

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG SEMICONDUCTOR, INC., and
SAMSUNG AUSTIN SEMICONDUCTOR, LLC,

Petitioners

v.

CHIEN-MIN SUNG,

Patent Owner

IPR2024-00535
U.S. Patent No. 9,724,802

PATENT OWNER'S DEMONSTRATIVES

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Patent Trial and Appeal Board
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Submitted Electronically via PTACTS

Samsung v. Chien-Min Sung, IPR2024-0535 U.S. Patent No. 9,724,802

Oral Argument

June 20, 2025

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Priority Dates of the '802 Claims

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

As Claims of a Continuation-in-part Application, the Claims of the ‘802 Patent Cannot All Have the Same Priority Date

“Different claims of [a CIP] application may . . . receive different effective filing dates.” *Augustine Medical, Inc. v. Gaymar Industries, Inc.*, 181 F.3d 1291, 1302 (Fed. Cir. 1999).

“A CIP application can be entitled to different priority dates for different claims. Claims containing any matter introduced in the CIP are accorded the filing date of the CIP application. However, matter disclosed in the parent application is entitled to the benefit of the filing date of the parent application.” *Waldemar Link v. Osteonics Corp.*, 32 F.3d 556, 558 (Fed. Cir. 1994).

Petitioners Do Not Dispute that Many of the Limitations of Claim 1 are Disclosed in Patent Owner's Prior Applications

- Petitioners do not dispute that at least three key limitations of the sole independent claim 1 of the '802 Patent contain only subject matter from prior applications.
- Petitioners acknowledge that Patent Owner amended claim 1 to include claim element [1D] and stated that this claim element is fully supported by Sung '817.
- Petitioners acknowledge that all of the limitations of claim 1 of the '802 Patent are disclosed in Dr. Sung's prior applications.

The '802 Patent Claims Priority to Sung '817

14/506,476
US 9,724,802
Filed: Oct. 3, 2014

13/797,704
Filed: Mar. 12, 2013

12/726,786
Filed: Mar. 18, 2010

11/560,817 (Sung '817)
Filed: Nov. 16, 2006

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

The '802 Patent Claims Priority to Sung '786

14/506,476
US 9,724,802
Filed: Oct. 3, 2014

13/797,704
Filed: Mar. 12, 2013

12/726,786
Filed: Mar. 18, 2010

11/560,817 (Sung '817)
Filed: Nov. 16, 2006

11/223,786 (Sung '786)
2007/0060026 (Sung '026)
Filed: Sep. 9, 2005

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

The Institution Decision Focuses on Limitations [1E] and [1F]

Sung '817	Sung '786
"It is not clear to us, and Patent Owner does not explain . . . how the '817 Application's disclosure pertaining to particle tips varying from a designated profile within variously specified tolerances demonstrates possession of limitation [1E] which concerns the difference in protrusion distance between the two highest particle tips." (Institution Decision at 38.) "It is not clear to us, and Patent Owner does not explain . . . how the '817 Application's disclosure pertaining to particle tips varying from a designated profile within variously specified tolerances demonstrates possession of limitation [1F] which concerns the difference in protrusion distance between the highest 1% of particle tips being 80 microns or less." (Institution Decision at 41.)	"Perhaps, with more explanation, some of these disclosures might demonstrate possession of limitation [1E], but such explanation is lacking in the preliminary record before us." (Institution Decision at 44.) "Perhaps, with more explanation, some of these disclosures might demonstrate possession of limitation [1F], but such explanation is lacking in the preliminary record before us." (Institution Decision at 47.)

Claim Limitation 1[E] Is Fully Supported by Sung '817

'802 Patent	Sung '817
[1E]: “wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns”	As such, in one aspect a majority of the plurality of cutting elements is arranged such that the tips vary from the designated profile by from about 1 micron to about 150 microns . . . [or] from about 5 microns to about 100 microns. (14:14-16.) In yet another aspect, the plurality of cutting elements are arranged such that their tips vary from the designated profile by from about 10 microns to about 75 microns . . . from about 10 microns to about 50 microns . . . from about 50 microns to about 150 microns . . . from about 20 microns to about 100 microns . . . from about 20 microns to about 50 microns . . . from about 20 microns to about 40 microns . . . by less than about 20 microns . . . by less than about 10 microns . . . by less than about 5 microns . . . [or] by less than about 1 micron . . . [or] less than about 10% of the average size of the superabrasive particles. (14:16-15:4.)

Dr. Tsai's Unrebutted Testimony Confirms that Claim Limitation 1[E] Is Fully Supported by Sung '817

“[A] POSITA would know that the claimed difference in protrusion distance of ‘less than or equal to about 50 microns’ between the highest and second highest tips are supported by the foregoing portions of the Sung '817.”

Ex. 2011 at ¶ 59.

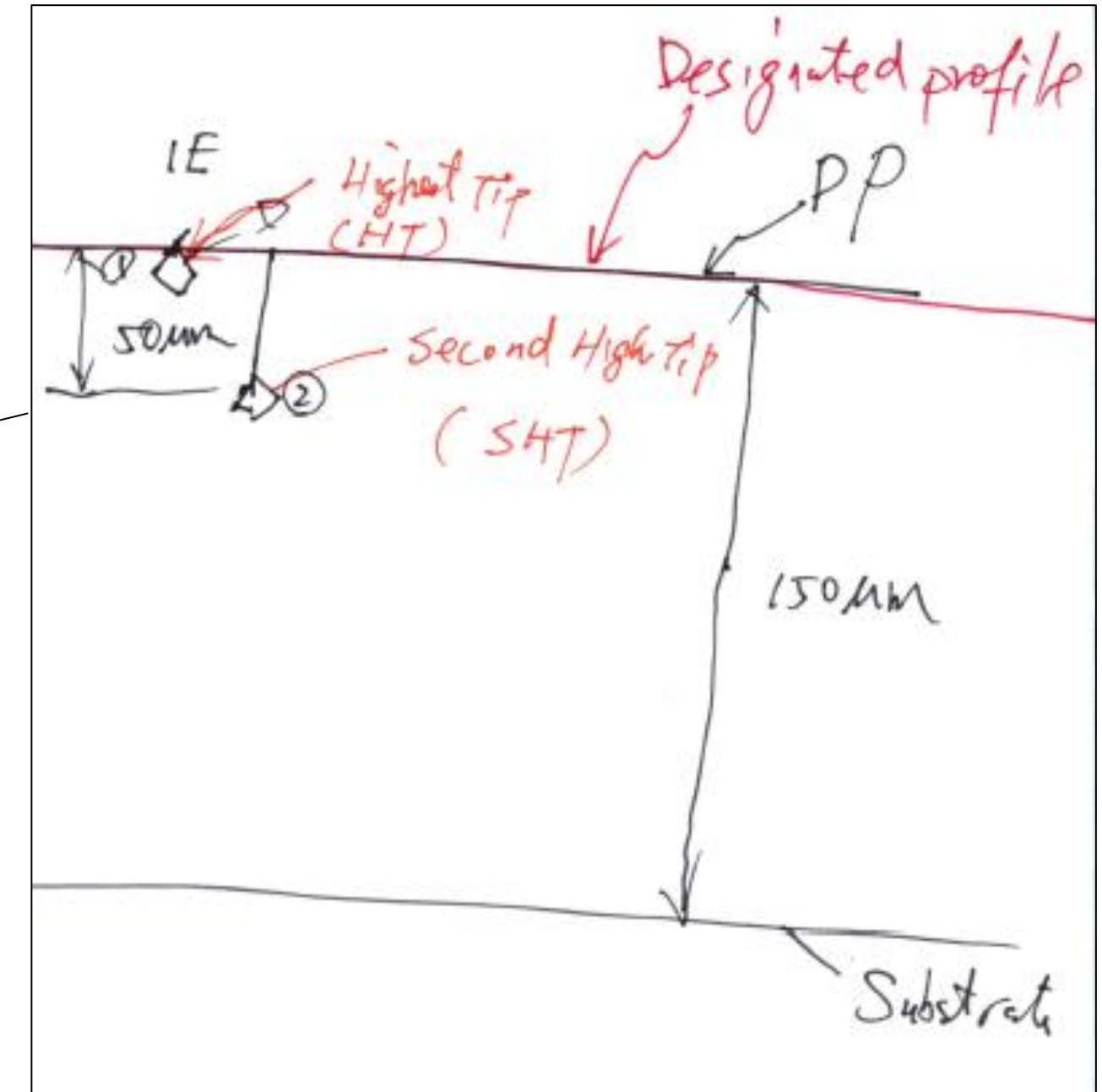
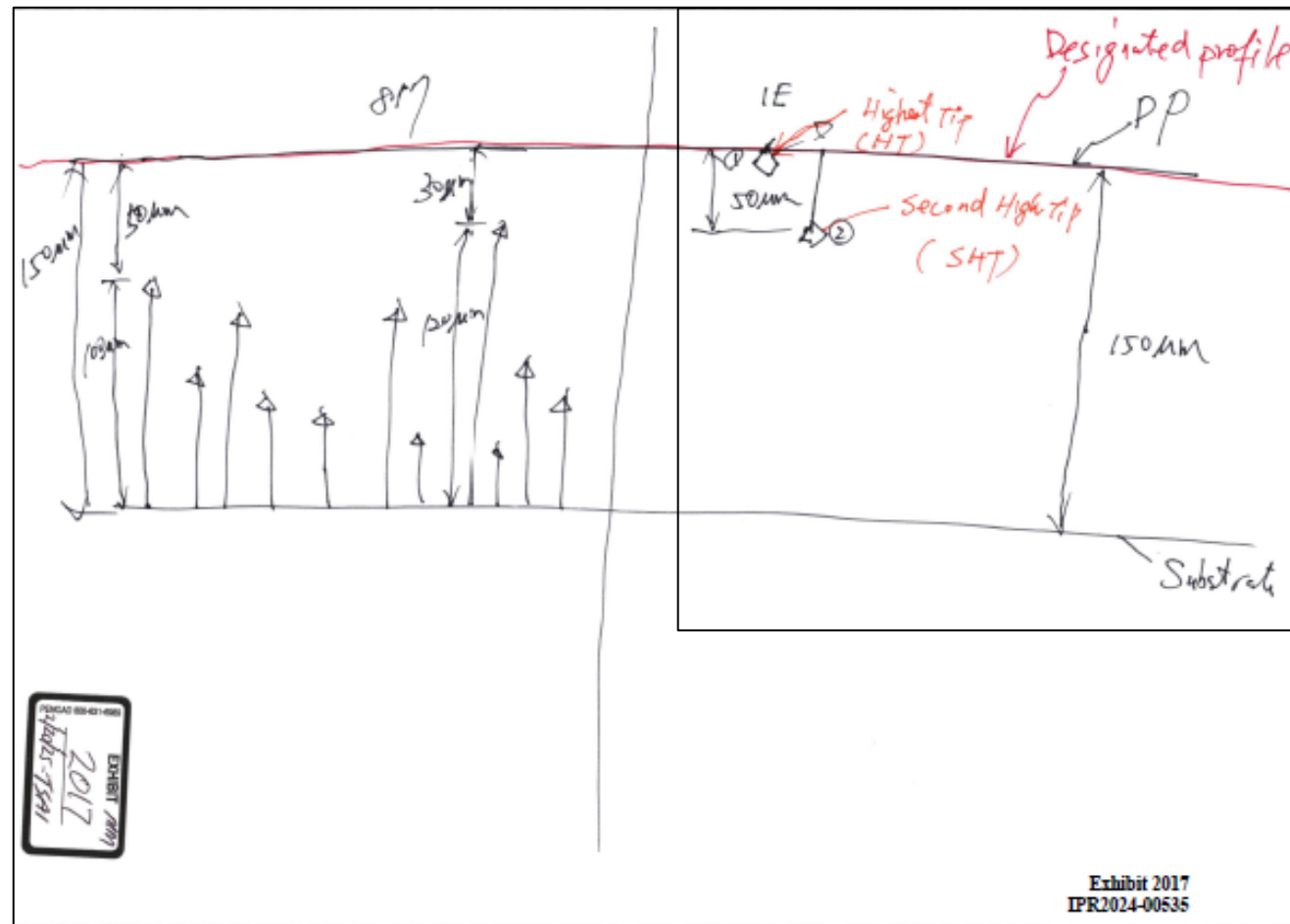
“It's obvious for '817, the range is from 1 micron to 150 micron, so 50 micron is in this range.”

