

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE GILLETTE COMPANY, FUJITSU SEMICONDUCTOR
LIMITED, and FUJITSU SEMICONDUCTOR AMERICA, INC.,
Petitioner,

v.

ZOND, LLC,
Patent Owner.

Case IPR2014-00604¹
Patent 6,896,775 B2

Before KEVIN F. TURNER, DEBRA K. STEPHENS, JONI Y. CHANG,
SUSAN L.C. MITCHELL, and JENNIFER MEYER CHAGNON,
Administrative Patent Judges.

TURNER, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

The Gillette Company (“Gillette”) filed a Petition requesting *inter partes* review of claims 30–37 of U.S. Patent No. 6,896,775 B2 (“the ’775 Patent”). Paper 3 (“Pet.”). Patent Owner Zond, LLC (“Zond”) filed a

¹ IPR2014-01482 has been joined with IPR2014-00604.

Preliminary Response. Paper 7 (“Prelim. Resp.”). We instituted the instant trial on October 15, 2014, pursuant to 35 U.S.C. § 314. Paper 9 (“Dec.”).

Subsequent to institution, we granted a revised Motion for Joinder filed by Taiwan Semiconductor Manufacturing Company, Ltd., TSMC North America Corp., (collectively, “TSMC”), Fujitsu Semiconductor Limited, and Fujitsu Semiconductor America, Inc. (collectively, “Fujitsu”), joining Case IPR2014-01482 with the instant trial (Paper 12), and also granted a Joint Motion to Terminate with respect to TSMC (Paper 40). Zond filed a Response (Paper 34 (“PO Resp.”)), and Gillette² filed a Reply (Paper 42 (“Reply”)). Oral hearing³ was held on May 26, 2015, and a transcript of the hearing was entered into the record. Paper 49 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we determine that Gillette has shown, by a preponderance of the evidence, that claims 30–37 of the ’775 Patent are unpatentable under 35 U.S.C. § 103(a).

A. Related District Court Proceedings

The parties indicate that the ’775 Patent was asserted in *Zond, LLC v. Advanced Micro Devices, Inc.*, No.1:13-cv-11567-DJC (D. Mass.), and identify other proceedings in which Zond asserted the ’775 patent. Pet. 1; Paper 6.

² We refer to Gillette and Fujitsu collectively as “Gillette” herein.

³ The hearings for this review and IPR2014-00578 were consolidated.

B. The '775 Patent

The '775 Patent relates to methods and apparatus for generating magnetically enhanced plasma. Ex. 1101, Abs. At the time of the invention, sputtering was a well-known technique for depositing films on semiconductor substrates. *Id.* at 1:14–25. The '775 Patent indicates that prior art magnetron sputtering systems deposit films having low uniformity and poor target utilization (the target material erodes in a non-uniform manner). *Id.* at 3:34–44. To address these problems, the '775 Patent discloses that increasing the power applied between the target and anode can increase the uniformity and density in the plasma. *Id.* at 3:45–56. However, increasing the power also “can increase the probability of generating an electrical breakdown condition leading to an undesirable electrical discharge (an electrical arc) in the chamber 104.” *Id.*

According to the '775 Patent, forming a weakly-ionized plasma substantially eliminates the probability of establishing a breakdown condition in the chamber when high-power pulses are applied between the cathode and anode. *Id.* at 7:4–15. Once the weakly-ionized plasma is formed, high-power pulses are applied between the cathode and anode to generate a strongly-ionized plasma from the weakly-ionized plasma. *Id.* at 7:16–24. The '775 Patent also discloses that the provision of the feed gas to the plasma allows for homogeneous diffusion of the feed gas in the weakly-ionized plasma and allows for the creation of a highly uniform strongly-ionized plasma. *Id.* at 5:59–67.

C. Illustrative Claims

Of the challenged claims, claims 30, 36, and 37 are independent claims. Claims 31–35 depend from claim 30. Claims 30 and 37, reproduced below, are illustrative:

30. A method of magnetically enhanced plasma processing, the method comprising:

ionizing a volume of feed gas to form a weakly-ionized plasma proximate to a cathode;

generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the cathode;

applying an electrical pulse across the weakly-ionized plasma to generate a strongly-ionized plasma comprising a first plurality of ions;

exchanging the strongly-ionized plasma with a second volume of feed gas while applying the electrical pulse across the second volume of feed gas to generate a strongly-ionized plasma comprising a second plurality of ions; and

applying a bias voltage to a substrate that is positioned proximate to the cathode, the bias voltage causing ions in the first and the second plurality of ions to impact a surface of the substrate in a manner that causes etching of the surface of the substrate.

