were rejected again, this time primarily in light of a European patent, PCT 85/03460. ('165 Prosecution History at 89-90, and 93.) Oldham refers to the European patent as the Schmidt '460 PCT Application. The patent examiner rejected claims 1 and 11 as obvious "over the European patent in view of Nishizawa, Robinson or Brandolf." (*Id*. at 89.) The patent examiner also rejected claims 1 and 11 as obvious over Brunner and Bergfelt "in view of the European patent in combination with Nishizawa, Robinson or Brandolf." *Id*.

The patent examiner finally allowed the claims after the inventors proposed additional amendments, which added the limitation that the apertures be in a generally circular configuration with a radius substantially equal to that of the substrate, and that the apertures be coaxially aligned with the substrate. *Id*. at 96, 101. These changes in alignment appear to be designed to influence the direction of the gas flow, rather than its speed. The inventors successfully argued that these amendments distinguished their invention from the prior art:

[I]ndependent claims 1 and 11 [now claim 6] have been amended to positively recite and claim the that [sic] the apertures in the gas injector are arranged in a circular configuration which has radius equal to the radius of the circular substrate and coaxially aligned with the center of the substrate. As disclosed in the Specification at Page 6, lines 1-12,FN4 a stagnation point flow is achieved only where the velocity vector of the gas flow is uniformly directed perpendicular to the surface of the substrate. Upon reaching the substrate surface, the perpendicular velocity vector is re-directed horizontally and radially outward from the central point of the susceptor with uniform velocity. This flow profile establishes isotherms at the substrate surface and an axially symmetric flow away from the center of the substrate. The uniform velocity of the horizontal and radial gas flow vectors establishes a point of no gas flow, or a stagnation point flow, at the center of the susceptor.

FN4. Page 6, lines 1 through 12, of the specification, as originally filed, corresponds to column 3, lines 43 through 55, of the issued patent.

(*Id*. at 97.) From this language, it appears that the inventors of the '165 patent are describing how a stagnation point flow can be achieved using the apparatus of the invention, but are not disagreeing with the common meaning of the term.

Genus argues that the inventors of the '165 patent also used a non-standard meaning of "stagnation point flow" in attempting to overcome the patent examiners' rejection of certain claims as obvious in light of four prior art patents (the European patent, Nishizawa, Robinson, and Brandolf). The inventors argued the following:

As described by the present application, creation and maintenance of the stagnation point gas flow can only be achieved by having and maintaining a uniform gas flow velocity vector perpendicular to the entire surface of the susceptor. This is accomplished by the present invention by providing the gas injector with apertures having a circular configuration corresponding to the circular configuration of the substrate. The pending claims have been amended to further clarify and point out this important distinction.

Even a cursory review of the European Patent discloses that the gas injector 1-3 in Fig. 1, is a nozzle shape which does not have an opening corresponding in radius to the radius of the substrate 1-10. Indeed, the flow of reactant material 1-3 forms a jet 1-7 which impinges on the substrate and transports the depositing species. As described on Page 19 of the European patent at line 7, the "flow geometry, flow speed and the carrier gas pressure can be arranged so that the synthesis of the depositing saturated vapor species occurs near the center of the forming jet and does not allow time for diffusion of this species to the walls of the apparatus ...." By its own terms, the European patent is designed and intended to permit variable velocity gas flows by providing a jet flow. This is completely contrary to the present invention where the gas flow velocity is substantially uniform across the entire substrate surface.

Similarly, a review of Nishizawa, Brandolf, Robinson, and McNeilly, reveals no hint that it is known to provide gas inlet apertures in a circular configuration corresponding to that of the substrate and coaxially aligned therewith.

Accordingly, *none of the references cited discloses the additional features, as presently claimed,* whereby the gas injection apparatus is formed with a plurality of apertures arranged in a circular configuration having a radius substantially equivalent to that of the circular substrate and coaxially aligned with the center thereof. *The stagnation point flow established with these features is not replicated nor disclosed by any of the art cited and relied upon by the Examiner*.

('165 Prosecution History at 98-99 (emphases added).) Oldham construes this language as stating that none of the prior art references disclose creation of a stagnation point flow, and states that the European patent "describes an opposing flow which would fit a real world definition of stagnation point flow." (Oldham Expert Report at 4.) Although the language could certainly be more clear, the Court does not agree that the inventors were claiming that the prior art failed to disclose stagnation point flow. Rather, it appears that the inventors were arguing that none of the prior art inventions created a stagnation point flow in the same manner as the '165 invention, i.e., by using gas flow apertures in a circular configuration coaxially aligned with the substrate, with the radius of the substrate and the gas flow apertures being substantially equivalent, or made that method obvious. (*See* Peltzer Rebuttal Report at 8.)

The European Patent does not use a circular pattern of gas flow apertures covering substantially the entire area of the substrate, but instead introduces the gas to the substrate through a narrow nozzle that, while aimed perpendicular to the substrate, is much narrower in circumference than the substrate. (Oldham Expert Report, Ex. D at Fig. 1.) Although the European Patent does claim to create a stagnation point (*id*. at 8:24-9:3, 41:15-18, and Fig. 8), nothing in the European Patent discloses that it can be accomplished by injecting the gas through a circular pattern of gas flow apertures that have essentially the same radius as the radius of the substrate. In fact, the European patent expressly assumes that the nozzle will be smaller than the substrate. *Id*. at 4:23-26 ("The nozzle 1-1 and the substrate 1-10 may move relative to one another in order to change the area of the substrate's 1-10 surface which is directly under the nozzle 1-1 and thereby coat a larger portion of that surface.") In essence, the European patent uses a narrow jet, in contrast to the broad showerhead of the '165 patent. The Court also agrees with the inventors and the patent examiner that

Nishizawa, Robinson, and Brandolf reveal "no hint that it is known to provide gas inlet apertures in a circular configuration corresponding to that of the substrate and coaxially aligned therewith." ('165 Prosecution History at 99; *see also* Reines Decl., Exs. M (Nishizawa patent No. 4,540,466), N (Robinson patent No. 3,916,822), and O (Brandolf patent No. 4,511,593).)

The Court agrees with Genus, however, that the inventors' statement that "[a]s described by the present application, creation and maintenance of the stagnation point gas flow can only be achieved by having and maintaining a uniform gas flow velocity vector perpendicular to the entire surface of the susceptor" is odd. Read in context with the remainder of the inventors' statements in this section of the prosecution history, the Court interprets this statement as requiring that the initial direction of the gas flow be perpendicular to the entire surface of the substrate, and that the width of the gas flow must be wide enough to cover the entire surface of the substrate. It is apparently undisputed that the European patent creates stagnation point flow with a narrow gas flow that is not as wide as the substrate. One of the ways to overcome the heavy presumption that a claim term carries its ordinary and customary meaning is to show that the patentee distinguished that term from prior art on the basis of a particular embodiment. CCS Fitness, 288 F.3d at 1366-67. Here, the inventors appear to have distinguished the European patent on the ground that the stagnation point flow achieved there was not achieved by arranging the gas flow apertures in a generally circular configuration axially aligned with the substrate, with the radius of the substrate substantially equivalent to that of the configuration of the gas flow apertures. One could legitimately argue that the definition of "stagnation point flow" in the context of the '165 patent should be limited to the stagnation point flow that is created by that configuration of gas flow apertures. It is meaningless to do so, however, because each of the independent claims specifically recites that configuration of gas flow apertures.