Ex. 1055 at 181:10-12.

“What I'm saying is that if it represents all tips, then, of course, it would also include the highest protruding tip and the second highest protruding tip.”

Ex. 1055 at 185:22-24.

Dr. Tsai's Unrebutted Testimony Confirms that Claim Limitation 1[E] Is Fully Supported by Sung '817



DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Claim Limitation [1F] Is Fully Supported by Sung '817

'802 Patent	Sung '817
[1F]: “and the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less”	In another aspect, the plurality of cutting elements are arranged such that their tips vary from the designated profile by from about 5 microns to about 100 microns . . . from about 10 microns to about 75 microns . . . [or] from about 10 microns to about 50 microns. . . . (14:16-21.)

Dr. Tsai's Unrebutted Testimony Confirms that Claim Limitation 1[F] Is Fully Supported by Sung '817

A POSITA would know that the foregoing disclosure provides sufficient written support for the subject matter of claim limitation [1F] because the above disclosure references “the plurality of cutting elements,” which covers all of the tips, including the highest 1%.

Ex. 2011 at ¶ 66.

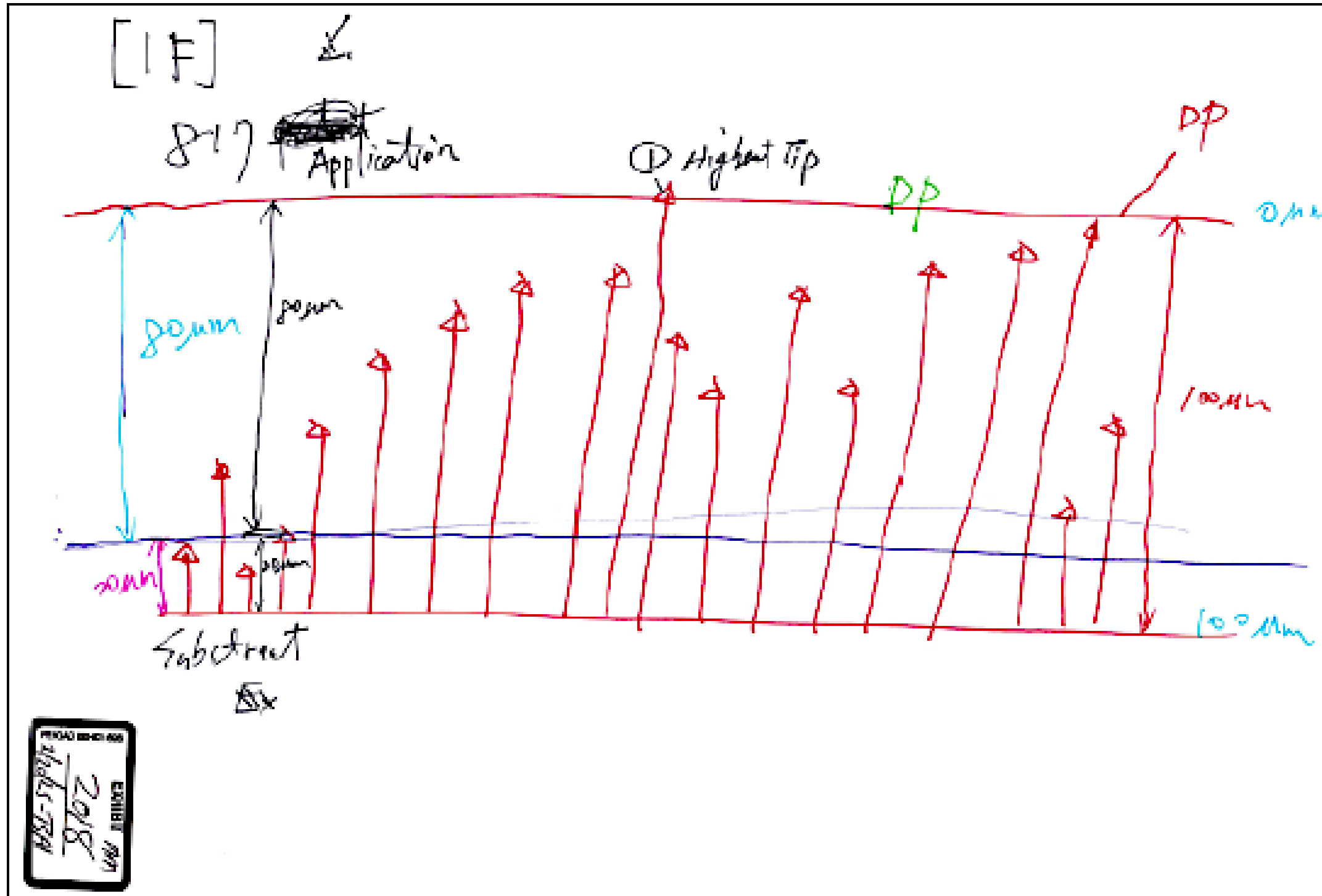
The range here says from zero to 100 micron, so this is the range. From this top, from this tip, go down 80 micron and covering all these tips, these are all the working particles, because they are within the 100 micron. Therefore, [] these are all the working particles.

Ex. 1055 at 183:22-184:6.

POR at 18; Sur-reply at 6.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Dr. Tsai's Unrebutted Testimony Confirms that Claim Limitation 1[F] Is Fully Supported by Sung '817



Ex. 2018.