37. A magnetically enhanced plasma processing apparatus comprising:

means for ionizing a volume of feed gas to form a weakly-ionized plasma proximate to a cathode;

means for generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the cathode;

means for applying an electrical pulse across the weakly-ionized plasma to generate a strongly-ionized plasma comprising a first plurality of ions;

means for exchanging the strongly-ionized plasma with a second volume of feed gas while applying the electrical pulse across the second volume of feed gas to generate a strongly-ionized plasma comprising a second plurality of ions; and

means for applying a bias voltage to a substrate that is positioned proximate to the cathode, the bias voltage causing ions in the first and the second plurality of ions to impact a surface of the substrate in a manner that causes etching of the surface of the substrate.

Ex. 1101, 23:46–67, 24:45–65.

D. Prior Art Relied Upon

Based on the instituted grounds, Gillette relies upon the following prior art references:

Lantsman	US 6,190,512	Feb. 20, 2001	(Ex. 1104)
Wang	US 6,413,382	July 2, 2002	(Ex. 1108)

D.V. Mozgrin, et al., *High-Current Low-Pressure Quasi-Stationary Discharge in a Magnetic Field: Experimental Research*, 21 PLASMA PHYSICS REPORTS 400–409 (1995) (Ex. 1102) (hereinafter “Mozgrin”).

A. A. Kudryavtsev and V.N. Skrebov, *Ionization Relaxation in a Plasma Produced by a Pulsed Inert-Gas Discharge*, 28(1) SOV. PHYS. TECH. PHYS. 30–35 (Jan. 1983) (Ex. 1103) (hereinafter “Kudryavtsev”).

E. Grounds of Unpatentability

We instituted the instant trial based on the following grounds of unpatentability (Dec. 28):

Claim(s)	Basis	References
30–34 and 37	§ 103(a)	Wang, Mozgrin, and Lantsman
35	§ 103(a)	Wang, Mozgrin, Lantsman, and Kudryavtsev
36	§ 103(a)	Wang and Mozgrin

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1275–79 (Fed. Cir. 2015) (“Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA,”⁴ and “the standard was properly adopted by PTO regulation.”). Significantly, claims are not interpreted in a vacuum but are part of, and read in light of, the specification. *United States v. Adams*, 383 U.S. 39, 49 (1966) (“[I]t is fundamental that claims are to be construed in the light of the specifications and both are to be read with a view to ascertaining the invention.”). Claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the

⁴ The Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”).

art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). An inventor may rebut that presumption by providing a definition of the term in the specification with “reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

The parties identify five claim elements recited in the claims as means-plus-function elements, invoking 35 U.S.C. § 112, ¶ 6.⁵ Pet. 12–15; Prelim. Resp. 15–19. We address the claim terms identified by the parties below.

We agree that those claim elements are written in means-plus-function form and fall under 35 U.S.C. § 112, ¶ 6, because: (1) each claim element uses the term “means for”; (2) the term “means for” in each claim element is modified by functional language; and (3) the term “means for” is not modified by any structure recited in the claim to perform the claimed function. *Personalized Media Commc’ns, LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 703–04 (Fed. Cir. 1998) (using the term “means for” creates a rebuttable presumption that the drafter intended to invoke § 112, ¶ 6) (citations omitted); *Sage Prods., Inc. v. Devon Indus., Inc.*, 126 F.3d 1420, 1427–28 (Fed. Cir. 1997) (the presumption is not rebutted if the term “means for” is modified by functional language and is not modified by any

⁵ Section 4(c) of the AIA re-designated 35 U.S.C. § 112, ¶ 6, as 35 U.S.C. § 112(f). Pub. L. No. 112-29, 125 Stat. 284, 296 (2011). Because the ’775 Patent has a filing date before September 16, 2012 (effective date), we refer to the pre-AIA version of § 112 in this Decision.

structure recited in the claim to perform the claimed function); *see also Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015) (confirming that “use of the word ‘means’ creates a presumption that § 112, ¶ 6 applies” (citing *Personalized Media*, 161 F.3d at 703)).

The first step in construing a means-plus-function claim element is to identify the recited function in the claim element. *Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1210 (Fed. Cir. 2003). The second step is to look to the specification and identify the corresponding structure for that recited function. *Id.* A structure disclosed in the specification qualifies as “corresponding” structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. *B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed. Cir.1997). “While corresponding structure need not include all things necessary to enable the claimed invention to work, it must include all structure that actually performs the recited function.” *Default Proof Credit Card Sys. Inc. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005) (citation omitted).

