PTO/AIA/14 (11-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Chien-Min		Sung	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Tansui	Country of Residence i	TW

Mailing Address of Inventor:

Address 1	4, Lane 32, Chung-Cheng Road		
Address 2			
City	Tansui, Taipei County	**State/Province**	
Postal Code	251	**Country** i	TW

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	20551		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS		
Attorney Docket Number	02074-24012.NP.CIP2	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	1	**Suggested Figure for Publication (if any)**	

PTO/AIA/14 (11-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	20551		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation in part of	13802112	2013-03-13
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
13802112	Continuation in part of	13479148	2012-05-23
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
13479148	Claims benefit of provisional	61489074	2011-05-23
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation in part of	13797704	2013-03-12
Prior Application Status	Patented		Remove

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13797704	Continuation in part of	12726786	2010-03-18	8622787	2014-01-07
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12726786	Continuation in part of	12255823	2008-10-22	8393934	2013-03-12
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12255823	Continuation in part of	12168110	2008-07-05	8398466	2013-03-19
Prior Application Status	Expired			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
12168110	Claims benefit of provisional	60976198	2007-09-28		
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12726786	Continuation in part of	11560817	2006-11-16	7762872	2010-07-27
Prior Application Status	Abandoned			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11560817	Continuation in part of	11357713	2006-02-17		
Prior Application Status	Expired			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11357713	Claims benefit of provisional	60681798	2005-05-16		
Prior Application Status	Abandoned			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11560817	Continuation in part of	11223786	2005-09-09		
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13797704	Continuation in part of	12850747	2010-08-05	8678878	2014-03-25
Prior Application Status	Expired			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
12850747	Claims benefit of provisional	61246816	2009-09-29		
Prior Application Status	Abandoned			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
13797704	Continuation in part of	13034213	2011-02-24		
Prior Application Status	Expired			Remove	

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
13034213	Claims benefit of provisional	61333162	2010-05-10

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code [j] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

PTO/AIA/14 (11-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◯ Assignee	◯ Legal Representative under 35 U.S.C. 117	◯ Joint Inventor
◯ Person to whom the inventor is obligated to assign.	◯ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

PTO/AIA/14 (11-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

Mailing Address Information:			
Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (11-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	02074-24012.NP.CIP2
	Application Number	
Title of Invention	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS	

Signature:

Remove

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications					
Signature	/David W. Osborne/			Date (YYYY-MM-DD)	2014-10-03
First Name	David W.	Last Name	Osborne	Registration Number	44989
Additional Signature may be generated within this form by selecting the Add button. Add					

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

PRIORITY DATA

This application is a continuation-in-part of U. S. Patent Application Serial No. 13/802,112, filed on March, 13, 2013, which is a continuation-in-part of United States Patent Application Serial No. 13/479,148, filed on May 23, 2012, which claims the benefit of U. S. Provisional Patent Application Serial no. 61/489,074, filed on May 23, 2011. This application is also a continuation-in-part of U. S. Patent Application Serial No. 13/797,704, filed March 12, 2013, which is a continuation-in-part of U.S. Patent Application Serial No. 12/726,786, filed on March 18, 2010, which is a is a continuation-in-part of U.S. Patent Application Serial No. 12/255,823, filed October 22, 2008, which is a continuation-in-part of U.S. Patent Application Serial No. 12/168,110, filed on July 5, 2008, which claims the benefit of U.S. Provisional Patent Application Serial No. 60/976,198, filed September 28, 2007. U.S. Patent Application Serial No. 12/726,786, filed on March 18, 2010 is also a continuation-in-part of U.S. Patent Application Serial No. 11/560,817, filed November 16, 2006, which is a continuation-in-part of U.S. Patent Application Serial No. 11/357,713, filed February 17, 2006, which claims the benefit of U.S. Provisional Patent Application Serial No. 60/681,798, filed May 16, 2005. U.S. Patent Application Serial No. 11/560,817 is additionally a continuation-in-part of U.S. Patent Application Serial No. 11/223,786, filed September 9, 2005. U.S. Patent Application Serial No. 13/797,704 is also a continuation-in-part of U.S. Patent Application Serial No. 12/850,747, filed August 5, 2010, which claims the benefit of United States Provisional Patent Application Serial No. 61/246,816, filed on September 29, 2009. U.S. Patent Application Serial No. 13/797,704 is further a continuation-in-part of U.S. Patent Application Serial No. 13/034,213, filed February 24, 2011, which claims the benefit of U.S. Provisional Patent Application Serial No. 61/333,162, filed on May 10, 2010. Each of these applications is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The semiconductor industry currently spends in excess of one billion U.S. dollars each year manufacturing silicon wafers that must exhibit very flat and smooth surfaces. Known techniques to manufacture smooth and even-surfaced silicon wafers are plentiful. The most common of these involves the process known as Chemical Mechanical Polishing (CMP) which includes the use of a polishing pad in combination with an abrasive slurry. Of central importance in all CMP processes is the attainment of high performance levels in aspects such as uniformity of polished wafer, smoothness of the IC circuitry, removal rate for productivity, longevity of consumables for CMP economics, etc.

SUMMARY OF THE INVENTION

The present disclosure provides CMP pad dressers and associated methods, including without limitation, methods directed to the manufacture and use of such dressers. In one aspect, for example, a CMP pad dresser can include a support substrate and a plurality of superabrasive particles secured to the support substrate with each superabrasive particle extending away from the support substrate to a protrusion distance. The plurality of superabrasive particles can be positioned such that the highest protruding tip of each of the plurality of superabrasive particles align along a designated profile with a tip variation of from about 5 microns to about 100 microns. In another aspect, the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 10 microns to about 50 microns. In yet another aspect, the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 20 microns to about 40 microns. In a further aspect, the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of less than about 20 microns. The designated profile can include any geometric configuration that can be useful in dressing a CMP pad, and any such configuration is considered to be within the present scope. Non-limiting examples can include a plane, a slope, a curved shape, a dome shape, and the like, including appropriate combinations thereof.

The positioning of superabrasive particles relative to the support substrate can also be described in terms of the depths that the superabrasive particles cut into a CMP pad when used to abrade the CMP pad. In one aspect, for example, the protrusions of the plurality of superabrasive particles produce cutting depths of less than about 20 microns when used to abrade a CMP pad. In another aspect, the protrusions of the plurality of superabrasive particles produce cutting depths of from about 1 micron to about 20 microns when used to abrade a CMP pad. In yet another aspect, the protrusions of the plurality of superabrasive particles produce cutting depths of from about 10 microns to about 20 microns when used to abrade a CMP pad.

As another exemplary aspect of the present disclosure, a CMP pad dresser can include a rigid support substrate and a monolayer of a plurality of superabrasive particles coupled to the support substrate, where each superabrasive particle in the monolayer extends from the support substrate to a protrusion distance. In one aspect, 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, and the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles is within about 80 microns or less. In another aspect, the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns. In yet another aspect, the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns. In a further aspect, the difference in protrusion distance between the highest protruding tip and the 10th highest protruding tip is less than or equal to about 20 microns. In yet another aspect, the difference in protrusion distance between the highest protruding tip and the 100th highest protruding tip is less than or equal to about 40 microns.

As yet another exemplary aspect of the present disclosure, a CMP pad dresser can include a rigid support substrate and a monolayer of a plurality of superabrasive particles coupled to the support substrate, where the plurality of superabrasive particles includes a plurality of working superabrasive particles, such that rotating the dresser against a CMP pad cuts asperities into the CMP pad having a cutting depth of less than or equal to about 50 microns. In another aspect, the cutting depth is from about 10 microns to about 50

microns. In yet another aspect, the plurality of working superabrasive particles includes at least 100 working superabrasive particles. In a further aspect, the plurality of working superabrasive particles includes at least 1000 working superabrasive particles. In yet another aspect, the plurality of working superabrasive particles includes from about 1000 to about 6000 working superabrasive particles. In another aspect, the plurality of working superabrasive particles includes from about 2000 to about 5000 working superabrasive particles. In a further aspect, the plurality of working superabrasive particles include at least about 1000 working superabrasive particles that protrude from the rigid support substrate to distances within about 30 microns of one another.

As another exemplary aspect of the present disclosure, a method of dressing a CMP pad can include applying a CMP pad dresser to a CMP pad, and moving at least one of the CMP pad or the CMP pad dresser with respect to one another to cut asperities into the CMP pad having a cutting depth of from about 10 microns to about 50 microns.

As a further exemplary aspect of the present disclosure, a CMP pad dresser is provided including a support substrate and a plurality of superabrasive particles secured to the support substrate and positioned to engage and dress a CMP pad, where the plurality of superabrasive particles cut to depths of less than 50 microns into a CMP pad during a dressing procedure.

There has thus been outlined, rather broadly, various features of the invention so that the detailed description thereof that follows may be better understood, and so that the present contribution to the art may be better appreciated. Other features of the present invention will become clearer from the following detailed description of the invention, taken with the accompanying claims, or may be learned by the practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side view of a CMP pad dresser in accordance with an embodiment of the present disclosure;

FIG. 2 is a schematic side view of a CMP pad dresser in accordance with an embodiment of the present disclosure;

FIG. 3 is a schematic side view of a CMP pad dresser in accordance with an embodiment of the present disclosure; and

FIG. 4 is a schematic side view of a CMP pad dresser in accordance with an embodiment of the present disclosure.

It will be understood that the above figures are merely for illustrative purposes in furthering an understanding of the invention. Further, the figures are not drawn to scale, thus dimensions, particle sizes, and other aspects may, and generally are, exaggerated to make illustrations thereof clearer. Therefore, departure can be made from the specific dimensions and aspects shown in the figures in order to produce the heat spreaders of the present invention.

DETAILED DESCRIPTION

Before the present invention is disclosed and described, it is to be understood that this invention is not limited to the particular structures, method steps, or materials disclosed herein, but is extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular embodiments only and is not intended to be limiting.

It must be noted that, as used in this specification and the appended claims, the singular forms "a," "an" and, "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a diamond particle" includes one or more of such particles and reference to "the layer" includes reference to one or more of such layers.

Definitions

In describing and claiming the present invention, the following terminology will be used in accordance with the definitions set forth below.

As used herein, the terms "conditioner" and "dresser" can be used interchangeably, and refer to a tool used to condition or dress a pad, such as a CMP pad.

As used herein, "superabrasive" may be used to refer to any crystalline, or polycrystalline material, or mixture of such materials that has a Mohr's hardness of about 8 or greater. In some aspects, the Mohr's hardness may be about 9.5 or greater. In other aspects, superabrasive materials can be materials having a Vicker's hardness of about

4000 Kg/mm^2 or greater. Suitable superabrasive material examples can include, without limitation, diamond, polycrystalline diamond (PCD), cubic boron nitride (cBN), polycrystalline cubic boron nitride (PcBN), corundum and sapphire, as well as other superabrasive materials known to those skilled in the art. Superabrasive materials may be incorporated into various tools in a variety of forms including particles, grits, films, layers, pieces, segments, etc. While superabrasive materials are very inert and thus difficult to form chemical bonds with, it is known that certain reactive elements, such as chromium and titanium are capable of chemically reacting with superabrasive materials at certain temperatures.

As used herein, "particle" refers, when used in connection with superabrasive particles, to a particulate form of superabrasive particle. Such particles may take a variety of shapes, including round, oblong, square, euhedral, etc., can be either single crystal or polycrystalline, and can have a number of mesh sizes. As is known in the art, "mesh" refers to the number of holes per unit area, as in the case of U.S. meshes. All mesh sizes referred to herein are U.S. mesh unless otherwise indicated. Further, mesh sizes are generally understood to indicate an average mesh size of a given collection of particles since each particle within a particular "mesh size" may actually vary over a small distribution of sizes, unless noted otherwise.

As used herein, "working superabrasive particles" are superabrasive particles that cut or otherwise deform a CMP pad during a dressing or conditioning procedure. This action can remove debris from the surface, it can deform the surface either elastically or plastically, or it can create a groove or asperity in the surface of the CMP pad. In one specific aspect, a working superabrasive particle can cut deeper than about 10 microns into a CMP pad during a dressing procedure.

As used herein, "non-working superabrasive particles" are superabrasive particles in a CMP pad dresser that do not significantly cut or deform the pad sufficient to remove debris from the surface, deform the surface, or create grooves in the surface.

As used herein, "overly-aggressive superabrasive particles" are superabrasive particles in a CMP pad dresser that aggressively dress or condition a CMP pad. In one aspect, aggressive superabrasive particles are superabrasive particles that cut deeper than about 50 microns into a CMP pad during a dressing procedure. In another aspect,

aggressive superabrasive particles are superabrasive particles that remove at least 1/5 of the material from the CMP pad. In yet another aspect, aggressive superabrasive particles are superabrasive particles that remove at least 1/2 of the material from the CMP pad.

As used herein, "working end" refers to an end of a particle that is oriented towards the CMP pad and that during a dressing operation makes contact with the pad. In many cases the working end of a particle will be distal from a substrate to which the particle is attached.

As used herein, cutting "tip" refers to a portion of a cutting element or particle that protrudes the greatest distance from the support substrate, e.g., that is the first portion of the cutting element that contacts a CMP pad when in use. It is to be understood that a cutting "tip" can include a planar surface, a pointed surface, or an edge; so long as the planar surface, pointed surface or edge of the cutting element is the first portion of the cutting element that contacts a CMP pad from which material is to be removed.

As used herein, "sharp portion" refers to any narrow portion to which a crystal or particle may converge, including but not limited to corners, apexes, ridges, edges, obelisks, and other protrusions. In some cases, corners and/or apexes are formed at the convergence of more than two faces of the particle or crystal, or other body, disposed in intersecting planes. In other aspects, edges and/or ridges may be formed at the convergence of two or at least two faces of the particle or crystal, or other body, disposed in intersecting planes. In some aspects, "sharp portion" can include a portion that is broken, chipped, cracked, jagged, and the like. In some aspects, degrees of sharpness can be correlated with the geometric angle formed by the particle, crystal, or other body, at the location in question. In some aspects, an angle of 90 degrees or less can be considered sharp. In other aspects, an angle of 60 degrees or less can be considered sharp. In yet other aspects, and angle of 45 degrees or less, or 30 degrees or less can be considered to be sharp.

As used herein, cutting "edge" refers to a portion of a cutting element or particle that includes some measurable width across a portion that contacts and removes material from a workpiece. As an exemplary illustration, a typical knife blade has a cutting edge that extends longitudinally along the knife blade, and the knife blade would have to be

oriented transversely to a workpiece to scrape or plane material from the workpiece in order for the cutting "edge" of the knife blade to remove material from the workpiece.

As used herein, "peripherally located," "peripheral location," and the like, refer to any particle or other cutting element of a dresser that is located in an area that originates at the leading edge or outer rim of a dresser and extends inwardly towards the center for up to about 90% of the radius of the dresser. In some aspects, the area may extend inwardly from about 20% to 90% of the radius. In other aspects, the area may extend in to about 50% of the radius. In yet another aspect, the area may extend in to about 33% of the radius of a dresser (i.e. 66% away from the center).

As used herein, "centrally located particle," "particle in a central location," and the like refer to any particle or other cutting element of a tool that is located in an area of the tool that originates at a center point of the tool and extends outwardly towards the tool's edge for up to about 90% of the radius of the tool. In some aspects, the area may extend outwardly from about 20% to about 90% of the radius. In other aspects, the area may extend out to about 50% of the radius. In yet another aspect, the area may extend out to about 33% of the radius of a tool.

As used herein, "attitude" refers to the position or arrangement of a superabrasive particle in relation to a defined surface, such as a substrate to which it is attached, or a CMP pad to which it is to be applied during a work operation. For example, a superabrasive particle can have an attitude that provides a specific portion of the particle in orientation toward a CMP pad.

As used herein, "leading edge" refers to the edge of a CMP pad dresser that is a frontal edge based on the direction that the CMP pad is moving, or the direction that the pad is moving, or both. Notably, in some aspects, the leading edge may be considered to encompass not only the area specifically at the edge of a dresser, but may also include portions of the dresser which extend slightly inward from the actual edge. In one aspect, the leading edge may be located along an outer edge of the CMP pad dresser. In another aspect, the CMP pad dresser may be configured with a pattern of abrasive particles that provides at least one effective leading edge on a central or inner portion of the CMP pad dresser working surface. In other words, a central or inner portion of the dresser may be

configured to provide a functional effect similar to that of a leading edge on the outer edge of the dresser.

As used herein, the term "profile" and "geometric profile" can be used interchangeably, and refer to a predetermined contour above a support substrate to which a plurality of superabrasive particles or other cutting elements are intended to align. Examples of such profiles may include, without limitation, flat or planar profiles, curved profiles, wavy profiles, convex profiles, concave profiles, multi-tiered profiles, and the like, including combinations thereof.

As used herein, "geometric configuration" refers to a shape that is capable of being described in readily understood and recognized mathematical terms. Examples of shapes qualifying as "geometric configurations" include, without limitation, cubic shapes, polyhedral (including regular polyhedral) shapes, triangular shapes (including equilateral triangles, isosceles triangles and three-dimensional triangular shapes), pyramidal shapes, spheres, rectangles, "pie" shapes, wedge shapes, octagonal shapes, circles, etc.

As used herein, "dressing segment" refers to a dressing or conditioning element of a CMP pad dresser. In one aspect, dressing segments are utilized to carry superabrasive particles having leveled tips. Thus, in some cases superabrasive particles can be introduced into a CMP pad dresser by the incorporation of multiple dressing segments. It should be noted that a variety of techniques of attaching the dressing segments to the substrates, and a variety of techniques of attaching the superabrasive particles to the dressing segments, are possible, all of which are considered to be within the present scope. It is to be understood that all of these various attachment mechanisms can be used interchangeably herein: that is, if a method of attaching a dressing segment to a substrate is discussed herein, the method of attachment discussed can also be used to attach superabrasive particles to a dressing segment. For any particular CMP pad dresser being discussed, however, it is understood that attachment methods of the superabrasive particles to the dressing segments can differ from, or can be the same as, the method used to attach the dressing segments to the pad conditioner substrate.

As used herein, "cutting element" describes a variety of structures capable of removing (e.g., cutting) material from a CMP pad. A cutting element can be a mass having several cutting points, ridges or mesas formed thereon or therein. It is notable that

such cutting points, ridges or mesas may be from a multiplicity of protrusions or asperities included in the mass. Furthermore, a cutting element can also refer an individual particle that may have only one cutting point, ridge or mesa formed thereon or therein.

As used herein, "organic material" refers to a semisolid or solid complex or mix of organic compounds. "Organic material layer" and "organic matrix" may be used interchangeably, and refer to a layer or mass of a semisolid or solid complex or mix of organic compounds, including resins, polymers, gums, etc. The organic material can be a polymer or copolymer formed from the polymerization of one or more monomers. In some cases, such organic material can be adhesive.

As used herein, the process of "brazing" is intended to refer to the creation of chemical bonds between the carbon atoms of the superabrasive particles/materials and the braze material. Further, "chemical bond" means a covalent bond, such as a carbide or boride bond, rather than mechanical or weaker inter-atom attractive forces. Thus, when "brazing" is used in connection with superabrasive particles a true chemical bond is being formed. However, when "brazing" is used in connection with metal to metal bonding the term is used in the more traditional sense of a metallurgical bond. Therefore, brazing of a superabrasive segment to a tool body does not necessarily require the presence of a carbide former.

As used herein, "mechanical bond" and "mechanical bonding" may be used interchangeably, and refer to a bond interface between two objects or layers formed primarily by frictional forces. In some cases the frictional forces between the bonded objects may be increased by expanding the contacting surface areas between the objects, and by imposing other specific geometrical and physical configurations, such as substantially surrounding one object with another.

As used herein, "sintering" refers to the joining of two or more individual particles to form a continuous solid mass. The process of sintering involves the consolidation of particles to at least partially eliminate voids between particles. Sintering may occur in either metal or carbonaceous particles, such as diamond. Sintering of metal particles occurs at various temperatures depending on the composition of the material. Sintering of diamond particles generally requires ultrahigh pressures and the presence of

a carbon solvent as a diamond sintering aid. Sintering aids are often present to aid in the sintering process and a portion of such may remain in the final product.

The term "metallic" refers to both metals and metalloids. Metals include those compounds typically considered metals found within the transition metals, alkali and alkali earth metals. Examples of metals are Ag, Au, Cu, Al, and Fe. Metalloids include specifically Si, B, Ge, Sb, As, and Te. Metallic materials also include alloys or mixtures that include metallic materials. Such alloys or mixtures may further include additional additives. In the present invention, carbide formers and carbon wetting agents may be included as alloys or mixtures, but are not anticipated to be the only metallic component. Examples of such carbide formers are Sc, Y, Ti, Zr, Hf, V, Nb, Cr, Mo, Mn, Ta, W, and Tc. Examples of carbon wetting agents are Co, Ni, Mn, and Cr.

As used herein, "infiltrating" refers to a situation where a material is heated to its melting point and then flows as a liquid through the interstitial voids between particles.

As used herein, the terms "substrate" and "support substrate" can be used interchangeably, and refer a portion of a pad conditioner that supports superabrasive materials, and to which abrasive materials and/or superabrasive segments that carry abrasive materials may be affixed. Substrates can have a variety of shapes, thicknesses, and/or materials that are capable of supporting abrasive materials in a manner that is sufficient to provide a CMP pad dresser useful for its intended purpose. Substrates may be of a solid material, a powdered material that becomes solid when processed, or a flexible material. Examples of typical substrate materials include without limitation, metals, metal alloys, ceramics, relatively hard polymers or other organic materials, glasses, and mixtures thereof. Further, the substrate may include a material that aids in attaching abrasive materials to the substrate, including, without limitation, brazing alloy material, sintering aids and the like.

As used herein, the term "substantially" refers to the complete or nearly complete extent or degree of an action, characteristic, property, state, structure, item, or result. For example, an object that is "substantially" enclosed would mean that the object is either completely enclosed or nearly completely enclosed. The exact allowable degree of deviation from absolute completeness may in some cases depend on the specific context.

However, generally speaking the nearness of completion will be so as to have the same overall result as if absolute and total completion were obtained.

The use of "substantially" is equally applicable when used in a negative connotation to refer to the complete or near complete lack of an action, characteristic, property, state, structure, item, or result. For example, a composition that is "substantially free of" particles would either completely lack particles, or so nearly completely lack particles that the effect would be the same as if it completely lacked particles. In other words, a composition that is "substantially free of" an ingredient or element may still actually contain such item as long as there is no measurable effect thereof.

As used herein, the term "about" is used to provide flexibility to a numerical range endpoint by providing that a given value may be "a little above" or "a little below" the endpoint. However, it is to be understood that even when the term "about" is used in the present specification in connection with a specific numerical value, that support for the exact numerical value recited apart from the "about" terminology is also provided.

In this disclosure, "comprises," "comprising," "containing" and "having" and the like can have the meaning ascribed to them in U.S. Patent law and can mean "includes," "including," and the like, and are generally interpreted to be open ended terms. The terms "consisting of" or "consists of" are closed terms, and include only the components, structures, steps, or the like specifically listed in conjunction with such terms, as well as that which is in accordance with U.S. Patent law. "Consisting essentially of" or "consists essentially of" have the meaning generally ascribed to them by U.S. Patent law. In particular, such terms are generally closed terms, with the exception of allowing inclusion of additional items, materials, components, steps, or elements, that do not materially affect the basic and novel characteristics or function of the item(s) used in connection therewith. For example, trace elements present in a composition, but not affecting the compositions nature or characteristics would be permissible if present under the "consisting essentially of" language, even though not expressly recited in a list of items following such terminology. When using an open ended term, like "comprising" or "including," it is understood that direct support should be afforded also to "consisting

essentially of" language as well as "consisting of" language as if stated explicitly and vice versa.

As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary.

Concentrations, amounts, and other numerical data may be expressed or presented herein in a range format. It is to be understood that such a range format is used merely for convenience and brevity and thus should be interpreted flexibly to include not only the numerical values explicitly recited as the limits of the range, but also to include all the individual numerical values or sub-ranges encompassed within that range as if each numerical value and sub-range is explicitly recited. As an illustration, a numerical range of "about 1 to about 5" should be interpreted to include not only the explicitly recited values of about 1 to about 5, but also include individual values and sub-ranges within the indicated range. Thus, included in this numerical range are individual values such as 2, 3, and 4 and sub-ranges such as from 1-3, from 2-4, and from 3-5, etc., as well as 1, 2, 3, 4, and 5, individually. This same principle applies to ranges reciting only one numerical value as a minimum or a maximum. Furthermore, such an interpretation should apply regardless of the breadth of the range or the characteristics being described.

The Invention

The present disclosure generally provides CMP pad dressers, methods associated with pad conditioning (e.g., smoothing, polishing, dressing), and the CMP polishing of a work piece. Pad conditioners according to aspects of the present disclosure can be advantageously utilized, for example, in dressing CMP pads that are used in polishing, finishing or otherwise affecting semiconductor materials. Specifically, in some aspects the present disclosure concerns CMP pad dressers having superabrasive particles with substantially leveled tips. In other aspects, the present CMP pad dressers can have superabrasive particles that are aligned across a designated profile, and as such, are

"leveled" with respect to that profile. Traditional CMP pad dresser manufacturing methods, even many of those describing techniques for leveling superabrasive particle tips prior to fixation, generally contain significant variation in tip height across the surface of the dresser that is not accounted for by an intended tip alignment profile. Often, the superabrasive particles are affixed to the CMP pad dresser support in a manner that disrupts any leveling that has occurred. For example, fixation techniques that utilize high heat and/or pressure can cause warping of the dresser support as the dresser cools. Thus, unless steps are taken to avoid such warpage, superabrasive particles are not maintained in their leveled state following cooling of the dresser. This can be particularly problematic with brazing techniques.

A CMP pad dresser can be used to dress or condition a CMP pad by removing dirt and debris (i.e. deglazing the pad), as well as opening up asperities in the pad surface to capture and hold chemical slurry during a polishing procedure. As has been described, due to difficulties associated with superabrasive particle leveling in many traditional manufacturing processes, only a small percentage of superabrasive particles in a typical CMP pad dresser are positioned so as to penetrate or cut into a CMP pad. As this small percentage of superabrasive particles become worn, plastic deformation of the CMP pad becomes large relative to the amount of CMP of pad that is cut. Consequently, the pad becomes highly deformed and accumulated with dirt. As a result the polishing rate of the CMP pad declines, and the scratch rate of the wafer or work piece increases.

CMP pads are typically made of a relatively soft polymer, such as, for example, polyurethane. As the CMP pad is engaged by the CMP pad dresser, the polymer material is deformed first by elastic strain and then by plastic strain. Eventually, the strain energy in the deformed material exceeds the bond energy density (i.e. the hardness of the pad) and the polymer material ruptures. Thus, the function of superabrasive particles in the CMP pad dresser is to dress the CMP pad material by breaking polymeric bonds through this deformation process. It should be noted that sharp superabrasive particle tips can penetrate the CMP pad material without causing excessive deformation. As such, the sharpness of a superabrasive particle can be defined as being inverse to the deformed volume prior to rupture. In other words, the smaller the volume of deformation prior to

cutting, the sharper the cutting tip. This deformation information can be used to determine the sharpness of superabrasive particles in the CMP pad dresser.

Additionally, a superabrasive particle having a tip with smaller tip radius, such as would be the case with a broken corner, can cut more cleanly through the CMP pad with less deformation as compared to a superabrasive particle having a larger tip radius. Consequently, an irregularly shaped superabrasive particle tip can be sharper than a euhedral superabrasive corner having an obtuse angle relative to the CMP pad. This also applies to the difference between a superabrasive particle corner as compared with a superabrasive particle face.

It is thus noted that sharp superabrasive particle tips can cut CMP pad materials with less deformation and material strain. Conversely, a dull superabrasive particle may deform but not cut the CMP pad material because the strain energy does not exceed the bond energy density of the polymeric material. As the tips of such particles are worn, the contact area between the polymeric material and the particles increase. This increase in contact area results in an increase in the deformation volume of the pad. Due to the increased strain energy required for the polymeric material to rupture with such an increased deformation volume, the number of superabrasive particles cutting the polymeric material will decrease in relation to the degree of dulling during a CMP process.

CMP pad dressing can also be affected by the proportion of superabrasive particles in the CMP pad dresser that are working and the proportion that are overly-aggressively cutting. As an example, a typical CMP pad dresser can have greater than 10,000 superabrasive particles. Of these 10, 000 particles, in some cases there may only be a few working superabrasive particles that are actually able to cut the CMP pad. Additionally, out of these few working superabrasive particles, there may be a smaller proportion of overly-aggressive superabrasive particles that cut over 50% of the entire pad that is consumed during conditioning, and in some cases can remove more that 25% of the total pad material. This uneven work load distribution can cause erratic CMP performance, and can result in over consumption of the CMP pad, chipping of the overly-aggressive superabrasive particles that can scratch the wafer, unpredictable wafer removal rates, uneven wafer surface planarization, shortened CMP pad dresser life,

compaction of the CMP pad with debris, and the like. Such effects can greatly lower the yield of wafers or work pieces processed under these conditions. A more effective normalization of work load distribution across the surface of the CMP pad dresser can lead to a more uniformly deglazed pad and more uniform pad asperities.

The present CMP pad dressers include a layer of superabrasive particles having substantially leveled tips across the working surface of the finished CMP pad dresser. A variety of techniques can be utilized to maintain tip leveling, and any such technique is considered to be within the present scope. A few non-limiting examples of such techniques are described below. It is intended that the term "leveling" with respect to superabrasive particles can refer to superabrasive particles that are leveled with respect to a planar profile, as well as to superabrasive particles that are aligned along a designated profile that is non-planar. In the latter case, "leveling" would thus describe the alignment of the superabrasive particles along the designated profile. So in the case of a profile having a dome-shape, leveled superabrasive particles would be particles that were in alignment with the profile.

Furthermore, superabrasive tip alignment can additionally be described in terms of height distribution, or in some cases protrusion distance from the support substrate that is represented by a height distribution across the plurality of superabrasive particles. An even height distribution of superabrasive particles may function to more effectively preserve the integrity of the CMP pad dresser as compared to CMP pad dressers lacking such an even height distribution. Similarly, a plurality of superabrasive particles can be described as extending away from a support substrate to a predetermined height, represented by a protrusion distance from the substrate, where the predetermined heights of the particles align along a designated profile. Thus, the actual distribution of protrusion distances across the plurality of superabrasive particles in a finished dresser can be compared against the designated profile to determine the variance, or degree of "leveling" achieved.

In one aspect, for example, a CMP pad dresser is provided including a support substrate and a plurality of superabrasive particles secured to the support substrate, with each superabrasive particle extending away from the support substrate to a protrusion distance, where the highest protruding tip of each of the plurality of superabrasive

particles align along a designated profile. While it is intended that the tips of the superabrasive particles align along the designated profile, some level of deviation may occur. These deviations may be a result of the design or manufacturing process of the tool. Given the wide variety of sizes of superabrasive particles that may potentially be utilized in a given tool, such deviations may be highly dependent on a particular application. Also, when referring to the designated profile, it should be noted that the term "tip" is intended to include the highest protruding point of a superabrasive particle, whether that point be an apex, an edge, or a face.

As such, in one aspect 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. In yet another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 10 microns to about 75 microns. In a further aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 10 microns to about 50 microns. In another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 50 microns to about 150 microns. In yet another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 20 microns to about 100 microns. In a further aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 20 microns to about 50 microns. In another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 20 microns to about 40 microns. Additionally, in one aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by less than about 20 microns. In another aspect the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by less than about 10 microns. In yet another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by less than about 5 microns. In yet another aspect, the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by less than

about 1 micron. In a further aspect, a majority of the plurality of superabrasive particles are arranges such that their tips vary from the designated profile to less than about 10% of the average size of the superabrasive particles.