Sur-reply at 7.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Claim Limitation [1E] Is Fully Supported by Sung '786

'802 Patent	Sung '786
“wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns”	As such, in one aspect a majority of the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 1 micron to about 150 microns. In another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 5 microns to about 100 microns . . . from about 10 microns to about 75 microns . . . from about 10 microns to about 50 microns . . . from about 50 microns to about 150 microns . . . from about 20 microns to about 100 microns . . . from about 20 microns to about 50 microns . . . from about 20 microns to about 40 microns . . . by less than about 20 microns . . . by less than about 10 microns . . . by less than about 5 microns . . . by less than about 1 micron . . . [or] less than about 10% of the average size of the superabrasive particles. (22:16-13:14.)

Dr. Tsai's Unrebutted Testimony Confirms that Claim Limitation 1[E] Is Fully Supported by Sung '786

Based on the foregoing disclosures, a POSITA would know that Sung '786 provides written support for the subject matter recited in claim limitation 1[E] for the same reason that Sung '817 provides written support for the subject matter recited in claim limitation 1[E].

Ex. 2011 at ¶ 71.

Q. . . . You already testified to Exhibits 2018 and 2017 with respect to Sung '817. Would your testimony change with respect to Sung '786 with respect to what you have drawn?

A. No.

Ex. 1055 at 186:13-17.

Claim Limitation [1F] Is Fully Supported by Sung '786

'802 Patent	Sung '786
1[F] “and the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less”	In another aspect, the plurality of cutting elements are arranged such that their tips vary from the designated profile by from about 5 microns to about 100 microns . . . from about 10 microns to about 75 microns . . . [or] from about 10 microns to about 50 microns. . . . (12:24-30) from about 1 micron to about 150 microns (12:22-24)

Dr. Tsai's Unrebutted Testimony Confirms that Claim Limitation 1[F] Is Fully Supported by Sung '786

“[A] POSITA would know that Sung '786 provides written support for the subject matter recited in claim limitation 1[F] for the same reason that Sung '817 provides written support for the subject matter recited in claim limitation 1[F].”

Ex. 2011 at ¶ 77.

“Q. . . . You already testified to Exhibits 2018 and 2017 with respect to Sung '817. Would your testimony change with respect to Sung '786 with respect to what you have drawn?

A. No.”

Ex. 1055 at 186:13-17.

Samsung's Arguments in IPR2024-0534 Lend Further Support

'862 Patent	'802 Patent
[1C] wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 10 microns	[1E] wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns
[1D] and the difference in protrusion distance between the highest 10 protruding tips of the monolayer of superabrasive particles are [sic] within about 20 microns or less; and	[1F] the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less

- Samsung has waived the argument that Sung '786/Sung '026 does not support claim elements [1E] and [1F] of the '802 patent when it has argued in the parallel proceeding that Sung '786/Sung '026 discloses the substantially similar elements of the '862 patent.

17. After the joint venture terminated, I continued to conduct my own research and development in CMP disk technology. During this period, I invented the subject matter that forms the basis of the patent application (the "'802 Application") from which the '802 Patent issued. I then filed the '802 Application with the United States Patent and Trademark Office on October 3, 2014.

18. I invented this new subject matter, which is claimed in the '802 Patent, after the joint venture with Kinik ended Oct. 28, 2013. This invention is not disclosed in any of the patents or patent applications to which the '802 Patent claims priority or during the pendency of the joint venture.

Ex. 1011 at ¶¶ 17-18.

POR at 32.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Claims 1-7 and 13-21 Share the Priority Date of Claim 1

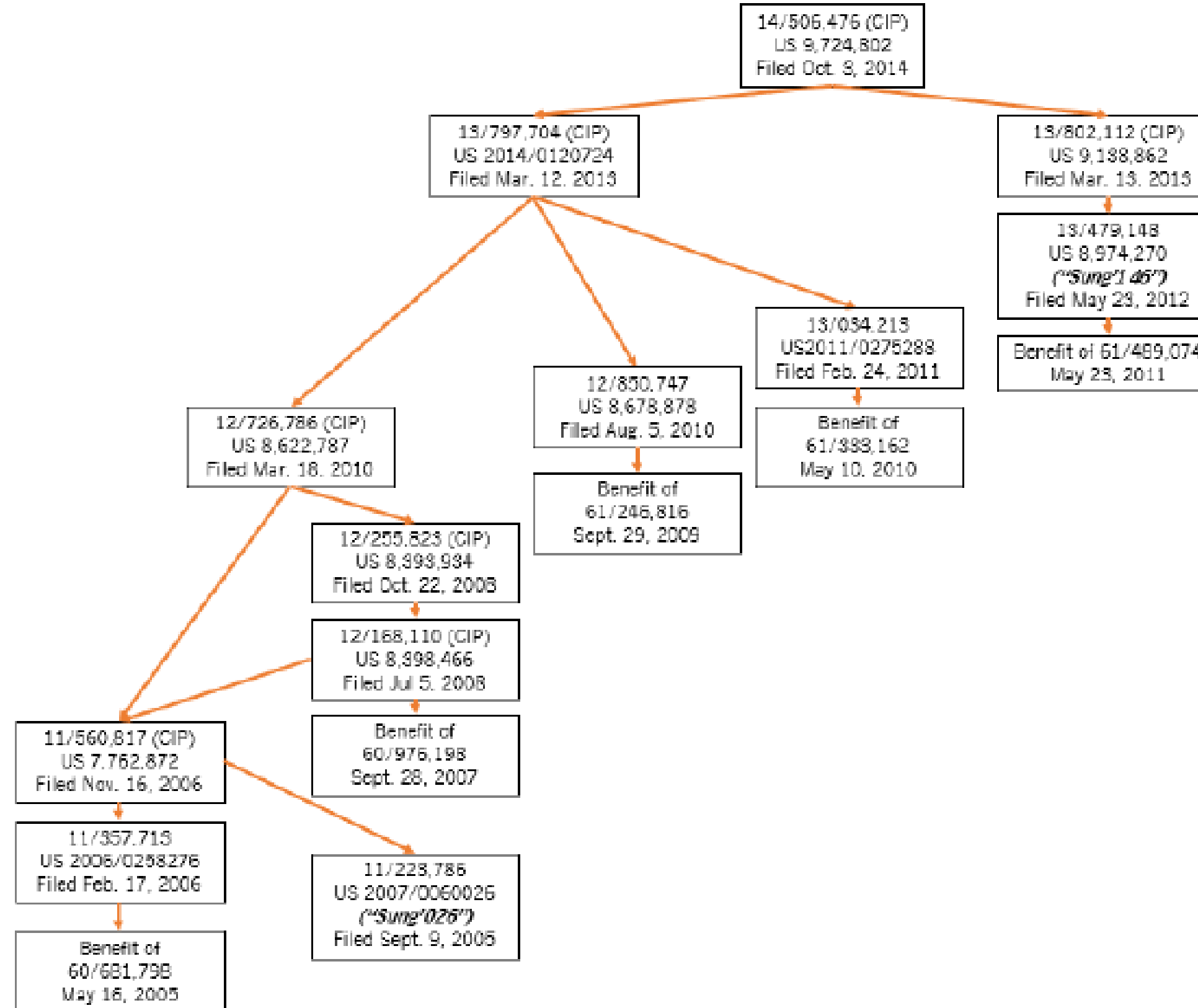
'802 Claims	Priority Date
1-7, 13-21	Sept. 9, 2005 (Sung '786) Nov. 16, 2006 (Sung '817)
8-12	Oct. 3, 2014 (filing date of '802 Patent)

The Co-Pending Application Requirement

- Each of the CIP applications in the chain between Sung '817 and Sung '786 and the '802 patent was co-pending with its parent, meeting the requirement of 35 U.S.C. § 120.
- None of the priority applications issued as a patent or was abandoned prior to the filing of the successive CIP.
- Petitioners' cited *Natural Alternatives* is inapplicable. There was no amendment to the priority claim here.

- In *Hollmer*, the priority claim for the '880 patent at issue was based on new matter incorporated by reference from the '579 application, an application outside the chain of applications to which the '880 application claimed priority
- Several of the intervening applications did not reference the '579 application at all.
- By contrast, in the case of the '802 patent, there are:
 - a direct chain of priority between each of the applications leading to the '802 patent;
 - no break in the priority chain as in *Hollmer*;
 - no new matter incorporated from outside of the family of applications to which the '802 patent claims priority.

The Co-Pending Application Requirement



DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

The Co-Pending Application Requirement


US 20140120724A1

(19) **United States**
(12) **Patent Application Publication**
(10) **Pub. No.: US 2014/0120724 A1**
(43) **Pub. Date: May 1, 2014**

(54) **COMPOSITE CONDITIONER AND ASSOCIATED METHODS**
61/246,816, filed on Sep. 29, 2009, provisional application No. 61/333,162, filed on May 10, 2010.