Upon review of the parties’ contentions and the Specification, we set forth our claim constructions in the Decision on Institution for the means-plus-function elements identified by the parties. Dec. 8–14. Petitioner does not challenge any aspect of our claim constructions as to these claim elements, and Patent Owner does not challenge these constructions, except as noted below in our substantive discussion of the grounds of unpatentability. PO Resp. 10–17; Reply 2. Based on this entire record, we also discern no reason to modify our claim constructions at this juncture.

For convenience, our claim constructions are reproduced in the table below:

Means-Plus-Function Claim Element	Identified Corresponding Structure
“means for ionizing a [volume of] feed gas”	a power supply electrically connected to a cathode, an anode, and/or an electrode
“means for generating a magnetic field”	a magnet assembly having either a permanent magnet or a current source coupled to one or more electro-magnets
“means for applying an electrical field [or pulse]”	a pulsed power supply electrically connected to a cathode, an anode, and/or an electrode
“means for exchanging”	a gas flow control system and structures for supplying the gas to the strongly-ionized plasma
“means for applying a bias voltage”	a bias voltage source electrically coupled to substrate

B. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). In that regard, an obviousness analysis “need not seek out precise teachings

directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418; *Translogic*, 504 F.3d at 1259. We analyze the asserted grounds of unpatentability in accordance with the above-stated principles.

C. Claims 30–37—Obviousness over Wang, Mozgrin, and Lantsman; Wang, Mozgrin, Lantsman, and Kudryavtsev; or Wang and Mozgrin

Gillette asserts that claims 30–34 and 37 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Wang, Mozgrin, and Lantsman. Pet. 38–51. Gillette also asserts that claims 35 and 36 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Wang, Mozgrin, Lantsman, and Kudryavtsev, or Wang and Mozgrin, respectively. Pet. 51–58. As support, Gillette provides detailed explanations as to how each claim limitation is met by the references and rationales for combining the references, as well as a declaration of Mr. Richard DeVito (Ex. 1111). Gillette also submitted a Declaration of Dr. John Bravman (Ex. 1120) to support its Reply to Zond’s Patent Owner Response.

Zond responds that the combinations of prior art do not disclose every claim element. PO Resp. 34–46. Zond also argues that insufficient reason exists to combine the technical disclosures of Wang, Mozgrin, Lantsman, and Kudryavtsev. *Id.* at 18–34. To support its contentions, Zond proffers a Declaration of Dr. Larry D. Hartsough (Ex. 2006).

We have reviewed the entire record before us, including the parties’ explanations and supporting evidence presented during this trial. We begin

our discussion with a brief summary of Wang, Lantsman, and Kudryavtsev, address their combination with Mozgrin, and then we address the parties' contentions in turn.

Wang

Wang discloses a power pulsed magnetron sputtering apparatus for generating a very high plasma density. Ex. 1108, Abs. Wang also discloses a sputtering method for depositing metal layers onto advanced semiconductor integrated circuit structures. *Id.* at 1:4–15.

Figure 1 of Wang, reproduced below, illustrates a cross-sectional view of a power pulsed magnetron sputtering reactor:

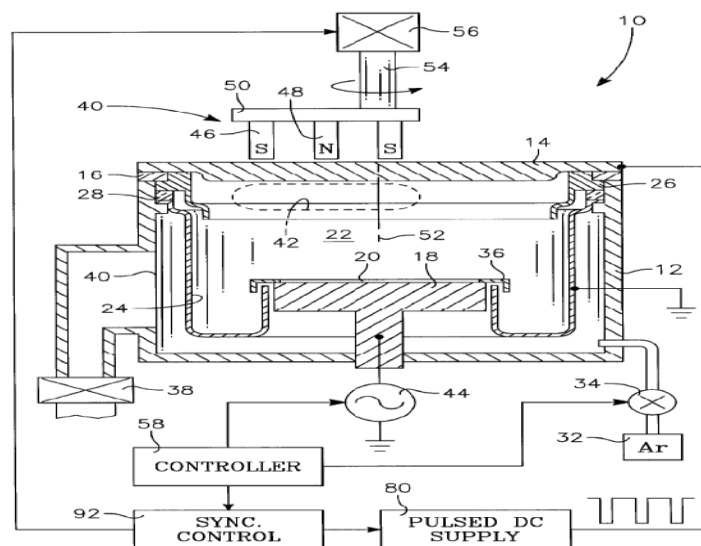


FIG. 1

Fig. 1 of Wang illustrates its magnetron sputtering apparatus.