More troublesome, however, is the inventors' statement that:

By its own terms, the European patent is designed and intended to permit variable velocity gas flows by providing a jet flow. This is completely contrary to the present invention where the gas flow velocity is substantially uniform across the entire substrate surface.

('165 Patent Prosecution History at 98.) At deposition, Peltzer strongly suggested that this portion of the prosecution history addressed the speed of the flow:

Q: Okay. And they're explaining that the gas flow velocity must be substantially uniform across the entire substrate surface, correct?

A: Yes. This refers to specific location.

Q: So one of the reasons that a jet flow as described in the European patent is different from the gas flow described in the'165 patent is that in the jet flow there's a much larger magnitude of velocity at the center of the wafer and a much smaller magnitude of velocity at the edges, correct? That's what they're explaining here?

A: Yes.

(Peltzer Dep. 183:14-25.) Later in the deposition, however, Peltzer retracted this statement somewhat:

Q: So one of the things he's saying is that the European patent doesn't-it may show stagnation point flow, but it doesn't show stagnation point flow where the magnitude of the velocity is-the stagnation point flow is different because the magnitude of velocity in the middle is different than the magnitude at the edges, correct, that's one of the reasons it's different?

A: Well, the term "stagnation point flow," there is a concept of stagnation point flow, which is well known. In the '165 what is described is an apparatus that produces stagnation point flow with particular characteristics, that is, of axial symmetry and all of the attributes that we described in column 4 of the '165.FN5

FN5. Column 4 of the '165 patent does not discuss uniformity of the speed of the gas flow, and column 3 states only that "[b]ecause of the relatively small size of the apertures 74, the magnitude of the gas velocity will generally be uniform among all of the apertures 74 as the gas passes through toward the plane of substrate 10." ('165 patent 3 :65-69.)

(*Id*. 184:17-185:6.) The topic was then abandoned at the deposition.

The Court has no reason to doubt Peltzer's statement that in a jet flow there is a much larger magnitude of velocity at the center of the wafer and a much smaller magnitude of velocity at the edges. The inventors' discussion of the jet flow of the European patent at page 99 of the prosecution history, however, is in the context of explaining how the gas flow in that invention is not directed to the entire surface of the substrate, unlike the gas flow in the present invention:

Even a cursory review of the European Patent discloses that the gas injector 1-3 in Fig. 1, is a nozzle shape which does not have an opening corresponding in radius to the radius of the substrate 1-10.... This is completely contrary to the present invention where the gas flow velocity is substantially uniform across the entire substrate surface.

('165 Patent Prosecution History at 99.) The Court interprets this language consistently with the inventors' other statements that a key distinguishing feature of the '165 invention is the configuration of gas flow apertures that correspond to the size of the substrate, and thus produce a uniformly directed gas flow perpendicular to the substrate. The Court is not convinced that this language demonstrates that the inventors used "stagnation point flow" in a nonstandard way.

Indeed, at the claim construction hearing, Peltzer clarified his prior statements and testified that the particular stagnation point flow of the '165 patent does not require uniform magnitude of velocity, and that the European patent "is distinguished by requiring that the apertures be disposed in a generally circular configuration over the entire surface of the substrate." (Transcript 92:24-93:14.) Although Peltzer later testified that the speed of the gas flow is "uniform across a horizontal plane," (*id*. 99:5-100:17), he was not then attempting to explain how the inventors distinguished the European patent or to define the concept of stagnation point flow.

ASM has consistently argued that only claim 6 requires that the speed of the gas flow be uniform, because only claim 6 requires "a flow of gas having a substantially uniform magnitude of velocity." ('165 patent 6 :26-27.) Claim 1, on the other hand, contains no such limitation, as Peltzer testified at the claim construction hearing. (Transcript 102:4-20.)

Genus also argues that ASM has admitted in previous litigation that "stagnation point flow" has a non-standard meaning in the context of the '165 patent. In answers to interrogatories propounded in 1993 in *Advanced Semiconductor Materials America, Inc. v. Applied Materials, Inc.*, C-95-20169 RMW (" *ASM v. Applied Materials*"), ASM was asked to define the term "stagnation point flow" as used in the '165 patent claims. ASM ultimately answered the interrogatory by pointing to the language from the patent specification and prosecution history that has already been quoted above, stating that "[t]his definition is consistent with the way in which the term is used in the relevant art," and pointing to a definition from F. Rosenberg, *Fundamentals of Crystal Growth I: Macroscopic Equilibrium and Transport Concepts*. (Reines Decl., Ex. G at 085810-11.) According to ASM's interrogatory responses, that treatise provides that stagnation point flow "occurs when a fluid stream impinges on a wall at right angles to it and flows away radially in all directions." (*Id*. at 085811-12.) Contrary to Genus' argument, the definition ASM proposed in that litigation is consistent with the definition it proposes now, and with the ordinary meaning of the term.FN6

FN6. Genus also argues that there is no way to measure whether a "stagnation point flow" actually exists in a CVD reactor, but that is an issue of indefiniteness or enablement, not an issue for claim construction.

Accordingly, the Court concludes that "stagnation point flow" should be construed in accordance with its

ordinary meaning:

Stagnation point flow is achieved when a flow toward a solid surface in which the gas or fluid approaching the surface divides into streams proceeding away from the point at which the central streamline intersects the surface. This point is called the "stagnation flow point." In order to achieve a stagnation point flow, the direction of the flow initially must be perpendicular to the surface.

Undisputed Claim Language
1. adapted so that a distance between said apparatus and said circular substrate may be varied

[15] The parties agree that this language should be construed as follows: "The apparatus for directing the flow of gas is designed so that the distance between the substrate and the apparatus may be varied while maintaining at all varied distances the perpendicularity of the gas flow relative to the substrate surface." Accordingly, the Court adopts this construction.

Disputed Claim Language	ASM's construction	Genus's construction
1. a generally circular configuration	No construction necessary.	Having a circular configuration corresponding to the circular configuration of the substrate
6. a generally circular configuration		

[16] The issue here is: how circular is "generally circular"? ASM argues that no construction is necessary, because no construction could improve upon the claim language "a generally circular configuration."

Genus correctly points out that "[w]hen a word of degree is used the district court must determine whether the patent's specification provides some standard for measuring that degree." Exxon Research and Engineering Co. v. United States, 265 F.3d 1371, 1381 (Fed.Cir.2001) (quoting Seattle Box Co. v. Indus. Crating & Packing, Inc., 731 F.2d 818, 826 (Fed.Cir.1984)). In *Exxon,* an issue was whether the term "substantial absence of slug flow" was indefinite because the specification did not provide any empirical standard for determining when the process could be said to be substantially lacking in slug flow. *Id*. The Federal Circuit found that one of ordinary skill in the art would understand from the specification that the reason slug flow should be avoided is that it may interfere with reactor efficiency. *Id*.