(71) Applicant: **Chien-Min Sung, Tansui (TW)**
(72) Inventor: **Chien-Min Sung, Tansui (TW)**
(21) Appl. No.: **13/797,704**
(22) Filed: **Mar. 12, 2013**

(30) **Foreign Application Priority Data**
Apr. 10, 2012 (TW) 101112625

Publication Classification

(51) **Int. Cl.**
B24B 53/017 (2006.01)
H01L 21/306 (2006.01)
B24D 18/00 (2006.01)

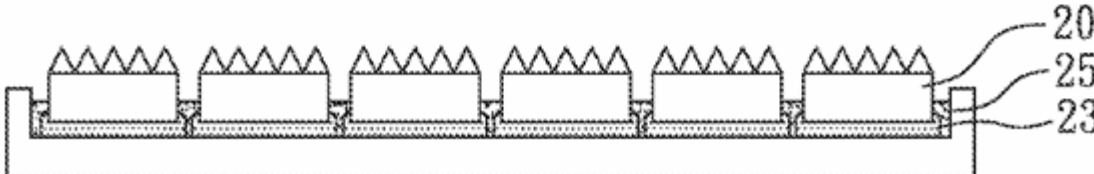
(52) **U.S. Cl.**
CPC *B24B 53/017* (2013.01); *B24D 18/0072* (2013.01); *H01L 21/30625* (2013.01)
USPC **438/692**; 451/443; 51/297

(57) **ABSTRACT**
CMP pad dressers having leveled tips and associated methods are provided. In one aspect, for example, a composite conditioner can include a base plate and a plurality of polishing units secured to a surface of the base plate by an adhesive layer, where each polishing unit includes a plurality of polishing tips secured in a binding layer. Additionally, a height difference between a first highest polishing tip and a second highest polishing tip is less than or equal to about 10 μm, a height difference between the first highest polishing tip and a tenth highest polishing tip is less than or equal to about 20 μm, and a height difference between the first highest polishing tip and a 100th highest polishing tip is less than or equal to about 40 μm. Furthermore, the first highest polishing tip protrudes from the binding layer to a height of greater than or equal to about 50 μm.

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/726,786, filed on Mar. 18, 2010, now Pat. No. 8,622,787, which is a continuation-in-part of application No. 12/255,823, filed on Oct. 22, 2008, now Pat. No. 8,393,934, which is a continuation-in-part of application No. 12/168,110, filed on Jul. 5, 2008, now Pat. No. 8,398,466, which is a continuation-in-part of application No. 11/560,817, filed on Nov. 16, 2006, now Pat. No. 7,762,872, which is a continuation-in-part of application No. 11/357,713, filed on Feb. 17, 2006, now abandoned, Continuation-in-part of application No. 12/628,859, filed on Dec. 1, 2009, now Pat. No. 7,901,272, which is a continuation-in-part of application No. 11/804,221, filed on May 16, 2007, now Pat. No. 7,651,386, which is a continuation-in-part of application No. 11/223,786, filed on Sep. 9, 2005, now abandoned, Continuation-in-part of application No. 12/850,747, filed on Aug. 5, 2010, Continuation-in-part of application No. 13/034,213, filed on Feb. 24, 2011, now abandoned.

(60) Provisional application No. 60/976,198, filed on Sep. 28, 2007, provisional application No. 60/681,798, filed on May 16, 2005, provisional application No.



Related U.S. Application Data

(63) Continuation-in-part of application No. 12/726,786, filed on Mar. 18, 2010, now Pat. No. 8,622,787, which is a continuation-in-part of application No. 12/255,823, filed on Oct. 22, 2008, now Pat. No. 8,393,934, which is a continuation-in-part of application No. 12/168,110, filed on Jul. 5, 2008, now Pat. No. 8,398,466, which is a continuation-in-part of application No. 11/560,817, filed on Nov. 16, 2006, now Pat. No. 7,762,872, which is a continuation-in-part of application No. 11/357,713, filed on Feb. 17, 2006, now abandoned, Continuation-in-part of application No. 12/628,859, filed on Dec. 1, 2009, now Pat. No. 7,901,272, which is a continuation-in-part of application No. 11/804,221, filed on May 16, 2007, now Pat. No. 7,651,386, which is a continuation-in-part of application No. 11/223,786, filed on Sep. 9, 2005, now abandoned, Continuation-in-part of application No. 12/850,747, filed on Aug. 5, 2010, Continuation-in-part of application No. 13/034,213, filed on Feb. 24, 2011, now abandoned.

Ground I: Tsai Does Not Anticipate or Render Obvious Claims 1-5, 13, 15 or 19-21

Tsai Is Not Prior Art to Claims 1-5 and 13-21

'802 Claims	Priority Date
1-7, 13-21	Sept. 9, 2005 (Sung '786) Nov. 16, 2006 (Sung '817)
8-12	Oct. 3, 2014 (filing date of '802 Patent)

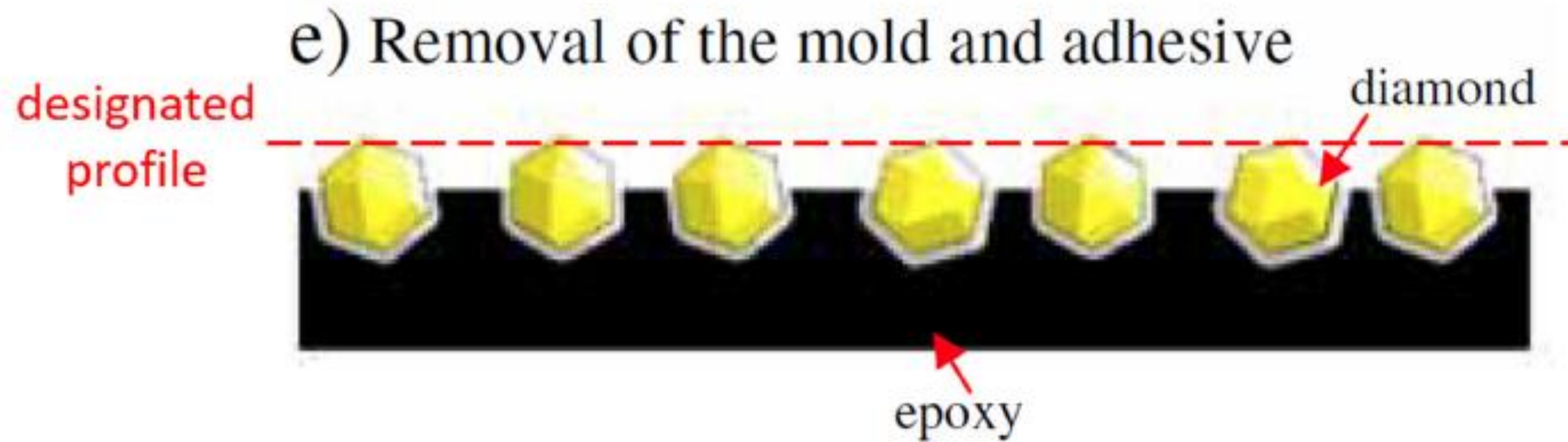
- According to Petitioners, the publication date of Tsai is January 10, 2012. (Pet. at 3.)
- Therefore Tsai is not prior art to claims 1-5 and 13-21.
- Petitioners do not argue that Tsai anticipates claims 8-12.

“designated profile”

Claims 1, 19

Dr. Tsai Was Unequivocal that his Article Does Not Teach a Designated Profile Along Which Tip Heights Align

Dr. Shanfield	Dr. Tsai (Author of Tsai)
“Controlling superabrasive tip height variation in this way designates a flat profile above the epoxy resin . . . to which each of the tips of the superabrasive particles should align” (Ex. 1002 at ¶ 131.)	“Tsai makes no mention of a profile or contour of any kind, nor does it teach that its particles must align in any specific way. That is because, as I have described above, Tsai is concerned with reducing the overall variation in diamond tip height, not with causing the diamond tips to arrange along a specific profile or contour.” (Ex. 2011 at ¶ 31.)



EX1004, Fig. 2e (annotated).

Dr. Tsai Was Unequivocal that His Research Did Not Involve Designating a Profile Along Which Tip Heights Align

“Q. . . . So looking at what you have labeled as Exhibit 1004, can that line correspond to the designated profile described in Claim 1 of the '802 patent? A. No.”

Ex. 1055 at 151:4-14.

“Q. Was the designated profile a design consideration for ODD at the time of publishing this paper? . . . THE WITNESS: We did not consider it.”

Ex. 1055 at 158:15-18.