In another aspect, each of the plurality of superabrasive particles can be defined by a protrusion distance from an exposed surface of a binding material from which they protrude to a predetermined height. Though the predetermined height may vary between tool applications, in one aspect the predetermined height may be greater than about 20 microns. In another aspect the variation from the predetermined height may be from about 1 micron to about 20 microns. In yet another aspect the variation from the predetermined height may be from about 5 microns to about 20 microns. In a further aspect the variation from the predetermined height may be from about 10 microns to about 20 microns. Superabrasive particles may also be arranged with respect to arrangement or distribution, attitude, size, etc. Furthermore, the distribution of protrusion of the plurality of superabrasive particles is reflected in the depth that the particles cut into a CMP pad.

As such, in one specific aspect the predetermined height or protrusion distance may produce a cutting depth of less than about 20 microns when used to dress a CMP pad. In another specific aspect, the predetermined height or protrusion distance may produce a cutting depth of from about 1 micron to about 20 microns when used to dress a CMP pad. In yet another specific aspect, the predetermined height or protrusion distance may produce a cutting depth of from about 10 micron to about 20 microns when used to dress a CMP pad. It should also be noted that the leveling of superabrasive particles to a predetermined height may be dependent on superabrasive particle spacing. In other words, the farther superabrasive particles are separated, the more the impinging forces will affect each superabrasive particle. As such, patterns with increased spacing between the superabrasive particles may benefit from a smaller variation from predetermined height.

In one specific example, a plurality of cutting elements such as superabrasive particles can protrude to a predetermined height above a binding material such as, for example, a solidified organic material layer. Though any predetermined height that would be useful in an abrading or cutting tool would be considered to be within the

presently claimed scope, in one specific aspect the predetermined height may produce a cutting depth of less than about 20 microns when used to abrade a workpiece. In another specific aspect, the predetermined height may produce a cutting depth of from about 1 micron to about 20 microns when used to abrade a workpiece. In yet another specific aspect, the predetermined height may produce a cutting depth of from about 10 micron to about 20 microns when used to abrade a workpiece. In yet another aspect, the predetermined height may produce a depth of up to or more than 50 or 100 microns.

As a further example, it may also be beneficial for the cutting elements to protrude from the binding material, for example, solidified organic material layer to a predetermined height or series of heights that is/are along a designated profile. Numerous configurations for designated profiles are possible, depending on the particular use of the abrading tool. In one aspect, the designated profile may be a plane. In planar profiles, the highest protruding points of the cutting elements are intended to be substantially level. It is important to point out that, though it is preferred that these points align with the designated profile, there may be some height deviation between cutting elements that occur due to limitations inherent in the manufacturing process.

In addition to planar profiles, in another aspect the designated profile has a slope. Tools having sloping surfaces may function to more evenly spread the frictional forces impinging thereon across the cutting elements, particularly for rotating tools such as disk sanders and CMP pad dressers. The greater downward force applied by higher central portions of the tool may offset the higher rotational velocity at the periphery, thus reducing the mechanical stress experienced by cutting elements in that location. As such, the slope may be continuous from a central point of the tool to a peripheral point, or the slope may be discontinuous, and thus be present on only a portion of the tool. Similarly, a given tool may have a single slope or multiple slopes. In certain aspects, the tool may slope in a direction from a central point to a peripheral point, or it may slope from a peripheral point to a central point.

Various slopes are contemplated that may provide a benefit to solidified organic material layer tools. It is not intended that the claims of the present invention be limited as to specific slopes, as a variety of slopes in numerous different tools are possible. In

one aspect, however, a CMP pad dresser may benefit from an average slope of 1/1000 from the center to the periphery.

As a variation on tools having a slope, in certain aspects the designated profile may have a curved shape. One specific example of a curved shape is a dome shape tool. Such curved profiles function in a similar manner to the sloped surfaces. Tools may include such curved profiles in order to more effectively distribute the frictional forces between all of the cutting elements, thus reducing failures of individual particles and prolonging the life of the tool.

Furthermore, in some aspects the determination of the distance that the tips of the cutting elements extend from a binder material, such as an organic binder, can also be affected by considering how much of the cutting elements extend above the binder compared to how much of the cutting elements remain submerged beneath the binder surface. In one aspect, a ratio of an amount the cutting elements protrude above the binder to an amount submerged beneath the binder is about 4 to 1. In another aspect, about 2/3 of the cutting elements are submerged, with about 1/3 being exposed above the binder. Other ratios are also possible, from a 20 to 1 ratio to about 0.2 to 1, inclusive of ranges therebetween.

As a non-limiting example, in one aspect a CMP pad dresser can include a support substrate, such as a rigid support substrate, and a monolayer of a plurality of superabrasive particles coupled to the support substrate, where the plurality of superabrasive particles includes a plurality of working superabrasive particles. In use the dresser can be engaged against a CMP pad and cut asperities into the CMP pad having a cutting depth of less than or equal to about 50 microns. In another aspect, the cutting depth is from about 10 microns to about 50 microns. Additionally, in one aspect the plurality of working superabrasive particles includes at least 100 working superabrasive particles, at least 300 working superabrasive particles, or at least 500 working superabrasive particles. In another aspect, the plurality of working superabrasive particles includes at least 1000 working superabrasive particles. In yet another aspect, the plurality of working superabrasive particles includes from about 1000 to about 6000 working superabrasive particles. In a further aspect, the plurality of working superabrasive particles includes from about 2000 to about 5000 working superabrasive

particles. In yet another aspect, the plurality of working superabrasive particles include at least about 1000 working superabrasive particles that protrude from the rigid support substrate to distances within about 30 microns of one another.

It is noted that, in some cases, the number of working superabrasive particles can be determined by observing edge or tip wear after use in a dressing operation. As such, in one aspect a CMP pad dresser can have greater than about 300 superabrasive particles with worn tips or edges following a CMP pad dressing procedure. In another aspect, a CMP pad dresser can have greater than about 500 superabrasive particles with worn tips or edges following a CMP pad dressing procedure. In a further aspect, a CMP pad dresser can have greater than about 1000 superabrasive particles with worn tips or edges following a CMP pad dressing procedure.

In one example, superabrasive particle tips can be described in terms of the distance that each superabrasive particle protrudes from the binding material, or matrix layer. The difference in protrusion distance between the highest protruding tip and the next highest protruding tip of the monolayer of superabrasive particles is described as the protrusion difference. In one aspect, the protrusion difference can be less than or equal to about 50 microns. In another aspect, the protrusion difference can be less than or equal to about 20 microns. In a further aspect, the protrusion difference can be less than or equal to about 10 microns. It is noted that the term "protrusion difference" can also be used to describe the difference in protrusion distance between any two or more superabrasive particles.

In another aspect, and in addition to the protrusion difference between the highest two protruding tips, the difference in protrusion distance between the highest 10 protruding tips of the monolayer of superabrasive particles are within about 30 microns or less. In yet another aspect, the difference in protrusion distance between the highest 10 protruding tips of the monolayer of superabrasive particles are within about 20 microns or less.

Additionally, in some aspects the difference in protrusion distance between the highest 1% of the protruding tips of the first monolayer of superabrasive particles can be within about 80 microns or less. In other words, for the 1% of the plurality of superabrasive particles that have the highest protruding tips, the variance in protrusion

distance for that 1% is less than or equal to about 80 microns. For example, the two highest protruding superabrasive particle tips protrude to within about 10 microns or less of each other, and in addition, the highest protruding 1% of superabrasive particle tips protrude to within about 80 microns or less of each other. In yet another aspect, the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 60 microns or less. In yet another aspect, the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 40 microns or less.

It is noted that the recited protrusion distances can include a distribution across the entire monolayer surface or a discrete area or segment of the monolayer. For example, the highest 1% of protruding tips can be located around the periphery of the monolayer. In one aspect, for example, substantially all of the asperities are cut in the CMP pad by superabrasive particles located at a peripheral location of the dresser. In another aspect, the peripheral location extends from an outer edge of the dresser inwardly toward a center point of the dresser for up to about 90% of the dresser radius. In yet another aspect, the peripheral location extends from an outer edge of the dresser inwardly toward a center point of the dresser for up to about 50% of the dresser radius. In a further aspect, the peripheral location extends from an outer edge of the dresser inwardly toward a center point of the dresser for up to about 33% of the dresser radius. Additionally, in some aspects, substantially all of the superabrasive particles are located at a peripheral location of the dresser. In other aspects, substantially all of the superabrasive particles are arranged in uniform predetermined pattern at a peripheral location of the dresser.

In another example, discrete regions of leveled superabrasive particle tips can be located within a larger area of superabrasive particles having a lower protrusion distance than the leveled portion. It is also contemplated that the monolayer can include multiple regions or segments of superabrasive particles that are leveled as described, within a larger area of superabrasive particles having a lower protrusion distance.

Thus, the relative leveling of the monolayer of superabrasive particles can greatly affect the morphology and distribution of asperities cut into the CMP pad by the dresser. For example, in one aspect, the monolayer is leveled such that rotating the dresser against the CMP cuts asperities having a maximum cutting depth of about 80 microns. In

another aspect, the monolayer is leveled such that rotating the dresser against the CMP cuts asperities having a maximum cutting depth of about 60 microns. In yet another aspect, the monolayer is leveled such that rotating the dresser against the CMP cuts asperities having a maximum cutting depth of about 40 microns. By forming pointed asperities, the contact pressure between the work piece and the CMP pad is increased, thus improving the polishing characteristics of the pad. As these pointed regions begin to flatten, the contact pressure begins to decrease, and slurry located therebetween is less effectively pressed against the work piece. In some aspects it can be beneficial for the contact area between the pad and the wafer to be less than or equal to about 1% of the total wafer surface area facing the pad. In other aspects, it can be beneficial for the contact area between the pad and the wafer to be less than or equal to about 0.1% of the total wafer surface area facing the pad. This small contact area is due to the wafer being perched on the contact points of the asperities. During the polishing process, the sharp tips of the asperities become worn, thus increasing the contact area and decreasing the contact pressure to a point whereby the slurry abrasives do not effectively abrade the wafer. At this point the removal rate of material from the wafer drops, and the pad needs to be redressed to resharpen the asperities.

Additionally, the load placed on the CMP pad by the dresser can affect the morphology of the spacers, such as, in some cases, the asperity depth. The load can be adjusted for a given dresser to adjust penetration depth. In one aspect, for example, the load can be from about 0.1 Kg to about 60 Kg. In other aspects, the load can be from about 2 Kg to about 20 Kg. In further aspects, the load may be from about 6 Kg to about 12 Kg. In some aspects the load may be Kg/m2. For example, in one aspect an 11.5 Kg load can allow a material removal rate from the wafer of about 200 microns per hour for Cu layers. In a related example, an 11.5 Kg load can allow a material removal rate from the wafer of about 100 microns per hour for oxides. In many cases, a lower load can be used in order to minimize the superabrasive particle damage (e.g., less than or equal to about 2 Kg).

Furthermore, leveling of the tips of the superabrasive particles in the monolayer allows differing amounts of superabrasive particles to actually cut asperities into the pad. In one aspect, for example, the tips are leveled such that at least 100 tips of the plurality

of superabrasive particles cut asperities into the CMP pad as the dresser is rotated. In another aspect, the tips are leveled such that at least 50 tips of the plurality of superabrasive particles cut asperities into the CMP pad as the dresser is rotated. In a further aspect, the tips are leveled such that at least 25 tips of the plurality of superabrasive particles cut asperities into the CMP pad as the dresser is rotated.

Additionally, various methods can be utilized to measure superabrasive particle tip height to determine the difference in protrusion distance between tips. As such, any method for making such a determination is considered to be within the present scope. It should be noted that for the purposes of the present disclosure, the term "protrusion" refers to the height of a particle relative to some reference point. Techniques for such measurements can include direct measurements of the tip heights relative to a reference point such as, for example, the highest particle tip, a surface of a rigid support, the bottom surface of the matrix, etc. Measurements of particle height from the surface of the matrix material can be problematic, however, due to the irregular nature of such materials due to wicking around the superabrasive particles. In those cases whereby the matrix material is uniform, such a surface may be used to determine particle height. Additionally, a relative protrusion or height difference between two particles would be the difference in the heights between these particles measured from a common reference point. Furthermore, in some cases the superabrasive particles may lie along a slope, curvature, or some other arrangement that is not parallel to the underlying support, such as, for example, a metal support layer. In these cases, the protrusion height would be normalized against the slope, curvature, or other arrangement so that the relative protrusion height difference between particles can be measured in the absence of the slope, curvature, etc. It should be noted that superabrasive particle tip height leveling can, in some cases, be independent from the positioning or patterning of the superabrasive particles across the surface of the dresser.

One example of a direct measurement technique can include an optical scanning process to evaluate superabrasive particle tip positions. In one such process, an optical scanner can scan the surface of the CMP pad dresser to determine the height of the superabrasive particle tips relative to a fixed point. For example, the scanner can scan downward in space toward the dresser until the highest tip is located. The highest tip can

then be set to the reference point, and the scanner can continue scanning in a direction toward the dresser measuring the distance from the reference point to each superabrasive particle tip across the surface of the dresser. Accordingly, the difference in protrusion distance between all of the superabrasive particles across the dresser can be directly measured.

Furthermore, measurement techniques can also include indirect measurements, such as, for example, applying the diamond monolayer to a deformable substrate that deforms relative to the protrusion distance of the particle tips. The diamond monolayer can be pressed into the deformable substrate and/or moved across the deformable substrate to form a scratch pattern therein. Tip height can thus be extrapolated from such indirect measurements.

Numerous configurations for designated profiles are possible depending on the particular use of the abrading tool, and all such designated profiles are considered to be within the present scope. In one aspect, for example, the designated profile can be a plane. In planar profiles, the highest protruding points of the superabrasive particles are intended to be substantially level in the traditional sense. It is important to point out that, though it is preferred that these points align with the designated profile, there may be some height deviation between superabrasive particles that occur due to limitations inherent in the manufacturing process.

In addition to planar profiles, in another aspect of the present invention the designated profile has a slope. Tools having sloping surfaces may function to more evenly spread the frictional forces impinging thereon across the superabrasive particles, particularly for rotating tools such as disk sanders and CMP pad dressers. The greater downward force applied by higher central portions of the tool may offset the higher rotational velocity at the periphery, thus reducing the mechanical stress experienced by superabrasive particles in that location. As such, the slope may be continuous from a central point of the tool to a peripheral point, or the slope may be discontinuous, and thus be present on only a portion of the tool. Similarly, a given tool may have a single slope or multiple slopes. In certain aspects, the tool may slope in a direction from a central point to a peripheral point, or it may slope from a peripheral point to a central point. Various slopes are contemplated that may provide a benefit to solidified organic material

layer tools. It is not intended that the claims of the present invention be limited as to specific slopes, as a variety of slopes in numerous different tools are possible. In one aspect, however, a CMP pad dresser may benefit from an average slope of 1/1000 from the center to the periphery.

Furthermore, in certain aspects the designated profile may have a curved shape. One specific example of a curved shape is a dome shape CMP pad dresser. Such curved profiles function in a similar manner to the sloped surfaces. CMP pad dressers may include such curved profiles in order to more effectively distribute the frictional forces between all of the superabrasive particles, thus reducing failures of individual particles and prolonging the life of the dresser. Also, CMP pad dressers can have designated profiles that combine any of a plane, a slope, a curved shape, a dome shape, and the like, into a variety of complex profiles.

In another aspect of the present disclosure, a CMP pad dresser can include a support substrate, such as a rigid support substrate, and a monolayer of a plurality of superabrasive particles coupled to the support substrate, where each superabrasive particle in the monolayer extends away from the support substrate to a protrusion distance, and where 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. Additionally, 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 difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns. In yet another aspect, the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns. In a further aspect, the difference in protrusion distance between the highest protruding tip and the 10th highest protruding tip is less than or equal to about 20 microns. In yet another aspect, the difference in protrusion distance between the highest protruding tip and the 100th highest protruding tip is less than or equal to about 40 microns.

In another aspect of the present disclosure, a CMP pad dresser is provided including a support substrate and a plurality of superabrasive particles secured to the

support substrate and positioned to engage and dress a CMP pad, where the plurality of superabrasive particles cut to depths of less than 50 microns into a CMP pad during a dressing procedure.

In a further aspect, a method of dressing a CMP pad is provided. Such a method can include applying a CMP pad dresser to a CMP pad, and moving at least one of the CMP pad or the CMP pad dresser with respect to one another to cut asperities into the CMP pad having a cutting depth of from about 10 microns to about 50 microns. As one non-limiting example, an exemplary CMP pad can include a support substrate and a monolayer of a plurality of superabrasive particles coupled to the support substrate, where the plurality of superabrasive particles includes a plurality of working superabrasive particles.

In one exemplary aspect, as is shown in FIG. 1, a CMP pad dresser 100 includes a monolayer of a plurality of superabrasive particles 102 coupled to a support substrate 104 with, for example, a binding material 105. Each superabrasive particle in the monolayer protrudes to a protrusion distance from the support substrate. The difference in protrusion distance 106 between the highest protruding tip 108 and the next highest protruding tip 110 of the monolayer of superabrasive particles is described as the protrusion difference. In one aspect, the protrusion difference can be less than or equal to about 50 microns. In another aspect, the protrusion difference can be less than or equal to about 20 microns. In a further aspect, the protrusion difference can be less than or equal to about 10 microns. It is noted that the term "protrusion difference" can also be used to describe the difference in protraction distance between any two or more superabrasive particles.

A variety of materials are contemplated for use as superabrasive particles. Any superabrasive known that can be utilized in a CMP pad dresser should be considered to be within the present scope. Non-limiting examples of such materials include diamond materials, nitride materials, ceramics, and the like. In one aspect, the superabrasive particles include diamond materials. Such diamond materials can include natural or synthetic diamond, single crystal, polycrystalline, and the like. In another aspect, the superabrasive particles include cubic boron nitride materials.

It is intended that the scope of the present disclosure include superabrasive particles of all conceivable sizes that would be useful in dressing a CMP pad. Aspects of the present disclosure, however, specifically allow the retention of superabrasive particles in a CMP pad dresser of sizes that have not previously been feasible for use in metal tools made using traditional techniques with particles exposed and arranged in a pattern. In one aspect, superabrasive particles may range in size from about 30 microns to about 250 microns. In another aspect, superabrasive particles may range in size from about 100 microns to about 200 microns. In yet another aspect, superabrasive particles can range from 100 microns to 150 microns. Additionally, various diamond particles sizes can be used, including mesh sizes such as 10/20, 30/40, 80/90, 90/100, 100/120, 120/140, 140/170, 170/200, 200/230, 230/270, 270/325, and 325/400.

Additionally, the plurality the superabrasive particles can be oriented so as to affect dressing performance of a CMP pad. Orienting the superabrasive particles in a specific attitude in relation to the CMP pad to be dressed creates different asperities in the pad surface, thus altering the performance of the CMP pad. Different asperities retain slurry in different manners and thus polish a workpiece differently according to asperity depth, width, density, etc. The superabrasive particles of a CMP pad dresser can be oriented according to the desired polishing characteristics of the CMP pad. For example, if the superabrasive particles predominantly have an apex oriented towards the CMP pad, the asperities of the pad will be narrow and deep. The advantages of narrow and deep asperities are that the pad can better retain the polishing slurry, and thus the polishing rate of the wafer increases. However, the increased polishing rate may also increase the wear rate of the superabrasive particles. As such, wear rate may vary depending on the attitude of the superabrasive particles, and therefore, the orientation of each superabrasive particle may be considered when designing a device with desired performance characteristics. Generally speaking, superabrasive particle attitudes that provide higher dressing rates (i.e. deeper penetration into a pad) also wear particles out at a higher rate.

In contrast, if the superabrasive particles are oriented with a face towards the pad, the resulting asperities may polish at a lower rate. The face of the particle is generally thought to be more durable, but does not typically cut deep and narrow asperities in the pad, but rather asperities that are shallow and broad. Therefore the face portion of a

particle will dress a CMP pad at a reduced rate compared to the apex portion of a particle, but the superabrasive particle will wear at a much lower rate.

The edge portions of a superabrasive particle have dressing and wear characteristics that are between those of the face and apex portions. It has been thought that if the edge portion is utilized to dress a CMP pad, the asperities are not as deep or narrow as those dressed with an apex portion, but may provide asperities having desirable intermediate characteristics. Further, the edge portion of the particle does not wear at such a high rate as that of an apex.

In one aspect, the plurality of superabrasive particles are substantially all configured in an attitude having either an apex portion or an edge portion oriented toward a pad to be dressed. In another aspect, the plurality of superabrasive particles are substantially all configured in an attitude having either an edge portion or a face portion oriented toward a pad to be dressed. In yet another aspect, the plurality of superabrasive particles can be configured in an attitude having a sharp portion oriented towards a pad to be dressed. In a further aspect, the plurality of superabrasive particles can be configured in an attitude having an apex portion oriented towards a pad to be dressed.

A CMP pad dresser having a substantially leveled tip arrangements can have a low scratch rate because superabrasive particles are less likely to pull out of the matrix layer due to their more uniform protrusion distribution compared to traditional dressers. Additionally, the more uniform protrusion distributions of such a dressers allows the conditioning of CMP pads in such a manner as to facilitate good polishing rates while at the same time extending the effective working life of the dresser. These benefits can be affected by, for example, uniform asperity spacing and size distribution in the CMP pad.

CMP pad dressers having substantially leveled or leveled superabrasive particle tips can be made using various manufacturing techniques, and any such technique is considered to be within the present scope. The following description provides a few non-limiting descriptions of such exemplary processes.

In one aspect, for example, a CMP pad dresser can be made using a brazing process, and as such would generally include a support substrate and a plurality of superabrasive particles coupled to the support substrate by a metal or metal alloy braze material. As has been described, traditional brazing techniques create warpage in the

dresser as the braze material cools. As such, superabrasive particle tips that were leveled prior to brazing are substantially misaligned in the manufactured dresser. Therefore, steps to minimize or eliminate the warpage must be taken when using a braze process in order to maintain tip leveling. Various techniques to minimize or eliminate warpage are contemplated, and any such technique is considered to be within the present scope.

As one general example, a CMP pad dresser can be made in at least a two stage process, where the first stage is performed in a manner that minimizes perturbations of the leveled tips in a process that would normally significantly move the superabrasive tips out of a leveled arrangement, such as, for example, by brazing. The second stage of the process can further enhance the leveling of superabrasive particle tips across the CMP pad dresser. Other examples may include utilizing lower temperature alloys, using slow temperature ramping in heating and/or cooling of the support substrate, using additional mechanical support to firmly hold the support substrate from moving when warpage occurs, and the like.

Warpage can also be minimized or eliminated through the structural design of the dresser. For example, in one aspect a CMP pad dresser can include a first monolayer of superabrasive particles disposed on one side of a metal support layer and a second monolayer of superabrasive particles disposed on the metal support layer on an opposite side from the first monolayer. The superabrasive particles of the second monolayer are positioned to have substantially the same distribution as the superabrasive particles of the first monolayer. A rigid support is coupled to the second monolayer of superabrasive particles opposite the first monolayer to provide support to the dresser.

As is shown in FIG. 2, for example, a first monolayer of superabrasive particles 202 is arranged on a surface of a support substrate 204. A second monolayer of superabrasive particles 206 is arranged on the support substrate 204 on a side that is opposite to the first monolayer. As is discussed further below, in some cases the first and second monolayers of superabrasive particles can be arranged such that corresponding superabrasive particles across the support layer are in substantial alignment, as is shown in FIG. 2. In other cases, the superabrasive particles of the first and second monolayers can be arranged in a substantially similar distribution, but may or may not be substantially aligned with one another across the support substrate.

The disposition of a monolayer of superabrasive particles on each side of the support substrate thus moderates the thermal shrinkage from the brazing temperature that would otherwise buckle a distribution of superabrasive particles arranged on just one side. By applying a monolayer to each side of the support substrate, warping forces such as thermal movement and pressure can be equalized or substantially equalized from both sides. As such, the warpage of the support substrate can be minimized. In other words, the forces responsible for warping are applied substantially equally to each side of the support substrate and can thus at least partially cancel one another out, thus minimizing warpage that can otherwise occur. In some aspects, the superabrasive particles making up the monolayers on each side of the support substrate can have matching configurations, patterns, or orientations to one another. In this way there can be a substantially matching spatial arrangement of superabrasive particles on each side of the support substrate. In another aspect, the configurations, patterns, or orientations can be different or varied from one another, or may be partially matching. In yet another aspect, the patterned placement of the superabrasive particles on one side of the support substrate can be substantially aligned with the pattern of superabrasive particles on the other side of the support substrate so that particle locations match one another. In some aspects, there can be a direct correspondence between the spatial positioning of superabrasive particles on one side of the support substrate and the spatial positioning of superabrasive particles on the other side of the metal support substrate. In another aspect, the patterns of superabrasive particles may match or substantially match one another, but may be offset on opposite sides of the support substrate so that particle locations do not match one another.

Accordingly, minimizing the warpage of the support substrate can maintain a greater degree of leveling of superabrasive particle tips in the finished tool. When heat and/or pressure are used to make a superabrasive tool, warpage of the support substrate can cause great variations in tip height level, even for those particles that were leveled prior to heating and/or applying pressure. In one aspect, distributing the warpage forces equally or substantially equally on both sides of a support substrate through the arrangement of the superabrasive particles can effectively cancel forces on opposing sides and thus greatly reduce the degree of warping occurring in the support substrate,

thus also minimizing the relative height movement of the superabrasive particles relative to one another. In other aspects, CMP pad dressers can be made using processes that do not utilized high pressure and/or high temperature.

The support substrate can be any material capable of supporting the diamond monolayer during tool formation. Such materials can include, without limitation, metal materials, metal alloy materials, braze alloy materials, ceramic materials, composites, and the like.

In one aspect, the superabrasive particles can be arranged into a predetermined pattern. Such a pattern can be a uniformly distributed pattern or a non-uniformly distributed pattern. Additionally, a variety of techniques are contemplated to facilitate the arrangement of superabrasive particles into a predetermined pattern. Predetermined is understood to mean a non-random pattern that has been determined prior to arranging the superabrasive particles. In one aspect, a predetermined pattern can also apply to a predetermined spacing between particles. Non-limiting examples of such techniques include arrangement by a template, arrangement using spots of adhesives, arrangement on a first substrate followed by a pattern specific transfer from the first substrate to the support substrate, and the like, including combinations thereof. The superabrasive particles from either of the monolayers can be temporarily held in position in the predetermined pattern using a variety of techniques, including, without limitation, adhesives, dimpled locations on the metal support matrix, a supporting compound such as, for example, a wax, and the like, including combinations thereof. In one specific aspect, the superabrasive particles can be temporarily coupled to the support substrate using an adhesive that then volatilizes away and is eliminated during construction of the dresser.

In one aspect, the predetermined pattern can be a uniformly distributed grid. In another aspect, the predetermined pattern can be an annular configuration having a central region devoid of superabrasive particles. In one specific aspect, the annular configuration can include an annular ring. In another specific aspect, the annular configuration can include a portion of an annular ring. In yet another aspect, an annular configuration can include one or more concentric annular rings nested inside one another.

In other aspects, the monolayer distribution can be discrete radial regions, spiral regions, and the like.

In another aspect, as is shown in FIG. 3, a first monolayer of superabrasive particles 302 is arranged on a surface of a support substrate 304. A second monolayer of superabrasive particles 306 is arranged on the support substrate 304 on a side that is opposite to the first monolayer. A bonding material 308 secures the first monolayer and the second monolayer to the support substrate 34. The bonding material can be any material capable of securing the first and second monolayer to the support substrate. In some aspect, the bonding material can be the same for securing the first monolayer and the second monolayer, while in other aspects the bonding material can be different for securing the first monolayer and the second monolayer.

It is noted that the various descriptions of materials, attachment techniques, and the like, can be generally applicable to any CMP pad dresser design to which such materials, techniques, and the like are applicable. For example, a material that can be used to secure a superabrasive particle to a substrate can be used in both dual monolayer and single monolayer dresser designs.

Accordingly, the bonding material can be any material capable of securing superabrasive particles therein. Non-limiting examples of bonding materials include metal brazes, metal braze alloys, organic matrix materials, sintered materials, electroplated materials, and the like, including combinations thereof.

In one aspect, for example, the superabrasive particles can be brazed to the support substrate, and thus the bonding material can be a metal braze or metal braze alloy. Metal brazing techniques are known in the art. A green braze material can be applied to the support substrate on or around the superabrasive particles. The metal braze can be applied in any known configuration, including braze sheets, powders, pastes, sprays, and the like, including combinations thereof. Once applied to the support substrate, the braze can be heated and melted to coat at least a portion of the support substrate and to bond the superabrasive particles. The heating temperature can vary depending on the braze material used, but in one aspect can be from about 700°C to about 1200°C.

In one non-limiting example, the superabrasive particles can be bonded to the support substrate by brazing with a nickel-based alloy containing chromium. In another example, the brazing can include pressing the superabrasive particles with a flat ceramic material that cannot be bonded to the braze in order to level the superabrasive particle tips. Various braze alloys are contemplated, including non-limiting examples such as BNi_2, BNi_7, and the like.

Additionally, in one aspect superabrasive particles can be coupled to the support substrate by an electrodeposition process, and thus the bonding material can be an electrodeposited metal material. As an example of a suitable method for positioning and retaining abrasive materials prior to and during the electrodeposition process, a mold can be used that includes an insulating material that can effectively prevent the accumulation of electrodeposited material on the molding surface. Superabrasive particles can be held on the molding surface of the mold during electrodeposition. As such, the accumulation of electrodeposited material can be prevented from occurring on the particle tips and the working surface of the pad conditioner substrate. Such techniques are described in U.S. Patent Application Serial No. 11/292,938, filed December 2, 2005, which is hereby incorporated herein by reference.

In another aspect, the superabrasive particles can be bonded to the support substrate by sintering, and thus the bonding material can include a sintering material. For example, the bonding of the superabrasive particles to the support substrate can include disposing a sintering compound on the support substrate in contact with the plurality of superabrasive particles, and sintering the sintering compound to bond the superabrasive particles to the support substrate. Suitable sintering methods will be readily appreciated by one of ordinary skill in the art having possession of this disclosure. Basically, a sintering compound is applied around the superabrasive particles and in contact with the support substrate. The sintering compound can be any known sintering material that can be used to secure superabrasive particles to a substrate. Non-limiting examples of such materials can include metal and metal alloy powders, ceramic powders, and the like. One specific non-limiting example of a sintering compound is cobalt powder.

Once the sintering compound has been applied around the superabrasive particles and to the support substrate, heat and in some cases pressure can be applied to cause

sintering to occur. In some aspects, a braze or braze alloy can be infiltrated into the sintering compound during bonding to further strengthen the bonding material matrix.

In yet another aspect, sintering can be used to sinter the plurality of superabrasive particles into a CMP pad dresser, where the support substrate is the sintering material. In this case, the above recited procedure can be repeated without the use of a support substrate.

In another aspect, heat and pressure can be applied to bond the plurality of superabrasive particles directly into the support substrate. Thus, upon the application of heat and pressure, the support substrate can be softened or partially melted. The superabrasive particles are then pressed into the support substrate. A planar leveling surface can be used to apply pressure to the monolayer of superabrasive particles to thus maintain the level nature of the superabrasive particle tips as the superabrasive particles are pressed into the support substrate. Pressure can be maintained upon the support substrate and superabrasive particles until cooled, thus minimizing warping.

In yet another aspect, as is shown in FIG. 4, a dual monolayer CMP pad dresser can include a first monolayer of superabrasive particles 402 and a second monolayer of superabrasive particles 406 coupled to a support substrate 404. The superabrasive particles can be coupled to the support substrate directly or via a bonding material. The second monolayer of superabrasive particles 406 is coupled to a second support substrate 408. A portion of the second support substrate is shown removed in FIG. 4 to expose the second monolayer. The second support substrate 408 can facilitate handling and use of the CMP pad dresser. By bonding the superabrasive particles of the second monolayer to the second support substrate, the first monolayer of superabrasive particles remains exposed for CMP pad conditioning operations.