Whether there is a "substantial absence of slug flow" therefore can be determined with reference to whether reactor efficiency is materially affected. If there is no slug flow or such minimal slug flow that the slug flow has no appreciable impact on reactor efficiency, then there is a "substantial absence of slug flow" within the meaning of the claims. In this setting, as in other, mathematical precision is not required-only a reasonable degree of particularity and definiteness.

(*Id*.) *See also* Modine Manufacturing Co. v. United States International Trade Commission, 75 F.3d 1545, 1550-54 (Fed.Cir.1996) (construing "relatively small" in light of the specification, the other claims, and the prosecution history); Andrew Corp. v. Gabriel Electronics, Inc., 847 F.2d 819, 821 (Fed.Cir.1988) (claim language such as "approach each other," "close to," "substantially equal," and "closely approximate" are "ubiquitous in patent claims" and "when serving reasonably to describe the claimed subject matter to those of skill in the field of the invention, and to distinguish the claimed subject matter from the prior art, have been accepted in patent examination and upheld by the courts.")

The claim language at issue requires that the gas flow apertures are placed "in a generally circular configuration having a radius substantially equivalent to a radius of" the substrate. ('165 patent 5 :47-6 :1, 6 :22-25.) The substrate itself is either circular (claim 1) or substantially circular (claim 6). (*Id*. 5:36, 6:19.) The reason for using a generally circular configuration of apertures that substantially matches the size of the substrate is not specifically set forth in the specification. Genus points to the following language from the prosecution history, however:

As described by the present application, creation and maintenance of the stagnation point gas flow can only be achieved by having and maintaining a uniform gas flow velocity vector perpendicular to the entire

surface of the susceptor. *This is accomplished by the present invention by providing the gas injector with apertures having a circular configuration corresponding to the circular configuration of the substrate*. The pending claims have been amended to further clarify and point out this important distinction.

('165 Prosecution History at 98.) Thus, the prosecution history identifies a purpose of the generally circular configuration of the gas flow apertures as enabling the creation and maintenance of the stagnation point gas flow by having and maintaining a uniform gas flow velocity vector perpendicular to the entire surface of the susceptor.

Genus argues, however, that this language *defines* "generally circular" as "circular." This argument is not persuasive. The inventors were simply using a shorthand version of the claim language to describe the creation and maintenance of the stagnation point flow. Importantly, the actual claim language at the time the inventors used that language called for a "generally circular configuration," just as it does now. (*Id*. at 96.)

Genus also points to ASM's position in prior litigation, in which it argued that the "generally circular" language means that "the gas injection apertures are distributed in a configuration which appears generally like a circle with apertures distributed within the circle," and that "any variance from circular cannot be such as to prevent commercially acceptable thickness uniformity in the deposition." (Reines Decl., Ex. A, March 10, 1997 Joint Claims Chart from *ASM v. Applied Materials* at 2.) Uniform deposition of material on the substrate is, of course, a major goal of the invention, as noted in the summary of the invention section of the '165 patent. ('165 patent 2 :3-11.) Thus, ASM's statement in the *Applied Materials* case is consistent with the language Genus cites from the prosecution history. Accordingly, it appears that the "generally circular configuration" of the gas flow apertures is one of the features of the invention that leads to uniform deposition of material on the substrate.

Thus, where there is a question as to whether a configuration is "generally circular" or not, the person of ordinary skill in the art can look to see whether the gas flow is initially directed perpendicularly across the entire surface of the substrate, and whether there is commercially acceptable uniformity of deposition of material on the substrate. Where all the other features of the invention exist, but these features do not exist, then one would know that the configuration of the gas flow apertures is too far from circular to be thought of as "generally circular." Thus, the term is not too indefinite to be construed.

Whether or not an apparatus has a generally circular configuration of gas flow apertures, however, is really a matter of infringement, not of claim construction. The Court agrees with ASM that there is no better way to define "generally circular" than to simply say "generally circular." Accordingly, the Court declines to construe the term.

Disputed Claim Language	ASM's construction	Genus's construction
1. axial symmetry	A geometric figure possesses axial symmetry if it looks the same when	Original proposed construction: The velocity vector of the flow is the
6. axial symmetry	rotated about its axis.	same at every point located at a given radius from the axis of the center of the substrate, and this condition is true for all radii up to and including the radius of the substrate, and for every plane between the gas flow and the substrate.
		Current proposed construction: Property of a geometric configuration which is unchanged when rotated about a given line.

Genus' original proposed construction is highly constrictive, requiring that the direction of the gas flow be

identical at every point in space between the gas flow apertures and the substrate surface. This construction conflicts with the plain language of the claims. Claim 1 requires that the "flow of gas *generally* has an axial symmetry" and claim 6 requires that there be "a flow of gas having a *substantially* uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular substrate." ('165 patent 6 :3-4; 6:26-29.) Thus, the velocity vector of the flow need not be the same at every point, as Peltzer points out in his expert report. (Peltzer Expert Report at 15.)

Peltzer also correctly points out that Genus' original proposed definition would exclude the preferred embodiment shown in Figure 4 of the patent, and it appears to this Court that it might well also exclude every apparatus that has multiple gas flow apertures. As Peltzer points out:

The velocity vector of the flow will by no means be the same at every point on a given radius on the plane immediately below the apertures-some points will be located below a gas flow aperture, and some will be located immediately below a solid section of the surface, through which gas cannot flow. Obviously, the velocity vector will vary between two such points. However, Genus' construction would exclude such a device, because Genus requires identical velocity vectors at each point on a given radius, and that this be true "for every plane between the gas flow apertures exits and the substrate."

(Peltzer Expert Report at 16.) In addition, because the specification of the '165 patent also uses the term "axial symmetry" to describe the substrate and the configuration of the gas flow apertures, Genus' original construction is inappropriate because it cannot be used to describe the axial symmetry of anything except the flow of gas. ('165 patent 2 :12-15, 4 :4-9.) Genus has wisely abandoned this proposed construction.

The patent specification does not define "axial symmetry." ASM's construction is an adaptation of the definition contained in the McGraw-Hill Dictionary of Scientific and Technical Terms, which defines "axial symmetry" as "Property of a geometric configuration which is unchanged when rotated about a given line." (Peltzer Expert Report at 15, and Ex. H.) Genus states in its opposition brief that it is willing to accept the McGraw-Hill definition, but objects to ASM's changes to that definition, particularly ASM's change of the language from "is unchanged" to "looks unchanged."

The McGraw-Hill definition, although useful by analogy, is somewhat unhelpful in describing a gas flow, which is not a geometric figure. Peltzer argues, however, that:

[o]nce the basic concept of axial symmetry is understood, it can be applied to gas flow. The flow described in the '165 patent is axially symmetric because, like the configuration of gas flow apertures and the substrate, it is circular in nature.

(Peltzer Expert Report at 17 (citing '165 patent, Fig. 2 and 2:47-49, 3:40-42, 5:15-16.))