Dr. Tsai Rejects Dr. Shanfield's "Expert" Opinion and Testifies to the "Blue Line" as Tsai's "Baseline"



Ex. 2013

Sur-reply at 14.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Dr. Tsai Explained that the Baseline in Ex. 2013 Could Not Be Used to Predetermine a Profile of Tip Heights

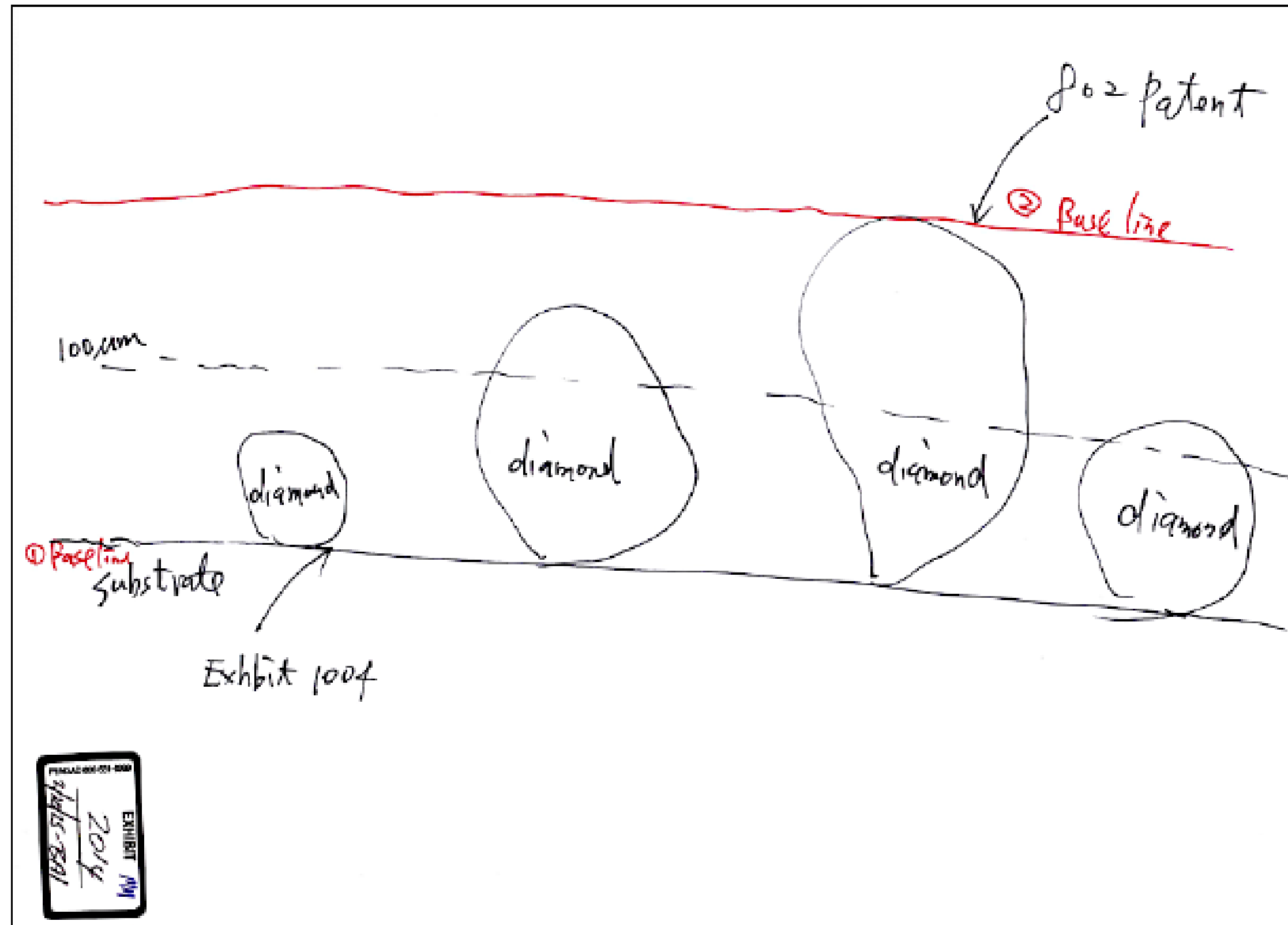
“Q. So how is the measurement of the heights different when someone uses the blue line as opposed to the red line?

. . .

THE WITNESS: If that one assumed it is 140 micron, then from the highest point to that point would be 10 micron. From the top point looking down to the second highest, the distance would be 10 micron in between.

And if you look at the distance from the bottom, from the blue line up, then that would be 140 micron. Therefore, they are different.

Dr. Tsai Testified that Tsai Does Not Use or Contemplate the Claimed “Designated Profile”



Ex. 2014

Sur-reply at 15.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Dr. Tsai's Unrebutted Testimony

- The method of levelling diamond tips taught by Tsai refers to reducing overall difference in tip height, not reducing all of the tips to the same height. (Ex. 2011 at)
- The goal of the Tsai reference was not to obtain “equal heights and identically shaped tips.” (Ex. 1055 at 16
- Diamond tips with the 15um height variation disclosed in Tsai would not have a flat contour. (Ex. 2011 at
- The reverse casting method used in Tsai does not involve designating a profile along which tip heights align. (Ex. 2011 at
- Reverse casting is not associated with a designated profile in the '802 patent.

**“highest/second highest/10th
highest/100th highest protruding tip”**

Claims 1-5

“predetermined pattern”

Claims 20-21

“I was using the probing approach to do this experiment.”

(Ex. 1055 at 208:25-209:1.)

“[U]sing the probing approach, I can only measure a portion of the entire[] [conditioner].”

(*Id.* At 207:3-7.)

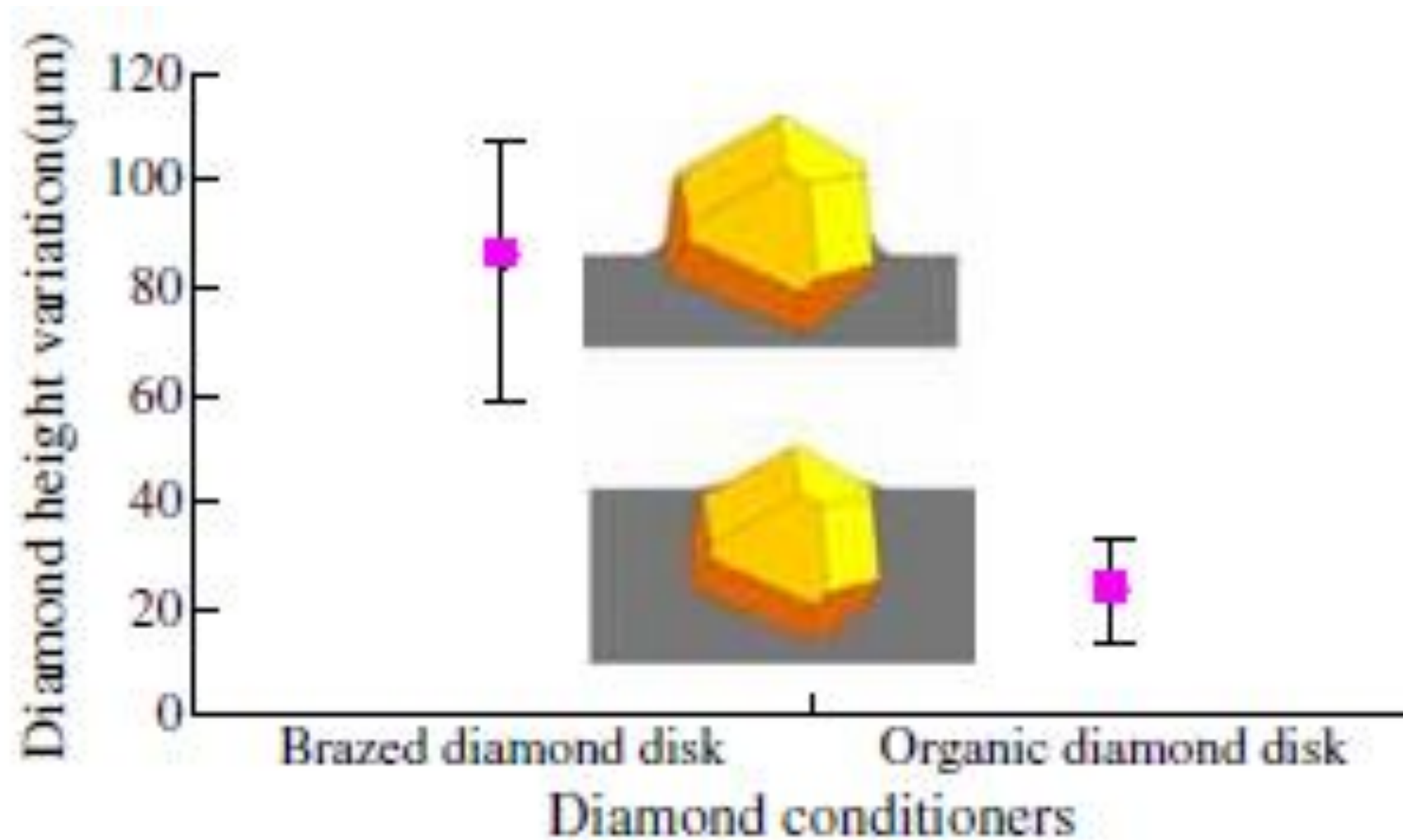
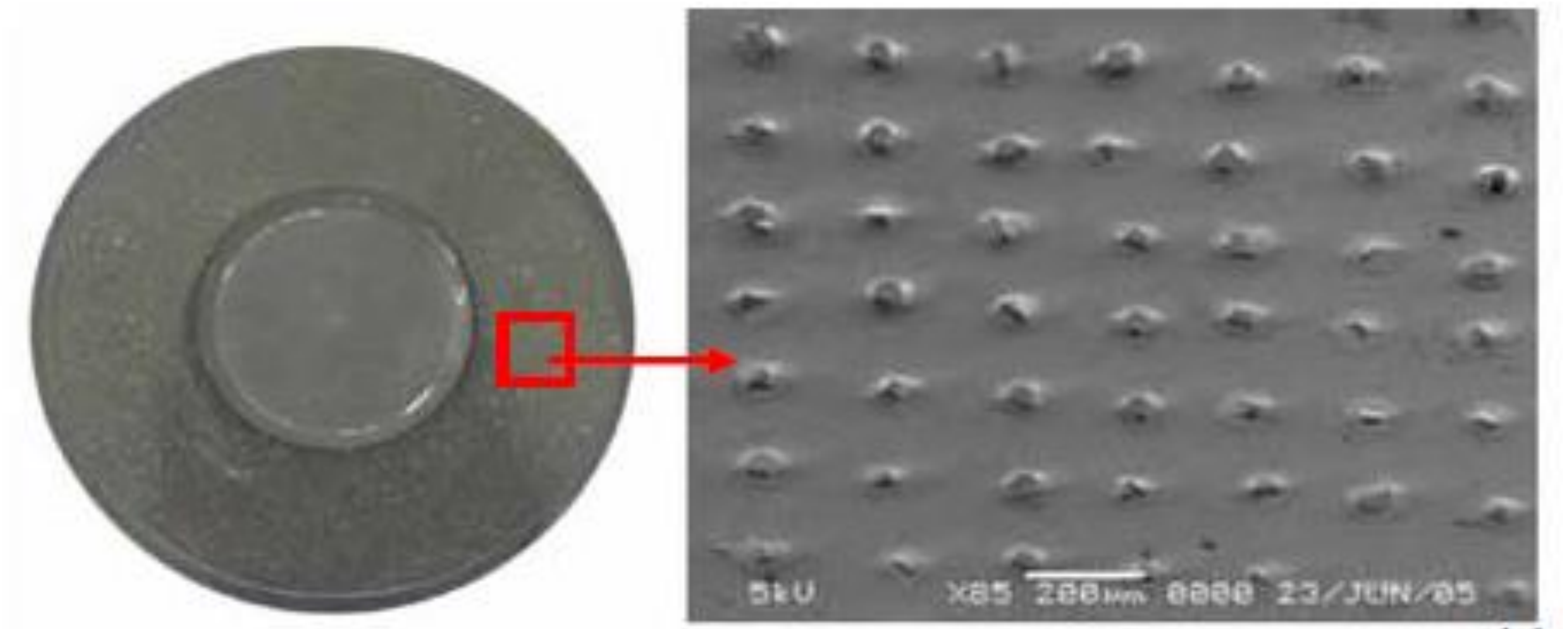