The second support substrate can be made from any material compatible with the abrading or dressing process. Such materials can include polymeric materials, metal materials, ceramic materials, glasses, composites, and the like. In one aspect, the second support substrate can be a polymeric material and the second monolayer of superabrasive particles can be embedded therein using heat, pressure, adhesives, etc. In some aspects, the second support substrate can be a non-polymeric material such as a metal layer. In such cases, the superabrasive particles can be bonded to the second support substrate by

adhesive attachment, soldering, brazing, electroplating, and the like. For brazing techniques, care can be taken to minimize or eliminate warpage in the substrate during the heating and cooling process. In another aspect, one or more magnetic elements can be placed into the second support substrate to attract and hold the CMP pad dresser in place, thus forming a temporary attachment. An optional locking mechanism can be utilized to further immobilize the CMP pad dresser to the second support substrate during use. In some aspects the second support substrate can include surface features to hold the dresser in place during rotational movement against a CMP pad. The second support substrate can have approximately the same diameter as the metal support layer, a larger diameter than the metal support layer, or, in some cases, a smaller diameter than the metal support layer.

In another aspect, a CMP pad dresser can be comprised of a plurality of dressing segments having a plurality of leveled superabrasive particles tips, where the plurality of dressing segments are held in place by a rigid support or support substrate. Such a design allows a plurality of smaller dressing segments to be manufactured having precisely leveled tips. Smaller diameter support layers in these dressing segments can be made by processes involving heat and/or pressure with less warpage due to their smaller size. For example, a 4 inch diameter metal disc can exhibit greater warping due to brazing as compared to a 0.5 inch diameter metal disc. Thus thermal distortion and particle floating problems are decreased. A plurality of such dressing segments can then be coupled to a larger diameter support substrate by processes that do not introduce significant warpage, such as bonding in an organic material. Such dressing segments can have one or more layer(s) of superabrasive particles coupled to a support layer. In one aspect, a segment can have a single layer of superabrasive particles coupled to a support layer. In another aspect, a segment can have a layer of superabrasive particles coupled to each side of a support layer, as has been described herein. Thus, this process allows the manufacture of CMP pad dressers that can have precise tip protrusion tolerances. Additionally, in one aspect, each dressing segment can have at least three superabrasive particles that protrude to the greatest extent. If the three highest protruding superabrasive particles on every dressing segment are leveled across the entire support substrate, a CMP pad dresser is made having very precise tip leveling across the entire surface. If, for example, ten

dressing segments are used to make the CMP pad dresser, then the highest protruding thirty superabrasive particles in the tool will have effectively the same protrusion distance and be substantially leveled. Various additional details regarding dressing segments are detailed in U.S. Patent Application No. 13/034,213, filed February 24, 2011, which is hereby incorporated herein by reference.

Various organic materials are contemplated for use as a support substrate, and/or to secure a second monolayer of superabrasive particles and/or the dressing segments to the support substrate. Examples of suitable organic matrix materials include, without limitation, amino resins, acrylate resins, alkyd resins, polyester resins, polyamide resins, polyimide resins, polyurethane resins, phenolic resins, phenolic/latex resins, epoxy resins, isocyanate resins, isocyanurate resins, polysiloxane resins, reactive vinyl resins, polyethylene resins, polypropylene resins, polystyrene resins, phenoxy resins, perylene resins, polysulfone resins, acrylonitrile-butadiene-styrene resins, acrylic resins, polycarbonate resins, polyimide resins, and mixtures thereof. In one specific aspect, the organic material can be an epoxy resin. In another aspect, the organic material can be a polyimide resin. In yet another aspect, the organic material can be a polyurethane resin.

Additionally, so-called "reverse casting" methods can be used to accurately orient and attach the dressing segments to the support substrate. Such methods can include initially securing the plurality of dressing segments to a substrate using a "mask" material. The portions of the dressing segments protruding from the mask material can then be attached to the rigid support using the methods discussed herein, after which (or during which), the masking material can be removed.

When an organic material is utilized, methods of curing the organic material can be a variety of processes known to one skilled in the art that cause a phase transition in the organic material from at least a pliable state to at least a rigid state. Curing can occur, without limitation, by exposing the organic material to energy in the form of heat, electromagnetic radiation, such as ultraviolet, infrared, and microwave radiation, particle bombardment, such as an electron beam, organic catalysts, inorganic catalysts, or any other curing method known to one skilled in the art.

In one aspect of the present invention, the organic material can be a thermoplastic material. Thermoplastic materials can be reversibly hardened and softened by cooling

and heating respectively. In another aspect, the organic material layer may be a thermosetting material. Thermosetting materials cannot be reversibly hardened and softened as with the thermoplastic materials. In other words, once curing has occurred, the process can be essentially irreversible, if desired.

As a more detailed list of what is described above, organic materials that may be useful in embodiments of the present invention include, but are not limited to: amino resins including alkylated urea-formaldehyde resins, melamine-formaldehyde resins, and alkylated benzoguanamine-formaldehyde resins; acrylate resins including vinyl acrylates, acrylated epoxies, acrylated urethanes, acrylated polyesters, acrylated acrylics, acrylated polyethers, vinyl ethers, acrylated oils, acrylated silicons, and associated methacrylates; alkyd resins such as urethane alkyd resins; polyester resins; polyamide resins; polyimide resins; reactive urethane resins; polyurethane resins; phenolic resins such as resole and novolac resins; phenolic/latex resins; epoxy resins such as bisphenol epoxy resins; isocyanate resins; isocyanurate resins; polysiloxane resins including alkylalkoxysilane resins; reactive vinyl resins; resins marketed under the Bakelite™ trade name, including polyethylene resins, polypropylene resins, epoxy resins, phenolic resins, polystyrene resins, phenoxy resins, perylene resins, polysulfone resins, ethylene copolymer resins, acrylonitrile-butadiene-styrene (ABS) resins, acrylic resins, and vinyl resins; acrylic resins; polycarbonate resins; and mixtures and combinations thereof. In one aspect of the present invention, the organic material may be an epoxy resin. In another aspect, the organic material may be a polyimide resin. In yet another aspect, the organic material may be a polyurethane resin.

Numerous additives may be included in the organic material to facilitate its use. For example, additional crosslinking agents and fillers may be used to improve the cured characteristics of the organic material layer. Additionally, solvents may be utilized to alter the characteristics of the organic material in the uncured state. Also, a reinforcing material may be disposed within at least a portion of the solidified organic material layer. Such reinforcing material may function to increase the strength of the organic material layer, and thus further improve the retention of the individual abrasive segments. In one aspect, the reinforcing material may include ceramics, metals, or combinations thereof.

Examples of ceramics include alumina, aluminum carbide, silica, silicon carbide, zirconia, zirconium carbide, and mixtures thereof.

Additionally, in one aspect a coupling agent or an organometallic compound may be coated onto the surface of a superabrasive material to facilitate the retention of the superabrasive particles in the organic material via chemical bonding. A wide variety of organic and organometallic compounds is known to those of ordinary skill in the art and may be used. Organometallic coupling agents can form chemicals bonds between the superabrasive materials and the organic material, thus increasing the retention of the superabrasive materials therein. In this way, the organometallic coupling agent can serve as a bridge to form bonds between the organic material and the surface of the superabrasive material. In one aspect of the present invention, the organometallic coupling agent can be a titanate, zirconate, silane, or mixture thereof. The amount of organometallic coupling agent used can depend upon the coupling agent and on the surface area of the superabrasive material. Oftentimes, 0.05% to 10% by weight of the organic material layer can be sufficient.

Specific non-limiting examples of silanes suitable for use in the present invention include: 3- glycidoxypropyltrimethoxy silane (available from Dow Corning as Z-6040); γ-methacryloxy propyltrimethoxy silane (available from Union Carbide Chemicals Company as A-174); β-(3,4-epoxycyclohexyl)ethyltrimethoxy silane, γ-aminopropyltriethoxy silane, N-(β-aminoethyl)-γ-aminopropylmethyldimethoxy silane (available from Union Carbide, Shin-etsu Kagaku Kogyo K.K., etc.). Specific non-limiting examples of titanate coupling agents include: isopropyltriisostearoyl titanate, di(cumylphenylate)oxyacetate titanate, 4- aminobenzenesulfonyldodecylbenzenesulfonyl titanate, tetraoctylbis (ditridecylphosphite) titanate, isopropyltri(N-ethylamino-ethylamino) titanate (available from Kenrich Petrochemicals. Inc.), neoalkyoxy titanates such as LICA-01, LICA-09, LICA-28, LICA-44 and LICA-97 (also available from Kenrich), and the like. Specific non-limiting examples of aluminum coupling agents include acetoalkoxy aluminum diisopropylate (available from Ajinomoto K.K.), and the like. Specific non-limiting examples of zirconate coupling agents include: neoalkoxy zirconates, LZ-01, LZ-09, LZ- 12, LZ-38, LZ-44, LZ-97 (all available from Kenrich Petrochemicals, Inc.), and the like. Other known organometallic coupling agents, e.g.,

thiolate based compounds, can be used in the present invention and are considered within the scope of the present invention.

In other aspects of the present disclosure, superabrasive particle tips can be leveled by reducing the protrusions of particles that are outside of the desired tolerance range. Once such particles are identified, various techniques can be utilized to reduce such protrusions. In one aspect, for example, mechanical abrasion of the dresser can reduce the protruding particles. In another aspect, a vibration tool can be used to individually break such particles. In yet another aspect, a laser such as a Nd:YAG laser can be used to disrupt such particles.

In yet a further aspect of the present disclosure, a CMP pad dresser can include a plurality of superabrasive particles arranged as a working surface, where the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the first monolayer of superabrasive particles is less than or equal to about 20 microns, and where the difference in protrusion distance between the highest 1% of the protruding tips of the first monolayer of superabrasive particles, excluding the highest protruding tip, are within about 80 microns.

In another aspect, a CMP pad dresser can include a plurality of superabrasive particles arranged as a working surface, where the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns, the difference in protrusion distance between the highest protruding tip and the 10th highest protruding tip is less than or equal to about 20 microns, the difference in protrusion distance between the highest protruding tip and the 100th highest protruding tip is less than or equal to about 40 microns, and the highest protruding tip has a protrusion distance of greater than or equal to about 50 microns.

It is noted that, while the above disclosure refers primarily to CMP pad dressers, other precision grinding and/or abrading tools are considered to be within the present scope. As such, the techniques and teaching disclosed herein can additionally be applied to such tools.

Additionally, it is noted that traditional CMP processing techniques, including pad dressing, has limited the critical dimension of integrated circuits. The presently disclosed CMP dressing devices and techniques can, however, allows processing of wafers having

integrated circuit critical dimensions of less than or equal to 45nm, 32nm, 28nm, 22nm, or less.

Of course, it is to be understood that the above-described arrangements are only illustrative of the application of the principles of the present invention. Numerous modifications and alternative arrangements may be devised by those skilled in the art without departing from the spirit and scope of the present invention and the appended claims are intended to cover such modifications and arrangements. Thus, while the present invention has been described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred embodiments of the invention, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, variations in size, materials, shape, form, function and manner of operation, assembly and use may be made without departing from the principles and concepts set forth herein.

CLAIMS

What is claimed is:

1. A CMP pad dresser, comprising:

a support substrate; and

a plurality of superabrasive particles secured to the support substrate with each superabrasive particle extending away from the support substrate to a protrusion distance, wherein a highest protruding tip of each of the plurality of superabrasive particles align along a designated profile with a tip variation of from about 5 microns to about 100 microns.

2. The dresser of claim 1, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 10 microns to about 50 microns.

3. The dresser of claim 1, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 20 microns to about 40 microns.

4. The dresser of claim 1, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of less than about 20 microns.

5. The dresser of claim 1, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of less than about 20 microns when used to abrade a CMP pad.

6. The dresser of claim 1, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of from about 1 micron to about 20 microns when used to abrade a CMP pad.

7. The dresser of claim 1, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of from about 10 microns to about 20 microns when used to abrade a CMP pad.

8. The dresser of claim 1, wherein the designated profile includes a configuration selected from the group consisting of a plane, a slope, a curved shape, a dome shape, and combinations thereof.

9. The dresser of claim 1, wherein the plurality of superabrasive particles is arranged across the support substrate in a predetermined pattern.

10. The dresser of claim 9, wherein the predetermined pattern includes an even distribution of the plurality of superabrasive particles spaced at a distance of from about 100 microns to about 800 microns.

11. A CMP pad dresser, comprising:

a rigid support substrate; and

a monolayer of a plurality of superabrasive particles coupled to the support substrate, wherein each superabrasive particle in the monolayer extends away from the support substrate to a protrusion distance, and 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, 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.

12. The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns.

13. The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns.

14. The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the 10th highest protruding tip is less than or equal to about 20 microns.

15. The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the 100th highest protruding tip is less than or equal to about 40 microns.

16. A CMP pad dresser, comprising:

a rigid support substrate; and

a monolayer of a plurality of superabrasive particles coupled to the support substrate, wherein the plurality of superabrasive particles includes a plurality of working superabrasive particles, such that rotating the dresser against a CMP pad cuts asperities into the CMP pad having a cutting depth of less than or equal to about 50 microns.

17. The dresser of claim 16, wherein the cutting depth is from about 10 microns to about 50 microns.

18. The dresser of claim 16, wherein the plurality of working superabrasive particles includes at least 100 working superabrasive particles.

19. The dresser of claim 16, wherein the plurality of working superabrasive particles includes at least 1000 working superabrasive particles.

20. The dresser of claim 16, wherein the plurality of working superabrasive particles includes from about 1000 to about 6000 working superabrasive particles.

21. The dresser of claim 16, wherein the plurality of working superabrasive particles includes from about 2000 to about 5000 working superabrasive particles.

22. The dresser of claim 16, wherein the plurality of working superabrasive particles include at least about 1000 working superabrasive particles that protrude from the rigid support substrate to distances within about 30 microns of one another.

23. A method of dressing a CMP pad, comprising:

applying the CMP pad dresser of claim 16 to a CMP pad;

moving at least one of the CMP pad or the CMP pad dresser with respect to one another to cut asperities into the CMP pad having a cutting depth of from about 10 microns to about 50 microns.

24. A CMP pad dresser, comprising:

a support substrate; and

a plurality of superabrasive particles secured to the support substrate and positioned to engage and dress a CMP pad, wherein the plurality of superabrasive particles cut to depths of less than 50 microns into a CMP pad during a dressing procedure.

ABSTRACT

CMP pad dressers having leveled tips and associated methods are provided. In one aspect, for example, a CMP pad dresser can include a support substrate and a plurality of superabrasive particles secured to the support substrate with each superabrasive particle extending away from the support substrate to a protrusion distance, where a highest protruding tip of each of the plurality of superabrasive particles align along a designated profile with a tip variation of from about 5 microns to about 100 microns.

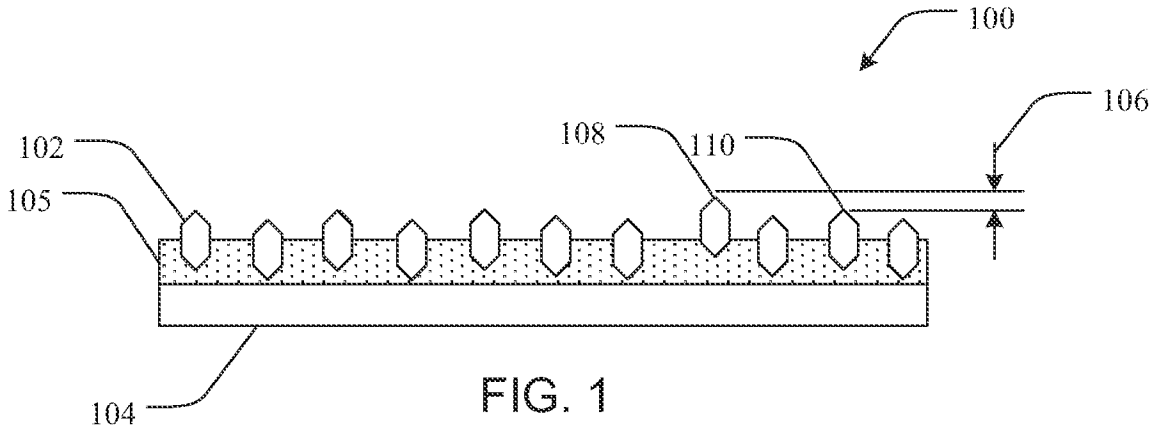


FIG. 1

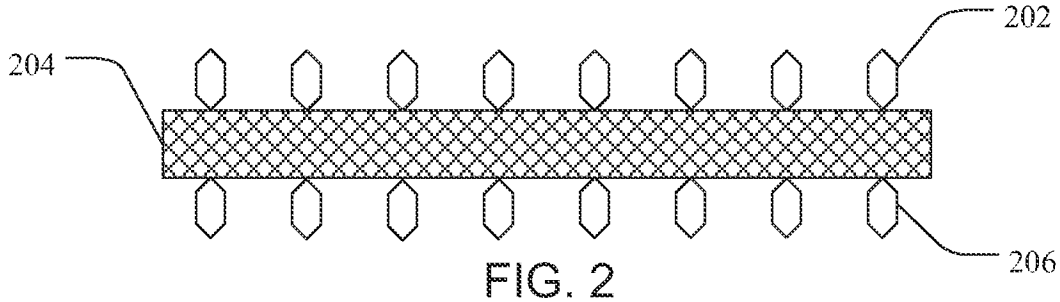


FIG. 2

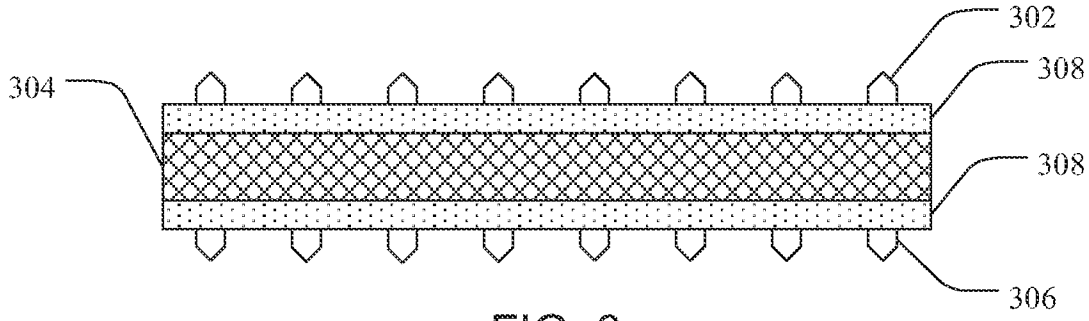


FIG. 3

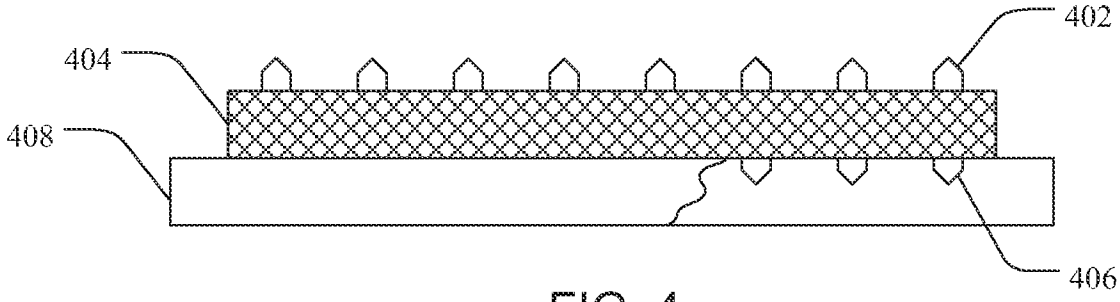


FIG. 4

Electronic Acknowledgement Receipt

EFS ID:	20329437
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Nicole Solomon
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	03-OCT-2014
Filing Date:	
Time Stamp:	19:15:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	24012-NP-CIP2-ADS.pdf	1265297 4922c1e6d5fd4373cfc1ce0d569f321e98fd0c1f	no	8

Warnings:	
Information:	

2		24012-NP-CIP2-Application.PDF	424658 c825e490abf255bd076f29a37d9895ed5373b00a	yes	46

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Specification	1	41
Claims	42	45
Abstract	46	46

Warnings:

Information:

3	Drawings-only black and white line drawings	24012-NP-CIP2-Drawings.pdf	20936 96231e9f2c3693d86ad838a5efd208c0536ff8fb	no	1

Warnings:

Information:

Total Files Size (in bytes):	1710891

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2

CONFIRMATION NO. 9471

20551
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

FORMALITIES LETTER

OC000000071295783

Date Mailed: 10/14/2014

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Additional claim fees of $ **1160** as an undiscounted entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.
  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **280** basic filing fee.
- $ **140** surcharge.
- $ **600** search fee.
- $ **720** examination fee.
- $ **840** for **2** independent claims over 3.
- $ **320** for **4** total claims over 20.

- $(**0**) previous unapplied payment amount.
- $ **2900** TOTAL FEE BALANCE DUE.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Chien-Min Sung

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/mabebe/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/506,476

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	24 minus 20 =	* 4			OR	x 80 =	320
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5 minus 3 =	* 2				x 420 =	840
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2760

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/506,476	10/03/2014	3723	0.00	02074-24012.NP.CIP2	24	5

CONFIRMATION NO. 9471

20551
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

FILING RECEIPT

OC000000071295782

Date Mailed: 10/14/2014

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Chien-Min Sung, Tansui, TAIWAN;

Applicant(s)

Chien-Min Sung, Tansui, TAIWAN;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 13/802,112 03/13/2013
which is a CIP of 13/479,148 05/23/2012
which claims benefit of 61/489,074 05/23/2011
This application 14/506,476
is a CIP of 13/797,704 03/12/2013
which is a CIP of 12/726,786 03/18/2010 PAT 8622787
which is a CIP of 12/255,823 10/22/2008 PAT 8393934
which is a CIP of 12/168,110 07/05/2008 PAT 8398466
which claims benefit of 60/976,198 09/28/2007
and said 12/726,786 03/18/2010
is a CIP of 11/560,817 11/16/2006 PAT 7762872
which is a CIP of 11/357,713 02/17/2006 ABN
which claims benefit of 60/681,798 05/16/2005
and said 11/560,817 11/16/2006
is a CIP of 11/223,786 09/09/2005 ABN
and said 13/797,704 03/12/2013
is a CIP of 12/850,747 08/05/2010 PAT 8678878
which claims benefit of 61/246,816 09/29/2009
and said 13/797,704 03/12/2013

is a CIP of 13/034,213 02/24/2011 ABN
which claims benefit of 61/333,162 05/10/2010

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 10/09/2014

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/506,476**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

Preliminary Class

451

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign

patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Electronic Patent Application Fee Transmittal

Application Number:	14506476
Filing Date:	03-Oct-2014
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Filer:	David William Osborne/Nicole Solomon
Attorney Docket Number:	02074-24012.NP.CIP2

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Pages:				
Claims:				
Claims in excess of 20	2202	4	40	160
Independent Claims in Excess of 3	2201	2	210	420
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Late Filing Fee for Oath or Declaration	2051	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1380**

Electronic Acknowledgement Receipt

EFS ID:	20759311
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Nicole Solomon
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	20-NOV-2014
Filing Date:	03-OCT-2014
Time Stamp:	18:05:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1380
RAM confirmation Number	4868
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Fee Worksheet (SB06)	fee-info.pdf	40027 89969952f4a2cfaf832da3351ec36ec1d5ead29f	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	40027

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/506,476	10/03/2014	3723	1380	02074-24012.NP.CIP2	24	5

CONFIRMATION NO. 9471

UPDATED FILING RECEIPT

20551
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

OC000000073266205

Date Mailed: 02/06/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Chien-Min Sung, Tansui, TAIWAN;

Applicant(s)

Chien-Min Sung, Tansui, TAIWAN;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 13/802,112 03/13/2013
which is a CIP of 13/479,148 05/23/2012
which claims benefit of 61/489,074 05/23/2011
This application 14/506,476
is a CIP of 13/797,704 03/12/2013
which is a CIP of 12/726,786 03/18/2010 PAT 8622787
which is a CIP of 12/255,823 10/22/2008 PAT 8393934
which is a CIP of 12/168,110 07/05/2008 PAT 8398466
which claims benefit of 60/976,198 09/28/2007
and said 12/726,786 03/18/2010
is a CIP of 11/560,817 11/16/2006 PAT 7762872
which is a CIP of 11/357,713 02/17/2006 ABN
which claims benefit of 60/681,798 05/16/2005
and said 11/560,817 11/16/2006
is a CIP of 11/223,786 09/09/2005 ABN
and said 13/797,704 03/12/2013
is a CIP of 12/850,747 08/05/2010 PAT 8678878
which claims benefit of 61/246,816 09/29/2009
and said 13/797,704 03/12/2013

is a CIP of 13/034,213 02/24/2011 ABN
which claims benefit of 61/333,162 05/10/2010

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 10/09/2014

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/506,476**

Projected Publication Date: 05/14/2015

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

Preliminary Class

451

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/506,476

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	24 minus 20 =	* 4	x 40 =	160	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5 minus 3 =	* 2	x 210 =	420			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1310		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2

CONFIRMATION NO. 9471

20551
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

NOTICE

OC000000073266206

Date Mailed: 02/06/2015

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Chien-Min Sung

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2

CONFIRMATION NO. 9471

20551
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

PUBLICATION NOTICE

OC000000075178491

Title:CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

Publication No.US-2015-0133036-A1
Publication Date:05/14/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PLUS Search Results for S/N 14506476, Searched Mon Jul 27 09:38:26 EDT 2015

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

7651386 99
7690971 99
7901272 99
7901272 99
8414362 99
8449357 99
8974270 99
20070060026 99
20070264918 99
20080171503 99
20080292869 99
20090098814 99
20100139174 99
20100221990 99
20110212670 99
20120302146 99
20140099868 99
20140308883 99
20150133036 99
6517424 83
6884155 83
7124753 83
7201645 83
7241206 83
7258708 83
7285039 83
7300338 83
7393264 83
7473162 83
7491116 83
7494404 83
7544117 83
7749050 83
7771498 83
8043145 83
8043145 83
8104464 83
8142261 83
8298043 83
8298048 83
8491358 83
8678878 83
8777699 83
8920214 83
20010046835 83
20020173234 83
20030084894 83
20040112359 83
20050095959 83
20060068691 83

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		0187593	02/1877	Brown et al.	
		0238946	03/1881	McKitrick	
		0296756	04/1884	Kirkpatrick	
		1854071	04/12/1932	Schacht	
		1988065	01/1935	Wooddell	
		2001/0003884	06/2001	Wei et al.	
		2001/0009844	07/2001	Cho et al.	
		2001/0046835	11/2001	Wielonski et al.	
		2002/0014041	02/2002	Baldonai et al.	
		2002/0042200	04/2002	Fawcett	
		2002/0127962	09/2002	Cho et al.	
		2002/0139680	10/2002	George	
		2002/0164928	11/2002	Tolles	
		2002/0173234	11/2002	Sung et al.	
		2002/0182401 A1	12/2002	Lawing	
		2003/0054746	03/2003	Nussbaumer	
		2003/0084894	05/2003	Sung	
		2003/0092357	05/2003	Yoon et al.	
		2003/0114094	06/2003	Myoung et al.	
		2003/0207659	11/2003	Annen et al.	
		2004/0009742	01/15/2004	Lin et al.	
		2004/0023610	02/05/2004	Hu et al.	
		2004/0060243	04/2004	Fries et al.	
		2004/0079033	04/2004	Long	
		2004/0091627	05/2004	Ohara et al.	
		2004/0107648	06/2004	Sung	
		2004/0112359	06/17/2004	Sung	
		2004/0180617	09/2004	Goers	
		2004/0185763 A1	09/23/2004	Ishizaki et al.	
		2004/0203325	10/2004	Donohue	
		2004/0235406 A1	11/2004	Duescher	
		2004/0238946	12/2004	Tachibana et al.	

Substitute for form 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** (Use as many sheets as necessary) Sheet | | of |	**Complete if Known**	
	Application Number	14/506,476
	Filing Date	10/3/2014
	First Named Inventor	Chien-Min Sung
	Art Unit	3723
	Examiner Name	
	Attorney Docket Number	02074-24012.NP.CIP2

		2005/0032462	02/2005	Gagliardi et al.	
		2005/0032469	02/10/2005	Duescher	
		2005/0060941	03/2005	Provow	
		2005/0095959	05/05/2005	Sung	
		2005/0118939	06/02/2005	Duescher	
		2005/0215188	09/2005	Toge et al.	
		2005/0227590	10/13/2005	Sung	
		2005/0260939	11/2005	Andrews et al.	
		2006/0073774	04/06/2006	Sung	
		2006/0079160	04/2006	Balagani et al.	
		2006/0079162	04/2006	Yamashita et al.	
		2006/0128288	06/2006	An et al.	
		2006/0135050	06/22/2006	Petersen et al.	
		2006/0143991	07/2006	Sung	
		2006/0213128 A1	09/28/2006	Sung	
		2006/0254154	11/2006	Huang et al.	
		2006/0258276	11/16/2006	Sung	
		2007/0051354	03/2007	Sung	
		2007/0051355	03/2007	Sung	
		2007/0060026	03/15/2007	Sung	
		2007/0066194	03/2007	Wielonski et al.	
		2007/0093181	04/26/2007	Lugg et al.	
		2007/0128994	06/07/2007	Sung	
		2007/0155298	07/2007	Sung	
		2007/0232074	10/04/2007	Ravi et al.	
		2007/0249270	10/2007	Sung	
		2007/0254566	11/01/2007	Sung	
		2007/0264918	11/2007	Sung	
		2007/0266639	11/22/2007	Chein-Min Sung	
		2007/0295267	12/27/2007	Sung	
		2008/0014845 A1	01/2008	Yimaz et al.	
		2008/0076338	03/2008	Andrews et al.	
		2008/0096479	04/2008	Sung	
		2008/0153398	06/2008	Sung	
		2008/0171503	07/2008	Sung	

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		2008/0271384	11/06/2008	Puthanangady et al.	
		2008/0292869	11/27/2008	Sung	
		2008/0296756	12/2008	Koch et al.	
		2009/0068937	03/2009	Sung	
		2009/0073774	03/2009	Horesh	
		2009/0093195	04/2009	Sung	
		2009/0094902 A1	04/2009	Hou	
		2009/0123705	05/14/2009	Sung	
		2009/0145045	06/11/2009	Sung	
		2009/0215363	08/27/2009	Sung	
		2009/0283089	11/19/2009	Sung	
		2010/0015898	01/2010	An et al.	
		2010/0022174	01/2010	Chou et al.	
		2010/0139174	06/2010	Sung	
		2010/0186479	07/29/2010	Borucki et al.	
		2010/0203811	08/2010	Philipossian et al.	
		2010/0221990	09/2010	Sung	
		2010/0248595	09/30/2010	Dinh-Ngoc et al	
		2010/0248596	09/2010	Sung	
		2010/0261419	10/14/2010	Chien-Min Sung	
		2010/0273402 A1	10/2010	Shimizu	
		2011/0076925 A1	03/2011	Sung	
		2011/0104989 A1	05/2011	Boutaghou et al.	
		2011/0192652 A1	08/2011	Shen et al.	
		2011/0212670	09/01/2011	Sung	
		2011/0252710 A1	10/2011	Hall et al.	
		2011/0275288	11/10/2011	Sung	
		2011/0293905	12/01/2011	Sung	
		2011/0296766	12/08/2011	Sung	
		2012/0192499	08/02/2012	Sung	
		2012/0241943	09/27/2012	Sung	
		2012/0244790 A1	09/2012	Sung	
		2012/0260582	10/18/2012	Sung	
		2012/0302146	11/29/2012	Sung	
		2013/0225052 A1	08/2013	Song et al	

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		2013/0244552	09/19/2013	Lee et al.	
		2014/0099868 A1	04/2014	Sung	
		2027087	01-07-1936	Buckner	
		2027307	01-07-1936	Schacht	
		2033991	03-17-1936	Melton	
		2035521	03-31-1936	Benner	
		2075354	03/1937	Monier	
		2078354	04/1937	Webster	
		2184348	12-26-1939	Kirchner	
		2187624	01-16-1940	Melton	
		2194253	03-19-1940	Benner	
		2268663	01/1942	Kuzmick	
		2281558	05-05-1942	Cross	
		2307461	01/1943	Ogden	
		2318570	05-04-1943	Paul	
		2334572	11-16-1943	Melton	
		2612348	09/1952	Catallo	
		2652951	09/1953	Augustus	
		2725693	12/06/1955	Leigh	
		2811960	11/1957	Fessel	
		2867086	01/1959	Haley	
		2876086	03/1959	Raymond	
		2947608	08/02/1960	Hall	
		2952951	09/1960	Simpson	
		3067551	12/1962	Maginnis	
		3121981	02/1964	Hurst	
		3127715	04/1964	Christensen	
		3146560	09/01/1964	Hurst	
		3276852	10/1966	Lemelson	
		3293012	12/1966	Smiley	
		3372010	03/1968	Parsons	
		3377411	04-09-1968	Charvat	
		3416560	12/1968	Bruno	
		3440774	04-29-1969	Curn	
		3593382 A	07/20/1971	Miller	

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		3608134	09-28-1971	Cook	
		3625666	12-07-1971	James	
		3630699	12/1971	Caitlin	
		3631638	01/1972	Yoshikawa et al.	
		3664662	05/23/1972	Linz	
		3706650	12/19/1972	Eisner	
		3743489	07/1973	Wentorf Jr. et al.	
		3767371	10/1973	Wentorf Jr. et al.	
		3802130	04/1974	Lindenbeck	
		3819814	06/1974	Pope	
		3852078	12/03/1974	Wakatsuki	
		3894673	07/1975	Lowder et al.	
		3905571	09/1975	Lombardo	
		3982358	09/28/1976	Fukuda	
		4018576	04/1977	Lowder et al.	
		4028576	06/1977	Wofsey	
		4078906	03/1978	Green	
		4149881	04/1979	D'Silva	
		4151154	04/1979	Berger	
		4155721	05/1979	Fletcher	
		4182628	01/08/1980	D'Silva	
		4188194	02/1980	Corrigan	
		4201601	05/1980	D'Silva	
		4211294	07/1980	Multakh	
		4211924	07/08/1980	Müller et al.	
		4224380	09/1980	Bovenkerek et al.	
		4228214	10/1980	Steigleman et al.	
		4229186	10/21/1980	Wilson	
		4273561	06/1981	Villalobos	
		4287168	09/01/1981	Wentorf et al.	
		4289503	09/1981	Corrigan	
		4341532	07/1982	Oide	
		4355489	10/1982	Heyer et al.	
		4405411	09/20/1983	Inoue et al.	
		4481016	11/1984	Campbell et al.	