Describing the gas flow as "circular" is somewhat simplistic, however. The outer perimeter of the gas flow could be described as generally circular, but in describing the gas flow as "axially symmetric," it is also necessary to take account of the gas flow apertures inside the outer perimeter. For the flow to be axially symmetric, each gas flow aperture would need to have a counterpart equidistant from the center, but on the opposite side of the circle. In other words, if one drew a line in any direction through the center of the generally circular configuration of the gas flow apertures, the apertures on one side of the line would be a mirror image of the apertures on the other side of the line. ASM acknowledges in its reply brief that "[i]n the context of real objects, the key question for symmetry is whether or not one side is the mirror image of the other." (Reply Brief at 21.) FN7

FN7. Figure 4 of the '165 patent, which illustrates a preferred embodiment, does not have a mirror-image configuration. The parties agreed at oral argument, however, that Figure 4 was merely a schematic drawing that was not intended to show the actual placement of the gas flow apertures.

In addition to the requirement of mirror-image placement of gas flow apertures, the direction and speed of the gas flow must also be in a mirror image configuration for the gas flow to be axially symmetric. As

Oldham points out:

[O]ne of ordinary skill in the art would understand that it is the *velocity vectors of the gas* which must be symmetrical about the shared axis of the showerhead and the substrate .... One of ordinary skill in the art would know that a flow of gas cannot be axially symmetric if the velocity vector of the gas is different at one point located at a given distance from the axis than at another point located at the same distance from the axis in the same plane.

(Oldham Rebuttal Report at 5 (emphasis in original).) Thus, for the gas flow to be axially symmetric, the direction of the gas flow and the speed of the gas flow must be the same on each horizontal plane for each gas flow stream that is equidistant from the center of the generally circular configuration.

ASM's proposal to insert a visual term, "looks," into the definition opens the door to unnecessary confusion and ambiguity. First, it is difficult to say that the flow of a presumably colorless gas has any particular "look." Second, the use of the word "looks" would introduce some uncertainty into the definition of a precise term. To the extent that ASM is seeking to avoid having to show, in the infringement phase of this litigation, that the gas flow is precisely axially symmetric, the claim language itself offers some wiggle room. Claim 1 requires only that the gas flow "generally has an axial symmetry." ('165 patent 6 :3-4.) Claim 6 requires that the flow of gas have a "substantially uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular surface." ('165 patent 6 :26-29.) If the speed of the gas flow need only be substantially uniform at each equidistant point on a horizontal plane, then the gas flow will only generally have axial symmetry. In addition, claim 6 requires that the gas flow apertures form "a *generallycircular* configuration having a radius substantially equal to a radius of said *substantially circular* substrate and coaxially aligned therewith," which also limits the precision of the axial symmetry of the gas flow. ('165 patent 6 :23-26 (emphasis added).)

Accordingly, the Court will construe "axial symmetry" in accordance with its ordinary dictionary definition, with a minor change to assist the jury's understanding of the term: "A geometric figure possesses axial symmetry if it is unchanged when rotated about a given line, such as a circle rotated around its axis."

Undisputed Claim Language
6. gas flow means

[17] The parties agree that "gas flow means" includes the structures and devices that influence the flow of gas through the apparatus. Accordingly, the Court adopts this construction.

Disputed Claim Language	ASM's construction	Genus's construction
6. producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to ... said circular substrate	The initial vector of the velocity is directed perpendicular to the substrate and the magnitude of the gas velocity is generally uniform among all of the apertures as the gas passes through toward the substrate.	The limitation is not subject to any definite meaning which would allow one skilled in the art to determine with reasonable efforts if such a flow is present in a given CVD reactor, but in any event requires that the magnitude of the velocity of the flow perpendicular to the substrate must be uniform for every plane between the gas flow aperture exits and the substrate, and further, that the velocity vector of the flow be the same at every point located at a given radius from the axis of the center of the substrate, and that this condition be true for all radii up to and including the radius of the substrate, and for every plane

between the gas flow aperture exits and the substrate.

[18] ASM takes its proposed construction from the '165 patent's description of a preferred embodiment. The specification explains that:

Referring next to FIG. 4, an implementation of the actual arrangement for providing the initial conditions of a gas with velocity vector with uniform magnitude directed towards the substrate is shown. A surface 71, either a surface of an enclosure or one of two generally parallel plates, has the gas 11 introduced into the region above surface 71. The gas 11 is forced through the apertures 74 in the surface 71 toward the semiconductor substrate 10. Thus, the initial vector of the velocity is directed toward the substrate. Because of the relatively small size of the apertures 74, the magnitude of the gas velocity will generally be uniform among all of the apertures 74 as the gas passes through toward the plane of substrate 10.

('165 patent 3 :56-69.) Although this language is taken from a preferred embodiment, it appears to describe what is meant by the disputed claim language, rather than simply providing one method of achieving it.

Genus objects that the disputed claim language is too indefinite to construe, but nonetheless provides its own draconian construction, which would require uniform direction of the gas flow at every horizontal plane between the gas flow apertures and the substrate. The Court has already rejected this requirement, for the reasons stated in the previous section. Genus' construction would also require that the "magnitude of the velocity of the flow perpendicular to the substrate must be uniform for every plane between the gas flow aperture exits and the substrate." This eliminates the claim language's requirement that the magnitude be only "substantially uniform."

It also eliminates the claim language's requirement that the flow of gas have a substantially uniform magnitude of velocity *directed* perpendicular to the substrate. Thus, the flow of gas having a substantially uniform magnitude of velocity need only be *directed* perpendicular to the substrate; there is no requirement that it be substantially uniform all the way *to* the substrate. As the gas flow approaches the substrate, the claim language requires that it have axial symmetry, but there is no requirement that there be uniform magnitude of velocity at each point on each horizontal plane. Axial symmetry would require only that there be uniform magnitude of velocity at all points on a horizontal plane that are equidistant from the center of the substrate; in other words, there can be a different magnitude of velocity at points close to the center than at points farther away from the center and the flow will still be axially symmetrical. As Peltzer states in his rebuttal expert report:

a person of ordinary skill in the art would be well aware of the fact that the magnitude of velocity (i.e., speed) of the flow *increases* as the flow proceeds radially outward from the stagnation point. That is, as the distance from the stagnation point increases, so does the speed of the flow.

(Peltzer Rebuttal Report at 12.)

Accordingly, the Court adopts ASM's construction, with minor changes to make it more juror-friendly:

The initial direction of the gas flow is perpendicular to the substrate and the speed of the gas flow is generally uniform among all of the apertures as the gas passes through them toward the substrate.

Undisputed Claim Language
10. baffles

[19] The parties agree that "baffles" are "structures affecting gas flow." Accordingly, the Court adopts this construction.

B. Claim 5

The Court turns to claim 5, which provides:

The apparatus for deposition of claim 1 further including apparatus for introducing a purge gas on a reverse side of said substrate.

('165 patent 6 :14-16.)