Fig. 6. Height variation in tips for diamond conditioners.

Tsai Does Not Teach Regularly Spaced Particles or a Pattern

Dr. Shanfield	Dr. Tsai (Author of Ex. 1004)
“For example, as I described in Paragraphs 153-155, Tsai discloses a CMP pad dresser with approximately 154,800 superabrasive particles based on the 200 micron inter-diamond spacing shown in Fig. 3.” (Ex. 1002 at ¶ 187.)	“A. Well, just like I said, in order to publish this paper, we measured quite a lot of small boxes on the disk, and then we selected the best one and put onto the paper. However, of course, one small area cannot represent the entire disk.” (Ex. 1055 at 174:6-15.)

Fig. 3 of Tsai



DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Tsai Does Not Teach Evenly Spaced Particles or a Pattern

Dr. Shanfield

“In Figure 5, the inter-diamond spacing is about 500 microns, and the superabrasive particles are again arranged in a grid. Assuming the same configuration of superabrasive particles shown in Figure 3 (i.e., no particles on the center of the disk), the CMP pad dresser has about 24,768 superabrasive particles.”

(Ex. 1002 at ¶ 156.)

Dr. Tsai (Author of Ex. 1004)

“Q. So would the spacing between the diamonds, as reflected in Figure 5, be the same or different, all the diamonds?

A. They would be different.”

(Ex 1055 at 177:3-6.)