As shown in Figure 1 of Wang, magnetron sputtering apparatus 10 has pedestal electrode 18 for supporting semiconductor substrate 20, anode 24, cathode 14, magnet assembly 40, pulsed DC power supply 80, and bias power supply 44, the latter used to apply a bias voltage to the substrate. *Id.* at 3:57–4:55. According to Wang, the apparatus is capable of creating high

density plasma in region 42, from argon gas feed 32 through mass flow controller 34, which ionizes a substantial fraction of the sputtered particles into positively charged metal ions and also increases the sputtering rate. *Id.* at 4:5–34. Wang further recognizes that, if a large portion of the sputtered particles are ionized, the films are deposited more uniformly and effectively—the sputtered ions can be accelerated towards a negatively charged substrate, coating the bottom and sides of holes that are narrow and deep. *Id.* at 1:24–29.

Figure 6 of Wang, reproduced below, illustrates how the apparatus applies a pulsed power to the plasma:

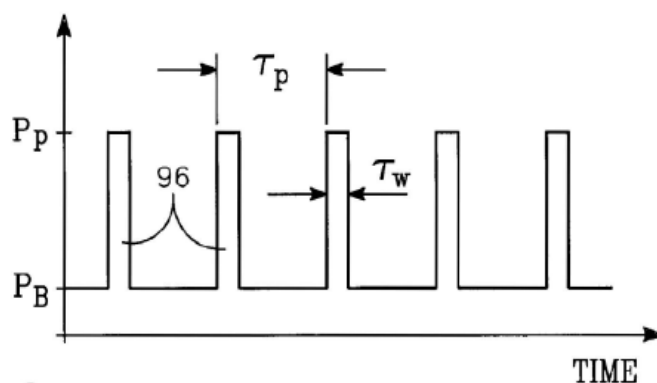


FIG. 6

Fig. 6 of Wang illustrates a representation of applied pulses.

As shown in Figure 6 of Wang, the target is maintained at background power level P_B between high power pulses 96 with peak power level P_P . *Id.* at 7:13–39. Background power level P_B exceeds the minimum power necessary to support a plasma in the chamber at the operational pressure (e.g., 1kW). *Id.* Peak power P_P is at least 10 times (preferably 100 or 1000 times) background power level P_B . *Id.* The application of high peak power P_P causes the existing plasma to spread quickly, and increases the density of

the plasma. *Id.* According to Mr. DeVito, Wang's apparatus generates a low-density (weakly-ionized) plasma during the application of background power P_B , and a high-density plasma during the application of peak power P_P . Ex. 1111 ¶¶ 137–140; *see also* Pet. 43–45.

Lantsman

Lantsman discloses a plasma ignition system for plasma processing chambers having primary and secondary power supplies, used to generate a plasma current and a process initiation voltage, respectively. Ex. 1104, Abs. The primary power supply provides the primary power to electrically drive the cathode during the plasma process, and the secondary power supply supplies an initial plasma ignition voltage to “pre-ignite” the plasma so that when the primary power supply is applied, the system smoothly transitions to final plasma development and deposition. *Id.* at 2:48–51.

The system is applicable to magnetron and non-magnetron sputtering and RF sputtering systems. *Id.* at 1:6–8. Lantsman also provides that “arcing which can be produced by overvoltages can cause local overheating of the target, leading to evaporation or flaking of target material into the processing chamber and causing substrate particle contamination and device damage,” and “[t]hus, it is advantageous to avoid voltage spikes during processing wherever possible.” *Id.* at 1:51–59.

Lantsman also discloses that “at the beginning of processing . . . gas is introduced into the chamber” and “[w]hen the plasma process is completed, the gas flow is stopped.” *Id.* at 3:10–13. This is illustrated in Figure 6 of Lantsman reproduced below:

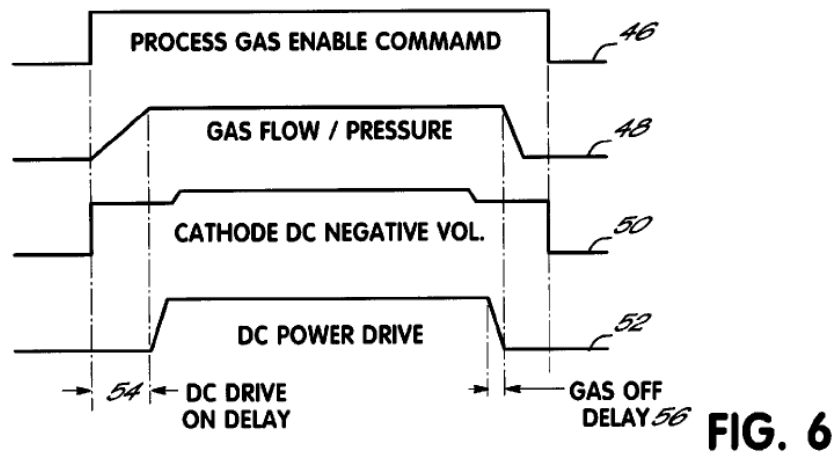
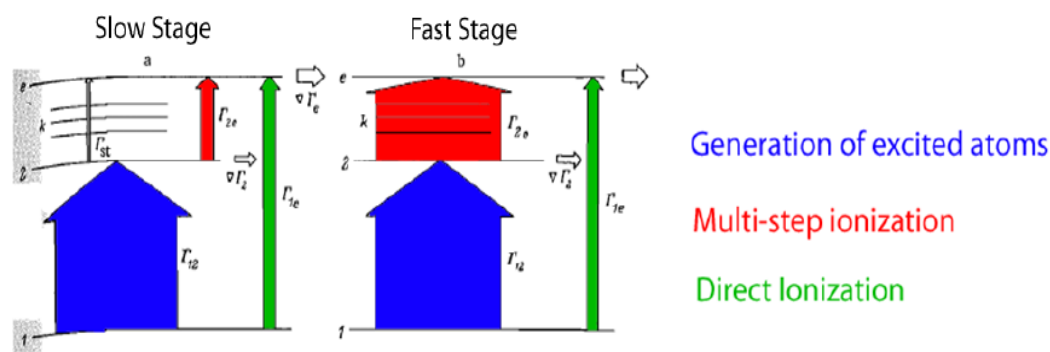


Fig. 6 of Lantsman illustrates the timing of its processes. Figure 6 illustrates that the gas flow is initiated, and the gas flow and pressure begin to ramp upwards toward normal processing levels for the processing stage. *Id.* at 5:39–42.

Kudryavtsev

Kudryavtsev discloses a multi-step ionization plasma process, comprising the steps of exciting the ground state atoms to generate excited atoms, and then ionizing the excited atoms. Ex. 1103, Abs., Figs. 1, 6.

Figure 1 of Kudryavtsev (annotations added) illustrates the atomic energy levels during the slow and fast stages of ionization. Annotated Figure 1 is reproduced below:



Annotated Fig. 1 of Kudryavtsev illustrates stages of ionization.

As shown in annotated Figure 1 of Kudryavtsev, ionization occurs with a “slow stage” (Fig. 1a) followed by a “fast stage” (Fig. 1b). During the initial slow stage, direct ionization provides a significant contribution to the generation of plasma ions (arrow Γ_{1e} showing ionization (top line labeled “e”) from the ground state (bottom line labeled “1”)). Mr. DeVito explains that Kudryavtsev notes that under certain conditions multi-step ionization can be the dominant ionization process. Ex. 1111 ¶¶ 121–124; Pet. 53.

Specifically, Kudryavtsev discloses:

For nearly stationary n_2 [excited atom density] values . . . *there is an explosive increase in n_e [plasma density]*. The subsequent increase in n_e then reaches its maximum value, equal to the rate of excitation . . . which is several orders of magnitude greater than the ionization rate during the initial stage.

Ex. 1103, 31 (emphasis added). Kudryavtsev also recognizes that “in a pulsed inert-gas discharge plasma at moderate pressures . . . [i]t is shown that the electron density increases explosively in time due to accumulation of atoms in the lowest excited states.” *Id.* at Abs., Fig. 6.

Rationale to Combine References

Gillette notes Mozgrin provides for a similar system to that described in Wang (Pet. 40), and Gillette also argues the similarities between the systems of Wang and Mozgrin would have made it obvious to have used the system of Wang for etching, as taught by Mozgrin. Pet. 47–48 (citing Ex. 1102, 403). With respect to Wang and Lantsman, Gillette argues that:

[I]f one of ordinary skill took Lantsman's teaching of continually introducing new feed gas during processing, then the electrical pulse of Wang would be applied across a second volume of feed gas, i.e., the additional volume of feed gas being supplied, and Mozgrin's pulse would thus generate a second plurality of ions.

Pet. 45–46. Gillette further argues that it would have been obvious to continue to add feed gas during etching, as confirmed by Lantsman. *Id.* at 46.