Substitute for form 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** (Use as many sheets as necessary) Sheet | | of |	**Complete if Known**	
	Application Number	14/506,476
	Filing Date	10/3/2014
	First Named Inventor	Chien-Min Sung
	Art Unit	3723
	Examiner Name	
	Attorney Docket Number	02074-24012.NP.CIP2

		4525179	06/1985	Gigl	
		4547257	10/1985	Iizuka et al.	
		4551195	11/05/1985	Iizuka et al	
		4565034	01/1986	Sekiya	
		4610699	09/1986	Yazu et al.	
		4617181	10/14/1986	Yazu et al.	
		4629373	12/1986	Hall	
		4632817	12/30/1986	Yazu et al.	
		4662896	05/1987	Dennis	
		4669522	06/1987	Griffin	
		4680199	07/1987	Vontell et al.	
		4712552	12/15/1987	Pangburn	
		4737162	04/1988	Grazen	
		4749514	06/07/1988	Murakami et al.	
		4770907	09/13/1988	Kimura	
		4776861	10/1988	Frushour	
		4780274	10/1988	Barr	
		4797241	01/1989	Peterson et al.	
		4828582	05/1989	Frushour	
		4849602	07/1989	Gardner	
		4863573	09/05/1989	Moore et al.	
		4866888	09/19/1989	Murai et al	
		4883500	11/1989	Deakins et al.	
		4908046	03/1990	Wiand	
		4916869	04/1990	Oliver	
		4923490	05/1990	Johnson et al.	
		4925457	05/15/1990	deKok et al.	
		4927619	05/22/1990	Tsuji	
		4943488	07/1990	Sung et al.	
		4945686	08/1990	Wiand	
		4949511	08/1990	Endo et al.	
		4954139	09/1990	Cerutti	
		4968326	11/1990	Wiand	
		5000273	03/1991	Horton et al.	
		5011513	04/1991	Zador et al.	

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		5022895	06/1991	Wiand	
		5024680	06/18/1991	Chen et al.	
		5030276	07/1991	Sung et al.	
		5037451	08/1991	Burnand et al.	
		5043120	08/1991	Corrigan	
		5049165	09/17/1991	Tselesin	
		5092082	03/1992	Padberg	
		5092910	03/1992	deKok et al.	
		5116568	05/26/1992	Sung	
		5131924	07/1992	Wiand	
		5133782	07/1992	Wiand	
		5137543	08/1992	Heath et al.	
		5151107	09/1992	Cho et al.	
		5164247	11/1992	Solanki et al.	
		5176155	01/05/1993	Rudolph, Jr.	
		5190568	03/1993	Tselesin	
		5194070	03/1993	Sumiya et al.	
		5194071	03/1993	Corrigan et al.	
		5195403	03/1993	Sani et al.	
		5195404	03/1993	Notter et al.	
		5197249	03/1993	Wiand	
		5203881	04/1993	Wiand	
		5232320	08/1993	Tank et al.	
		5243790	09/14/1993	Gagne	
		5246884	09/1993	Jaso	
		5247765	09/1993	Quintana	
		5248317	09/28/1993	Tank	
		5264011	11/1993	Brown et al.	
		5266236	11/1993	Bovenkerk	
		5271547	12/1993	Carlson	
		5273730	12/1993	Yoshida et al.	
		5295402	03/22/1994	Bovenkerk	
		5314513	05-24-1994	Miller	
		5328548	07/12/1994	Tsuji et al.	
		5364423	11/1994	Bigelow et al.	

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		5374293	12/20/1994	Takashita et al.	
		5380390	01/1995	Tselesin	
		5443032	08/1995	Vichr et al.	
		5453106	09-26-1995	Roberts	
		5454343	10/03/1995	Eun et al.	
		5458754	10/17/1995	Sathrum et al.	
		5486131	01/1996	Cesna et al.	
		5492771	02/1996	Lowder et al.	
		5492774	02/1996	Tateno	
		5496386	03/1996	Broberg et al.	
		5500248	03/1996	Iacovangelo et al.	
		5505272	04/1996	Clark	
		5518443	05/1996	Fisher	
		5527424	06/1996	Mullins	
		5536202	07/1996	Appel et al.	
		5547417	08/1996	Breivogel et al	
		5551959	09/03/1996	Martin et al.	
		5560745	10/1996	Roberts	
		5560754	10/1996	Johnson et al	
		5609286	03/1997	Anthon	
		5620489	04/15/1997	Tselesin	
		5660894	08/1997	Chen et al.	
		5669943	09/1997	Horton et al.	
		5674572	10/07/1997	Sarin et al.	
		5725421	03/10/1998	Goers et al.	
		5746931	05/1998	Graebner	
		5772756	06/30/1998	Davies et al.	
		5776214	07/1998	Wood	
		5779743	07/1998	Wood	
		5791975	08/1998	Cesna et al.	
		5801073	09/01/1998	Robbins et al.	
		5816891	10/1998	Woo	
		5820450	10/1998	Calhoun	
		5833519	11/1998	Moore	
		5840090	11/24/1998	Ho et al.	

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		5851138	12/1998	Hempel Jr.	
		5855314	01/1999	Shiue et al.	
		5868806	02/09/1999	Nishio et al.	
		5885137	03/1999	Ploessl	
		5902173	05/1999	Tanaka	
		5916011	06/1999	Kim et al.	
		5919084	07/1999	Powell et al.	
		5921856	07/13/1999	Zimmer	
		5924917	07/1999	Benedict et al.	
		5961373	10/1999	Lai	
		5975988	11/1999	Christianson	
		5976001	11/1999	Powell et al.	
		5976205	11/1999	Andrews et al.	
		5980852	11/09/1999	Gurns et al.	
		5980982	11/1999	Degawa et al.	
		5985228	11/1999	Corrigan et al.	
		6001008	12/1999	Fujimori et al	
		6001174	12/14/1999	Fang	
		6024824	02-15-2000	Krech	
		6027659	02/22/2000	Billet	
		6030595	02/29/2000	Sumiya et al.	
		6039641	03/21/2000	Sung	
		6054183	04/2000	Zimmer et al.	
		6093280	07/2000	Kirchner et al.	
		6106382	08/2000	Sakaguchi	
		6123612	09/26/2000	Goers	
		6125612	10/03/2000	Main	
		6159087	12/2000	Briang et al.	
		6159286	12/2000	Sung	
		6179886	01/2001	Gordeev et al.	
		6190240	02/2001	Kinoshita et al.	
		6193770 B1	02/27/2001	Sung	
		6196911	03/2001	Preston et al.	
		6200360	03/2001	Imai et al.	
		6206942	03/2001	Wood et al.	

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		6213856	04/2001	Cho et al.	
		6217413	04/2001	Christianson	
		6224469	05/01/2001	Ohmori et al.	
		6258138	07/2001	DeVoe et al.	
		6258201	07-10-2001	Krech	
		6258237	07/2001	Gal-Or et al.	
		6281129	08/2001	Easter et al.	
		6284556	09/2001	Wang et al.	
		6286498	09/11/2001	Sung	
		6293854	09/2001	Kimura et al.	
		6299508	10/09/2001	Gagliardi et al.	
		6299521 B1	10/09/2001	Morimura et al.	
		6312324	11/06/2001	Mitsui et al.	
		6319108	11/2001	Adefris et al.	
		6325709	12/2001	Nanda et al.	
		6346202	02/12/2002	Molnar	
		6354918	03/12/2002	Togawa et al.	
		6354929	03/12/2002	Adefris et al.	
		6368198	04/2002	Sung et al.	
		6371838	04/16/2002	Holzapfel	
		6371842	04/2002	Romero	
		6372001 B1	04/16/2002	Omar et al.	
		6394886	05/2002	Chen et al.	
		6409580	06/2002	Lougher et al.	
		6416878	07/09/2002	An	
		6439986	08/27/2002	Myoung et al.	
		6446740	09/2002	Eyre	
		6458018	10/01/2002	Goers et al.	
		6478831	11/12/2002	Tselesin	
		6497853	12/24/2002	Davies et al.	
		6544599	04/08/2003	Brown et al.	
		6551176	04/2003	Garretson	
		6605798	08/2003	Cullen	
		6607423	08/2003	Areayan et al.	
		6616725	09/2003	Cho et al.	

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		6616752	09/2003	Basura	
		6626167	09/30/2003	Kim et al.	
		6627168	09/2003	Ohtsubo et al.	
		6629884	10/2003	Goers	
		6646725	11/2003	Eichinger	
		6672943	01/06/2004	Vogtmann	
		6679243	01/2004	Sung	
		6692547	02/2004	Kim	
		6694847	02/2004	Hiroyasu et al.	
		6722952	04/20/2004	Goers et al.	
		6749485	06/2004	James et al.	
		6755720	06/29/2004	Ishizaki et al.	
		6769969	08/03/2004	Duescher	
		6790126	09/2004	Wood et al.	
		6818029	11/16/2004	Myoung et al.	
		6824455	11/30/2004	Osterheld et al.	
		6835365	12/2004	Davies et al.	
		6837979	01/04/2005	Uzho et al.	
		6884155	04/26/2005	Sung et al.	
		6899592	05/2005	Kojima et al.	
		6905571	06/14/2005	Sakuma et al.	
		6935365	08/2005	Schuster	
		6945857	09/2005	Doan et al.	
		6979357	12/27/2005	Fries et al.	
		7021995	04/04/2006	Toge et al.	
		7033408	04/25/2006	Fries et al.	
		7044990 B2	05/16/2006	Ishizaki et al.	
		7066795	06/2006	Balagani et al.	
		7067903	06/27/2006	Tachibana et al.	
		7124753	10/24/2006	Sung	
		7150677	12/2006	Yamashita et al.	
		7198553	04/03/2007	Goers	
		7201645	04/10/2007	Sung	
		7247577	07/24/2007	Palmgren et al.	
		7258708	08/2007	Sung	

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		7261621	08/2007	Moon et al.	
		7323049	01/29/2008	Sung	
		7368013	05/06/2008	Sung	
		7384436	06/10/2008	Sung	
		7393264	07/01/2008	Sung	
		7404857	07/2008	Sung	
		7465217	12/2008	Kinoshita et al.	
		7494404	02/24/2009	Sung	
		7507267 B2	03/2009	Hall et al.	
		7585366	09/08/2009	Sung	
		7641538	01/05/2010	Goers	
		7651368	01/26/2010	Kendall et al.	
		7651386	01/26/2010	Sung	
		7658666	02/2010	Sung	
		7690971	04/06/2010	Sung	
		7762872	07/27/2010	Sung	
		7791188	09/2010	Sung	
		7840305	11/23/2010	Behr et al.	
		7954483 B2	06/2011	Kim et al.	
		8104464	01/2012	Sung	
		8377158 B2	02/2013	Palmgren et al.	
		8393934	03/17/2013	Sung	
		8398466	03/19/2013	Sung et al.	
		8545583 B2	10/2013	Duescher	
		8678878	03/2014	Sung	
		8777699	07/15/2014	Sung	
		RE20660	02/22/1938	Schacht	
		RE35812	06/1998	Oliver	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]- Number[4] – Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		CN 1351922	06/05/2002	China Emerg. Wheel Entpr. Co. Ltd.		
		CN 1494984	05/12/2004	Read Co. Ltd.		
		EP 0238434	03/1987	United Technologies		

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

				Corp.		
		EP 0264674	09/1995	Baker-Hughes Inc.		
		EP 0280657	08/31/1988	Diabrasive International		
		EP 0331344	02/1989	Minnesota Mining & Manf.		
		EP 0712941	05/22/1966	Agency of Industrial Sci.		
		EP 1075898	02/2001	Tanaka et al.		
		GB 2239011	06/1991	Anthony et al.		
		GB 2366804	03/02/2002	Kinik Company		
		JP 2003/071718	03/12/2003	Nippon Steel Corp.		
		JP 2007/044823	02/22/2007	Soken		
		JP 06182184	04/1994	Sumiya et al.		
		JP 10128654	05/1998	Tokyo Shibaura Electric		
		JP 10180618	07/1998	Nippon Kokan KK		
		JP 11048122	02/1999	Hitachi Ltd.		
		JP 11077536	03/1999	Asahi Diamond Ind.		
		JP 2000/343436	12/12/2000	Noritake Diamond Ind. Co. Ltd.		
		JP 2000/167774	06/20/2000	Toho Titanium Co. Ltd.		
		JP 2004/025401	01/29/2004	Airtec Japan KK		
		KR 10/2002/0036138	05/16/2002	Kinik Co.		
		KR 10/2007/0063569	06/19/2007	Sung		
		KR 20/0339181	01/31/2004	Jang		
		WO 2004/094106	11/04/2004	Intel Corporation		
		WO 2006/039413	04/13/2006	Sung		
		WO 2006/124792	11/23/2006	Sung		
		WO 2007/032946	03/22/2007	Sung		
		WO 2008/063599	05/29/2008	Sung		
		WO 2009/043058	04/02/2009	Sung et al.		
		WO 2009/064677	05/22/2009	Sung		
		WO 2012/040374 A2	03/29/2012	Rite Dia Corporation		

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		WO 95/31006	11/16/1995	Siliconix Incorporated		
		WO 02/31078	04/2002	Fries		
		WO 94/27883	12/08/1994	Ultimate Abrasive Systems, Inc.		
		WO 95/27596	10/1995	Ultimate Abrasive System		
		WO 96/06732	03/07/1996	Roberts		
		WO 98/10897	03/1998	Norton Co.		
		WO 98/45091	03/1998	Sung		
		WO 98/45092	10/15/1998	Sung		
		WO 98/51448	03/1998	Norton Co.		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

Sheet | | of |

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Colmonoy Technical Data Sheet; no. DSP-A; 1993	
		Endecott's Specifications; 2004	
		Kennametal Specification for DMHPM002 Hot Press Matrix N-50 12/06/2001	
		Material Safety Data Sheet (MSDS), Wall Colmonoy Corporation; prepared 07/20/1989	
		Material Safety Data Sheet MSDS); Kennametal; issued 06/11/2004	
		SUNG et al.; The Eastern Wind of Diamond Symthesis; New Diamond and Frontier Carpon Technology; 2003; pages 47-61; vol. 13, no. 1	
		SUNG et al; Mechanism of the Solvent-Assisted Graphite to Diamond Transition Under High Pressure: Implications for the Selection of Catalysts, High Temperatures-High Pressure; 1995/1996; pages 523-546; vol. 27/28	
		Syndite, CTM302; Announcement, Elementsix Advancing Diamond; 01/14/2003; http://www.e6.com/en/resourches/announcementsheets/CTM302.pdf; as accessed on 12/16/2008	
		YASUNAGA et al; Advances in Abrasive Technology, III; Soc. Of Grinding Engineers (SGE) in Japan; 2000. (Abstract Only)	
		U.S. Application 12/726,786; filed 03/18/2010; Chien-Min Sung; office action dated 03/19/2013	
		U.S. Application 13/021,350; filed 02/04/2011; Chien-Min Sung; office action dated 03/20/2013	
		U.S. Application 13/362,917; filed 01/31/2012; Chien-Min Sung; office action dated 04/10/2013	
		U.S. Application 13/239,189; filed 09/21/2011; Chien-Min Sung; notice of allowance dated	

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

Sheet | | of |

		05/03/2013	
		U.S. Application 13/239,198; filed 09/21/2011; Chien-Min Sung; office action dated 07/23/2013	
		PCT/US2013/042538; filed 05/23/2013; Chien-Min Sung; international search report dated 08/27/2013	
		U.S. Application 12/726,786; filed 03/18/2010; Chien-Min Sung; notice of allowance dated 09/04/2013	
		US Application 13/113,779; filed 05/23/2011; Chien-Min Sung; office action dated 11/12/2013	
		US Application 13/153,176; filed 06/03/2011; Chien-Min Sung; office action dated 12/06/2013	
		US Application 13/239,198; filing date 09/21/2011; Chien-Min Sung; Notice of Allowance mailed 03/04/2014	
		US Application 12/255,823; filed 10/22/2008; Chien-Min Sung; notice of allowance dated 12/26/2012	
		US Application 12/267,172; filed 11/07/2008; Chien-Min Sung; notice of allowance dated 10/22/2012	
		US Application 12/168,110; filed 07/05/2008; Chien-Min Sung; notice of allowance dated 01/18/2013	
		US Application 12/255,823; filing dae 10/22/2005; Chien-Min Sung; office action issued 03/07/2012	
		US Application 12/168, 110; filing date 07/05/2008; Chien-Min Sung; office action issued 05/14/2012	
		US Application 12/715,583; filing date 03/02/2010; Chien-Min Sung; office action issued 03/21/2012	
		US Application 11/805,549; filed 05/22/2007; Chien-Min Sung; office action issued 10/06/2010	
		US Application 12/267,172; filed 11/07/2008; Chien-Min Sung; office action dated 07/09/2012	
		US Application 12/267,172; filing date 11/07/2008; Chien-Min Sung; office action issued 01/03/2012	
		US Application 12/328,338; filing date 12/04/2008; Chien-Min Sung; office action dated 03/20/2014	
		US Application 13/153, 176; filing date 06/03/2011; Chien-Min Sung; office action dated 07/01/2014	

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet		of	

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		US Application 13/113, 779; filing date 05/23/2011; Chien-Min Sung; office action dated 07/02/2014	
		PCT Application PCT/US2011/052627; filing date 09/21/2011; Chien-Min Sung; international search report mailed 05/11/2012	
		PCT Application PCT/US2012/039,199; filed 05/23/2012; Chien-Min Sung; international search report dated 12/18/2012	
		U.S. Application 12/168,110; filed 07/05/2008; Chien-Min Sung; office action dated 05/14/2012	
		U.S. Application 12/255,823; filed 10/22/2008; Chien-Min Sung; notice of allowance dated 12/26/2012	
		U.S. Application 12/168,110; filed 07/05/2008; Chien-Min Sung; notice of allowance dated 01/18/2013	
		U.S. Application 12/059,422; filed 03/31/2008; Chien-Min Sung; office action dated 01/24/2013	
		US Application 12/715,583; filed 03/02/2010; Chien-Min Sung; notice of allowance dated 12/07/2012	
		US Application 13/362,917; filed 01/31/2012; Chien-Min Sung office action dated 06/14/2012	
		US Application 12/059,422; filed 03/20/2008; Chien-Min Sung; office action dated 08/22/2012	
		US Application 13/239,189; filed 09/21/2011; Chien-Min Sung; office action dated 12/21/2012	
		US Application 13/362,917; filed 01/13/2012; Chien-Min Sung; office action dated 12/31/2012	
		US Application 12/255,823; filed 10/21/2008; Chien-Min Sung; notice of allowance dated 09/21/2012	
		US Application 12/168,110; filed 07/05/2008; Chien-Min Sung; notice of allowance dated 09/28/2012	
		US Application 12/267,172; filed 11/07/2008; Chien-Min Sung; notice of allowance dated 01/07/2013	
		US Application 13/153, 176; filing date 06/03/2011; Chien-Min Sung; office action dated 12/06/2013	
		US Application 13/479,148; filing date 05/23/2012; Chien-Min Sung; office action dated 05/15/2014.	

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** (Use as many sheets as necessary)				**Complete if Known**	
				Application Number	14/506,476
				Filing Date	10/3/2014
				First Named Inventor	Chien-Min Sung
				Art Unit	3723
				Examiner Name	
Sheet		of		Attorney Docket Number	02074-24012.NP.CIP2

		US Application 13/407,634; filing date 02/28/2012; Chien-Min Sung; office action dated 06/13/2014	
		US Application 13/644,790; filing date 10/04/2012; Chien-Min Sung; office action dated 06/17/2014	
		US Application 13/416,201; filing date 03/09/2012; Chien-Min Sung; office action dated 06/18/2014	
		PCT Application PCT/US2007/024165; filed 11/16/2007; Chien-Min Sung; Internaitonal Search Report mailed 05/23/2011	
		PCT Application PCT/US2011/052626; filing date 09/21/2011; Chien-Min Sung; International Search Report mailed 05/02/2012	
		US Application 12/715,583;; filling date 03/02/2010; Chien-Min Sung; office action issued 08/09/2012	
		US Application 12/715,583; filing date 03/02/2010; Chien-Min Sung; office action issued 10/25/2011	
		US Application 12/328,338; filed 12/04/2008; Chien-Min Sung; office action issued 05/10/2011	
		US Application 13/021,350; filing date 02/04/2011; Chien-Min Sung; office action issued 08/31/2011	
		US Application 13/021,350; filed 02/04/2011; Chien-Min Sung; office action issued 02/07/2012	
		US Application 12/715,583; filed 03/02/2010; Chien-Min Sung; Notice of Allowance dated 12/07/2012	
		US Application 13/794,164; filing date 03/11/2013; Chien-Min Sung; office action dated 07/16/2014	
		US Application 13/113/779; filing date 05/23/2011; Chien-Min Sung; office action dated 10/09/2014	
		US Application 13/153,176; filing date 06/03/2011; Chien-Min Sung; office action dated 10/10/2014	
		US Application 13/407,634; filing date 02/28/2012; Chien-Min Sung; office action dated 10/29/2014	
		US Application 13/802,112; filing date 03/13/2013; Chien-Min Sung; office action dated 11/06/2014	
		US Application 12/328,338; filing date 12/04/2008; Chien-Min Sung; Notice of Allowance mailed 11/21/2014	

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

Sheet | | of |

		US Application 13/479,148; Filing date 05/23/2012; Chien Min-Sung; Notice of Allowance mailed 12/09/2014	
		US Application 13/644,790; filing date 10/04/2012; Chien-Min Sung; office action dated 12/24/2014	
		US Application 13/797,704; filing date 03/12/2013; Chien-Min Sung; office action dated 01/12/2015	
		US Application 13/479,148; filing date 05/23/2012; Chien-Min Sung; Notice of Allowance mailed 01/12/2015	
		US Application 13/416,201; filing date 03/09/2012; Chien-Min Sung; office action dated 01/22/2015	
		US Application 13/113,779; filing date 05/23/2011; Chien-Min Sung; office action dated 02/10/2015	
		US Application 13/153,176; filing date 05/03/2011; Chien-Min Sung; office action dated 02/10/2015	
		U.S. Application No. 13/633,082; Filing date October 1, 2012; Chien-Min Sung; Office Action dated February 26, 2015.	
		U.S. Application No. 13/407,634; Filing date February 28, 2012; Chien-Min Sung; Office Action dated March 5, 2015.	
		U.S. Application No. 14/248,163; Filing date April 8, 2014; Chien-Min Sung; Office Action dated April 28, 2015.	
		U.S. Application No. 13/416,201; Filing date March 9, 2012; Chien-Min Sung; Office Action dated May 15, 2015.	
		U.S. Application No. 13/644,790; Filing date October 4, 2012; Chien-Min Sung; Notice of Allowance mailed June 8, 2015.	
		U.S. Application No. 13/802,112; Filing date March 13, 2013; Chien-Min Sung; Notice of Allowance mailed May 15, 2015.	
		U.S. Application No. 13/113,779; Filing date May 23, 2011; Chien-Min Sung; Notice of Allowance mailed July 17, 2015.	
		U.S. Application No. 13/153,176; Filing date June 3, 2011; Chien-Min Sung; Office Action dated August 13, 2015.	
		US Application 13/633,082; filing date 10/01/2012; Chien-Min Sung; Notice of Allowance mailed 08/19/2015	
		U.S. Application No. 13/407,634; Filing date February 28, 2012; Chien-Min Sung; Notice of Allowance mailed September 3, 2015.	

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

Sheet | | of | |

		U.S. Application No. 14/223,810; Filing date March 24, 2014; Chien-Min Sung; Office Action dated October 8, 2015.	
		U.S. Application No. 14/120,976; Filing date July 15, 2014; Chien-Min Sung; Office Action dated October 15, 2015.	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **Send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

No documents available for this priority number.

Europäisches Patentamt
European Patent Office
Office européen des brevets

Espacenet

Bibliographic data: JP2007044823 (A) — 2007-02-22

CMP PAD CONDITIONER IN SEMICONDUCTOR PLANARIZATION CMP PROCESS (CHEMICAL-MECHANICAL POLISHING)

Inventor(s): TANI KAZUNORI; IWASAKI HIDEKAZU ± (TANI KAZUNORI, ; IWASAKI HIDEKAZU)

Applicant(s): SOKEN KK ± (SOKEN:KK)

Classification: **- international:** ***B24B37/00; B24B53/12; B24D3/00; H01L21/304***
- cooperative:

Application number: JP20050232524 20050810

Priority number (s): JP20050232524 20050810

Abstract of JP2007044823 (A)

PROBLEM TO BE SOLVED: To reduce the time and trouble for replacing a CMP pad conditioner, and the down time and loss time of a CMP device by preventing abrasion, wearing and alteration of abrasive grains and fallout and defective of the abrasive grains to achieve long-time conditioning of the polishing pad. ; SOLUTION: This pad conditioner includes abrasive grains for pad polishing and grinding used in a semiconductor planarization CMP process, a bond layer holding the abrasive grains; and a bed to which the bond layer is fixed, wherein the abrasive grains or coating material coating the abrasive grains is a material having durability against CMP slurry. The material having durability is silicon carbide (SiC), diamond-like carbon, sapphire, alumina, TiO<SB>2</SB>, stabilized zirconia, ZrN, ZrC, WC, WC-Co, TiC, TiAlN, Tin-Ni, LiNbO<SB>3</SB>, NbC, LiTaO<SB>3</SB>, TaC or HfC. ; COPYRIGHT: (C) 2007,JPO&INPIT

Last updated: 19.12.2012 Worldwide Database 5.8.4; 93p

(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2007-44823
(P2007-44823A)
(43)公開日　平成19年2月22日(2007.2.22)

(51)Int.Cl.		F I			テーマコード（参考）
B24B 53/12	(2006.01)	B24B	53/12	Z	3C047
H01L 21/304	(2006.01)	H01L	21/304	622M	3C058
B24B 37/00	(2006.01)	B24B	37/00	A	3C063
B24D 3/00	(2006.01)	B24D	3/00	320A	
		B24D	3/00	330D	

審査請求 未請求　請求項の数 8　OL　（全 9 頁）　最終頁に続く

(21)出願番号　特願2005-232524 (P2005-232524)
(22)出願日　平成17年8月10日 (2005.8.10)

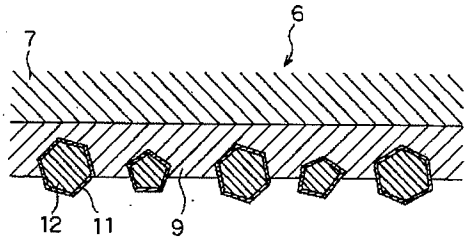
(71)出願人　504149867
株式会社ソウケン
東京都昭島市武蔵野３－２－１１
(74)代理人　100062982
弁理士　澤木　誠一
(74)代理人　100102749
弁理士　澤木　紀一
(72)発明者　谷　和憲
東京都昭島市武蔵野３－２－１１　株式会社ソウケン内
(72)発明者　岩崎　英一
東京都昭島市武蔵野３－２－１１　株式会社ソウケン内

Ｆターム(参考)　3C047 AA12　AA34　EE18　EE19　FF08

最終頁に続く

(54)【発明の名称】半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー

(57)【要約】　（修正有）
【課題】砥粒の磨耗、磨滅、変質や砥粒の脱落、欠損を防止できるので、長時間研磨パッドのコンディショニングを行うことができ、ＣＭＰパッドコンディショナーの交換の手間やＣＭＰ装置のダウンタイムならびにロス時間を減らすこと。
【解決手段】パッドコンディショナーは、半導体平坦化ＣＭＰプロセスに用いるパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、砥粒あるいは砥粒を被覆する被膜物質がＣＭＰスラリーに対して耐久性を持つ物質である。耐久性を持つ物質は、炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、TiO_2、安定化ジルコニア、ＺｒＮ、ＺｒＣ、ＷＣ、ＷＣ－Ｃｏ、ＴｉＣ、ＴｉＡｌＮ、Ｔｉｎ－Ｎｉ、$LiNbO_3$、ＮｂＣ、$LiTaO_3$、ＴａＣあるいはＨｆＣである。
【選択図】　図２



【特許請求の範囲】
【請求項1】
半導体平坦化ＣＭＰプロセスに用いるＣＭＰパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、上記砥粒はダイヤモンドよりＣＭＰスラリーに対して耐久性を持つ物質であることを特徴とする半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項2】
半導体平坦化ＣＭＰプロセスに用いるＣＭＰパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、上記砥粒の表面にＣＭＰスラリーに対して耐久性を持つ物質が被覆されていることを特徴とする半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項3】
半導体平坦化ＣＭＰプロセスに用いるＣＭＰパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、ＣＭＰスラリーに対して耐久性を持つ物質を上記砥粒表面及び上記ボンド層表面に被覆せしめたことを特徴とする半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項4】
上記被覆した物質の膜厚が１０ｎｍ～９００μｍであることを特徴とする請求項２又は３記載の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項5】
上記各砥粒は夫々離間しており、上記砥粒のうち上記台からの高さが一番低い砥粒の高さと、上記台からの高さが一番高い砥粒の高さとの差が１００μｍ以内であることを特徴とする請求項１、２、３又は４記載の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項6】
上記各砥粒は夫々離間しており、上記被覆した砥粒のうち上記台からの高さが一番低い砥粒の高さと、上記台からの高さが一番高い砥粒の高さとの差が１００μｍ以内であることを特徴とする請求項２、３又は４記載の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項7】
上記ダイヤモンドよりＣＭＰスラリーに対して耐久性を持つ物質が、炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、安定化ジルコニアであることを特徴とする請求項１又は５記載の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。
【請求項8】
上記ＣＭＰスラリーに対して耐久性を持つ物質が、炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、TiO_2、安定化ジルコニア、ＺｒＮ、ＺｒＣ、ＷＣ、ＷＣ－Ｃｏ、ＴｉＣ、ＴｉＡｌＮ、Ｔｉｎ－Ｎｉ、$LiNbO_3$、ＮｂＣ、$LiTaO_3$、ＴａＣあるいはＨｆＣであることを特徴とする請求項２、３、４、５又は６記載の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー。