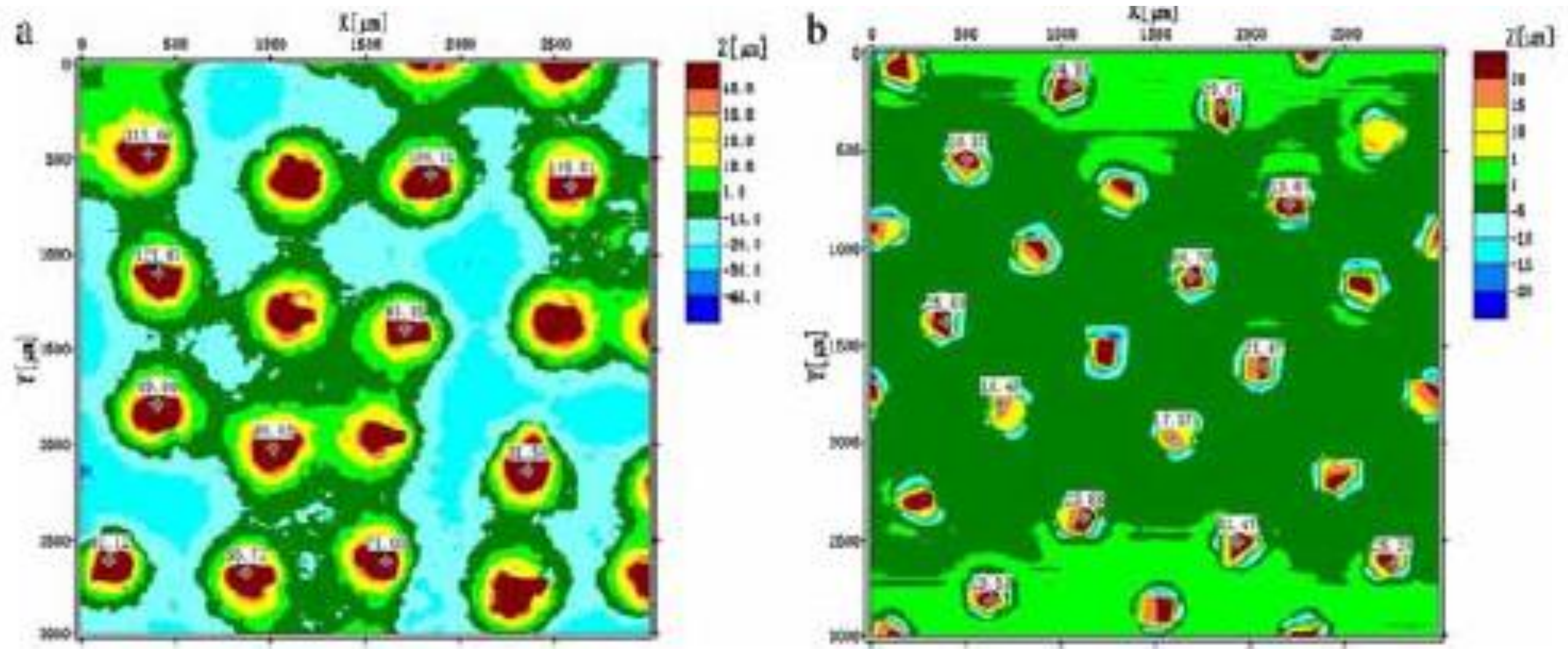


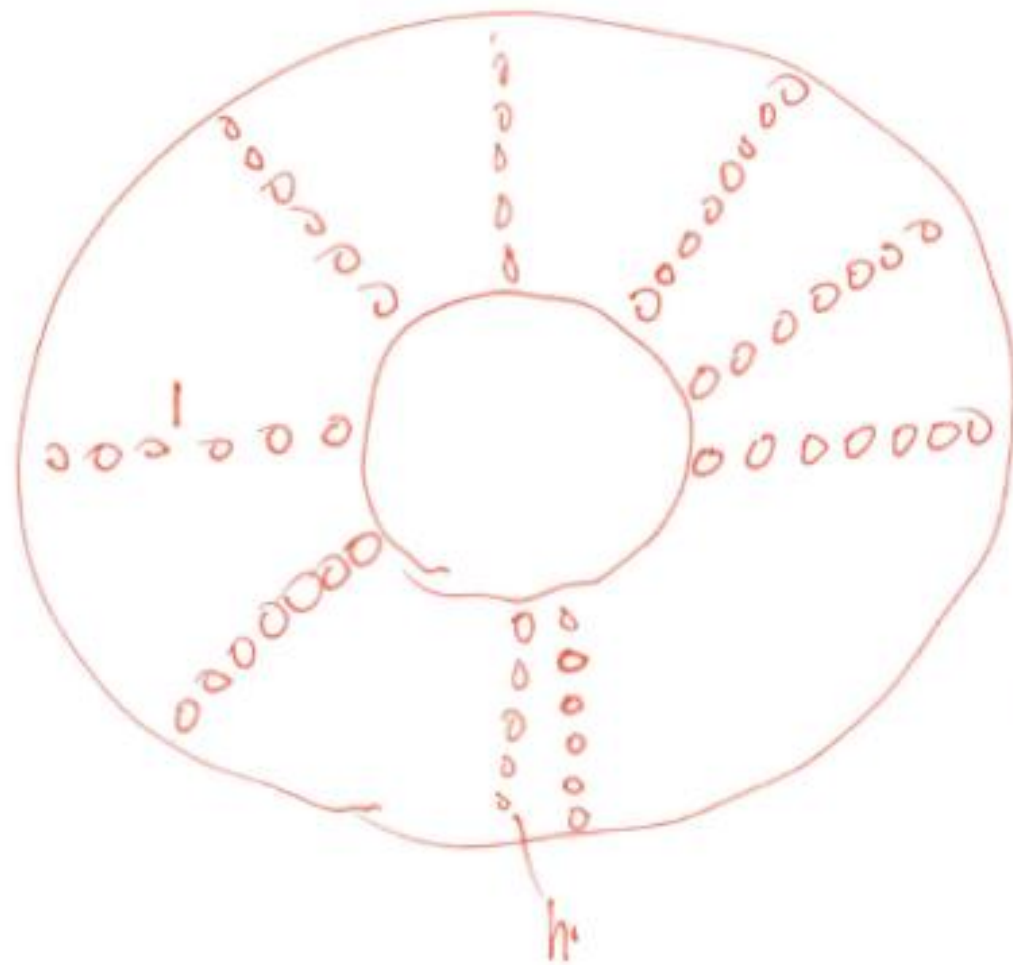
Fig. 5. Comparison of the cutting tips of (a) brazed diamond disk (b) organic diamond disk.

Ex. 1004 at Fig. 5.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

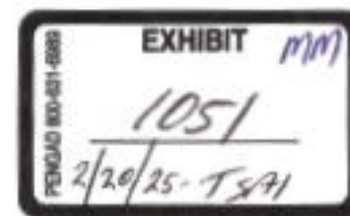
POR at 46; Sur-reply at 21.

Tsai Does Not Teach Equal Spacing Between Particles



“Q. Now, going back to [Ex.] 1051, where you drew a bunch of circles, is the spacing between those circles the same across the entire mesh? . . . THE WITNESS: (In English) No.”

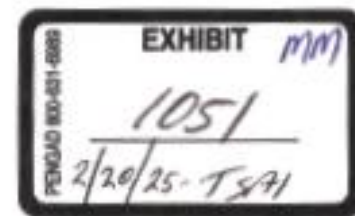
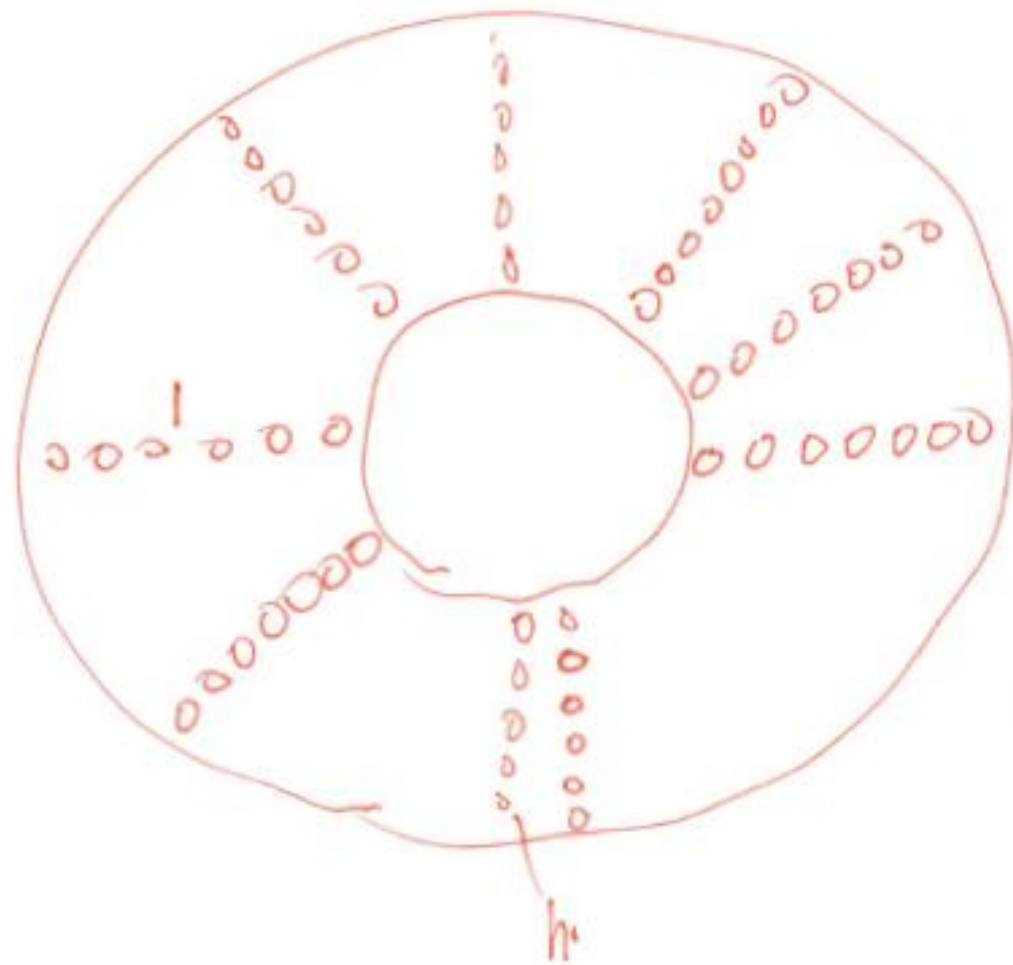
Ex. 1055 at 175:25-176:4.



IPR2024-00535
Samsung Electronics Co. Ltd. et al v. Chien-Min Sung
Samsung's Exhibit 1051
Ex. 1051, Page 1

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Tsai Does Not Teach Equal Spacing Between Particles



IPR2024-00535
Samsung Electronics Co. Ltd. et al v. Chien-Min Sung
Samsung's Exhibit 1051
Ex. 1051, Page 1

“Q. So even using the mesh that you drew up in Exhibit 1051 as an example, when diamonds of different sizes fall through the holes, do they fall exactly and land at the same place across the entire disk?

A. Because, as I said, we shake the mesh a little bit. Therefore, when we shake it, they may not drop at exactly the same place.”

Ex. 1055 at 176:21-177:2.

- Ex. 1004 does not address spacing between diamond particles; that publication is concerned with leveling of the tips of diamond particles. (Ex. 2011 at ¶ 39.)
- The reference to “regular distribution” in Ex. 1004 does not mean perfect distribution such that spacing is identical across the disk. (Ex. 2011 at ¶ 41.)
- It is not be possible to determine the total number of diamond particles on an ODD based on partial images, because the distribution of diamond particles is not the same across the entire ODD. (Ex. 1055 at 174:6-15.)

Ground 2: Tsai and Sung '026 Do Not Render Obvious Claims 1-3, 6-14 and 16-18

Sung '026/Sung '786 Is Not Prior Art to Claims 1-3, 6-14 and 16-18

'802 Claims	Priority Date
1-7, 13-21	Sept. 9, 2005 (Sung '786) Nov. 16, 2006 (Sung '817)
8-12	Oct. 3, 2014 (filing date of '802 Patent)

- Sung '026 is the publication of Sung '786 to which the '802 patent claims priority.
- Sung '026 is the grandparent of the '802 patent and fully supports claims 1-3, 6-7, 13-14 and 16-18.

“working superabrasive particles”

Claims 8-12

Tsai Does Not Teach that All Diamonds Are Cutters

Dr. Shanfield	Dr. Tsai (Author of Ex. 1004)
“Tsai discloses that all the diamond particles on the CMP pad dressers are cutters and share an equal dressing load when conditioning CMP pads.” (Ex. 1002 at ¶ 189.)	“I note that there is no explicit disclosure of any specific numbers of ‘cutters’ on an ODD anywhere in Tsai, or of a plurality of cutters.” (Ex. 2011 at ¶ 44.)

Dr. Tsai Did Not Calculate a Specific Number of Working Particles or Cutters

Dr. Shanfield	Dr. Tsai (Author of Ex. 1004)
“Tsai discloses that all the diamond particles on the CMP pad dressers are cutters and share an equal dressing load when conditioning CMP pads.” (Ex. 1002 at ¶ 189.)	“And the purpose for the research was to determine the protrusion differences between different tips. And we were not thinking of researching or studying the distribution of all the diamonds on the disk because <i>we did not want to analyze the number of working particles.</i>” (Ex. 1055 at 209:17-20 (emphasis added).)