In addition, Gillette argues that it would have been obvious to combine Wang, Mozgrin, and Lantsman with Kudryavtsev because Kudryavtsev generally discloses the characteristic of ionization whenever a field is applied suddenly to a weakly-ionized gas. Pet. 30–33, 53 (citing Ex. 1103, 34). The applied pulses of Wang, discussed above, would act to generate suddenly an electric field, and one of ordinary skill reading Wang would have been motivated to consider Kudryavtsev to further appreciate the effects of applying Wang's pulse. *Id.* Mr. DeVito provides similar conclusions, testifying that “Kudryavtsev . . . explains the contribution of excited atoms to the overall ionization process,” and that this would have been

obvious to have been applied to the system in Wang. Ex. 1111

¶¶ 120, 156.

The parties' dispute mainly centers on whether Gillette has articulated a reason with rational underpinning why one with ordinary skill in the art would have combined the prior art teachings. Zond argues that Gillette fails to demonstrate that one with ordinary skill in the art would have combined the systems of Wang, Mozgrin, Kudryavtsev, and Lantsman to achieve the claimed invention with reasonable expectation of success or predictable results. PO Resp. 18–34.

In particular, Zond contends that Gillette does not take into consideration the substantial, fundamental structural differences between the systems of Wang, Mozgrin, Kudryavtsev, and Lantsman—e.g., pressure, chamber geometry, gap dimensions, and magnetic fields. *Id.* at 29–34 (citing, *e.g.*, Ex. 1102, Abstract, 400–401; Ex. 1104, Abstract, 2:49–51, 4:11–37, 5:42–52, Fig. 6; Ex. 1108, 3:60–61, 5: 18–22, 26–27, 43–48, 52–54, 8:41–42; Ex. 2006 ¶¶ 12, 15, 57–60, 66, 70–71, 78). Additionally, even if a combination was somehow made, Zond argues that it would differ significantly from the system disclosed in the '775 Patent. *Id.*

In its Reply, Gillette responds that Zond's arguments focus on bodily incorporating one system into the other. Reply 8–11. Gillette also responds that Mozgrin demonstrates that the teachings of Kudryavtsev can be successfully applied in different systems with different geometries and conditions. *Id.* at 10–11. Upon consideration of the evidence before us, we are persuaded by Gillette's contentions.

Specifically, we are not persuaded by Zond's argument that Mozgrin's and Wang's sputtering apparatuses would have been viewed as significantly

different, or that one with ordinary skill in the art would not have had a reasonable expectation of success in combining the teachings. Obviousness does not require absolute predictability, only a reasonable expectation that the beneficial result will be achieved. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

As Dr. Bravman testifies, it was known that increasing the sputter etching rate was desirable and that all of the references are directed to that same common goal. Ex. 1120 ¶¶ 68, 71, 79. Additionally, Kudryavtsev's model on plasma behavior is not intended to be limited to a particular type of plasma apparatus. *Id.* ¶ 72. Indeed, Kudryavtsev discloses a study of the ionization relaxation in plasma when the external electric field suddenly increases. *Id.* Specifically, Kudryavtsev discloses that “the *electron density increases explosively* in time due to accumulation of atoms in the lowest excited states.” Ex. 1103, Abs. (emphasis added). Kudryavtsev also describes the experimental results that confirm the model. *Id.* at 32–34. Moreover, Kudryavtsev expressly explains that “the effects studied in this work are characteristic of ionization *whenever a field is suddenly applied to a weakly ionized gas.*” *Id.* at 34 (emphasis added).

Dr. Bravman also testifies that a person having ordinary skill in the art “would have looked to Kudryavtsev to understand how plasma would react to a quickly applied voltage pulse, and how to achieve an explosive increase in electron density” when generating a strongly-ionized plasma for improving sputtering and manufacturing processing. Ex. 1120 ¶ 73. Dr. Bravman further explains that such an artisan would have known how to apply Kudryavtsev's model to Wang's system by making any necessary changes to accommodate the differences through routine experimentation.

Id. ¶¶ 73–74. Mozgrin cites to Kudryavtsev and discloses that in “[d]esigning the unit, we took into account the dependences which had been obtained in [Kudryavtsev] of ionization relaxation on pre-ionization parameters, pressure, and pulse voltage amplitude.” Ex. 1102, 401.