【発明の詳細な説明】
【技術分野】
【0001】
本発明は半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナー、特に、化学機械的研磨（ＣＭＰ）装置に用いるＣＭＰパッドのコンディショナーに関するものである。
【背景技術】
【0002】

コンピュータのＣＰＵ能力向上の為には回路の集積度を上げる必要があり、これを実現する為に配線の多層化が行なわれているが、この時、シリコン基板上の各層間絶縁膜を平坦化するＣＭＰ（Chemical Mechanical Polishing）加工技術がキーテクノロジーとなる。半導体デバイスの多層配線化プロセスにおいては、半導体ウェハ表面の凹凸を極力平坦化することが重要であり、この半導体ウェハ表面の平坦化装置として化学的エッチングと研磨剤による機械的研磨とを組み合わせた研磨加工を行うＣＭＰ装置がある。

【0003】

図４は従来のＣＭＰ装置のコンセプトの一例を示す。１は回転自在な直径３００ｍｍの円板状の定盤、２は上記定盤１の略全面に設けたＣＭＰ研磨パッド、３は上記定盤１の回転中心軸に対して偏心した位置に設けた円板状の半導体ウェハ、４は上記半導体ウェハ３を保持し、上記半導体ウェハ３を上記研磨パッド２に押圧せしめる回転自在の半導体ウェハ押圧具、５は上記研磨パッド２上にコロイダルシリカ系、ヒュームドシリカ系、セリア系またはアルミナ系などのＣＭＰスラリーを供給するＣＭＰスラリー供給部、６は上記研磨パッド２の表面を再研磨または再研削（コンディショニング）するため上記半導体ウェハ３とは異なる位置で上記研磨パッド２上に載置した回転自在のＣＭＰパッドコンディショナーを示す。

【0004】

上記研磨パッド２は一般に大別して発泡ウレタンを基材としたパッドと無発泡のウレタンを基材としたパッドが使用されている。前者の発泡ウレタンを基材とする研磨パッドは弾力性があり後者の無発泡のウレタンを基材とするものに比べ平坦性が劣るという報告もある。発泡性ウレタン研磨パッドのＣＭＰパッドコンディショナーにはブラシ状の繊維を埋めこんだもの、あるいはダイヤモンド砥粒をメタルボンドした砥石状のＣＭＰパッドコンディショナーが使用される。一方、無発泡のウレタンの基材を用いたＣＭＰパッドコンディショナーにはダイヤモンド砥粒をメタルボンドした砥石状のＣＭＰパッドコンディショナーが用いられる。

【0005】

上記砥石状のＣＭＰパッドコンディショナー６は図４及び図５に示すように、円板状の金属製台金７と、この台金７の下面に設けた粒径５０μｍ～２００μｍのダイヤモンド砥粒８と、上記ダイヤモンド砥粒８を保持するための上記金属製台金７の下面あるいは台金表面全体を被覆するＮｉメッキボンド層等のボンド層９とよりなる。

【0006】

上記のような従来のＣＭＰ装置においては、上記ＣＭＰ研磨パッド２上にＣＭＰスラリーを供給し、上記定盤１と上記半導体ウェハ押圧具４とを相対的に回転せしめて、上記半導体ウェハ押圧具４により上記半導体ウェハ３を上記ＣＭＰ研磨パッド２上に押圧せしめれば、上記半導体ウェハ３の表面が研磨される。また、上記ＣＭＰパッドコンディショナー６を常時又は定期的に回転せしめれば、上記研磨パッド２の平坦度を維持、修復し、また目詰まりを防止せしめ、また、ＣＭＰ研磨パッド表面の面粗さを維持することによりＣＭＰスラリーの研磨特性を維持、回復せしめることができる。

【0007】

また、上記ＣＭＰパッドコンディショナー６におけるボンド層９により上記台金７を被覆しているので、上記ＣＭＰスラリーにより台金が溶出することがなく、ダイヤモンド砥粒８の脱落を防止できる。このようなＣＭＰ装置は特許文献１に記載されている。

【特許文献1】特開２００１－２３９４４９号

【発明の開示】

【発明が解決しようとする課題】

【0008】

しかしながら、上記従来のＣＭＰ装置においては、ある程度ＣＭＰ研磨パッド２のコンディショニングを続ければ、ＣＭＰパッドコンディショナー上の砥粒の切刃が研磨、磨滅、平坦化され、切れ味が鈍ることにより上記ＣＭＰ研磨パッド２の平坦度の修復が遅くなる。またダイヤモンド砥粒８等がＣＭＰパッドコンディショナー６のボンド層９から脱落

、欠損し、脱落したダイヤモンド砥粒８等がＣＭＰ研磨パッド２の表面に落下、固定され、あるいは転動してウェハ表面に傷をつけてしまうという欠点があった。

【0009】

本発明者は種々実験研究の結果、ダイヤモンド砥粒はコロイダルシリカ系、ヒュームドシリカ系、セリア系またはアルミナ系などのＣＭＰスラリーにより磨耗、磨滅、変質すること、また、この磨耗等により砥粒にかかる力が増大しダイヤモンド砥粒が脱落、欠損することを見出した。また、ＣＭＰスラリーに対して耐久性のある物質、例えば炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、TiO_2、安定化ジルコニア、ＺｒＮ、ＺｒＣ、ＷＣ、ＷＣ－Ｃｏ、ＴｉＣ、ＴｉＡｌＮ、Ｔｉｎ－Ｎｉ、$LiNbO_3$、ＮｂＣ、$LiTaO_3$、ＴａＣあるいはＨｆＣで砥粒あるいはＣＭＰコンディショナーの加工部表面を被覆すれば砥粒の磨耗等を少なくでき、研磨パッドの平坦度ならびに面粗さを維持し、砥粒の脱落等を防止できることを見出した。また、安価な砥粒にＣＭＰスラリーに対して耐久性のある物質を被覆すれば、安価で高品質のＣＭＰコンディショナーを提供できることを見出した。本発明はかかる知見をもとになされたものである。

【課題を解決するための手段】

【0010】

本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーは、半導体平坦化ＣＭＰプロセスに用いるＣＭＰパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、上記砥粒はダイヤモンドよりＣＭＰスラリーに対して耐久性を持つ物質であることを特徴とする。

【0011】

本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーは、半導体平坦化ＣＭＰプロセスに用いるＣＭＰパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、上記砥粒の表面にＣＭＰスラリーに対して耐久性を持つ物質が被覆されていることを特徴とする。

【0012】

本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーは、半導体平坦化ＣＭＰプロセスに用いるＣＭＰパッド研磨研削用の砥粒と、この砥粒を保持するボンド層と、このボンド層を固着した台とよりなり、ＣＭＰスラリーに対して耐久性を持つ物質を上記砥粒表面及び上記ボンド層表面に被覆せしめたことを特徴とする。

【0013】

上記被覆した物質の膜厚は１０ｎｍ～９００μｍであることを特徴とする。

【0014】

上記各砥粒は夫々離間しており、上記砥粒のうち上記台からの高さが一番低い砥粒の高さと、上記台からの高さが一番高い砥粒の高さとの差が１００μｍ以内であることを特徴とする。

【0015】

上記各砥粒は夫々離間しており、上記被覆した砥粒のうち上記台からの高さが一番低い砥粒の高さと、上記台からの高さが一番高い砥粒の高さとの差が１００μｍ以内であることを特徴とする。

【0016】

上記ダイヤモンドよりＣＭＰスラリーに対して耐久性を持つ物質は、炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、安定化ジルコニアであることを特徴とする。

【0017】

上記ＣＭＰスラリーに対して耐久性を持つ物質は、炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、TiO_2、安定化ジルコニア、ＺｒＮ、ＺｒＣ、ＷＣ、ＷＣ－Ｃｏ、ＴｉＣ、ＴｉＡｌＮ、Ｔｉｎ－Ｎｉ、$LiNbO_3$、ＮｂＣ、$LiTaO_3$、ＴａＣあるいはＨｆＣであることを特徴とする。

【発明の効果】
【0018】
本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーによれば、砥粒の磨耗、磨滅、変質や砥粒の脱落、欠損を防止できるので、長時間研磨パッドのコンディショニングを行うことができ、ＣＭＰパッドコンディショナーの交換の手間やＣＭＰ装置のダウンタイムならびにロス時間を減らすことができ、また、半導体ウェハ表面に傷が付くのを防止することができるという大きな利益がある。また、安価で高品質のＣＭＰコンディショナーを提供できる。
【発明を実施するための最良の形態】
【0019】
以下図面によって本発明の実施例を説明する。
【実施例】
【0020】
本発明のＣＭＰ装置用のＣＭＰパッドコンディショナー６においては、図１に示すように、ＣＭＰ研磨パッドのＣＭＰコンディショニング用砥粒としてダイヤモンド砥粒８を用いる代わりに、例えば粒径１００μｍ±４０μｍの、ダイヤモンドよりＣＭＰスラリーに対して耐磨耗性、耐磨滅性、耐変質性等の耐久性を持つ化学的に安定した結晶構造を持った例えば炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、安定化ジルコニアなどの物質からなる砥粒などの物質からなる砥粒１０を用いる。パッドコンディショナー用の台金７に形成せしめたＮｉメッキボンド層等のボンド層９の厚さは、上記砥粒１０の粒径のおよそ三分の一を突出せしめて固着せしめることができる程度が好適である。なお、各砥粒間隔は例えば約１０μｍ～１０ｍｍとし、ＣＭＰコンディショナーにかかる加圧力と相関してひとつの砥粒にかかる加圧力でＣＭＰコンディショナー全体の砥粒の数を決定することが望ましい。
【0021】
本発明によれば、上記砥粒１０はＣＭＰスラリー対して耐久性がダイヤモンドより大きいので、磨耗、磨滅、変質しづらく、砥粒の脱落、欠損を防ぐ事ができ、長期間ＣＭＰ研磨パッドのコンディショニングを続けることができるという大きな利益がある。
【0022】
なお、ＣＭＰスラリーをポリシャーとしての被研磨特性を試行したところ、ダイヤモンドは１時間程度で磨滅したが、サファイアを同じ量削るには２～３時間かかり、また、ＳｉＣを同量研磨するには１０～２０時間かかった。従って、ＣＭＰスラリーに対して耐久性のある物質としては特にＳｉＣが好ましい。
【0023】
また、上記各砥粒を夫々離間せしめ、また、上記砥粒のうち、台金からの先端高さが一番低い砥石の先端高さと、台金からの先端高さが一番高い砥粒の先端高さとの差を１００μｍ以内、例えば３μｍ以内としたＣＭＰコンディショナーを用いた場合、ＣＭＰパッドの面粗さを均一化することができ、ＣＭＰ加工品質を向上させ、半導体ウェハの品質を高めることができる。
【0024】
また、上記台金７は金属系の他に樹脂系、粉末冶金系であってもよい。
【実施例】
【0025】
本発明の第２の実施例においては、図２に示すように研磨パッドのコンディショニング用の砥粒として、その表面にスパッタリング、イオンプレーティング、真空蒸着法又は化学蒸着（ＣＶＤ）法等により、ＣＭＰスラリーに対して耐久性のある、例えば炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、TiO_2、安定化ジルコニア、ＺｒＮ、ＺｒＣ、ＷＣ、ＷＣ－Ｃｏ、ＴｉＣ、ＴｉＡｌＮ、Ｔｉｎ－Ｎｉ、$LiNbO_3$、ＮｂＣ、$LiTaO_3$、ＴａＣあるいはＨｆＣなどの物質１１を例えば約１０ｎｍ～９００μｍ被覆したダイヤモンド砥粒、ＳｉＣ砥粒、アルミナ砥粒あるいは立方晶窒

化ホウ素（ＣＢＮ）砥粒などの砥粒１２を用い、パッドコンディショナー用の台金７に形成せしめたＮｉメッキボンド層等のボンド層９に、上記砥粒１２の全部あるいは一部を上記ボンド層９で固着せしめる。

【0026】

この第２の実施例においては、上記物質１１はＣＭＰスラリーに対して耐久性があるので、磨耗等しづらく、砥粒の脱落等を防ぐ事ができ、長期間ＣＭＰ研磨パッドのコンディショニングを続けることができる。また、安価な砥粒にＣＭＰスラリーに対して耐久性のある物質を被覆すれば、安価で高品質のＣＭＰコンディショナーを提供できる。

【0027】

なお、上記物質１１を被覆する部分は、上記砥粒１２の切刃となる部分の表面だけであってもよい。

【0028】

また、各砥粒を夫々離間せしめ、また、上記被覆した砥粒のうち、台金からの先端高さが一番低い砥石の先端高さと、台金からの先端高さが一番高い砥粒の先端高さとの差を１００μｍ以内、例えば３μｍ以内としたＣＭＰコンディショナーを用いた場合、ＣＭＰパッドの面粗さを均一化することができ、ＣＭＰ加工品質を向上させ、半導体ウェハの品質を高めることができる。

【0029】

また、上記台金は金属系の他に樹脂系、粉末冶金系であってもよい。

【0030】

また、上記ＣＭＰスラリーに対して耐久性のある物質は炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、安定化ジルコニアなどのダイヤモンドよりＣＭＰスラリーに対して耐久性のある物質であることが好ましい。

【実施例】

【0031】

本発明の第３の実施例においては、図３に示すようにＣＭＰ研磨パッドのコンディショニング用の砥粒としてダイヤモンド砥粒、ＳｉＣ砥粒、アルミナ砥粒あるいは立方晶窒化ホウ素（ＣＢＮ）砥粒などの砥粒１２を用い、パッドコンディショナー用の台金７に形成せしめたＮｉメッキボンド層等のボンド層９に、上記砥粒１２の全部あるいは一部を上記ボンド層９の表面から突出せしめて固着せしめる。また加えて上記ボンド層９の表面から突出した砥粒１２の表面及び上記ボンド層９の表面にスパッタリング又はＣＶＤ法等により、ＣＭＰスラリーに対する耐久性のある、例えば炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、TiO_2、安定化ジルコニア、ＺｒＮ、ＺｒＣ、ＷＣ、ＷＣ－Ｃｏ、ＴｉＣ、ＴｉＡｌＮ、Ｔｉｎ－Ｎｉ、$LiNbO_3$、ＮｂＣ、$LiTaO_3$、ＴａＣあるいはＨｆＣなどの物質１１を例えば厚さ約１０ｎｍ～９００μｍで被覆せしめる。

【0032】

この第３の実施例においても、上記物質１１はＣＭＰスラリーに対して耐久性があるので、磨耗等しづらく、砥粒の脱落等を防ぐ事ができ、長期間ＣＭＰ研磨パッドのコンディショニングを続けることができる。また、安価な砥粒にＣＭＰスラリーに対して耐久性のある物質を被覆すれば、安価で高品質のＣＭＰコンディショナーを提供できる。

【0033】

なお、上記砥粒１２を被覆する部分は、上記砥粒１２の切刃となる部分の表面だけであってもよい。

【0034】

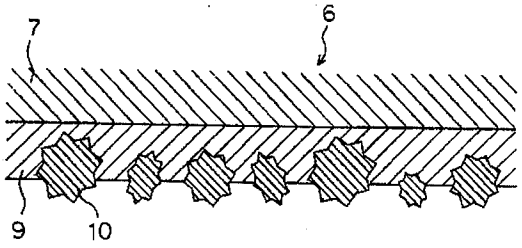
また、上記ＣＭＰスラリーに対して耐久性のある物質は炭化珪素（ＳｉＣ）、ダイヤモンドライクカーボン、サファイア、アルミナ、安定化ジルコニアなどのダイヤモンドよりＣＭＰスラリーに対して耐久性のある物質であることが好ましい。

【図面の簡単な説明】

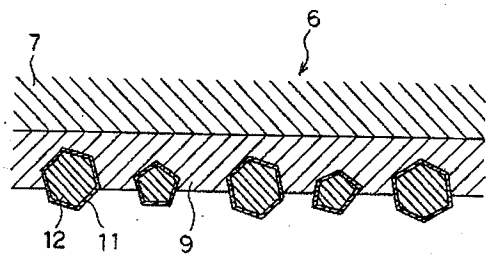
【0035】

【図1】本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーの第１の実施例の要部を拡大した縦断側面図である。
【図2】本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーの第２の実施例の要部を拡大した縦断側面図である。
【図3】本発明の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーの第３の実施例の要部を拡大した縦断側面図である。
【図4】従来の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰ装置の斜視図である。
【図5】従来の半導体平坦化ＣＭＰプロセス（化学機械的研磨）におけるＣＭＰパッドコンディショナーの要部を拡大した縦断側面図である。
【符号の説明】
【0036】
１　定盤
２　ＣＭＰ研磨パッド
３　半導体ウェハ
４　半導体ウェハ押圧具
５　ＣＭＰスラリー供給部
６　ＣＭＰパッドコンディショナー
７　金属製台金
８　砥粒
９　ボンド層
１０　砥粒
１１　被覆物質
１２　砥粒

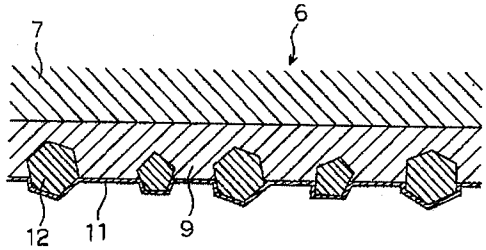
【図1】



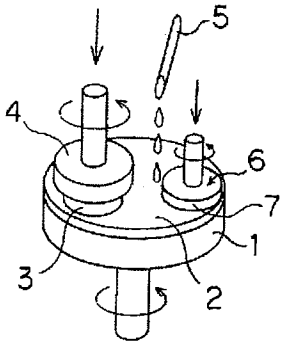
【図2】



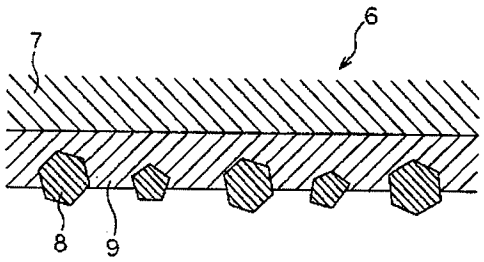
【図3】



【図4】



【図5】



(51)Int.Cl.	F I	テーマコード（参考）
	Ｂ２４Ｄ　3/00　３１０Ｄ	

Ｆターム(参考)　3C058 AA07 AA19 CB04 CB05 DA12 DA17
3C063 AB05 BA37 BB02 BB03 BB04 BB15 BC02 EE26 FF08 FF22
FF23

Korean to English translation

Abstract KR 20-0339181

Abstract The present invention Chemical - Mechanical - Polishing (CMP) polishing pad for planarization while improving, the conditioning of the pad has the ability to effectively do more, excellent conditioning performance and long life, easy to manufacture in Conditioner When the manufacturer can significantly reduce the failure rate for devices in the CMP has its purpose in providing conditioners.

This is designed to achieve these goals, the shank (3) the shape of the holes on the surface of bimaseukingbu (1) with masking sheet (2) adhesion, and one bimaseukingbu (1) of a diamond particles (4) only after pre-fixed masking sheet (2) and the detachment, followed by diamond plating, put in 40-60% of particle diameter to have the thickness of Ni plating (6) deposition sikimyeo, moreover, a hole the shape of the non- maseukingbu (1) the area of diamond particles (4), 110-160% of the projected doubling of the area and above-masking sheet (2) of the bimaseukingbu (1) of the full two baseuking sheet (2) of the full in the range from 0.04 to 0.2 times as frequently as the chemical - mechanical - polishing pad diamond deposition provides conditioners.

We have devised a strict dimensional precision by highly reproducible pattern shape can be easily formed, and masking sheets (2) of the shank (3) for the high adhesion, the shank (3) is deposited on the diamond of 80-120 mesh particles (4), hole type bimaseukingbu (1) to be distributed one by one. Therefore, the polishing pads for CMP planarization while improving, the conditioning of the pad has the ability to effectively do more, and superior conditioning performance, long life, easy to manufacture because of conditioner manufacturing significantly reduce the failure rate can.

Chemical - Mechanical - polishing pads, conditioners, polishing, diamond

(19)대한민국특허청(KR)
(12) 등록실용신안공보(Y1)

(51) 。Int. Cl.[7]
B24B 37/00

(45) 공고일자 2004년01월31일
(11) 등록번호 20-0339181
(24) 등록일자 2004년01월08일

(21) 출원번호 20-2003-0029176
(22) 출원일자 2003년09월13일

(73) 실용신안권자 장성만
경기도 군포시 산본1동 삼성미노아파트 101동 609호

(72) 고안자 장성만
경기도 군포시 산본1동 삼성미노아파트 101동 609호

이재우
경기도안성시죽산면장원리678번지두원공과대학기계과

기초적요건 심사관 : 김상해

기술평가청구 : 없음

(54)화학적-기계적-연마 패드용 다이아몬드 전착 컨디셔너

요약

본 고안은 화학적-기계적-연마(CMP)용 폴리싱 패드의 평탄화를 향상시킴과 동시에, 이 패드의 컨디셔닝을 효과적으로 행하는 기능을 가지고, 더구나 컨디셔닝 성능이 우수하고, 수명이 길며, 컨디셔너의 제조가 용이하여 제조시의 불량률을 현저히 감소시킬 수 있는 CMP 장치용 컨디셔너를 제공함에 그 목적이 있다.

이러한 목적을 달성하기 위한 본 고안은, 샹크(3)의 표면에 구멍 형상의 비마스킹부(1)를 가지는 마스킹 시트(2)를 점착하고, 하나의 비마스킹부(1)에 하나의 다이아몬드 입자(4) 만을 예비 고정한 후에 마스킹 시트(2)를 박리시키고, 이어서 도금액 안에 넣어서 다이아몬드 입자 직경의 40~60% 정도의 두께를 가지도록 Ni 도금층(6)을 석출시키며, 더욱이 1개 구멍 형상의 비마스킹부(1)의 면적이 다이아몬드 입자(4)의 투영 면적의 110~160%배로 하고, 상기한 마스킹 시트(2)의 비마스킹부(1)의 전면적이 마스킹 시트(2)의 전면적의 0.04~0.2배의 범위로 하는 것이 특징으로 된 화학적-기계적-연마 패드용 다이아몬드 전착 컨디셔너를 제공한다.

본 고안에 의해 치수 정밀도가 엄격한 패턴 형상을 재현성 높게 용이하게 형성시킬 수 있고, 마스킹 시트(2)의 샹크(3)에 대한 밀착력이 높으며, 또한 샹크(3)에 전착되는 80~120메쉬의 다이아몬드 입자(4)가, 구멍형의 비마스킹부(1)에 한 개씩 분산된다. 따라서 CMP용 폴리싱 패드의 평탄화를 향상시킴과 동시에, 이 패드의 컨디셔닝을 효과적으로 행하는 기능을 가지고, 더구나 컨디셔닝 성능이 우수하고, 수명이 길며, 컨디셔너의 제조가 용이하기 때문에 제조시의 불량률을 현저히 감소시킬 수 있다.

대표도

도 1

색인어

Ex. 1003, Page 108

화학적-기계적-연마, 패드, 컨디셔너, 폴리싱, 다이아몬드

명세서

도면의 간단한 설명

도 1은 마스킹 시트를 점착한 샹크의 부분 평면도

도 2는 다이아몬드 입자가 예비 고정된 샹크의 부분 평면도

도 3은 본 고안 컨디셔너의 연삭면의 부분 단면도

도 4는 본 고안에 의한 일실시예인 컨디셔너의 작용면의 평면도

도 5는 본 고안에 의한 다른 실시예인 컨디셔너의 작용면의 평면도

〈도면의 주요부분에 대한 부호의 설명〉

1 : 구멍형상의 비마스킹부 2 : 마스킹 시트

3 : 샹크 4 : 다이아몬드 입자

5 : 예비 도금층 6 : Ni 도금층

7 : 컨디셔너 8 : 비전착 영역

고안의 상세한 설명

고안의 목적

고안이 속하는 기술 및 그 분야의 종래기술

본 고안은 반도체의 웨이퍼 가공에 사용되는 CMP(Chemical mechanical planarization) 장치의 패드 컨디셔너에 관한 것이다. 보다 상세하게는, 본 고안은 CMP용 폴리싱 패드의 평탄화를 향상시킴과 동시에, 이 패드의 컨디셔닝을 효과적으로 행하는 기능을 가지고, 더구나 컨디셔닝 성능이 우수하고, 수명이 긴 CMP 장치용 컨디셔너에 관한 것이다.

반도체 웨이퍼의 연마를 반복하기 위하여, 연마 입자나 연마칩 등이 폴리싱 패드의 미세한 구멍에 들어가서 눈메움이 일어난다든지, 연마 입자와 웨이퍼와의 화학 반응열에 의해 폴리싱 패드의 표면이 경면화하여 연마 속도를 저하시키게 된다. 이 때문에 폴리싱 패드의 표면을 재생시켜 연마 속도를 회복시키는 컨디셔너라고 불리는 공구가 사용된다. 다이아몬드 입자는 우수한 컨디셔닝 재료이며, 다이아몬드 입자를 이용한 컨디셔닝이 실용화되어 있다. 이와 같은 CMP용 폴리싱 패드의 컨디셔너에 대해서는, 폴리싱 패드의 마멸을 가급적 억제할 수 있으며, 더욱이 패드의 표면 상태를 항상 소정의 연마속도가 얻어지도록 일정하게 유지되는 것과, 다이아몬드 입자의 탈락이 없고, 패드면에 눈메움을 일으키지 않는 것이 요구된다.

다이아몬드 입자를 컨디셔너 본체의 작용면에 금속 결합제를 사용하여 고착하는 방법에는 여러 가지가 있으나, 전착법은 비교적 용이하고 더욱이 다이아몬드 입자를 컨디셔너 본체의 작용면에 확실하게 고착시킬 수 있으므로 많이 사용되고 있다. 전착법에 의해 다이아몬드 입자를 고착하는 경우는, 컨디셔너 본체의 작용면에 다이아몬드 입자의 고정면을 남겨 두고서, 절연성의 마스킹 재료로 피복한다. 컨디셔너의 본체를 도금액에 담그고 입자 고정면에 입자를 놓고서 컨디셔너의 본체에 음극을 접속하고, 도금액에 양극을 접속하여 전기 도금을 행하여 다이아몬드 입자를 예비 고정한다. 다이아몬드 입자를 예비 고정한 후에 대부분의 입자는 그 일 부가 본체의 입자 고정면에 접한 상태에서 예비 고정되지만, 본체의 입자 고정면에 접하지 않은 상태에 부착하여, 부유하는 입자가 존재하는 경우도 있다. 컨디셔너의 본체를 다시 도금액에 넣어서, 본체에 음극을 접속하고 도금액에 양극을 접속하여 다이아몬드 입자 고정면의 도금을 행한다.

Ex. 1003, Page 109

그러나 종래의 전착 숫돌의 제조에 있어서, 컨디셔너 본체의 작용면에 다이아몬드 입자의 고정면을 남겨 두고서, 절연성의 마스킹 재료로 피복하는 경우에 미세한 크기의 적절한 치수 정밀도로 피복하는 것이 곤란하여 마스킹 되어 있지 않은 곳에 두 개 이상의 다이아몬드 입자가 동시에 들어가는 문제가 발생하였고, 마스킹 위치가 어긋나서 동일한 형상으로 재현하는 것이 곤란하였고, 피복층이 평활하게 되지않고 요철(凹凸)이 심하였으며, 피복층의 밀착력이 약하여 이후에 공정에서 벗겨지는 경우가 있었기 때문에, CMP 패드를 컨디셔닝 하는데 있어서 불량률이 매우 높았다. 또한 종래의 컨디셔너는, 패드의 표면 상태를 항상 소정의 연마속도가 얻어지도록 일정하게 유지시키는 것이 곤란하였으며, 다이아몬드 입자의 탈락이 많고, 패드면에 눈메움을 일으키는 경우가 많았으며, 종래의 컨디셔너를 사용하여 패드를 컨디셔닝하면, 웨이퍼의 표면거칠기 값 및 스크래치 개수가 높은 것이 큰 문제로 되어왔다.

고안이 이루고자 하는 기술적 과제

본 고안은 CMP용 폴리싱 패드의 평탄화를 향상시킴과 동시에, 이 패드의 컨디셔닝을 효과적으로 행하는 기능을 가지고, 더구나 컨디셔닝 성능이 우수하고, 수명이 길며, 컨디셔너의 제조가 용이하여 제조시의 불량률을 현저히 감소시킬 수 있 는 CMP 장치용 컨디셔너를 제공함에 그 목적이 있다.

고안의 구성 및 작용

본 고안자들은, 상기의 과제를 해결하기 위하여 실험적인 연구를 거듭한 결과, 전착 컨디셔너의 연삭면에 있어서, 하나의 비마스킹부에 한 개씩의 다이아몬드 입자를 분산시키는 것에 의해, 연삭 저항을 감소시키고 컨디셔너의 수명이 증기되며, 연마속도비와 컨디셔닝 속도가 높아지며, 웨이퍼의 표면거칠기 값이 낮아지며, 웨이퍼의 스크래치 개수가 감소됨을 확인하였다. 즉, 본 고안은, 샹크(3)의 표면에 구멍 형상의 비마스킹부(1)를 가지는 마스킹 시트(2)를 점착하고, 하나의 비마스킹부(1)에 하나의 다이아몬드 입자(4) 만을 예비 고정한 후에 마스킹 시트(2)를 박리시키고, 이어서 도금액 안에 넣어서 다이아몬드 입자 직경의 40~60% 정도의 두께를 가지도록 Ni 도금층을 석출시키며, 더욱이 1개의 구멍 형상의 비마스킹부(1)의 면적이 다이아몬드 입자(4)의 투영 면적의 110~160%배로 하고, 상기한 마스킹 시트(2)의 비마스킹부(1)의 전면적이 마스킹 시트(2)의 전면적의 0.04~0.2배의 범위로 하는 것이 특징으로 된 화학적-기계적-연마 패드 컨디셔너를 제공하는 것이다.

아래에, 도면을 참고하여 본 고안을 상세히 설명한다. 그림 1은 마스킹 시트(2)를 점착한 샹크의 부분 평면도이다. 그림 1에서 원으로 표시되는 부분이 비마스킹부(1)로서, 한 개의 비마스킹부(1)에 1개의 다이아몬드 입자(4)가 고착된다. 1개의 비마스킹부(1)에 고착되는 다이아몬드 입자(4)가 2개를 넘으면, 패드에 의한 연마에서 웨이퍼의 표면거칠기 값이 낮아지며, 웨이퍼의 스크래치 개수가 감소되기 쉽다. 그림 1에서 비마스킹부(1)의 전면적이 다이아몬드 입자(4)를 고착한 연삭면 적의 0.04~0.2배이다. 비마스킹부(1)의 전면적이 다이아몬드 입자(4)를 고착한 연삭면의 전면적의 0.04배 미만이면, 컨디셔너(7)로서의 연삭력이 부족한 문제가 있으며, 컨디셔너(7)의 수명이 짧아지게 된다. 또한 비마스킹부(1)의 전면적이 다이아몬드 입자(4)를 고착한 연삭면의 전면적의 0.3배 이상이면 패드에 의한 연마에서 웨이퍼의 표면거칠기 값이 낮아지며, 웨이퍼의 스크래치 개수가 감소되기 쉽다. 본 고안의 컨디셔너의 샹크(3) 재료로는, 스테인레스 강재인 STS 304를 사용하는 것이 바람직하나, 경우에 따라서는 예를 들면 알루미늄 합금 등이 사용될 수 있다.