Tsai Does Not Teach a Specific Number of Working Particles

Dr. Shanfield	Dr. Tsai (Author of Ex. 1004)
“Tsai’s ODDs have superabrasive particles that share an equal dressing load while conditioning the CMP pad. . . . This is an improvement over traditional CMP pad dressers, which have over 10,000 superabrasive particles, but only around 10% of the superabrasive particles cut the CMP pad.” (Ex. 1002 at ¶ 180.)	“A POSITA generally would know this is just a general description. In order to know the actual detail quantity or quantify that, we need to do many, many experiments in order to also know how many diamond grits. Then we need to do a lot of measurements in order to define the number of working particles. Then we can get the answer.” (Ex. 1055 at 169:8-14.)

Dr. Tsai Never Contemplated a Specific Number of Working Particles

Dr. Shanfield

“Tsai discloses that all the diamond particles on the CMP pad dressers are cutters and share an equal dressing load when conditioning CMP pads.”

(Ex. 1002 at ¶ 189.)

Dr. Tsai (Author of Ex. 1004)

“To be clear, I did not predict or otherwise determine the number or location of the diamonds or diamond tips that would actually cut asperities into the CMP pad dresser during use because they were not the focus of my research.”

(Ex. 2011 at ¶ 44.)

Sung '026 Does Not Teach a Specific Number of Working Particles

Dr. Shanfield

“Sung '026 discloses that . . . frictional forces are distributed equally across each superabrasive particle . . . If each superabrasive particle is itself cutting asperities in the CMP pad and is a working superabrasive particle.”

(Ex. 1002 at ¶ 191.)

Dr. Tsai

“Dr. Shanfield’s view that diamond particles that experience frictional forces are by definition working particles that cut a CMP pad reflects an understanding of how a pad conditioner works that had been superseded by 2012.”

(Ex. 2011 at ¶ 52.)

Sung '026 Does Not Teach a Specific Number of Working Particles

Dr. Shanfield

“Sung '026 discloses that . . . frictional forces are distributed equally across each superabrasive particle . . . If each superabrasive particle is itself cutting asperities in the CMP pad and is a working superabrasive particle.”

(Ex. 1002 at ¶ 191.)

Dr. Tsai

“[E]ven distribution of frictional forces across the conditioner could also be achieved by diamond particles that are randomly distributed on a conditioner as such frictional forces can be tightly controlled by tip leveling.”

(Ex. 2011 at ¶ 54.)

- There is no explicit teaching of any number of cutters on an ODD in Tsai. (Ex. 2011 at ¶ 44.)
- There was no number of working diamonds contemplated in the research underlying Tsai. (Ex. 2011 at ¶ 44.)
- The notion that frictional forces are equally distributed across the face of a CMP pad conditioner, which underlies Dr. Shanfield's Sung '026 opinion, was superseded by 2012.

Ground 3: Sung '146 and Sung '026 Do Not Render Obvious Claims 1-7 and 13-21

Sung '146 Is Not Prior Art to Claims 1-3, 6-14 and 16-18

'802 Claims	Priority Date
1-7, 13-21	Sept. 9, 2005 (Sung '786) Nov. 16, 2006 (Sung '817)
8-12	Oct. 3, 2014 (filing date of '802 Patent)

- Like Sung '026, Sung '146, which issued as USP No. 8,974,270, is not prior art because Sung '146 is the grandparent of the '802 Patent and the '802 Patent claims priority to Sung '146.

The Testimony of Samsung's Expert Dr. Shanfield Is Inadmissible

Level of Skill In the Art

- A POSITA for purposes of the '802 patent includes at least two years of experience in developing CMP technology including experience with the design and development of CMP pad dressers.
- Specific experience with CMP pad conditioners is necessary due to the particularized context of this distinct technical field which requires knowledge of:
 - abrasive materials,
 - mechanical wear mechanisms,
 - pad/wafer interaction physics
 - performance optimization of pad conditioners.
- General expertise in semiconductor manufacturing is insufficient.

Dr. Shanfield's Experience

Stanley Shanfield



Curriculum Vitae for Stanley Shanfield

Education:

Massachusetts Institute of Technology, Ph.D., Physics, 1981

University of California, Irvine, B.S. Cum Laude, Physics, 1977

Educational Awards:

Outstanding Research Project, U.C. Regents Award, 1977

Phi Beta Kappa, 1977

Four Year Scholarship, Tuition & Research, ERDA/DOE, 1977-1981

Hands-On Professional Expertise:

Semiconductor Physics & Chemistry
Semiconductor Fabrication: Silicon and III-V Materials
Semiconductor Device & Integrated Circuit Engineering
Semiconductor Equipment: Front & Back End
Semiconductor Packaging Design and Manufacturing
Passive Component Design and Manufacturing
RF Design and Fabrication
Digital Design & Fabrication
Semiconductor Manufacturing in Silicon and III-V Materials
MEMS Design and Fabrication: Electrical, Optical, & Sensing Devices
Fiber Optic Device Design and Fabrication
Integrated Optics & Electro-Optical Devices
Plasma Physics

Specialized Training:

Global Positioning Electronics, Systems and Components
Six Sigma Semiconductor Manufacturing
Microwave Engineering
US Patent Law in Technology
Patent Application and Prosecution
Semiconductor Plasma Processing
Thin Film Physics and Technology
MEMS-based Gyroscopes and Accelerometers
Thermoelectric Materials & Technology
Phased Array Radar Engineering
Antennas and Electromagnetic Propagation
Solid State Optical Devices
Fiber Optic Communication System Operation
HALT and HAST Reliability Testing Methods

Hands-On Professional Expertise:

Semiconductor Physics & Chemistry
Semiconductor Fabrication: Silicon and III-V Materials
Semiconductor Device & Integrated Circuit Engineering
Semiconductor Equipment: Front & Back End
Semiconductor Packaging Design and Manufacturing
Passive Component Design and Manufacturing
RF Design and Fabrication
Digital Design & Fabrication
Semiconductor Manufacturing in Silicon and III-V Materials
MEMS Design and Fabrication: Electrical, Optical, & Sensing Devices
Fiber Optic Device Design and Fabrication
Integrated Optics & Electro-Optical Devices
Plasma Physics

Dr. Shanfield's Experience

Stanley Shanfield



Curriculum Vitae for Stanley Shanfield

Education:

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Semiconductor Physics & Chemistry
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Semiconductor Device & Integrated Circuit Engineering
Semiconductor Equipment: Front & Back End
Semiconductor Packaging Design and Manufacturing
Passive Component Design and Manufacturing
RF Design and Fabrication
Digital Design & Fabrication
Semiconductor Manufacturing in Silicon and III-V Materials
MEMS Design and Fabrication: Electrical, Optical, & Sensing Devices
Fiber Optic Device Design and Fabrication
Integrated Optics & Electro-Optical Devices
Plasma Physics

Specialized Training:

Global Positioning Electronics, Systems and Components
Six Sigma Semiconductor Manufacturing
Microwave Engineering
US Patent Law in Technology
Patent Application and Prosecution
Semiconductor Plasma Processing
Thin Film Physics and Technology
MEMS-based Gyroscopes and Accelerometers
Thermoelectric Materials & Technology
Phased Array Radar Engineering
Antennas and Electromagnetic Propagation
Solid State Optical Devices
Fiber Optic Communication System Operation
HALT and HAST Reliability Testing Methods

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Thermoelectric Materials & Technology
Phased Array Radar Engineering
Antennas and Electromagnetic Propagation
Solid State Optical Devices
Fiber Optic Communication System Operation
HALT and HAST Reliability Testing Methods

Dr. Shanfield's Experience with CMP Pad Conditioning

- Dr. Shanfield lacks experience in CMP pad conditioning, which is the technical field of the '802 patent.
- Dr. Shanfield admits that he has never measured the number of diamonds on a CMP pad conditioner or inspected a CMP pad conditioner using an electron microscope.
- At best, Dr. Shanfield has worked in a lab where CMP equipment was present.

Dr. Tsai Identified Numerous Flaws in Dr. Shanfield's Analysis

- Dr. Shanfield's contention that Tsai's ODD "designates a flat profile" based on a partial image of a pad conditioner.
- Dr. Shanfield's speculation as to the exact number of particles on Tsai's ODD by multiplying the number of diamond tips shown on single section of the ODD.
- Dr. Shanfield's assertion that all diamond particles are cutters without performing any research or measurement.
- Dr. Shanfield's unreliable calculation of a total number of grits on a pad conditioner from on approximate numbers.
- Dr. Shanfield's erroneous contention that all diamond particles that experience frictional forces are working particles.

Thank You.

Case IPR2024-00535
Patent No. 9,724,802
Patent Owner's Demonstratives

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on June 16, 2025, the foregoing document is being served via electronic mail upon the following counsel of record for Petitioner:

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