Dr. Bravman also explains that this illustrates that one with ordinary skill in the art at the time of the invention was capable of applying the teachings of Kudryavtsev to magnetron sputtering systems, such as Wang’s. Ex. 1120 ¶ 75. On this record, we credit Dr. Bravman’s testimony (*id.* ¶¶ 68–77) because his explanations are consistent with the prior art of record.

For the foregoing reasons, we are persuaded that Gillette has articulated a reason with rational underpinning why one with ordinary skill in the art would have combined Wang, Mozgrin, Lantsman, and Kudryavtsev as indicated in the Petition.

The Steps of Claim 30 Do Not Require a Specific Order

Claim 30 recites steps of “ionizing a . . . feed gas to form a weakly-ionized plasma,” and “generating a magnetic field proximate to the weakly-ionized plasma.” Zond argues that the Petition is deficient because it fails to demonstrate the method steps of claim 30 in their required, recited order, because the magnetic field in Wang is always on and not generated later, after the formation of the weakly-ionized plasma. PO Resp. 34–37.

Gillette responds that Zond’s expert, Dr. Hartsough, acknowledges that claim 15, which recites similar steps in the same order, covers embodiments where the magnetic field is applied prior to feed gas being ionized to form the weakly-ionized plasma. Reply 2–3 (citing Ex. 1101,

Figs. 12A, 13A; Ex. 1119, 87:6–18). Gillette also cites to its own expert, Dr. Bravman, to support its interpretation of claim 30. Reply 3 (citing Ex. 1120 ¶¶ 97–100). We agree with Gillette’s arguments.

During Oral Hearing, counsel for Zond acknowledged Dr. Hartsough’s testimony and did not dispute that the steps of claim 15, and thus, claim 30, do not require a specific order, but continued to emphasize that if Gillette believed a specific order was required, and did not make that case in its Petition, the Petition continues to be deficient. Tr. 50–51. We are not persuaded, however, that a petition must be judged according to its own internalized metrics. Rule 42.104(b)(4) requires that the petition “must specify where each element of the claim is found in the prior art patents or printed publications relied upon.” 37 C.F.R. § 42.104(b)(4). Often, a petition must consider multiple theories of claim construction, and to fault a petition for not adequately supporting a theory we find to be incorrect does not seem appropriate. Although we may consider correct theories not adequately supported in a petition to weigh against institution and against unpatentability, we are not persuaded that incorrect theories, not espoused in a petition, should be held against that petition.

In the instant case, there appears to be no dispute that the steps of claim 30 need not be performed in the recited order, and we do not find Zond’s arguments to be persuasive. Further, based on the evidence before us, we are persuaded that Gillette has demonstrated, by a preponderance of evidence, that the combination of Wang, Mozgrin, and Lantsman discloses all of the steps of claim 30.

Means for Ionizing Requiring a Gap Between Cathode and Anode

Claims 36 and 37 recite, in part, “means for ionizing a [volume of] feed gas to generate a weakly-ionized plasma proximate to a cathode.” Zond relies on the testimony of Dr. Hartsough in asserting that the means for ionizing must have a gap between the anode and cathode, and that the dimensions and volume are parameters in the ionization process. PO Resp. 37–38 (citing Ex. 2006 ¶ 22).

Zond continues that, because “Wang does not teach that any plasma is positioned between its cathode 14 and grounded shield anode 24,” Wang cannot teach the claimed gap. PO Resp. 40–41. Zond also argues that the floating shield precludes a finding that the cathode is positioned adjacent to the anode, as required by claims 36 and 37. *Id.* Zond continues that citations to “Fu” (U.S. Patent No. 6,306,265) and “Chiang” (U.S. Patent Application No. 09/414,614 (Ex. 2009)), incorporated by reference in Wang, further suggest that an interposed grounded shield would have been the anode-cathode geometry that a person of ordinary skill in the art would have looked to and would not meet the requirements of claims 36 and 37. PO Resp. 41–44 (citing Ex. 2006 ¶¶ 22, 80). Zond also argues that relying on the gap found in Mozgrin would not benefit the combination because it would require the abandonment of the grounded shield favored by Wang. *Id.* at 44.

We note that our construction of “means for ionizing a [volume of] feed gas to generate a weakly-ionized plasma proximate to a cathode” is “a power supply electrically connected to a cathode, an anode, and/or an electrode.” Zond’s arguments directed to the requirement of a “gap” are misplaced. Just as the corresponding structure for the “means for ionizing”

relates to the cathode and anode, as discussed in Section II.A, we need not include specifically the anode and cathode in that structure, as they are separate elements. For example, both claims 36 and 37 separately recite “a cathode” and “a substrate,” so that they need not be included in the means-plus-function elements. Similarly, we do not find the corresponding structure for the “means for ionizing” need include “a gap,” with or without a specific value for that gap. We are not persuaded that any proposed construction, which requires the corresponding structure include a particular “gap” between the cathode and anode, is the broadest reasonable interpretation.