본 고안의 컨디셔너를 제조하기 위해서는, 우선 샹크(3)의 탈지를 행하는 것이 바람직하다. 탈지를 종료한 샹크면에, 구멍 형상의 비마스킹부(1)를 가지는 마스킹 시트(2)를 점착한다. 그림 1에서, 원형의 구멍 형상의 비마스킹부(1)를 가지는 마스킹 시트(2)가 샹크(3)에 점착되고, 샹크(3)의 일부가 비마스킹부(1)의 형상으로 노출되어 있다. 본 고안에서는, 마스킹 시트(2)를 점착한 상태에서, 컨디셔너의 연삭면으로 되는 샹크면에 예비 도금층(5)을 형성시키는 것이 바람직하다. 예비 도금을 실시하는 것에 의해, 다이아몬드 입자(4)와 샹크(3)가 직접 접촉하는 것이 아니고, 다이아몬드 입자(4)의 샹크(3)에 대한 고착성이 개량된다. 예비 도금하는 금속으로는 니켈 및 니켈 합금을 사용할 수가 있다. 본 고안에서는, 예비 도금을 실시한 샹크를, 마스킹 시트(2)를 점착한 상태에서 도금 용기에 넣고, 도금 용기 중에서 샹크의 마스킹 시트(2)를 점착한 면의 부분에 다이아몬드 입자(4)를 충진한다. 이어서, 샹크에 음극을 접속하고, 도금액에 양극을 접속하여, 예비 도금층(5)의 형성을 위한 전기 도금을 실시한다. 예비 도금을 위한 금속은 다이아몬드 입자(4)를 샹크(3)에 예비 고정할 수 있는 것이라면 제한이 없으나, 니켈 및 니켈 합금을 사용할 수가 있다. 각 다이아몬드 입자(4)의 일부분이 비마스킹부(1)에서 예비 도금층(5)을 사이에 두고 예비고정되며, 샹크 표면에서 탈락하지 않는 상태로 되면, 예비 고정을 위한 도금을 종료하고, 샹크를 도금 용기로부터 꺼낸다. 그림 2는, 다이아몬드 입자가 예비 고정된 샹크의 부분 단면도이다. 본 그림에서, 샹크(3)에 마스킹 시트(2)가 점착되고, 마스킹 시트의 구멍 형상의 비마스킹부(1)에 나이아몬드 입자(4)가 예비 도금층(5)에 의해 예비 고정되어 있다.

이어서 샹크(3)의 표면으로부터 마스킹 시트(2)를 박리시키고, 더욱이 마스킹부의 탈지와 활성화 처리를 행한 후에, 다시 샹크(3)를 도금 용기에 딤그어 음극을 접속하고, 도금액에 양극을 접속하여 도금을 계속하며, 다이아몬드 입자(4)를 샹크(3)에 전착하여 연삭면을 형성하고, 컨디셔너를 완성하게 된다. 도금에 사용하는 금속은, 예비 고정의 경우

와 마찬가지로 다이아몬드 입자(4)를 샹크(3)에 고착할 수 있는 것이면 제한이 없고, 예를 들면 니켈 및 니켈 합금을 사용할 수 있다. 그림 3은 본 고안의 컨디셔너의 연삭면의 부분 단면도이다. 본 그림에서 다이아몬드 입자(2)는 샹크(3)에 예비 도금층(5)에 의해 예비 고정되며, 더욱이 도금에 의해 형성된 Ni 도금층(6)에 의해 완전히 고착되어 있다. 본 고안에서 이용하는 마스킹 시트(2)는, 도금 조건에 견딜 수 있는 것이면 제한은 없으며, 예를 들면 폴리 염화비닐 등의 수지 시트의 일면에 아크릴계 또는 비닐 에테르계 등의 점착제를 도포한 뒤에 박리시트를 적층시키고, 또한 구멍 형상의 비마스킹부(1)의 가공을 실시한 것을 용이하게 사용할 수가 있다. 마스킹 시트(2)의 두께란, 수지 시트 및 점착 제 층의 두께의 합이 되며 이러한 마스킹 시트의 두께는 다이아몬드 입자 직경의 60%~140%의 범위로 하는 것이 바람직하다. 또한 더욱이 1개의 구멍 형상의 비마스킹부(1)의 면적이 다이아몬드 입자의 투영 면적의 110~160%배의 범위로 되어야 한다. 마스킹 시트의 두께를 다이아몬드 입자 직경의 60% 미만으로 한다든지, 또는 한 개의 비마스킹부의 면적이 다이아몬드 입자의 투영 면적의 160%를 초과하면, 한 개의 비마스킹부에 2개 이상의 다이아몬드 입자가 고착되어서 균등한 분산이 이루어지지 않는다. 또한 비마스킹부의 면적이 다이아몬드 입자의 투영 면적의 110% 미만에서는, 다이아몬드 입자의 샹크에 대한 부착이 곤란하게 된다. 따라서 마스킹의 두께를 전착할 다이아몬드 입자경의 60~140%의 범위로 하고, 마스킹하지 않는 구멍의 직경을 전착할 입자경의 110~160%의 범위로 하는 것에 의해, 컨디셔너 금속에 전착되는 다이아몬드 입자(4)가, 비마스킹부(1)에 한 개씩 분산되도록 된다. 다이아몬드 입자의 평균 투영 면적은, 다이아몬드 입자가 분산된 상태에서 확대 사진을 촬영하는 것에 의해 구할 수 있다. 본 고안에서는, 상기한 마스킹 시트의 비마스킹부의 전면적이 마스킹 시트의 전면적의 0.04~0.2배의 범위이다. 마스킹 시트의 비마스킹부의 전면적은, 본 고안의 컨디셔너의 연삭면에서 다이아몬드 입자가 고착된 부분의 전면적에 대응한다. 마스킹 시트의 비마스킹부의 전면적이 마스킹 시트의 전면적의 0.04배 미만이면, 구멍 형상의 비마스킹부의 전면적이 다이아몬드 입자를 고착한 연삭면의 전면적의 0.04배 미만으로 되어, 컨디셔너로서의 연삭력이 부족할 염려가 있다. 마스킹 시트의 비마스킹부의 전면적이 마스킹 시트의 전면적의 0.2배를 초과하면, 구멍 형상의 비마스킹부의 전면적이 다이아몬드 입자를 고착 한 연삭면의 전면적의 0.2배를 초과하여, 연삭시에 눈메움이 발생할 염려가 있다.

〈실시예〉

컨디셔너 샹크(3)의 연삭면으로 되는 작용면을 탈지하고, 마스킹 시트를 점착한 후에, 니켈에 의한 예비 도금층(5)을 형성하였다. 마스킹 시트(2)의 두께를 전착할 #120 메쉬 다이아몬드 입자경의 80%로 하였으며, 더욱이 다이아몬드 입자(4)를 전착시키기 위해 비마스킹부(1)의 직경을 전착할 다이아몬드 입자경의 140%로 하였다. 구멍 형상의 비마스킹부(1)의 전면적을 마스킹 시트(2)의 전면적의 0.1배가 되도록 하였다. 그 후에 컨디셔너의 본체를 도금액에 담그고 입자 고정면에 다이아몬드 입자(4)를 놓고서 컨디셔너의 본체에 음극을 접속하고, 도금액에 양극을 접속하여 전기 도금을 행하여 다이아몬드 입자(4)를 예비 고정하였다. 샹크를 도금액으로부터 빼내고, 마스킹 시트(2)를 박리시키며, 탈지를 행한 후에 컨디셔너의 본체를 다시 도금액에 담그며, 본체에 음극을 접속하고 도금액에 양극을 접속하여 다이아몬드 입자 고정면의 최종 Ni 도금을 행함에 의해 다이아몬드 입자(4)를 샹크의 연삭면에 고착하였다.

컨디셔너의 형상은 실시예 1에서는 도 4와 같은 다이아몬드 입자의 분포를 가지도록 하였으며, 실시예 2에서는 도 5와 같이 전착부가 스파이럴 형상이 되도록 하였고, 실시예 2에는 미전착 영역(8)이 형성되도록 하였다. 실시예 1 및 실시예 2는 컨디셔너의 형상을 제외하고는 다른 모든 제조 조건은 동일하였다. 비교예는 실시예 1 및 실시예 2의 컨디셔너의 성능과 비교를 행하기 위하여 당사에서 종래의 제조방법으로 제조되어 시중에서 판매되는 것으로, 비교예 1은 실시예 1과 동일 형 상이며, 비교예 2는 실시예 2와 동일 형상의 컨디셔너를 사용하였다. 실시예 1, 실시예 2, 비교예 1 및 비교예 2의 컨디셔너를 사용하여, 반도체의 웨이퍼 가공에 사용되는 화학-기계-연마 장치의 패드 컨디셔닝을 행한 결과를 표 1에 나타낸다.

[표 1]

	실시예 1	실시예 2	비교예 1	비교예 2
연마속도비	1.38	1.35	1	0.9
컨디셔닝속도(㎛/h)	35	34	12	11
컨디셔너수명(hr)	600	590	160	155
웨이퍼표면거칠기(nm)	0.33	0.34	0.43	0.44
웨이퍼의 스크래치 개수	1	1	7	8
패드의 표면상태	연삭흔 거의 없음	연삭흔 거의 없음	연삭흔 많음	연삭흔 많음

실시예 1 및 실시예 2의 패드 연마속도비, 컨디셔닝 속도 및 컨디셔너 수명이 비교예에 비해 현저히 높으며, 웨이퍼의 표면거칠기 및 스크래치 개수의 경우에서도 실시예 1과 실시예 2가 비교예에 비해 현저히 낮은 값을 보이며, 실시예 1 및 실시예 2의 컨디셔너를 사용한 경우 패드의 연삭흔이 거의 나타나지 않았으나, 비교예의 컨디셔너를 사용한 경

Ex. 1003, Page 111

우는 패드의 표면에 연삭흔이 많이 나타났다.

고안의 효과

이상에서 서술한 바와 같이 본 고안은, 마스킹 시트(2)의 점착에 의해 마스킹을 행하므로 치수 정밀도가 엄격한 패턴 형상을 재현성 높게 용이하게 형성시킬 수 있으며, 마스킹 시트(2)의 컨디셔너 금속에 대한 밀착력이 높으며, 또한 컨디셔너 금속에 전착되는 80~120메쉬의 다이아몬드 입자(4)가, 비마스킹부(1)에 한 개 씩 분산된다. 따라서 CMP용 폴리싱 패드의 평탄화를 향상시킴과 동시에, 이 패드의 컨디셔닝을 효과적으로 행하는 기능을 가지고, 더구나 컨디셔닝 성능이 우수하고, 수명이 길며, 컨디셔너의 제조가 용이하기 때문에 제조시의 불량률을 현저히 감소시킬 수 있다.

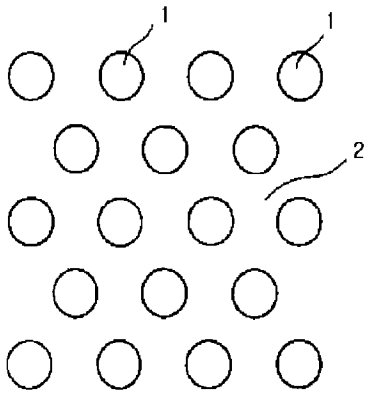
(57) 청구의 범위

청구항 1.

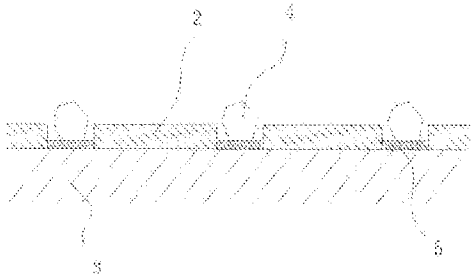
Ni 도금층이 다이아몬드 입자 직경의 40~60% 정도의 두께를 가지며, 샹크의 표면에 있어서, 1개의 구멍 형상의 비마스킹부의 면적이 다이아몬드 입자의 투영 면적의 110~160%배로 하고, 마스킹 시트의 비마스킹부의 전면적이 마스킹 시트의 전면적의 0.04~0.2배의 범위로 하는 것이 특징으로 된 화학적-기계적-연마 패드 컨디셔너.

도면

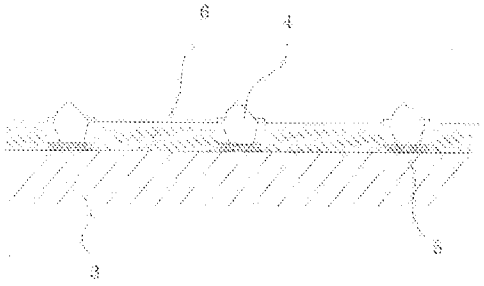
도면1



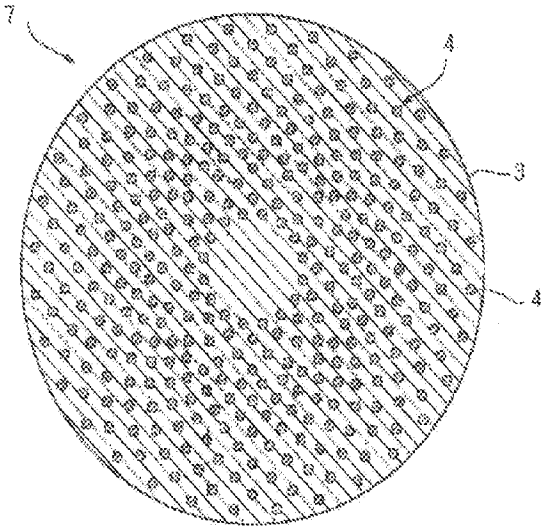
도면2



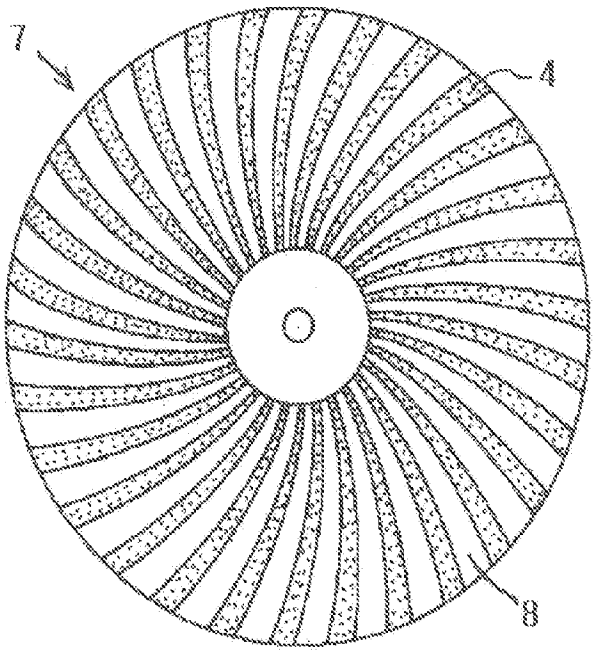
도면3



도면4



도면6



Electronic Acknowledgement Receipt

EFS ID:	23883187
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Stephen Neville
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	25-OCT-2015
Filing Date:	03-OCT-2014
Time Stamp:	21:32:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	t.pdf	71891 4eb8d9a668fa93e8bf1303fce0dd17c3a7e9bbae	no	4

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Form (SB08)	a.PDF	615500 3a360e31c742ea8eb055ba95f963ff7102ebe62a	no	14
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Information Disclosure Statement (IDS) Form (SB08)	b.PDF	202334 ea904908c00abef5319c9165c8b5baaca91f68db	no	6
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	JP823.pdf	517134 9f3ea781d20cb04673ef0cb9535f68f1b8ce977e	no	10
Warnings:					
Information:					
5	Foreign Reference	KR181XXX.pdf	405972 9726511504 92f78af2b0629ad8466cf9402ccaf4	no	8
Warnings:					
Information:					
6	Non Patent Literature	Colmony.pdf	709325 00d96f5188c85efd55fd402cf7757a0d3fd29eb2	no	2
Warnings:					
Information:					
7	Non Patent Literature	EndecottSpec.pdf	408523 7b04533f50e66de77950ac03cc3a384fecd264d4	no	2
Warnings:					
Information:					
8	Non Patent Literature	Kennametal.pdf	228235 e151c5f25f9606efbd4b32f068ae2b5df595a441	no	2
Warnings:					
Information:					
9	Non Patent Literature	MSDSk.pdf	1204957 e56ca845434f6745c00246f498a633d7c31e43bb	no	6
Warnings:					
Information:					

10	Non Patent Literature	MSDSWall.pdf	839563 1bc91d176686dc5e71cc3454271792e3073d4c05	no	3
Warnings:					
Information:					
11	Non Patent Literature	SungEast.pdf	3714682 848c372d99833841157ddf65f52687eae2458793	no	15
Warnings:					
Information:					
12	Non Patent Literature	SungMech.pdf	8962132 eec4331ed5161a75ef0a4fb659e101618d6d311a	no	24
Warnings:					
Information:					
13	Non Patent Literature	Syndite.pdf	730600 4a11d3c580aaf5be7d792d3cc8c1598acf0d08b9	no	2
Warnings:					
Information:					
14	Non Patent Literature	YasingaNFP.pdf	144771 49b0f550fce739e914405c3b7db22ca5d15702a9	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	18755619		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

ART UNIT: 3723 EXAMINER: NGUYEN, GEORGE BINH MINH FIRST NAMED INVENTOR: Chien-Min Sung SERIAL NO.: 14/506,476 FILED: 10/3/2014 CONF. NO.: 9471 FOR: CMP PAD DRESSER HAVING LEVELED TIPS AND ASSOCIATED METHODS DOCKET NO.: 02074-24012.NP.CIP2	**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8** DATE OF DEPOSIT: October 25, 2015 I hereby certify that this paper or fee (along with any paper or fee referred to as being attached or enclosed) is being submitted on the date indicated above via: ☒ EFS Web ☐ facsimile to _____ ☐ the United States Postal Service with sufficient postage as first class mail addressed to: Mail Stop _____, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. /Stephen Neville/ Stephen Neville

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §§ 1.56, 1.97 and 1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

Pursuant to the duty of disclosure under 37 C.F.R. §§ 1.56, 1.97 and 1.98, the Applicant requests consideration of this Information Disclosure Statement, which is being submitted in accordance with:

☒ 37 C.F.R. § 1.97(b)(1) or (3), within three months of the filing date of the application, or before a first office action on the merits, whichever occurs last;

☐ 37 C.F.R. § 1.97(c), after a first office action on the merits, but before a Final Office Action or a Notice of Allowance, whichever occurs first, and is accompanied by **EITHER** a statement in accordance with 37 C.F.R. § 1.97(e), **OR** the fee set forth in 37 C.F.R. § 1.17(p); or

☐ 37 C.F.R. § 1.97(d), after a Final Office Action or Notice of Allowance, whichever occurs first, but on or before payment of the issue fee, and is accompanied by **BOTH** a statement in

accordance with 37 C.F.R. § 1.97(e), **AND** the fee set forth in 37 C.F.R. § 1.17(p).

SUBMISSIONS

Please find enclosed, pursuant to 37 C.F.R. §§ 1.97 and 1.98:

☒ Form **PTO/SB/08A** and/or **PTO/SB/08B** listing the references submitted for consideration, which contains a list of all patents, publications and all other items that have come to the attention of one or more of the individuals designated in 37 C.F.R. § 1.56(c).

☒ Legible copies of the listed non-patent documents, unpublished U.S. applications and foreign documents or their relevant portions are included.

☒ All English translations of each non-English reference, if any, within the possession, custody, control or availability of anyone designated in 37 C.F.R. § 1.56(c) (see 37 C.F.R. §1.98 are included.

☐ For all listed references that are not either in the English language, or accompanied by a translation into English, a concise explanation of relevance as required under 37 C.F.R. § 1.98(a)(3) is enclosed attached to each.

Copies of references listed on the enclosed PTO/SB/08A and/or PTO/SB/08B are **not** enclosed:

☒ because, under 37 C.F.R. § 1.98.(d), they were previously cited by or submitted to the Office in application number **13/802,112**, which is relied upon for an earlier filing date under 37 C.F.R. § 1.20.

☐ because they are substantially cumulative of an enclosed reference.

STATEMENT IN ACCORDANCE WITH 37 C.F.R. § 1.97(e)

☐ I hereby certify that each item contained in the information disclosure statement was first cited in

a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement.

☐ I hereby certify that no item contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of the information disclosure statement.

REMARKS

While no representation is made that any of these references may be "prior art" within the meaning of that term in accordance with 37 C.F.R. §§ 102 or 103, the enclosed list of references is disclosed so as to comply with the duty of disclosure set forth in 37 C.F.R. § 1.56.

Moreover, while no representation is made that a specific search of office files or patent office records has been conducted or that no better art exists, the undersigned attorney of record believes that the references listed, together with any other references which may have been previously submitted or listed, are the closest to the claimed invention (taken in its entirety) of which the undersigned is presently aware, and no art which is closer to the claimed invention (taken in its entirety) has been knowingly withheld.

☐ Check No. ____ in the amount of $ ____(amount in § 1.17(p)) constituting the submission fee set forth in 37 C.F.R. § 1.17(p) is enclosed.

In the event that 37 C.F.R. § 1.97(c) applies and the Examiner is not satisfied that the Statement meets the requirements of 37 C.F.R. § 1.97(e), or in any other event remediable by a fee, please credit any over payment or charge any additional fees to Deposit Account No. 20-0100 of the undersigned.

Dated this 25th day of October, 2015.

Respectfully submitted,

/David W. Osborne/

David W. Osborne
Attorney for Applicant
Registration No. 44989

THORPE NORTH & WESTERN, LLP
Customer No. 20,551
P.O. Box 1219
Sandy, Utah 84091-1219
Telephone: (801) 566-6633

PLUS Search Results for S/N 14506476, Searched Tue Oct 27 14:17:09 EDT 2015

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

7651386 99
7690971 99
7901272 99
7901272 99
8414362 99
8449357 99
8974270 99
9138862 99
20070060026 99
20070264918 99
20080171503 99
20080292869 99
20090098814 99
20100139174 99
20100221990 99
20110212670 99
20120302146 99
20140099868 99
20140308883 99
20150133036 99
6517424 83
6884155 83
7124753 83
7201645 83
7241206 83
7258708 83
7285039 83
7300338 83
7393264 83
7473162 83
7491116 83
7494404 83
7544117 83
7749050 83
7771498 83
8043145 83
8043145 83
8104464 83
8142261 83
8298043 83
8298048 83
8491358 83
8678878 83
8777699 83
8920214 83
9132526 83
20010046835 83
20020173234 83
20030084894 83
20040112359 83

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

20551 7590 10/30/2015

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER	
NGUYEN, GEORGE BINH MINH	

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
10/30/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@tnw.com
rich@tnw.com
annette.fields@tnw.com

Office Action Summary	Application No. 14/506,476	Applicant(s) SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-24* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-24* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *10/03/2014* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *10/25/2015*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Claims 1-24 are presented for examination.

Receipt is acknowledged of the IDS filed on October 25, 2015 which has been considered and placed of record in the file.

This application has been filed with formal drawings which are acceptable to the examiner.

Claim Rejections - 35 USC § 112

> The following is a quotation of 35 U.S.C. 112(b):
> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.
>
> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> 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.

Claims 11-15 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

In claim 1, lines 5-9, the claimed limitations of" the protrusion difference between the highest 1% of the protruding tips are within 80 microns or less" are unclear because how the highest 1% is determined. And it does not make sense that the protrusion difference of 80 microns is more than "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".

Therefore, the scope of the claim is unascertainable which renders the claim indefinite.

Claims 12-15 are also rejected because of their dependency on rejected claim 11.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented 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. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim1-10 and 16-24 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Dinh-Ngoc et al.'2010/0248595.

In re claims 1-4, Dinh-Ngoc et al.'595 discloses a CMP pad dresser, comprising: a support substrate #201; and a plurality of superabrasive particles #221 secured to the support substrate with each superabrasive particle extending away from the support substrate to a protrusion distance and wherein the difference in protrusion distance #215 between the highest protruding tip #213 and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns (Fig. 2A, [0075]-[0076]).

However, Dinh-Ngoc et al.'595 does not disclose the tip variation as set forth in the claim.

Therefore, regarding to the tip variation range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claims 5-7, 16-17, and 23-24, Dinh-Ngoc et al.'595 does not disclose cutting depth range as set forth in claim. Please note that the claimed limitations of "cutting depth" is treated as the same as the tip variation because the tip height of abrasive particles is the cutting depth as the pad dresser is pressed into the polishing pad.

Therefore, regarding to the cutting depth range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that

where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claim 8, Dinh-Ngoc et al.'595 discloses a configuration of plane in [0060].

In re claim 9, Dinh-Ngoc et al.'595 discloses a predetermined pattern of abrasives arrangement in [0064].

In re claim 10, Dinh-Ngoc et al.'595 does not disclose the distribution space range as set forth in the claim. Therefore, regarding to the distribution space range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claims 18-21, Dinh-Ngoc et al.'595 discloses the placement of abrasive grains in [0064] and the size of the abrasive grains in [0066]. Dinh-Ngoc et al.'595 does not disclose the amount of abrasive grains range placed on the dresser as set forth in the claims.

Therefore, regarding to the amount of abrasive grains range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claim 22, it would have been obvious to one skilled in the art at the time the invention was made to have modified Dinh-Ngoc et al.'595 dresser with the combination

of amount of abrasive particles with a particular protrusion distance of 30 microns or less in order to achieve designated profiles configurations depending on the particular use of the abrading tool.

Claims 5-7, 11-15 , 16-24 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Dinh-Ngoc et al.'595 in view of Sung'2008/2008/0292861.

In re claims 5-7, 16-17, and 23-24, Dinh-Ngoc et al.'595 has been discussed above, but does not disclose cutting depth as set forth in the claims.

Nevertheless, Sung'869 discloses a superabrasive tool for conditioning a polishing pad. Sung'869 discloses that superabrasive particles #24 protruding to a predetermined height may produce **a cutting depth** of less than about 20 microns when used to abrade a work piece ([0010]). Sung'869 further discloses that it may also be beneficial for the superabrasive particles to protrude from the solidified organic material layer to a predetermined height or series of heights that is/are along a designated profile. Numerous configurations for designated profiles are possible, depending on the particular use of the abrading tool ([0057-0059]).

Thus, it would have been obvious to one skilled in the art at the time the invention was made to have modified Dinh-Ngoc et al.'869 conditioner tool with a designated profile as taught by Sung'869 as set forth in the claim in order to achieve a desired cutting depth.

In re claims 18-21, Dinh-Ngoc et al.'595 discloses the placement of abrasive grains in [0064] and the size of the abrasive grains in [0066]. Dinh-Ngoc et al.'595 does

not disclose the amount of abrasive grains range placed on the dresser as set forth in the claims.

Therefore, regarding to the amount of abrasive grains range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claim 22, it would have been obvious to one skilled in the art at the time the invention was made to have modified Dinh-Ngoc et al.'595 dresser with the combination of amount of abrasive particles with a particular protrusion distance of 30 microns or less in order to achieve designated profiles configurations depending on the particular use of the abrading tool

In re claims 11, Dinh-Ngoc et al.'595 discloses a CMP pad dresser #200 against a CMP pad ([0007]), the dresser including a monolayer of a plurality of superabrasive particles #221 protruding from a matrix layer #201, wherein the difference in protrusion distance #215 between the highest protruding tip #213 and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns ([0075-0076], Fig. 2A, flatness even not greater than 0.005cm or 50 microns).

However, Dinh-Ngoc et al.'595 does not disclose 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.

Nevertheless, Sung'869 discloses a superabrasive tool for conditioning a polishing pad. Sung'869 discloses that superabrasive particles #24 protruding to a predetermined height may produce **a cutting depth** of less than about 20 microns when used to abrade a work piece ([0010]). Sung'869 further discloses that it may also be beneficial for the superabrasive particles to protrude from the solidified organic material layer to a predetermined height or series of heights that is/are along a designated profile. Numerous configurations for designated profiles are possible, depending on the particular use of the abrading tool ([0057-0059]).

Thus, it would have been obvious to one skilled in the art at the time the invention was made to have modified Dinh-Ngoc et al.'869 conditioner tool with a designated profile as taught by Sung'869 as set forth in the claim in order to achieve a desired cutting depth.

In re claims 12-15, regarding to the protrusion distance difference range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Please see PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GEORGE NGUYEN whose telephone number is (571)272-4491. The examiner can normally be reached on Monday -Friday from 8 AM-4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hail Joseph can be reached on 571-272-4485. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

George Nguyen
Primary Examiner
Art Unit 3723

/GEORGE NGUYEN/
Primary Examiner, Art Unit 3723

Notice of References Cited	Application/Control No. 14/506,476	Applicant(s)/Patent Under Reexamination SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-8,393,934 B2	03-2013	Sung; Chien-Min	B24D3/007	451/443
*	B	US-8,622,787 B2	01-2014	Sung; Chien-Min	B24B53/017	451/443
*	C	US-8,974,270 B2	03-2015	Sung; Chien-Min	B24B53/017	451/443
*	D	US-9,138,862 B2	09-2015	Sung; Chien-Min	B24B53/017	1/1
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 9471

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/506,476	10/03/2014 RULE	451	3723	02074-24012.NP.CIP2

APPLICANTS

INVENTORS

Chien-Min Sung, Tansui, TAIWAN;

**** CONTINUING DATA ***************************

This application is a CIP of 13/802,112 03/13/2013 PAT 9138862
which is a CIP of 13/479,148 05/23/2012 PAT 8974270
which claims benefit of 61/489,074 05/23/2011
This application 14/506,476 10/03/2014
is a CIP of 13/797,704 03/12/2013
which is a CIP of 12/726,786 03/18/2010 PAT 8622787
which is a CIP of 12/255,823 10/22/2008 PAT 8393934
which is a CIP of 12/168,110 07/05/2008 PAT 8398466
which claims benefit of 60/976,198 09/28/2007
and said 12/726,786 03/18/2010
is a CIP of 11/560,817 11/16/2006 PAT 7762872
which is a CIP of 11/357,713 02/17/2006 ABN
which claims benefit of 60/681,798 05/16/2005
and said 11/560,817 11/16/2006
is a CIP of 11/223,786 09/09/2005 ABN
and said 13/797,704 03/12/2013
is a CIP of 12/850,747 08/05/2010 PAT 8678878
which claims benefit of 61/246,816 09/29/2009
and said 13/797,704 03/12/2013
is a CIP of 13/034,213 02/24/2011 ABN
which claims benefit of 61/333,162 05/10/2010

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
10/09/2014

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged /GN / Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		TAIWAN	1	24	5

ADDRESS

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219
UNITED STATES

TITLE

CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

		☐ All Fees

BIB (Rev. 05/07).