Undisputed Claim Language
5. purge gas

[20] The parties agree that "purge gas" should be construed as follows: "A gas that aids in the removal of unwarranted material." Alternately, the parties agree that no construction is necessary. In light of the substantial disputes surrounding "evacuate" and "purge" in the patents the Court has previously construed, the Court will adopt the parties' joint construction of this term, rather than leave the term unconstrued.

Disputed Claim Language	ASM's construction	Genus's construction
5. apparatus for introducing a purge gas	ASM contends that interpretation of this claim is not governed by 35 U.S.C. s. 112 para. 6, and that this limitation is not indefinite.	Genus contends that interpretation of this claim is governed by 35 U.S.C. s. 112 para. 6, and that this limitation is indefinite.

[21] [22] The dispute here is whether this is a means-plus-function claim, and thus is governed by 35 U.S.C. s. 112 para. 6. A "means-plus-function" claim is a special type of claim provided for in 35 U.S.C. s. 112, paragraph 6, which states:

An element in a claim for a combination may be expressed as a means or a step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. s. 112, para. 6. Under this provision, an inventor may describe an element of the invention by the result accomplished or the function served, rather than by describing the item or element to be used. Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co., 520 U.S. 17, 27, 117 S.Ct. 1040, 137 L.Ed.2d 146 (1997). When using means-plus-function language, however, "[t]he applicant must describe in the patent specification some structure which performs the specified function." Valmont Industries, Inc. v. Reinke Manufacturing Co., Inc., 983 F.2d 1039, 1042 (Fed.Cir.1993). A structure disclosed in the specification is only deemed to be "the corresponding structure" if the specification clearly links or associates that structure to the function recited in the claim. Kahn v. General Motors Corp., 135 F.3d 1472, 1476 (Fed.Cir.1998). The duty to link or associate structure in the specification with the function is the quid pro quo for the convenience of employing the means-plus-function format. *Id*.

[23] [24] The use of the word "means" creates a presumption that s. 112 para. 6 applies. Personalized Media Communications, LLC v. International Trade Commission, 161 F.3d 696, 703 (Fed.Cir.1999). Failure to use the word "means" creates a presumption that s. 112 para. 6 does not apply. *Id*. at 703-04. "These presumptions can be rebutted if the evidence intrinsic to the patent and any relevant extrinsic evidence so warrant." *Id*. at 704. "In deciding whether either presumption has been rebutted, the focus remains on whether the claim as properly construed recites sufficiently definite structure to avoid the ambit of s. 112 para. 6." *Id*. Where a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format, even if the claim uses the term "means." *Id*. (quoting Sage Prods. v. Devon Indus., Inc., 126 F.3d 1420, 1427-28 (Fed.Cir.1997)).

Claim 5 does not use the word "means." Thus, there is a presumption that the claim is not a means-plus-function claim. Personalized Media, 161 F.3d at 703-04. The presumption that s. 112 para. 6 does not apply can be rebutted by showing that the claim element recites a function without reciting sufficient structure for performing that function. Watts v. XL Systems, Inc., 232 F.3d 877, 880 (Fed.Cir.2000). Claim 5 requires that there be an "apparatus for introducing a purge gas on a reverse side of said substrate," but the claim

does not recite any structure for performing that function.

A claim that is not a means-plus-function claim need not always specifically recite a structure for performing the function, however. In *Personalized Media,* the claim language at issue was "a digital detector for receiving said transmission and detecting said predetermined signal in said transmission based on either a specific location or a specific time[.]" Personalized Media, 161 F.3d at 698. The Federal Circuit held that this was not a means-plus-function claim because the term "detector" was a sufficient recitation of structure. *Id*. at 704. The court found that:

"detector" had a well-known meaning to those of skill in the electrical arts connotative of structure, including a rectifier or demodulator. No other extrinsic evidence, including the expert testimony, and no evidence intrinsic to the patent casts doubt on this conclusion. Moreover, neither the fact that a "detector" is defined in terms of its function, nor the fact that the term "detector" does not connote a precise physical structure in the minds of those of skill in the art detracts from the definiteness of structure. Even though the term "detector" does not specifically evoke a particular structure, it does convey to one knowledgeable in the art a variety of structures known as "detectors." We therefore conclude that the term "detector" is a sufficiently definite structural term to preclude the application of s. 112, para. 6.

Id. at 704-05. ASM argues that persons of ordinary skill in the art would think of numerous structures for providing a purge gas to the reverse side of the substrate, and thus claim 5 is not a means-plus-function claim.

Personalized Media, however, found that the term "detector" itself conveyed a variety of structures to persons of ordinary skill in the art. In other words, it found that "detector" was, in and of itself, a structural term. *Personalized Media* relied on Greenberg v. Ethicon Endo-Surgery, Inc., 91 F.3d 1580 (Fed.Cir.1996), in which the phrase "detent mechanism" was at issue. Personalized Media, 161 F.3d at 703 (citing Greenberg, 91 F.3d at 1583). There, the court held that:

The fact that a particular mechanism-here "detent mechanism"-is defined in functional terms is not sufficient to convert a claim element containing that term into a "means for performing a specified function" within the meaning of [s. 112, para. 6.] Many devices take their names from the functions they perform. The examples are innumerable, such as "filter," "brake," "clamp," "screwdriver," or "lock." ...

"Detent" (or its equivalent "detent mechanism") is just such a term. Dictionary definitions make clear that the noun "detent" denotes a type of device with a generally understood meaning in the mechanical arts, even though the definitions are expressed in functional terms. It is true that "detent" does not call to mind a single well-defined structure, but the same could be said of other commonplace structural terms such as "clamp" or "container." What is important is not simply that a "detent" or "detent mechanism" is defined in terms of what it does, but that the term, as the name for structure, has a reasonably well understood meaning in the art.

Id. In *Personalized Media,* the Federal Circuit distinguished "detector," as a specific type of structure, from vague, generic terms like "means," "element," or "device." *Id*. at 704.

By contrast, claim 5 contains no structural term like "detent mechanism." The only remotely structural term in claim 5 is "apparatus," which no one would claim calls to mind a structure for purging gas. Rather, "apparatus," without more, is just a synonym for "device," and just as inadequate to provide the requisite structure. *See, e.g., The American Heritage Dictionary of the English Language, Fourth Edition,* at *http://www.dictionary.com* (defining "apparatus" as "an appliance or device for a particular purpose.")

Unlike the claim language at issue in *Personalized Media* or *Greenberg,* claim 5 is stated in purely functional terms. Thus, claim 5 is more like Mas-Hamilton Group v. LaGard, Inc., 156 F.3d 1206 (Fed.Cir.1998), where "a substantially non-resilient lever moving element for moving the lever" failed to cite sufficient structure to avoid application of s. 112 para. 6. In *Mas-Hamilton,* as in claim 5, the only vaguely structural term used in defining the function was "lever moving element," which the court found did not have a generally understood structural meaning in the art. *Id*. at 1213.