Nonetheless, Gillette, in response, counters that Wang provides for such a gap, between its cathode and anode. Reply 7. Therefore, based on the evidence before us, we are persuaded that Gillette has demonstrated, by a preponderance of evidence, that the combination of Wang and Mozgrin or the combination of Wang, Mozgrin, and Lantsman discloses a cathode that is positioned adjacent to the anode and forming a gap there between, per claims 36 and 37.

Location of Strongly-Ionized Plasma

Claim 33 recites, in part, that “the strongly-ionized plasma [is] substantially uniform in an area adjacent to the surface of the substrate.” Zond argues that Wang teaches that its strongly-ionized plasma is confined to the high density plasma (“HDP”) region adjacent the sputtering target, which is considerably distant from the substrate and will not result in plasma that is uniform throughout. PO Resp. 44–46. We do not agree.

Zond does not dispute that Wang’s strongly-ionized plasma located in region 42, as shown in Figure 1 of Wang, is substantially uniform. *Id.* Zond also does not dispute that “the unbalanced magnetic field will cause the HDP region to extend into the processing space 22” (*id.* at 45), thus potentially making it proximate to the substrate. Rather, Zond’s argument attempts to construe the claim term “proximate to the sputtering target” to require the plasma to be generated across *the entire area* of the sputtering target at all times. *Id.*

Zond’s arguments are not commensurate with the scope of the claims. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) (stating that limitations not appearing in the claims cannot be relied upon for patentability). Zond and its expert do not direct us to where the Specification sets forth a special definition, let alone explain why such a construction would be the broadest reasonable interpretation. PO Resp. 44–46; Ex. 2006 ¶¶ 79, 90. Based on our review of the Specification, we discern nothing in claim 33 that would require the strongly-ionized plasma to be generated across the entire surface area of the substrate at all times.

Even if the claim requires the plasma to be substantially uniform across *the entire area* across the surface of the substrate, as urged by Zond, the combination of Wang, Mozgrin, and Lantsman would have rendered such a limitation obvious. Zond’s argument narrowly focuses on Wang’s Figure 1 that shows the situation where the magnetron is *not rotating*. PO Resp. 44–46. In fact, Wang discloses another embodiment in which the *magnetron rotates* behind the target and moves the strongly-ionized plasma over the entire surface of the sputtering target, generating a substantially uniform plasma across the entire area proximate to the sputtering target.

Ex. 1108, 4:46–51. Dr. Bravman’s Declaration indicates that over time, the plasma would be uniform across the surface of the substrate based on the rotation of the magnetron. Ex. 1120 ¶¶ 112–120. We credit Dr. Bravman’s testimony as it is consistent with Wang’s disclosure.

Given the evidence in this record, we determine that Gillette has demonstrated, by a preponderance of evidence, that the combination of Wang, Mozgrin, and Lantsman would have suggested to one with ordinary skill in the art at the time of the invention generating a substantially uniform strongly-ionized plasma proximate to the substrate surface, as required by claim 33.

Conclusion

Patent Owner does not provide additional arguments with respect to claims 31, 32, 34, and 35. We have reviewed Petitioner’s arguments and evidence regarding these claims (Pet. 38–58), and given the evidence in the record before us, we determine that Petitioner has demonstrated, by a preponderance of evidence, the unpatentability of those claims. For the foregoing reasons, we conclude that Gillette has demonstrated, by a preponderance of evidence, that claims 30–37 are unpatentable over the asserted combinations of Wang, Mozgrin, and Lantsman; Wang, Mozgrin, Lantsman, and Kudryavtsev; and Wang and Mozgrin.

III. CONCLUSION

For the foregoing reasons, we conclude that Gillette has demonstrated, by a preponderance of the evidence, that claims 30–37 of the '775 Patent are unpatentable based on the following grounds of unpatentability:

Claim(s)	Basis	References
30–34 and 37	§ 103(a)	Wang, Mozgrin, and Lantsman
35	§ 103(a)	Wang, Mozgrin, Lantsman, and Kudryavtsev
36	§ 103(a)	Wang and Mozgrin

IV. ORDER

In consideration of the foregoing, it is
ORDERED that claims 30–37 of the '775 Patent are held
unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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