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		0187593	02/1877	Brown et al.	
		0238946	03/1881	McKitrick	
		0296756	04/1884	Kirkpatrick	
		1854071	04/12/1932	Schacht	
		1988065	01/1935	Wooddell	
		2001/0003884	06/2001	Wei et al.	
		2001/0009844	07/2001	Cho et al.	
		2001/0046835	11/2001	Wielonski et al.	
		2002/0014041	02/2002	Baldonai et al.	
		2002/0042200	04/2002	Fawcett	
		2002/0127962	09/2002	Cho et al.	
		2002/0139680	10/2002	George	
		2002/0164928	11/2002	Tolles	
		2002/0173234	11/2002	Sung et al.	
		2002/0182401 A1	12/2002	Lawing	
		2003/0054746	03/2003	Nussbaumer	
		2003/0084894	05/2003	Sung	
		2003/0092357	05/2003	Yoon et al.	
		2003/0114094	06/2003	Myoung et al.	
		2003/0207659	11/2003	Annen et al.	
		2004/0009742	01/15/2004	Lin et al.	
		2004/0023610	02/05/2004	Hu et al.	
		2004/0060243	04/2004	Fries et al.	
		2004/0079033	04/2004	Long	
		2004/0091627	05/2004	Ohara et al.	
		2004/0107648	06/2004	Sung	
		2004/0112359	06/17/2004	Sung	
		2004/0180617	09/2004	Goers	
		2004/0185763 A1	09/23/2004	Ishizaki et al.	
		2004/0203325	10/2004	Donohue	
		2004/0235406 A1	11/2004	Duescher	
		2004/0238946	12/2004	Tachibana et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		2005/0032462	02/2005	Gagliardi et al.	
		2005/0032469	02/10/2005	Duescher	
		2005/0060941	03/2005	Provow	
		2005/0095959	05/05/2005	Sung	
		2005/0118939	06/02/2005	Duescher	
		2005/0215188	09/2005	Toge et al.	
		2005/0227590	10/13/2005	Sung	
		2005/0260939	11/2005	Andrews et al.	
		2006/0073774	04/06/2006	Sung	
		2006/0079160	04/2006	Balagani et al.	
		2006/0079162	04/2006	Yamashita et al.	
		2006/0128288	06/2006	An et al.	
		2006/0135050	06/22/2006	Petersen et al.	
		2006/0143991	07/2006	Sung	
		2006/0213128 A1	09/28/2006	Sung	
		2006/0254154	11/2006	Huang et al.	
		2006/0258276	11/16/2006	Sung	
		2007/0051354	03/2007	Sung	
		2007/0051355	03/2007	Sung	
		2007/0060026	03/15/2007	Sung	
		2007/0066194	03/2007	Wielonski et al.	
		2007/0093181	04/26/2007	Lugg et al.	
		2007/0128994	06/07/2007	Sung	
		2007/0155298	07/2007	Sung	
		2007/0232074	10/04/2007	Ravi et al.	
		2007/0249270	10/2007	Sung	
		2007/0254566	11/01/2007	Sung	
		2007/0264918	11/2007	Sung	
		2007/0266639	11/22/2007	Chein-Min Sung	
		2007/0295267	12/27/2007	Sung	
		2008/0014845 A1	01/2008	Yimaz et al.	
		2008/0076338	03/2008	Andrews et al.	
		2008/0096479	04/2008	Sung	
		2008/0153398	06/2008	Sung	
		2008/0171503	07/2008	Sung	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		2008/0271384	11/06/2008	Puthanangady et al.	
		2008/0292869	11/27/2008	Sung	
		2008/0296756	12/2008	Koch et al.	
		2009/0068937	03/2009	Sung	
		2009/0073774	03/2009	Horesh	
		2009/0093195	04/2009	Sung	
		2009/0094902 A1	04/2009	Hou	
		2009/0123705	05/14/2009	Sung	
		2009/0145045	06/11/2009	Sung	
		2009/0215363	08/27/2009	Sung	
		2009/0283089	11/19/2009	Sung	
		2010/0015898	01/2010	An et al.	
		2010/0022174	01/2010	Chou et al.	
		2010/0139174	06/2010	Sung	
		2010/0186479	07/29/2010	Borucki et al.	
		2010/0203811	08/2010	Philipossian et al.	
		2010/0221990	09/2010	Sung	
		2010/0248595	09/30/2010	Dinh-Ngoc et al	
		2010/0248596	09/2010	Sung	
		2010/0261419	10/14/2010	Chien-Min Sung	
		2010/0273402 A1	10/2010	Shimizu	
		2011/0076925 A1	03/2011	Sung	
		2011/0104989 A1	05/2011	Boutaghou et al.	
		2011/0192652 A1	08/2011	Shen et al.	
		2011/0212670	09/01/2011	Sung	
		2011/0252710 A1	10/2011	Hall et al.	
		2011/0275288	11/10/2011	Sung	
		2011/0293905	12/01/2011	Sung	
		2011/0296766	12/08/2011	Sung	
		2012/0192499	08/02/2012	Sung	
		2012/0241943	09/27/2012	Sung	
		2012/0244790 A1	09/2012	Sung	
		2012/0260582	10/18/2012	Sung	
		2012/0302146	11/29/2012	Sung	
		2013/0225052 A1	08/2013	Song et al	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		2013/0244552	09/19/2013	Lee et al.	
		2014/0099868 A1	04/2014	Sung	
		2027087	01-07-1936	Buckner	
		2027307	01-07-1936	Schacht	
		2033991	03-17-1936	Melton	
		2035521	03-31-1936	Benner	
		2075354	03/1937	Monier	
		2078354	04/1937	Webster	
		2184348	12-26-1939	Kirchner	
		2187624	01-16-1940	Melton	
		2194253	03-19-1940	Benner	
		2268663	01/1942	Kuzmick	
		2281558	05-05-1942	Cross	
		2307461	01/1943	Ogden	
		2318570	05-04-1943	Paul	
		2334572	11-16-1943	Melton	
		2612348	09/1952	Catallo	
		2652951	09/1953	Augustus	
		2725693	12/06/1955	Leigh	
		2811960	11/1957	Fessel	
		2867086	01/1959	Haley	
		2876086	03/1959	Raymond	
		2947608	08/02/1960	Hall	
		2952951	09/1960	Simpson	
		3067551	12/1962	Maginnis	
		3121981	02/1964	Hurst	
		3127715	04/1964	Christensen	
		3146560	09/01/1964	Hurst	
		3276852	10/1966	Lemelson	
		3293012	12/1966	Smiley	
		3372010	03/1968	Parsons	
		3377411	04-09-1968	Charvat	
		3416560	12/1968	Bruno	
		3440774	04-29-1969	Curn	
		3593382 A	07/20/1971	Miller	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		3608134	09-28-1971	Cook	
		3625666	12-07-1971	James	
		3630699	12/1971	Caitlin	
		3631638	01/1972	Yoshikawa et al.	
		3664662	05/23/1972	Linz	
		3706650	12/19/1972	Eisner	
		3743489	07/1973	Wentorf Jr. et al.	
		3767371	10/1973	Wentorf Jr. et al.	
		3802130	04/1974	Lindenbeck	
		3819814	06/1974	Pope	
		3852078	12/03/1974	Wakatsuki	
		3894673	07/1975	Lowder et al.	
		3905571	09/1975	Lombardo	
		3982358	09/28/1976	Fukuda	
		4018576	04/1977	Lowder et al.	
		4028576	06/1977	Wofsey	
		4078906	03/1978	Green	
		4149881	04/1979	D'Silva	
		4151154	04/1979	Berger	
		4155721	05/1979	Fletcher	
		4182628	01/08/1980	D'Silva	
		4188194	02/1980	Corrigan	
		4201601	05/1980	D'Silva	
		4211294	07/1980	Multakh	
		4211924	07/08/1980	Müller et al.	
		4224380	09/1980	Bovenkerek et al.	
		4228214	10/1980	Steigleman et al.	
		4229186	10/21/1980	Wilson	
		4273561	06/1981	Villalobos	
		4287168	09/01/1981	Wentorf et al.	
		4289503	09/1981	Corrigan	
		4341532	07/1982	Oide	
		4355489	10/1982	Heyer et al.	
		4405411	09/20/1983	Inoue et al.	
		4481016	11/1984	Campbell et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		4525179	06/1985	Gigl	
		4547257	10/1985	Iizuka et al.	
		4551195	11/05/1985	Iizuka et al	
		4565034	01/1986	Sekiya	
		4610699	09/1986	Yazu et al.	
		4617181	10/14/1986	Yazu et al.	
		4629373	12/1986	Hall	
		4632817	12/30/1986	Yazu et al.	
		4662896	05/1987	Dennis	
		4669522	06/1987	Griffin	
		4680199	07/1987	Vontell et al.	
		4712552	12/15/1987	Pangburn	
		4737162	04/1988	Grazen	
		4749514	06/07/1988	Murakami et al.	
		4770907	09/13/1988	Kimura	
		4776861	10/1988	Frushour	
		4780274	10/1988	Barr	
		4797241	01/1989	Peterson et al.	
		4828582	05/1989	Frushour	
		4849602	07/1989	Gardner	
		4863573	09/05/1989	Moore et al.	
		4866888	09/19/1989	Murai et al	
		4883500	11/1989	Deakins et al.	
		4908046	03/1990	Wiand	
		4916869	04/1990	Oliver	
		4923490	05/1990	Johnson et al.	
		4925457	05/15/1990	deKok et al.	
		4927619	05/22/1990	Tsuji	
		4943488	07/1990	Sung et al.	
		4945686	08/1990	Wiand	
		4949511	08/1990	Endo et al.	
		4954139	09/1990	Cerutti	
		4968326	11/1990	Wiand	
		5000273	03/1991	Horton et al.	
		5011513	04/1991	Zador et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		5022895	06/1991	Wiand	
		5024680	06/18/1991	Chen et al.	
		5030276	07/1991	Sung et al.	
		5037451	08/1991	Burnand et al.	
		5043120	08/1991	Corrigan	
		5049165	09/17/1991	Tselesin	
		5092082	03/1992	Padberg	
		5092910	03/1992	deKok et al.	
		5116568	05/26/1992	Sung	
		5131924	07/1992	Wiand	
		5133782	07/1992	Wiand	
		5137543	08/1992	Heath et al.	
		5151107	09/1992	Cho et al.	
		5164247	11/1992	Solanki et al.	
		5176155	01/05/1993	Rudolph, Jr.	
		5190568	03/1993	Tselesin	
		5194070	03/1993	Sumiya et al.	
		5194071	03/1993	Corrigan et al.	
		5195403	03/1993	Sani et al.	
		5195404	03/1993	Notter et al.	
		5197249	03/1993	Wiand	
		5203881	04/1993	Wiand	
		5232320	08/1993	Tank et al.	
		5243790	09/14/1993	Gagne	
		5246884	09/1993	Jaso	
		5247765	09/1993	Quintana	
		5248317	09/28/1993	Tank	
		5264011	11/1993	Brown et al.	
		5266236	11/1993	Bovenkerk	
		5271547	12/1993	Carlson	
		5273730	12/1993	Yoshida et al.	
		5295402	03/22/1994	Bovenkerk	
		5314513	05-24-1994	Miller	
		5328548	07/12/1994	Tsuji et al.	
		5364423	11/1994	Bigelow et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		5374293	12/20/1994	Takashita et al.	
		5380390	01/1995	Tselesin	
		5443032	08/1995	Vichr et al.	
		5453106	09-26-1995	Roberts	
		5454343	10/03/1995	Eun et al.	
		5458754	10/17/1995	Sathrum et al.	
		5486131	01/1996	Cesna et al.	
		5492771	02/1996	Lowder et al.	
		5492774	02/1996	Tateno	
		5496386	03/1996	Broberg et al.	
		5500248	03/1996	Iacovangelo et al.	
		5505272	04/1996	Clark	
		5518443	05/1996	Fisher	
		5527424	06/1996	Mullins	
		5536202	07/1996	Appel et al.	
		5547417	08/1996	Breivogel et al	
		5551959	09/03/1996	Martin et al.	
		5560745	10/1996	Roberts	
		5560754	10/1996	Johnson et al	
		5609286	03/1997	Anthon	
		5620489	04/15/1997	Tselesin	
		5660894	08/1997	Chen et al.	
		5669943	09/1997	Horton et al.	
		5674572	10/07/1997	Sarin et al.	
		5725421	03/10/1998	Goers et al.	
		5746931	05/1998	Graebner	
		5772756	06/30/1998	Davies et al.	
		5776214	07/1998	Wood	
		5779743	07/1998	Wood	
		5791975	08/1998	Cesna et al.	
		5801073	09/01/1998	Robbins et al.	
		5816891	10/1998	Woo	
		5820450	10/1998	Calhoun	
		5833519	11/1998	Moore	
		5840090	11/24/1998	Ho et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		5851138	12/1998	Hempel Jr.	
		5855314	01/1999	Shiue et al.	
		5868806	02/09/1999	Nishio et al.	
		5885137	03/1999	Ploessl	
		5902173	05/1999	Tanaka	
		5916011	06/1999	Kim et al.	
		5919084	07/1999	Powell et al.	
		5921856	07/13/1999	Zimmer	
		5924917	07/1999	Benedict et al.	
		5961373	10/1999	Lai	
		5975988	11/1999	Christianson	
		5976001	11/1999	Powell et al.	
		5976205	11/1999	Andrews et al.	
		5980852	11/09/1999	Gurns et al.	
		5980982	11/1999	Degawa et al.	
		5985228	11/1999	Corrigan et al.	
		6001008	12/1999	Fujimori et al	
		6001174	12/14/1999	Fang	
		6024824	02-15-2000	Krech	
		6027659	02/22/2000	Billet	
		6030595	02/29/2000	Sumiya et al.	
		6039641	03/21/2000	Sung	
		6054183	04/2000	Zimmer et al.	
		6093280	07/2000	Kirchner et al.	
		6106382	08/2000	Sakaguchi	
		6123612	09/26/2000	Goers	
		6125612	10/03/2000	Main	
		6159087	12/2000	Briang et al.	
		6159286	12/2000	Sung	
		6179886	01/2001	Gordeev et al.	
		6190240	02/2001	Kinoshita et al.	
		6193770 B1	02/27/2001	Sung	
		6196911	03/2001	Preston et al.	
		6200360	03/2001	Imai et al.	
		6206942	03/2001	Wood et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		6213856	04/2001	Cho et al.	
		6217413	04/2001	Christianson	
		6224469	05/01/2001	Ohmori et al.	
		6258138	07/2001	DeVoe et al.	
		6258201	07-10-2001	Krech	
		6258237	07/2001	Gal-Or et al.	
		6281129	08/2001	Easter et al.	
		6284556	09/2001	Wang et al.	
		6286498	09/11/2001	Sung	
		6293854	09/2001	Kimura et al.	
		6299508	10/09/2001	Gagliardi et al.	
		6299521 B1	10/09/2001	Morimura et al.	
		6312324	11/06/2001	Mitsui et al.	
		6319108	11/2001	Adefris et al.	
		6325709	12/2001	Nanda et al.	
		6346202	02/12/2002	Molnar	
		6354918	03/12/2002	Togawa et al.	
		6354929	03/12/2002	Adefris et al.	
		6368198	04/2002	Sung et al.	
		6371838	04/16/2002	Holzapfel	
		6371842	04/2002	Romero	
		6372001 B1	04/16/2002	Omar et al.	
		6394886	05/2002	Chen et al.	
		6409580	06/2002	Lougher et al.	
		6416878	07/09/2002	An	
		6439986	08/27/2002	Myoung et al.	
		6446740	09/2002	Eyre	
		6458018	10/01/2002	Goers et al.	
		6478831	11/12/2002	Tselesin	
		6497853	12/24/2002	Davies et al.	
		6544599	04/08/2003	Brown et al.	
		6551176	04/2003	Garretson	
		6605798	08/2003	Cullen	
		6607423	08/2003	Areayan et al.	
		6616725	09/2003	Cho et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		6616752	09/2003	Basura	
		6626167	09/30/2003	Kim et al.	
		6627168	09/2003	Ohtsubo et al.	
		6629884	10/2003	Goers	
		6646725	11/2003	Eichinger	
		6672943	01/06/2004	Vogtmann	
		6679243	01/2004	Sung	
		6692547	02/2004	Kim	
		6694847	02/2004	Hiroyasu et al.	
		6722952	04/20/2004	Goers et al.	
		6749485	06/2004	James et al.	
		6755720	06/29/2004	Ishizaki et al.	
		6769969	08/03/2004	Duescher	
		6790126	09/2004	Wood et al.	
		6818029	11/16/2004	Myoung et al.	
		6824455	11/30/2004	Osterheld et al.	
		6835365	12/2004	Davies et al.	
		6837979	01/04/2005	Uzho et al.	
		6884155	04/26/2005	Sung et al.	
		6899592	05/2005	Kojima et al.	
		6905571	06/14/2005	Sakuma et al.	
		6935365	08/2005	Schuster	
		6945857	09/2005	Doan et al.	
		6979357	12/27/2005	Fries et al.	
		7021995	04/04/2006	Toge et al.	
		7033408	04/25/2006	Fries et al.	
		7044990 B2	05/16/2006	Ishizaki et al.	
		7066795	06/2006	Balagani et al.	
		7067903	06/27/2006	Tachibana et al.	
		7124753	10/24/2006	Sung	
		7150677	12/2006	Yamashita et al.	
		7198553	04/03/2007	Goers	
		7201645	04/10/2007	Sung	
		7247577	07/24/2007	Palmgren et al.	
		7258708	08/2007	Sung	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		7261621	08/2007	Moon et al.	
		7323049	01/29/2008	Sung	
		7368013	05/06/2008	Sung	
		7384436	06/10/2008	Sung	
		7393264	07/01/2008	Sung	
		7404857	07/2008	Sung	
		7465217	12/2008	Kinoshita et al.	
		7494404	02/24/2009	Sung	
		7507267 B2	03/2009	Hall et al.	
		7585366	09/08/2009	Sung	
		7641538	01/05/2010	Goers	
		7651368	01/26/2010	Kendall et al.	
		7651386	01/26/2010	Sung	
		7658666	02/2010	Sung	
		7690971	04/06/2010	Sung	
		7762872	07/27/2010	Sung	
		7791188	09/2010	Sung	
		7840305	11/23/2010	Behr et al.	
		7954483 B2	06/2011	Kim et al.	
		8104464	01/2012	Sung	
		8377158 B2	02/2013	Palmgren et al.	
		8393934	03/17/2013	Sung	
		8398466	03/19/2013	Sung et al.	
		8545583 B2	10/2013	Duescher	
		8678878	03/2014	Sung	
		8777699	07/15/2014	Sung	
		RE20660	02/22/1938	Schacht	
		RE35812	06/1998	Oliver	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]- Number[4] – Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		CN 1351922	06/05/2002	China Emerg. Wheel Entpr. Co. Ltd.		
		CN 1494984	05/12/2004	Read Co. Ltd.		
		EP 0238434	03/1987	United Technologies		

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

				Corp.		
		EP 0264674	09/1995	Baker-Hughes Inc.		
		EP 0280657	08/31/1988	Diabrasive International		
		EP 0331344	02/1989	Minnesota Mining & Manf.		
		EP 0712941	05/22/1966	Agency of Industrial Sci.		
		EP 1075898	02/2001	Tanaka et al.		
		GB 2239011	06/1991	Anthony et al.		
		GB 2366804	03/02/2002	Kinik Company		
		JP 2003/071718	03/12/2003	Nippon Steel Corp.		
		JP 2007/044823	02/22/2007	Soken		
		JP 06182184	04/1994	Sumiya et al.		
		JP 10128654	05/1998	Tokyo Shibaura Electric		
		JP 10180618	07/1998	Nippon Kokan KK		
		JP 11048122	02/1999	Hitachi Ltd.		
		JP 11077536	03/1999	Asahi Diamond Ind.		
		JP 2000/343436	12/12/2000	Noritake Diamond Ind. Co. Ltd.		
		JP 2000/167774	06/20/2000	Toho Titanium Co. Ltd.		
		JP 2004/025401	01/29/2004	Airtec Japan KK		
		KR 10/2002/0036138	05/16/2002	Kinik Co.		
		KR 10/2007/0063569	06/19/2007	Sung		
		KR 20/0339181	01/31/2004	Jang		
		WO 2004/094106	11/04/2004	Intel Corporation		
		WO 2006/039413	04/13/2006	Sung		
		WO 2006/124792	11/23/2006	Sung		
		WO 2007/032946	03/22/2007	Sung		
		WO 2008/063599	05/29/2008	Sung		
		WO 2009/043058	04/02/2009	Sung et al.		
		WO 2009/064677	05/22/2009	Sung		
		WO 2012/040374 A2	03/29/2012	Rite Dia Corporation		

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		WO 95/31006	11/16/1995	Siliconix Incorporated		
		WO 02/31078	04/2002	Fries		
		WO 94/27883	12/08/1994	Ultimate Abrasive Systems, Inc.		
		WO 95/27596	10/1995	Ultimate Abrasive System		
		WO 96/06732	03/07/1996	Roberts		
		WO 98/10897	03/1998	Norton Co.		
		WO 98/45091	03/1998	Sung		
		WO 98/45092	10/15/1998	Sung		
		WO 98/51448	03/1998	Norton Co.		

Examiner Signature	/GEORGE NGUYEN/	Date Considered	10/27/2015

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	Art Unit
	GEORGE NGUYEN	3723

CPC- SEARCHED		
Symbol	Date	Examiner
B24B53/07;53/017;53/12;37/04;37/042;57/02	10/28/2015	GN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
451	443,444,548,56	10/28/2015	GN

SEARCH NOTES		
Search Notes	Date	Examiner
updated parent search 13/802,112	10/28/2015	GN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Please see East search history	10/28/2015	GN

	/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	142	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:56
L6	893	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:57
L7	0	b24b3/125.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:58
L8	459	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:59
L9	1028	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:00
L10	1133	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:01
L11	684	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:03
S1	48	(US-20120244790-$ or US-20120302146-$ or US-20130165023-$ or US-20010046835-$ or US-20070066194-$ or US-20020139680-$ or US-20070175765-$ or US-20030084894-$ or US-20040112359-$ or US-20070051354-$ or US-20070051355-$ or US-20090283089-$ or US-20110296766-$ or US-20120192499-$ or US-20120220208-$ or US-20120260582-$ or US-20020173234-$ or US-20050095959-$ or US-20060068691-$ or US-20060073774-$).did. or (US-6517424-$ or US-7300338-$ or US-5492771-$ or US-5511718-$ or US-5976205-$ or US-7124753-$ or US-7771498-$ or US-8104464-$ or US-6884155-$ or US-7201645-$ or US-7241206-$ or US-7258708-$ or US-7285039-$ or US-7393264-$ or US-7473162-$ or US-7491116-$ or US-7494404-$ or US-7544117-$ or US-7651386-$ or US-7690971-$ or US-7749050-$ or US-7901272-$ or US-8043145-$ or US-8142261-$ or US-8298043-$ or US-8298048-$).did. or (US-8414362-$ or US-8449357-$).did.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:32
S2	6	("20070232074" | "20080271384" | "20090073774" | "7067903" | "7198553" | "7651386").PN.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:42
S3	10	("20040180617" | "20080076338" | "20100015898" | "6899592" | "7150677").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2013/07/09 08:42

			DERWENT; IBM_TDB			
S4	6	("0238946" | "0296756" | "7791188").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:43
S5	843	451/443.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 09:39
S6	462	451/444.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:02
S7	84	("20070049185" | "6136043" | "3990124" | "4818515" | "6402603" | "6626747" | "7641538" | "20020068518" | "20040198206" | "4925457" | "6022266" | "6416878" | "6511713" | "RE26879" | "20080248734" | "20100022174" | "7467989" | "20060010780" | "5919084" | "6099603" | "7217172" | "7124753" | "5049165" | "5304223" | "5511718" | "5833724" | "6096107" | "6575353" | "20050214201" | "5921856" | "20060254154" | "5791975" | "5863306" | "6159087" | "6347982" | "20050260922" | "20040037948" | "5219462" | "6136143" | "20060010780" | "5152917" | "5669943" | "5842912" | "6679243" | "6769975" | "6234883" | "6309433" | "20020072302" | "20060213128" | "20050215188" | "20060073774" | "2175073" | "5645474" | "5683289" | "20050276979" | "20020197947" | "5492771" | "6358133" | "6368198" | "6537140" | "6572446" | "7258708" | "20080132153" | "20020173234" | "4968326" | "20020173234" | "4222204" | "4951423" | "5851138" | "7575503" | "6123612" | "6286498" | "20080004743" | "20070060026" | "5382189" | "6261167" | "6887138" | "20030036341" | "5014468" | "5980678" | "6293980" | "6818029" | "6039641" | "20050118820" | "20100022174").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 10:14
S8	1658	451/548.ccls.	US-PGPUB; USPAT; USOCR;	OR	OFF	2013/07/09 10:21

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S9	4663	51/309.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:46
S10	180	S9 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:47
S11	2468	51/295.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:31
S12	86	S11 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:32
S13	1378	451/56.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S14	204	S13 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S15	180	("1854071" | "1988065" | "0187593" | "2027087" | "2027307" | "2033991" | "2035521" | "2075354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659" | "20040009742" | "20040060243" | "20040079033" | "20040107648" | "20050032462" | "20050060941" | "20050118939" |	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:47

		"20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181" | "20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918" | "20070295267" | "20080096479" | "20080171503" | "20080292869" | "20090068937" | "20090093195" | "20090145045" | "20090283089" | "20100139174" | "20100186479" | "20100221990" | "20100248596" | "20110212670" | "20110275288" | "20110296766" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3905571" | "3982358" | "4028576" | "4078906" | "4149881" | "4182628" | "4188194" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4662896" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326").pn.				
S16	159	("5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492774" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5674572" | "5725421" | "5746931" | "5772756" | "5779743" | "5791975" | "5801073" | "5815891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:49

		"5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6159286" | "6179886" | "6190240" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616725" | "6616752" | "6626167" | "6627168" | "6646725" | "6672943" | "6679243" | "6694847" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7201645" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7585366" | "7651386" | "7658666" | "7690971" | "RE20660" | "RE35812").PN.				
S17	672	first near2 monolayer near2 second	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:42
S18	81761	rigid near2 support	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S19	0	S17 with S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S20	341	sung-chien-min.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:47
S24	655	b24b53/07.cpc.	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2014/02/24 11:04

			EPO; JPO; DERWENT; IBM_TDB			
S25	3143	b24b53/017.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:07
S26	608	451/443.ccls.	USPAT	OR	OFF	2014/02/24 11:31
S27	331	451/444.ccls.	USPAT	OR	OFF	2014/02/24 11:34
S28	912	451/548.ccls.	USPAT	OR	OFF	2014/02/24 11:37
S29	1838	b24b53/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:40
S34	6	("20040203325" | "20070266639" | "20100203811" | "20100248595" | "20120241943" | "6196911").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/02/25 09:10
S35	204	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305" | "20070266639" | "1988065" | "0187593" | "2652951" | "2725693" | "2811960" | "2876086" | "2952951" | "20030054746" | "20030114094" | "20040060243" | "20040107648" | "20050060941" | "20070295267" | "20080076338" | "20090283089" | "20100186479" | "3416560" | "3625666" | "3631638" | "4525179" | "4797241" | "4916869" | "4954139" | "5024680" | "5092082" | "5151107" | "5194071" | "5247765" | "5314513" | "5496386" | "5560754" | "5620489" | "5669943" | "5885137" | "5902173" | "6001008" | "6001174" | "6027659" | "6054183" | "6258138" | "6371842" | "6616752" | "6899592" | "6905571" | "7124753" | "7465217" | "7585366" | "8104464" | "20100261419" | "2307461" | "2268663" | "20060128288" | "20110212670" |	USPAT	OR	OFF	2014/04/01 13:58

		"3127715" | "3440774" | "3894673" | "4201601" | "4551195" | "4908046" | "5022895" | "5133782" | "5195404" | "5243790" | "5248317" | "5443032" | "5486131" | "5500248" | "5518443" | "5609286" | "5772756" | "5820450" | "5916011" | "5921856" | "5961373" | "5976205" | "5985228" | "6190240" | "6224469" | "6258237" | "6286498" | "6325709" | "6354918" | "6409580" | "6544599" | "6749485" | "6884155" | "7033408" | "7258708" | "7658666" | "6722952" | "20040203325" | "6692547" | "7494404" | "20060143991" | "20070051354" | "20070249270" | "20110293905" | "20120192499" | "3067551" | "3276852" | "3372010" | "3608134" | "4155721" | "4188194" | "4229186" | "4481016" | "4547257" | "4617181" | "4669522" | "4680199" | "4849602" | "4866888" | "4925457" | "4949511" | "5049165" | "5116568" | "5195403" | "5266236" | "5374293" | "5492771" | "5527424" | "5660894" | "5855314" | "6024824" | "6206942" | "6478831" | "6629884" | "6672943" | "6679243" | "6694847" | "6818029" | "6935365" | "7651386" | "6458018" | "20100203811" | "2318570" | "20030084894" | "20050215188" | "20050260939" | "20060073774" | "20060254154" | "20070051355" | "20070066194" | "20070155298" | "20090093195" | "3121981" | "3630699" | "3664662" | "3852078" | "4149881" | "4355489" | "4629373" | "4749514" | "5037451" | "5137543" | "5232320" | "5246884" | "5273730" | "5364423" | "5454343" | "5746931" | "5779743" | "5976001" | "5980852" | "5980982" | "6299508" | "6371838" | "6945857" | "7044990" | "7261621" | "RE20660" | "6125612" | "6354929" | "20100248595" | "2078354" | "2187624" | "2281558" | "2612348" | "2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S36	252	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" |	US-PGPUB; USPAT	OR	OFF	2014/04/01 13:58

"20100139174" | "20110296766" |
"3146560" | "3802130" | "3982358" |
"4018576" | "4610699" | "4632817" |
"4780274" | "4828582" | "4923490" |
"5295402" | "5328548" | "5536202" |
"5674572" | "5924917" | "5975988" |
"6106382" | "6217413" | "6346202" |
"6497853" | "6626167" | "6712552" |
"6790126" | "7021995" | "7150677" |
"7368013" | "7641538" | "7840305" |
"20070266639" | "1988065" |
"0187593" | "2652951" | "2725693" |
"2811960" | "2876086" | "2952951" |
"20030054746" | "20030114094" |
"20040060243" | "20040107648" |
"20050060941" | "20070295267" |
"20080076338" | "20090283089" |
"20100186479" | "3416560" |
"3625666" | "3631638" | "4525179" |
"4797241" | "4916869" | "4954139" |
"5024680" | "5092082" | "5151107" |
"5194071" | "5247765" | "5314513" |
"5496386" | "5560754" | "5620489" |
"5669943" | "5885137" | "5902173" |
"6001008" | "6001174" | "6027659" |
"6054183" | "6258138" | "6371842" |
"6616752" | "6899592" | "6905571" |
"7124753" | "7465217" | "7585366" |
"8104464" | "20100261419" |
"2307461" | "2268663" |
"20060128288" | "20110212670" |
"3127715" | "3440774" | "3894673" |
"4201601" | "4551195" | "4908046" |
"5022895" | "5133782" | "5195404" |
"5243790" | "5248317" | "5443032" |
"5486131" | "5500248" | "5518443" |
"5609286" | "5772756" | "5820450" |
"5916011" | "5921856" | "5961373" |
"5976205" | "5985228" | "6190240" |
"6224469" | "6258237" | "6286498" |
"6325709" | "6354918" | "6409580" |
"6544599" | "6749485" | "6884155" |
"7033408" | "7258708" | "7658666" |
"6722952" | "20040203325" |
"6692547" | "7494404" |
"20060143991" | "20070051354" |
"20070249270" | "20110293905" |
"20120192499" | "3067551" |
"3276852" | "3372010" | "3608134" |
"4155721" | "4188194" | "4229186" |
"4481016" | "4547257" | "4617181" |
"4669522" | "4680199" | "4849602" |
"4866888" | "4925457" | "4949511" |
"5049165" | "5116568" | "5195403" |
"5266236" | "5374293" | "5492771" |
"5527424" | "5660894" | "5855314" |
"6024824" | "6206942" | "6478831" |
"6629884" | "6672943" | "6679243" |
"6694847" | "6818029" | "6935365" |
"7651386" | "6458018" |
"20100203811" | "2318570" |
"20030084894" | "20050215188" |
"20050260939" | "20060073774" |
"20060254154" | "20070051355" |