Thus, claim 5 must be viewed as a means-plus-function claim. As a means-plus-function claim, claim 5 is invalid due to indefiniteness if the specification, as understood by a person of ordinary skill in the art, fails to describe some structure that performs the specified function. Atmel Corp. v. Information Storage Devices, 198 F.3d 1374, 1378 (Fed.Cir.1999). "[A] court's determination of the structure that corresponds to a particular means-plus-function limitation is indeed a matter of claim construction." *Id*. at 1379. The structure does not have to be disclosed explicitly in the specification; rather, disclosure of structure corresponding to a means-plus-function limitation may be implicit in the specification if it would have been clear to those skilled in the art what structure must perform the function recited in the means-plus-function limitation. *Id*. at 1380.

The following language is the only reference in the specification to an "apparatus for introducing a purge gas on a reverse side of said substrate:"

The axially symmetric flow of gas (away from the axis) has the important benefit of reducing autodoping by creating a flow of gas in a direction, relative to the substrate, that is opposite from the flow of materials producing the autodoping. This effect can be enhanced and autodoping further reduced, by applying a purge gas to the bottom of the substrate.

('165 patent 5 :15-22.) This language contains *no* structure for applying a purge gas.

Fulfillment of the s. 112 para. 6 tradeoff cannot be satisfied when there is a total omission of structure. There must be structure in the specification. This conclusion is not inconsistent with the fact that the knowledge of one skilled in the art may be used to understand what structure(s) the specification discloses, or that even a dictionary or other documentary source may be resorted to for such assistance, because such resources may only be employed in relation to structure that is disclosed in the specification.

Atmel, 198 F.3d at 1382.

The Court has previously declined to rule on indefiniteness arguments during claim construction. If the patent had arguably provided some structure for applying a purge gas, and the experts disagreed about what that structure would reveal to a person of ordinary skill in the art, the Court might possibly defer the indefinitenessinquiry to the summary judgment stage. Here, however, the failure to provide any structure for applying a purge gas requires that the Court find the claim indefinite as a matter of law. As a person of ordinary skill in the art could not read the specification as describing any structure for introducing a purge gas on a reverse side of the substrate, claim 5 is invalid for indefiniteness.

C. Claim 7

The Court turns to claim 7, which provides:

The apparatus for chemical vapor deposition of claim 6 wherein said gas flow means includes means for varying a distance between said substrate and a region where said gas is directed toward said substrate.

('165 patent 6 :32-35.)

Undisputed Claim Language
7. gas flow means

The parties agree "gas flow means" includes the structures and devices that influence the flow of gas through the apparatus. Accordingly, the Court adopts this construction.

Disputed Claim Language	ASM's construction	Genus's construction
7. means for varying a distance between said substrate and a region where said gas is directed toward	ASM contends this limitation is not indefinite.	Genus contends that this limitation is indefinite.

[25] The parties agree that claim 7 is a "means-plus-function" claim, and that interpretation of the claim is governed by 35 U.S.C. s. 112 para. 6. Accordingly, the claim is valid only if the specification, as understood by a person of ordinary skill in the art, describes some structure which performs the specified function of varying the distance between the substrate and a region where gas is directed to the substrate. Atmel, 198 F.3d at 1378.

There is no hint of such a structure in the specification. The abstract of the '165 patent states that "[t]he apparatus permits convenient control of the deposition process by varying the distance between apparatus introducing the gas carrying the deposition materials and the substrate." The summary of the invention states that "a gas, introduced at a preselected distance from the circular substrate, has an initial uniform velocity toward the surface" and that "[t]he distance from the substrate to the apparatus introducing the gas can be varied." ('165 patent 2 :45-47, 2 :55-56.) This language is simply a description of the function and does not suggest any structure for performing the function of varying the distance between the substrate and the place where the gas is directed towards the substrate.

The patent also provides:

One important aspect of the instant invention is the ability to control the distance as shown in FIG. 4 between the apparatus introducing the gas and the substrate. The ability to determined [sic] this distance provides an important tool in controlling the growth of the deposited materials on the substrate 10.

(*Id*. 5:10-15.) Figure 4, however, is merely "a schematic diagram of an apparatus for providing the initial conditions for the flow of gas," (*id*. 3:9-10), and does not illustrate any structure for varying the distance. Figure 4 merely indicates, with a lower-case "d" between two vertical arrows, the distance between the substrate and the showerhead mechanism that contains the gas flow apertures. Similarly, the text explaining Figure 4 (*id*. 3:50-4:9) makes no reference to any structure for varying the distance. As with claim 5, there is no structure disclosed in the specification for performing the desired function.

ASM argues that the Court should defer to the patent examiner, who approved the claim over an initial rejection. The patent examiner initially rejected claim 7 (then known as claim 13) for several reasons. Her concern regarding indefiniteness arose only because of an apparent drafting error in which claim 13 (now claim 7) was written as dependent on cancelled claim 12. ('165 Prosecution History at 0091.) When the inventors amended that claim to be dependent on claim 11 (which is now claim 6), the patent examiner dropped the indefiniteness argument. (*Id*. at 0097, 0101.)

The patent examiner also rejected claim 7 (then known as claim 13) because it failed to meet the written description requirement of 35 U.S.C. s. 112 para. 1. "No where [sic] in the original specification can be found the limitation of 'said member being ... adapted so that a distance between said apparatus and said circular substrate may be varied.' " (*Id*. at 0091.) When the inventors pointed out the language that now appears at column 5, lines 10 to 15, of the '165 patent (quoted above), the patent examiner dropped the rejection based on the "written description" requirement. (*Id*. at 0099.)

The "written description" requirement is set forth in an entirely separate section of the statute than either the definiteness requirement or the requirements for means-plus-function claims. At no point did the patent examiner ever offer an opinion as to whether the specification set forth a structure for performing the function in claim 7.

Because the specification sets forth no structure at all for varying the distance between the substrate and the place where the gas is directed to the substrate, claim 7 is not a valid means-plus-function claim. Atmel, 198 F.3d at 1378, 1382. Accordingly, claim 7 is invalid for indefiniteness.

C. Claim 11

The Court turns to claim 11, which provides:

The apparatus for chemical vapor deposition of claim 6 further including means for reducing autodoping of said substrate.

('165 patent 6 :14-16.)

Disputed Claim Language	ASM's construction	Genus's construction
11. means for reducing autodoping	ASM contends that no construction of this language is necessary, and that this limitation is not indefinite.	"reducing autodoping"-reducing the number of impurity atoms from the highly doped substrate that are detached from the substrate surface and incorporated via the gas phase into the more lightly doped layer of material being deposited.
		Genus contends that this limitation is indefinite.

[26] The parties agree that claim 11 is a "means-plus-function" claim, and that interpretation of the claim is governed by 35 U.S.C. s. 112 para. 6. The specification of the '165 patent expressly explains the concept of "autodoping":

A third problem is generally referred to as autodoping. In the autodoping process, impurity atoms from the highly doped substrate can be detached from the substrate surface and can be incorporated via the gas phase into the more lightly doped layer of material being deposited. In the related art, special steps must be taken to minimize autodoping, such as deposition of an extra coating onto the back of the substrate.

('165 patent 1 :47-55.) Genus' proposed construction is taken directly from this language.

ASM offers no construction of "autodoping" and does not specifically object to Genus' proposed construction. Since "autodoping" is a term that jurors will not recognize, it needs to be defined. As Genus' definition is taken directly from the specification, ASM can have no objection to defining "autodoping" in those terms. Accordingly, the Court adopts Genus' construction of "autodoping."

As claim 11 is a means-plus-function claim, the specification must disclose structure for reducing autodoping. There is very little language in the specification that discusses ways of reducing autodoping. The specification states that "the axial symmetry of the flow of gas reduces the autodoping of the deposited material." ('165 patent 2 :56-57.) The specification also provides that:

The axially symmetric flow of gas (away from the axis) has the important benefit of reducing autodoping by creating a flow of gas in a direction, relative to the substrate, that is opposite from the flow of materials producing the autodoping. This effect can be enhanced and autodopng [sic] further reduced, by applying a purge gas to the bottom of the substrate.

(*Id*. 5:15-22.) Creating an axially symmetric flow of gas cannot be the "means for reducing autodoping" claimed in claim 11, however. Claim 6 already requires a flow of gas having axial symmetry. Claim 11 is dependent on claim 6, and if creating an axially symmetric flow of gas is the "means for reducing autodoping," then claim 11 has no independent meaning. *See* 35 U.S.C. s. 112 para. 4 ("A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers."); s. 112 para. 2 ("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."). Thus, the only possible reference in the patent specification that could provide the structure for performing the function of reducing autodoping, as required by section 112, paragraph 6, is the single phrase "by applying a purge gas to the bottom of the substrate." ('165 patent 5 :21-22.)

This language, however, merely adds more functional language. There is nothing in the specification that explains *how* one should apply a purge gas to the bottom of the substrate, and there is no structure at all disclosed in the specification for applying a purge gas. Accordingly, once again, the failure of the specification to set forth any structure at all for reducing autodoping requires that the Court invalidate claim 11 for indefiniteness.

D. Claims 6 and 9

The Court turns to the parties' dispute about whether claims 6 and 9 are means-plus-function claims.

Disputed claim language	ASM's proposed construction	Genus' proposed construction
6. gas flow means having a plurality of apertures passing therethrough and disposed parallel to said substantially circular substrate, said plurality of apertures forming a generally circular configuration having a radius substantially equal to a radius of said substantially circular substrate and coaxially aligned therewith for producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular substrate, and maintaining a stagnation flow point at a center of said circular substrate.	ASM contends that the interpretation of these claims is not governed by 35 U.S.C. s. 112, para. 6.	Genus contends that the interpretation of these claims is governed by 35 U.S.C. s. 112, para. 6.
9. The apparatus for chemical vapor deposition of claim 6 wherein said gas flow means includes a plurality of apertures for extracting said gas without significantly altering said axial symmetry.		

[27] ASM contends that neither claim 6 nor claim 9 is a means-plus-function claim. Genus argues that both claims are means-plus-function claims, and that both claims are indefinite for failure to disclose the appropriate structure in the specification.

ASM argues that claim 6 may have been stated originally in means-plus-function format, but was amended to add so much structure that is no longer subject to section 112, paragraph 6. Claim 6, as originally filed, was much shorter. Then known as claim 11, the relevant original language of the claim was "gas flow means for producing a flow of gas having axial symmetry across said circular surface." ('165 Prosecution History at 0015.) This claim was rejected as obvious in light of prior art, and as indefinite. (*Id*. at 0035-36.)

David G. Rosenbaum, one of the attorneys who prosecuted the patent application, but who did not prepare the patent application, testified that he believed when he prosecuted the patent that claim 6 was a means-plus-function claim. (Sarboraria Decl., Ex. L (Rosenbaum Dep. 217:10-218:7.)) It is not clear from the deposition testimony, however, to which version of claim 6 Rosenbaum was referring. The deposition transcript refers him to claim 6 on page 13 of the prosecution history, but that page does not contain any claims. Moreover, at that early stage in the prosecution history, claim 6 would have been referred to as claim 11. Thus, Rosenbaum's testimony is unhelpful.

Genus also points to the testimony of William Holloway, who apparently had some role in drafting the

patent application. Holloway was asked about the original version of claim 11 (now claim 6), and was asked whether he intended to make that a means-plus-function claim element. Holloway responded:

I can't remember. It certainly says means. Yes, it-looking at it now, that would be my best guess, but I -

Q: So, you had a practice when you were drafting patent applications while you were at Weiss & Holloway to use the term means when you intended something to be means-plus-function and not use means when you intended it not to be means-plus-function?

A: I would say that was my practice, right.

(Sarboraria Decl., Ex. M (Holloway Dep.) 120:11-121:4.) Genus has not pointed to any testimony from Holloway about the later amendments to claim 11, however, which are the crux of the matter. In addition, whether a claim is a means-plus-function claim is a matter of law for the Court, not a matter of the intent of the parties.

After the original version of claim 11 was rejected, the inventors then amended it to provide:

gas flow means for producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular surface.

(*Id*. at 0040.) Claim 11 was rejected again as obvious in light of prior art, and was also rejected for failure to meet the written description requirement of section 112, paragraph 1, because the specification did not provide support for the invention as it was claimed. (*Id*. at 0048-50.)

The inventors amended claim 11 again, so that the relevant language provided:

gas flow means having a plurality of apertures passing therethrough and disposed parallel to said substantially circular substrate, for producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular substrate, and maintaining a stagnation flow point at a center of said circular substrate.

(*Id*. at 0052-53.) The examiner refused to enter the amendment to claim 11 because the language "gas flow means ... disposed parallel to said substantially circular substrate" raised new issues that were not present in the rejected claims. The examiner also rejected claim 11 again, for the same reasons previously stated.

The inventors ultimately abandoned the appeal and instead filed a continuation application, which reasserted the amended claims the examiner had previously refused to enter. (*Id*. 0062, 0073-74, 0078, 0081.) The examiner again rejected claim 11 as obvious, and also because it failed to meet the written description requirement. (*Id*. at 0089-91.)

The inventors again amended claim 11 so that it contained the language that was ultimately issued as claim 6. (*Id*. at 0096.) The examiner then allowed the claim. (*Id*. at 0101.)

ASM argues that by repeatedly amending claim 11 to add more and more structural limitations, the inventors took the claim out of means-plus-function format. Because the claim still uses the word "means," however, there is a presumption that it is in means-plus-function format. Personalized Media Communications, 161 F.3d at 703. In deciding whether the presumption has been rebutted, "the focus remains on whether the claim as properly construed recites sufficiently definite structure to avoid the ambit of s. 112 para. 6." *Id*. at 704. Where a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format, even if the claim uses the term "means." *Id*. (quoting Sage Prods. v. Devon Indus., Inc., 126 F.3d 1420, 1427-28 (Fed.Cir.1997)). ASM argues that the claim now contains sufficient structure to take it out of means-plus-function format.

The Court agrees with ASM that claim 6 now contains sufficient structure to "perform entirely the recited

function." The claim, as issued, now contains specific limitations describing the structure of the gas flow means. Claim 6 thus is similar to the claim at issue in Envirco Corp. v. Clestra Cleanroom, Inc., 209 F.3d 1360 (Fed.Cir.2000), which the court found was not a means-plus-function claim, despite the use of the word "means." *Id*. at 1363, 1364-65. "This recital of structure conflicts with the statutory requirement that means-plus-function claim elements state a function 'without the recital of structure.' " *Id*. at 1365 (quoting 35 U.S.C. s. 112, para. 6.); *see also* Cole v. Kimberly-Clark Corp., 102 F.3d 524, 531 (Fed.Cir.1996) ("To invoke this statute, the alleged means-plus-function claim element must not recite a definite structure which performs the described function.")

Genus argues, however, that the structure recited in claim 6 is not sufficient to perform the function of the gas flow means because "critical elements such as the plenum, the chamber, the diffuser behind the apertures, the size and shape of the apertures, to name a few, are not recited." (Opposition brief at 32.) At oral argument, Genus also argued that claim 6 fails to recite any structure for the extracting apertures.

There are only two functions described in the claim, though. The first is "producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to and having axial symmetry across said circular substrate," and the second is "maintaining a stagnation flow point at a center of said circular substrate." The first function, "producing a flow of gas" is specifically associated with the gas flow means in the original version of claim 11, and the later introduction of the language about apertures did not change this association. The second function is also associated with the gas flow means, and the apertures are identified as a structure for performing that function. The Court finds, however, that according to the specification, the arrangement of the apertures and the placement of the gas flow means parallel to the substrate are key to performing both of those functions, and these structures are set forth in claim 6. ('165 patent 3 :36-69.) The extracting apertures are not even claimed in claim 6, but instead appear only in claims 9 and 10. Thus, there is no need to provide structure for the extracting apertures in claim 6.

Accordingly, the Court finds that claim 6 contains enough structure to perform the recited functions, and is thus not a means-plus-function claim. Claim 9 is dependent on claim 6, and adds additional structural limitations to the gas flow means. Accordingly, claim 9 is not a means-plus-function claim either.

III. CONCLUSION

For the reasons set forth above, and for good cause shown, the Court construes the terms of the '165 patent as follows:

Claim 1:

Claim language	Court's construction
having a plurality of apertures passing therethrough	Apertures are discrete, arrangeable, openings through a solid material that allow a gas to flow from one side to the other.
	The use of the term "having" does not preclude the possibility that the apparatus may have additional gas flow apertures that do not have the characteristics of the gas flow apertures described in the claims. As the gas flow apertures described in the claims are associated with the performance of particular processes, however, any additional gas flow apertures must not be necessary to perform the processes described in the claims, and also must not interfere with those processes.
maintaining said flow of gas perpendicular to said substrate	The gas flow apertures always direct the flow of gas in an initial direction that is perpendicular to the substrate.
stagnation point flow	Stagnation point flow is achieved when a flow toward a solid surface in which the gas or fluid approaching the

	surface divides into streams proceeding away from the point at which the central streamline intersects the surface. This point is called the "stagnation flow point." In order to achieve a stagnation point flow, the direction of the flow initially must be perpendicular to the surface.
adapted so that a distance between said apparatus and said circular substrate may be varied	The apparatus for directing the flow of gas is designed so that the distance between the substrate and the apparatus may be varied while maintaining at all varied distances the perpendicularity of the gas flow relative to the substrate surface. (Agreed)
a generally circular configuration	No construction necessary
axial symmetry	A geometric figure possesses axial symmetry if it is unchanged when rotated about a given line, such as a circle rotated around its axis.

Claim 5:

Claim language	**Court's construction**
purge gas	A gas that aids in the removal of unwanted material. (Agreed)
apparatus for introducing a purge gas on a reverse side of said substrate	This is a means-plus-function claim.

Claim 6:

Claim language	**Court's construction**
gas flow means	The structures and devices that influence the flow of gas through the apparatus. (Agreed)
having a plurality of apertures passing therethrough	Apertures are discrete, arrangeable, openings through a solid material that allow a gas to flow from one side to the other.
	The use of the term "having" does not preclude the possibility that the apparatus may have additional gas flow apertures that do not have the characteristics of the gas flow apertures described in the claims. As the gas flow apertures described in the claims are associated with the performance of particular processes, however, any additional gas flow apertures must not be necessary to perform the processes described in the claims, and also must not interfere with those processes.
stagnation flow point	Stagnation point flow is achieved when a flow toward a solid surface in which the gas or fluid approaching the surface divides into streams proceeding away from the point at which the central streamline intersects the surface. This point is called the "stagnation flow point." In order to achieve a stagnation point flow, the direction of the flow initially must be perpendicular to the surface.
a generally circular configuration	No construction necessary
axial symmetry	A geometric figure possesses axial symmetry if it is unchanged when rotated about a given line, such as a circle rotated around its axis.
producing a flow of gas having a substantially uniform magnitude of velocity directed perpendicular to ... said circular substrate	The initial direction of the gas flow is perpendicular to the substrate and the speed of the gas flow is generally uniform among all of the apertures as the gas passes

	through them toward the substrate.

Claim 7:

Claim language	Court's construction
gas flow means	The structures and devices that influence the flow of gas through the apparatus. (Agreed)
means for varying a distance between said substrate and a region where said gas is directed toward such substrate	This is a means-plus-function claim. (Agreed)

Claim 9:

Claim language	Court's construction
gas flow means	The structures and devices that influence the flow of gas through the apparatus. (Agreed)
apertures	Apertures are discrete, arrangeable, openings through a solid material that allow a gas to flow from one side to the other.
axial symmetry	A geometric figure possesses axial symmetry if it is unchanged when rotated about a given line, such as a circle rotated around its axis.

Claim 10:

Claim language	Court's construction
baffles	Structures affecting gas flow. (Agreed)
apertures	Apertures are discrete, arrangeable, openings through a solid material that allow a gas to flow from one side to the other.

Claim 11:

Claim language	Court's construction
reducing autodoping	reducing the number of impurity atoms from the highly doped substrate that are detached from the substrate surface and incorporated via the gas phase into the more lightly doped layer of material being deposited.
means for reducing autodoping	This is a means-plus-function claim. (Agreed)

The Court also finds that:

1. Claim 5 is a means-plus-function claim. Because the specification does not disclose any structure for "introducing a purge gas on a reverse side of said substrate," claim 5 is invalid for indefiniteness.

2. Claim 7 is a means-plus-function claim. Because the specification does not disclose any structure for "varying a distancebetween said substrate and a region where said gas is directed toward such substrate," claim 7 is invalid for indefiniteness.

3. Claim 11 is a means-plus-function claim. Because the specification does not disclose any structure for reducing autodoping, other than the creation of an axially symmetric gas flow which is already claimed in independent claim 6, claim 11 is invalid for indefiniteness.

4. Claims 6 and 9 are not means-plus-function claims.

IT IS SO ORDERED.

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