		"20070066194" | "20070155298" | "20090093195" | "3121981" | "3630699" | "3664662" | "3852078" | "4149881" | "4355489" | "4629373" | "4749514" | "5037451" | "5137543" | "5232320" | "5246884" | "5273730" | "5364423" | "5454343" | "5746931" | "5779743" | "5976001" | "5980852" | "5980982" | "6299508" | "6371838" | "6945857" | "7044990" | "7261621" | "RE20660" | "6125612" | "6354929" | "20100248595" | "2078354" | "2187624" | "2281558" | "2612348" | "2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S37	87	("6258201" | "6293854" | "6319108" | "6394886" | "6605798" | "6755720" | "7201645" | "7404857" | "7198553" | "2033991" | "2194253" | "20040079033" | "20060079162" | "20060135050" | "20070254566" | "20110275288" | "3293012" | "4182628" | "4211294" | "4273561" | "4341532" | "4945686" | "5000273" | "5011513" | "5030276" | "5043120" | "5203881" | "5264011" | "5380390" | "5453106" | "5833519" | "6281129" | "6284556" | "6439986" | "6551176" | "6607423" | "6627168" | "6824455" | "7323049" | "7384436" | "20070232074" | "20040180617" | "20100015898" | "1854071" | "2035521" | "2334572" | "20040009742" | "20060258276" | "20070093181" | "20070128994" | "20070264918" | "20090145045" | "20100248596" | "4228214" | "4289503" | "4712552" | "4770907" | "4927619" | "5131924" | "5194070" | "5197249" | "5271547" | "5492774" | "5551959" | "5560745" | "5725421" | "5791975" | "5801073" | "6039641" | "6123612" | "6368198" | "6446740" | "6616725" | "6835365" | "6979357" | "7066795" | "7690971" | "RE35812" | "20080271384" | "0238946").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/04/01 14:03
S38	48	(US-20120302146-$ or US-20130165023-$ or US-20120244790-$ or US-20010046835-$ or US-20070066194-$ or US-20070060026-$ or US-20070264918-$ or US-20080171503-$ or US-20080292869-$ or US-20100139174-$ or US-	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:23

		20100221990-$ or US-20110212670-$ or US-20060068691-$ or US-20070215486-$ or US-20070289223-$ or US-20020139680-$ or US-20070175765-$ or US-20020173234-$).did. or (US-6517424-$ or US-7300338-$ or US-7651386-$ or US-7690971-$ or US-7901272-$ or US-8414362-$ or US-5976205-$ or US-7241206-$ or US-7393264-$ or US-7494404-$ or US-5492771-$ or US-5511718-$ or US-6884155-$ or US-7124753-$ or US-7201645-$ or US-7258708-$ or US-7285039-$ or US-7473162-$ or US-7491116-$ or US-7544117-$ or US-7749050-$ or US-7771498-$ or US-8043145-$ or US-8104464-$ or US-8142261-$ or US-8298043-$).did. or (US-8298048-$ or US-8449357-$ or US-8491358-$ or US-8678878-$).did.				
S39	1	"7198553".pn.	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:41
S40	1203	tip adj (level leveling)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:42
S41	113033	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S42	8	S40 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S43	14761	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:52
S44	3	S40 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:53
S45	1212	tip adj (level leveling leveled)	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2014/05/07 12:54

			EPO; JPO; DERWENT; IBM_TDB			
S46	8	S45 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:54
S47	59	protrusion adj difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 13:42
S48	4102	heat near2 pressure near2 bonding	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 13:59
S49	9	S48 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:00
S50	263	sintering adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:05
S51	3	S50 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S52	4	S50 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S53	1160	adhesive near2 transfer near2 sheet	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S54	12	S53 and S43	US-PGPUB; USPAT;	OR	OFF	2014/05/07 15:46

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S55	971	aperture near2 template	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:09
S56	0	S53 with S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S57	0	S53 same S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S58	44	("2223063" | "2642654" | "3817719" | "3894673" | "4018576" | "4042559" | "4311489" | "4378975" | "4621031" | "4652275" | "4799939" | "4925457" | "5000273" | "5049165" | "5131924" | "5203880" | "5203881" | "5251802" | "5264011" | "5304342" | "5380390" | "5486131" | "5492188" | "5511718" | "5569062" | "5605499" | "5707276" | "5782679" | "5832360" | "5833021" | "5871060" | "6039641" | "6123612" | "6361423" | "6434946" | "6679243").PN. OR ("7198553").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/05/08 22:41
S59	53542	hot adj pressing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S60	14766	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S61	581	S59 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18

S62	126	warping adj (reducing reduction minimizing mininized)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S63	0	S62 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S64	113048	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S65	0	S62 and S64	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:52
S66	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:43
S67	13	("20040235406" | "20060213128" | "20080014845" | "20090094902" | "20110076925" | "20110104989" | "20110192652" | "20120244790" | "20130225052" | "3593382" | "6299521" | "6372001" | "8545583").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:44
S68	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:46
S69	5	("20020182401" | "20110252710" | "7507267" | "7954483" | "8377158").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:48
S70	2	("5919084" | "6159286").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:50
S71	59	("1854071" | "1875930" | "1988065" | "2027087" | "2027307" | "2033991" | "2035521" | "2078354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2307461" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20010046835" | "20020042200" | "20020127962" | "20020139680" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:00

S72	26	("20040009742" | "20040060243" | "20040079033" | "20040091627" | "20040107648" | "20040180617" | "20040203325" | "20040238946" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:01
S73	59	("20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918" | "20070266639" | "20070295267" | "20080076338" | "20080096479" | "20080171503" | "20080248305" | "20080271384" | "20080292869" | "20080296756" | "20090068937" | "20090145045" | "20090283089" | "20100015898" | "20100022174" | "20100139174" | "20100186479" | "20100203811" | "20100221990" | "20100248595" | "20100248596" | "20100261419" | "20110212670" | "20110275288" | "20110293905" | "20110296766" | "20120192499" | "20120241943" | "20120244790" | "20120260582" | "20120302146" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:03
S74	112	("3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" |	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:05

		"5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236").PN.				
S75	71	("3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:07
S76	164	("5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492771" | "5492774" | "5496386" | "5500248" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5669943" | "5674572" | "5725421" | "5746931" | "5772756" | "5776214" | "5779743" | "5791975" | "5801073" | "5816891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976001" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6125612" | "6179886" | "6190240" | "6196911" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918"	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:10

		"6354929" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6458018" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616752" | "6626167" | "6627168" | "6629884" | "6672943" | "6692547" | "6722952" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6899592" | "6905571" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7150677" | "7198553" | "7201645" | "7247577" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7494404" | "7585366" | "7641538" | "7651386" | "7658666" | "7662896" | "7690971" | "7791188" | "7840305" | "8104464" | "8393934" | "8398466" | "RE20660" | "RE35812").PN.				
S77	159296	cmp	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S78	1380104	pad	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S79	434842	dresser conditioner	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S80	3851	superabrasive	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S81	114947	monolayer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S82	1806819	matrix	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2014/10/31 09:59

			DERWENT; IBM_TDB			
S83	609495	protrusion	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S84	1632039	tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S85	3944964	difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S86	12687	asperities	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S87	12692	cutting adj depth	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S88	3	S77 and S78 and S79 and S80 and S81 and S82 and S83 and S84 and S85 and S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:01
S89	3	S86 same S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:17
S90	36	S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:18
S91	2031	node adj size	US-PGPUB; USPAT; USOCR;	OR	OFF	2014/10/31 10:50

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S92	61	S91 same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:50
S93	15740	(line adj width) same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:59
S94	8820	(line adj width) with semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S95	114233	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S96	52	S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S97	198	oxidative adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:39
S98	1	S97 same slurry	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:40
S99	1	S95 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:41
S100	700	451/443.ccls.	USPAT;	OR	OFF	2015/05/06

			USOCR			13:36
S101	381	451/444.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:37
S102	1446	451/548.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:40
S103	988	451/56.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:42
S104	140	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:45
S105	874	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:46
S106	458	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:48
S107	1018	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:50
S108	1108	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:52
S109	679	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:54
S110	35	("20020014041" | "20020164928" | "20030092357" | "20040023610" | "20050032469" | "20050095959" | "20050118939" | "20050227590" | "20070232074" | "20080153398" | "20090073774" | "20090123705" | "20090215363" | "20110293905" | "20120192499" | "20120260582" | "20120302146" | "3664662" | "3706650" | "4151154" | "4405411" | "4737162" | "4863573" | "5224469" | "5868806" | "6159087" | "6200360" | "6312324" | "6416878" | "6769969" | "6837979" | "7067903" | "7651368" | "7762872").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:43
S111	1	("6193770").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:44
S112	1	"9138862".pn.	USPAT	OR	OFF	2015/10/27 11:58
S113	1	"8974270".pn.	USPAT	OR	OFF	2015/10/27 11:58
S114	1	"8622787".pn.	USPAT	OR	OFF	2015/10/27 11:59
S115	1	"8393934".pn.	USPAT	OR	OFF	2015/10/27 11:59

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S21	608	first near2 monolayer near2 second	US-PGPUB; USPAT	OR	OFF	2013/07/16 11:56
S22	53464	rigid near2 support	US-PGPUB; USPAT	OR	OFF	2013/07/16 11:56
S23	1	S21 same S22	US-PGPUB; USPAT	OR	OFF	2013/07/16 11:56

S30	635	first near2 monolayer near2 second	US-PGPUB; USPAT	OR	OFF	2014/02/24 11:38
S31	55259	rigid near2 support	US-PGPUB; USPAT	OR	OFF	2014/02/24 11:38
S32	19881	(superabrasive abrasive) adj particles	US-PGPUB; USPAT	OR	OFF	2014/02/24 11:39
S33	1	S30 same S31 same S32	US-PGPUB; USPAT	OR	OFF	2014/02/24 11:39

10/ 28/ 2015 9:05:47 AM
C:\ Users\ gnguyen\ Documents\ EAST\ Workspaces\ 14506476.wsp

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Colmonoy Technical Data Sheet; no. DSP-A; 1993	
		Endecott's Specifications; 2004	
		Kennametal Specification for DMHPM002 Hot Press Matrix N-50 12/06/2001	
		Material Safety Data Sheet (MSDS), Wall Colmonoy Corporation; prepared 07/20/1989	
		Material Safety Data Sheet MSDS); Kennametal; issued 06/11/2004	
		SUNG et al.; The Eastern Wind of Diamond Symthesis; New Diamond and Frontier Carpon Technology; 2003; pages 47-61; vol. 13, no. 1	
		SUNG et al; Mechanism of the Solvent-Assisted Graphite to Diamond Transition Under High Pressure: Implications for the Selection of Catalysts, High Temperatures-High Pressure; 1995/1996; pages 523-546; vol. 27/28	
		Syndite, CTM302; Announcement, Elementsix Advancing Diamond; 01/14/2003; http://www.e6.com/en/resourches/announcementsheets/CTM302.pdf; as accessed on 12/16/2008	
		YASUNAGA et al; Advances in Abrasive Technology, III; Soc. Of Grinding Engineers (SGE) in Japan; 2000. (Abstract Only)	
		U.S. Application 12/726,786; filed 03/18/2010; Chien-Min Sung; office action dated 03/19/2013	
		U.S. Application 13/021,350; filed 02/04/2011; Chien-Min Sung; office action dated 03/20/2013	
		U.S. Application 13/362,917; filed 01/31/2012; Chien-Min Sung; office action dated 04/10/2013	
		U.S. Application 13/239,189; filed 09/21/2011; Chien-Min Sung; notice of allowance dated	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Use as many sheets as necessary)

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

Sheet | | of | |

		05/03/2013	
		U.S. Application 13/239,198; filed 09/21/2011; Chien-Min Sung; office action dated 07/23/2013	
		PCT/US2013/042538; filed 05/23/2013; Chien-Min Sung; international search report dated 08/27/2013	
		U.S. Application 12/726,786; filed 03/18/2010; Chien-Min Sung; notice of allowance dated 09/04/2013	
		US Application 13/113,779; filed 05/23/2011; Chien-Min Sung; office action dated 11/12/2013	
		US Application 13/153,176; filed 06/03/2011; Chien-Min Sung; office action dated 12/06/2013	
		US Application 13/239,198; filing date 09/21/2011; Chien-Min Sung; Notice of Allowance mailed 03/04/2014	
		US Application 12/255,823; filed 10/22/2008; Chien-Min Sung; notice of allowance dated 12/26/2012	
		US Application 12/267,172; filed 11/07/2008; Chien-Min Sung; notice of allowance dated 10/22/2012	
		US Application 12/168,110; filed 07/05/2008; Chien-Min Sung; notice of allowance dated 01/18/2013	
		US Application 12/255,823; filing dae 10/22/2005; Chien-Min Sung; office action issued 03/07/2012	
		US Application 12/168, 110; filing date 07/05/2008; Chien-Min Sung; office action issued 05/14/2012	
		US Application 12/715,583; filing date 03/02/2010; Chien-Min Sung; office action issued 03/21/2012	
		US Application 11/805,549; filed 05/22/2007; Chien-Min Sung; office action issued 10/06/2010	
		US Application 12/267,172; filed 11/07/2008; Chien-Min Sung; office action dated 07/09/2012	
		US Application 12/267,172; filing date 11/07/2008; Chien-Min Sung; office action issued 01/03/2012	
		US Application 12/328,338; filing date 12/04/2008; Chien-Min Sung; office action dated 03/20/2014	
		US Application 13/153, 176; filing date 06/03/2011; Chien-Min Sung; office action dated 07/01/2014	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

		US Application 13/113, 779; filing date 05/23/2011; Chien-Min Sung; office action dated 07/02/2014	
		PCT Application PCT/US2011/052627; filing date 09/21/2011; Chien-Min Sung; international search report mailed 05/11/2012	
		PCT Application PCT/US2012/039,199; filed 05/23/2012; Chien-Min Sung; international search report dated 12/18/2012	
		U.S. Application 12/168,110; filed 07/05/2008; Chien-Min Sung; office action dated 05/14/2012	
		U.S. Application 12/255,823; filed 10/22/2008; Chien-Min Sung; notice of allowance dated 12/26/2012	
		U.S. Application 12/168,110; filed 07/05/2008; Chien-Min Sung; notice of allowance dated 01/18/2013	
		U.S. Application 12/059,422; filed 03/31/2008; Chien-Min Sung; office action dated 01/24/2013	
		US Application 12/715,583; filed 03/02/2010; Chien-Min Sung; notice of allowance dated 12/07/2012	
		US Application 13/362,917; filed 01/31/2012; Chien-Min Sung office action dated 06/14/2012	
		US Application 12/059,422; filed 03/20/2008; Chien-Min Sung; office action dated 08/22/2012	
		US Application 13/239,189; filed 09/21/2011; Chien-Min Sung; office action dated 12/21/2012	
		US Application 13/362,917; filed 01/13/2012; Chien-Min Sung; office action dated 12/31/2012	
		US Application 12/255,823; filed 10/21/2008; Chien-Min Sung; notice of allowance dated 09/21/2012	
		US Application 12/168,110; filed 07/05/2008; Chien-Min Sung; notice of allowance dated 09/28/2012	
		US Application 12/267,172; filed 11/07/2008; Chien-Min Sung; notice of allowance dated 01/07/2013	
		US Application 13/153, 176; filing date 06/03/2011; Chien-Min Sung; office action dated 12/06/2013	
		US Application 13/479,148; filing date 05/23/2012; Chien-Min Sung; office action dated 05/15/2014.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Use as many sheets as necessary)

				Complete if Known	
				Application Number	14/506,476
				Filing Date	10/3/2014
				First Named Inventor	Chien-Min Sung
				Art Unit	3723
				Examiner Name	
Sheet		of		Attorney Docket Number	02074-24012.NP.CIP2

		US Application 13/407,634; filing date 02/28/2012; Chien-Min Sung; office action dated 06/13/2014	
		US Application 13/644,790; filing date 10/04/2012; Chien-Min Sung; office action dated 06/17/2014	
		US Application 13/416,201; filing date 03/09/2012; Chien-Min Sung; office action dated 06/18/2014	
		PCT Application PCT/US2007/024165; filed 11/16/2007; Chien-Min Sung; Internaitonal Search Report mailed 05/23/2011	
		PCT Application PCT/US2011/052626; filing date 09/21/2011; Chien-Min Sung; International Search Report mailed 05/02/2012	
		US Application 12/715,583;; filling date 03/02/2010; Chien-Min Sung; office action issued 08/09/2012	
		US Application 12/715,583; filing date 03/02/2010; Chien-Min Sung; office action issued 10/25/2011	
		US Application 12/328,338; filed 12/04/2008; Chien-Min Sung; office action issued 05/10/2011	
		US Application 13/021,350; filing date 02/04/2011; Chien-Min Sung; office action issued 08/31/2011	
		US Application 13/021,350; filed 02/04/2011; Chien-Min Sung; office action issued 02/07/2012	
		US Application 12/715,583; filed 03/02/2010; Chien-Min Sung; Notice of Allowance dated 12/07/2012	
		US Application 13/794,164; filing date 03/11/2013; Chien-Min Sung; office action dated 07/16/2014	
		US Application 13/113/779; filing date 05/23/2011; Chien-Min Sung; office action dated 10/09/2014	
		US Application 13/153,176; filing date 06/03/2011; Chien-Min Sung; office action dated 10/10/2014	
		US Application 13/407,634; filing date 02/28/2012; Chien-Min Sung; office action dated 10/29/2014	
		US Application 13/802,112; filing date 03/13/2013; Chien-Min Sung; office action dated 11/06/2014	
		US Application 12/328,338; filing date 12/04/2008; Chien-Min Sung; Notice of Allowance mailed 11/21/2014	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Use as many sheets as necessary)

				Complete if Known	
				Application Number	14/506,476
				Filing Date	10/3/2014
				First Named Inventor	Chien-Min Sung
				Art Unit	3723
				Examiner Name	
Sheet		of		Attorney Docket Number	02074-24012.NP.CIP2

		US Application 13/479,148; Filing date 05/23/2012; Chien Min-Sung; Notice of Allowance mailed 12/09/2014	
		US Application 13/644,790; filing date 10/04/2012; Chien-Min Sung; office action dated 12/24/2014	
		US Application 13/797,704; filing date 03/12/2013; Chien-Min Sung; office action dated 01/12/2015	
		US Application 13/479,148; filing date 05/23/2012; Chien-Min Sung; Notice of Allowance mailed 01/12/2015	
		US Application 13/416,201; filing date 03/09/2012; Chien-Min Sung; office action dated 01/22/2015	
		US Application 13/113,779; filing date 05/23/2011; Chien-Min Sung; office action dated 02/10/2015	
		US Application 13/153,176; filing date 05/03/2011; Chien-Min Sung; office action dated 02/10/2015	
		U.S. Application No. 13/633,082; Filing date October 1, 2012; Chien-Min Sung; Office Action dated February 26, 2015.	
		U.S. Application No. 13/407,634; Filing date February 28, 2012; Chien-Min Sung; Office Action dated March 5, 2015.	
		U.S. Application No. 14/248,163; Filing date April 8, 2014; Chien-Min Sung; Office Action dated April 28, 2015.	
		U.S. Application No. 13/416,201; Filing date March 9, 2012; Chien-Min Sung; Office Action dated May 15, 2015.	
		U.S. Application No. 13/644,790; Filing date October 4, 2012; Chien-Min Sung; Notice of Allowance mailed June 8, 2015.	
		U.S. Application No. 13/802,112; Filing date March 13, 2013; Chien-Min Sung; Notice of Allowance mailed May 15, 2015.	
		U.S. Application No. 13/113,779; Filing date May 23, 2011; Chien-Min Sung; Notice of Allowance mailed July 17, 2015.	
		U.S. Application No. 13/153,176; Filing date June 3, 2011; Chien-Min Sung; Office Action dated August 13, 2015.	
		US Application 13/633,082; filing date 10/01/2012; Chien-Min Sung; Notice of Allowance mailed 08/19/2015	
		U.S. Application No. 13/407,634; Filing date February 28, 2012; Chien-Min Sung; Notice of Allowance mailed September 3, 2015.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Use as many sheets as necessary)

Sheet		of		Attorney Docket Number	02074-24012.NP.CIP2

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	

		U.S. Application No. 14/223,810; Filing date March 24, 2014; Chien-Min Sung; Office Action dated October 8, 2015.	
		U.S. Application No. 14/120,976; Filing date July 15, 2014; Chien-Min Sung; Office Action dated October 15, 2015.	

Examiner Signature	/GEORGE NGUYEN/	Date Considered	10/27/2015

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **Send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /GN/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		2004/0048557	03/11/2004	Nabeya	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]- Number[4] – Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet		of	

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		U.S. Application No. 13/846,740; Filing date March 18, 2013; Chien-Min Sung; Office Action dated November 4, 2015.	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **Send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	24137041
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Stephen Neville
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	19-NOV-2015
Filing Date:	03-OCT-2014
Time Stamp:	16:38:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	Tye.PDF	80889 d0961d057ea7c01f05d629f046120076141 06024	no	4
Warnings:					
Information:					

2	Information Disclosure Statement (IDS) Form (SB08)	Aye.PDF	116568 488ace5f5da5fd07d5ea1b3460f4d55d8cde2a43	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Information Disclosure Statement (IDS) Form (SB08)	Bye.PDF	93217 07417c2c8490c275b9b1a8db9d6ff400d83c3f18	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
			Total Files Size (in bytes):	290674	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

ART UNIT: 3723 EXAMINER: NGUYEN, GEORGE BINH MINH FIRST NAMED INVENTOR: Chien-Min Sung SERIAL NO.: 14/506,476 FILED: 10/3/2014 CONF. NO.: 9471 FOR: CMP PAD DRESSER HAVING LEVELED TIPS AND ASSOCIATED METHODS DOCKET NO.: 02074-24012.NP.CIP2	**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8** DATE OF DEPOSIT: November 19, 2015 I hereby certify that this paper or fee (along with any paper or fee referred to as being attached or enclosed) is being submitted on the date indicated above via: ☒ EFS Web ☐ facsimile to _____ ☐ the United States Postal Service with sufficient postage as first class mail addressed to: Mail Stop _____, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. /Stephen Neville/ Stephen Neville

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §§ 1.56, 1.97 and 1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

Pursuant to the duty of disclosure under 37 C.F.R. §§ 1.56, 1.97 and 1.98, the Applicant requests consideration of this Information Disclosure Statement, which is being submitted in accordance with:

☐ 37 C.F.R. § 1.97(b)(1) or (3), within three months of the filing date of the application, or before a first office action on the merits, whichever occurs last;

☒ 37 C.F.R. § 1.97(c), after a first office action on the merits, but before a Final Office Action or a Notice of Allowance, whichever occurs first, and is accompanied by **EITHER** a statement in accordance with 37 C.F.R. § 1.97(e), **OR** the fee set forth in 37 C.F.R. § 1.17(p); or

☐ 37 C.F.R. § 1.97(d), after a Final Office Action or Notice of Allowance, whichever occurs first, but on or before payment of the issue fee, and is accompanied by **BOTH** a statement in

accordance with 37 C.F.R. § 1.97(e), **AND** the fee set forth in 37 C.F.R. § 1.17(p).

☒ 37 C.F.R. § 1.704(d), within 30 days of receipt of a first citation in any communication from a patent office in a counterpart foreign or international application or from the Office, in accordance with 37 C.F.R. § 1.97 and 1.98.

SUBMISSIONS

Please find enclosed, pursuant to 37 C.F.R. §§ 1.97 and 1.98:

☒ Form **PTO/SB/08A** and/or **PTO/SB/08B** listing the references submitted for consideration, which contains a list of all patents, publications and all other items that have come to the attention of one or more of the individuals designated in 37 C.F.R. § 1.56(c).

☒ Legible copies of the listed non-patent documents, unpublished U.S. applications and foreign documents or their relevant portions are included.

☒ All English translations of each non-English reference, if any, within the possession, custody, control or availability of anyone designated in 37 C.F.R. § 1.56(c) (see 37 C.F.R. §1.98 are included.

☐ For all listed references that are not either in the English language, or accompanied by a translation into English, a concise explanation of relevance as required under 37 C.F.R. § 1.98(a)(3) is enclosed attached to each.

Copies of references listed on the enclosed PTO/SB/08A and/or PTO/SB/08B are **not** enclosed:

☐ because, under 37 C.F.R. § 1.98.(d), they were previously cited by or submitted to the Office in application number _____, which is relied upon for an earlier filing date under 37 C.F.R. § 1.20.

☐ because they are substantially cumulative of an enclosed reference.

STATEMENT IN ACCORDANCE WITH 37 C.F.R. § 1.97(e)

☐ I hereby certify that each item contained in the information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement.

☒ I hereby certify that no item contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of the information disclosure statement.

REMARKS

While no representation is made that any of these references may be "prior art" within the meaning of that term in accordance with 37 C.F.R. §§ 102 or 103, the enclosed list of references is disclosed so as to comply with the duty of disclosure set forth in 37 C.F.R. § 1.56.

Moreover, while no representation is made that a specific search of office files or patent office records has been conducted or that no better art exists, the undersigned attorney of record believes that the references listed, together with any other references which may have been previously submitted or listed, are the closest to the claimed invention (taken in its entirety) of which the undersigned is presently aware, and no art which is closer to the claimed invention (taken in its entirety) has been knowingly withheld.

☐ Check No. ____ in the amount of $ ____(amount in § 1.17(p)) constituting the submission fee set forth in 37 C.F.R. § 1.17(p) is enclosed.

In the event that 37 C.F.R. § 1.97(c) applies and the Examiner is not satisfied that the Statement

meets the requirements of 37 C.F.R. § 1.97(e), or in any other event remediable by a fee, please credit any over payment or charge any additional fees to Deposit Account No. 20-0100 of the undersigned.

Dated this 19th day of November, 2015.

Respectfully submitted,

/David W. Osborne/

David W. Osborne
Attorney for Applicant
Registration No. 44989

THORPE NORTH & WESTERN, LLP
Customer No. 20,551
P.O. Box 1219
Sandy, Utah 84091-1219
Telephone: (801) 566-6633

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ART UNIT: 3723 EXAMINER: George Binh Minh Nguyen FIRST NAMED INVENTOR: Chien-Min Sung SERIAL NO.: 14/506,476 FILED: 10/03/2014 CONF. NO.: 9471 FOR: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS DOCKET NO.: 02074-24012.NP.CIP2	**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8** DATE OF DEPOSIT: **May 2, 2016** I hereby certify that this paper or fee (along with any paper or fee referred to as being attached or enclosed) is being submitted on the date indicated above via: ☒ EFS Web ☐ facsimile to _____ ☐ the United States Postal Service with sufficient postage as first class mail addressed to: Mail Stop _____, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. /Nicole Solomon/ Nicole Solomon

RESPONSE UNDER 37 C.F.R. § 1.111

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

Dear Sir:

In response to the communication mailed on October 30, 2015, please reconsider this application in view of the remarks provided herein. A petition for a 3-month extension of time and associated fees are submitted herewith.

CLAIM LISTING

1. (Original) A CMP pad dresser, comprising:

a support substrate; and

a plurality of superabrasive particles secured to the support substrate with each superabrasive particle extending away from the support substrate to a protrusion distance, wherein a highest protruding tip of each of the plurality of superabrasive particles align along a designated profile with a tip variation of from about 5 microns to about 100 microns.

2. (Original) The dresser of claim 1, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 10 microns to about 50 microns.

3. (Original) The dresser of claim 1, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 20 microns to about 40 microns.

4. (Original) The dresser of claim 1, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of less than about 20 microns.

5. (Original) The dresser of claim 1, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of less than about 20 microns when used to abrade a CMP pad.

6. (Original) The dresser of claim 1, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of from about 1 micron to about 20 microns when used to abrade a CMP pad.

7. (Original) The dresser of claim 1, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of from about 10 microns to about 20 microns when used to

abrade a CMP pad.

8. (Original) The dresser of claim 1, wherein the designated profile includes a configuration selected from the group consisting of a plane, a slope, a curved shape, a dome shape, and combinations thereof.

9. (Original) The dresser of claim 1, wherein the plurality of superabrasive particles is arranged across the support substrate in a predetermined pattern.

10. (Original) The dresser of claim 9, wherein the predetermined pattern includes an even distribution of the plurality of superabrasive particles spaced at a distance of from about 100 microns to about 800 microns.

11. (Currently Amended) A CMP pad dresser, comprising:

a rigid support substrate; and

a monolayer of a plurality of superabrasive particles coupled to the support substrate, wherein each superabrasive particle in the monolayer extends away from the support substrate to a protrusion distance, wherein a tip of each of the plurality of superabrasive particles aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns, and 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, 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.

12. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns.

13. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns.

14. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the 10th highest protruding tip is less than or equal to about 20 microns.

15. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the 100th highest protruding tip is less than or equal to about 40 microns.

16. (Original) A CMP pad dresser, comprising:

a rigid support substrate; and

a monolayer of a plurality of superabrasive particles coupled to the support substrate, wherein the plurality of superabrasive particles includes a plurality of working superabrasive particles, such that rotating the dresser against a CMP pad cuts asperities into the CMP pad having a cutting depth of less than or equal to about 50 microns.

17. (Original) The dresser of claim 16, wherein the cutting depth is from about 10 microns to about 50 microns.

18. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes at least 100 working superabrasive particles.

19. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes at least 1000 working superabrasive particles.

20. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes from about 1000 to about 6000 working superabrasive particles.

21. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes from about 2000 to about 5000 working superabrasive particles.

22. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles include at least about 1000 working superabrasive particles that protrude from the rigid support substrate to distances within about 30 microns of one another.

23. (Original) A method of dressing a CMP pad, comprising:

applying the CMP pad dresser of claim 16 to a CMP pad;

moving at least one of the CMP pad or the CMP pad dresser with respect to one another to cut asperities into the CMP pad having a cutting depth of from about 10 microns to about 50 microns.

24. (Original) A CMP pad dresser, comprising:

a support substrate; and

a plurality of superabrasive particles secured to the support substrate and positioned to engage and dress a CMP pad, wherein the plurality of superabrasive particles cut to depths of less than 50 microns into a CMP pad during a dressing procedure.

REMARKS

The Applicant expresses appreciation to the Examiner for consideration of the subject patent application. This communication is in response to the Office Action mailed on October 30, 2015. In the Office Action the Examiner rejected claims 1-24 on various statutory grounds, each of which will be addressed in turn below. Claim 11 has been amended. Support for this amendment can be found in claim 1. Therefore, no new matter has been added.

It is noted that any lack of discussion regarding any point, issue, or argument raised by the Examiner should not be seen as being in agreement. The Applicant reserves the right to pursue any such point, issue, or argument at a later time.

Claim Rejections – 35 U.S.C. § 112, Second Paragraph

In the Office Action the Examiner rejected claims 11-15 under pre-AIA 35 U.S.C. § 112, second paragraph as allegedly being indefinite. Specifically, the Examiner states that the claim limitation "the protrusion difference between the highest 1% of the protruding tips are within 80 microns or less" is unclear because it is not clear how the highest 1% is determined. Further, the Examiner states that "it does not make sense that the protrusion difference of 80 microns is more than '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, the Examiner asserts that claims 11-15 are indefinite. The Applicant respectfully disagrees and traverses this rejection.

With respect to the Examiner's first concern (i.e. how the highest 1% is determined), exemplary methods of doing so are outlined in the specification. "One example of a direct measurement technique can include an optical scanning process to evaluate superabrasive particle tip positions. In one such process, an optical scanner can scan the surface of the CMP pad dresser to determine the height of the superabrasive particle tips relative to a fixed point. For example the scanner can scan downward in space toward the dresser until the highest tip is located. The highest tip can then be set to the reference point, and the scanner can continue scanning in a direction toward the dresser measuring the distance from the reference point to each superabrasive particle tip across the surface of the dresser. Accordingly, the difference in

protrusion distance between all of the superabrasive particles across the dresser can be directly measured." See, for example, page 24, line 27 – page 25, line 5. Thus, the specification clearly describes at least one method of determining tip heights of individual superabrasive particles.

With respect to the Examiner's second concern (i.e. how the difference in height between the highest 1% can be greater than the difference in height between the first and second highest protruding tip), it is noted that "a typical CMP pad dresser can have greater than 10,000 superabrasive particles," in some examples. See page 15, lines 22-23. Accordingly, assuming 10,000 total superabrasive particles coupled to the support substrate, the highest 1% would include the highest 100 superabrasive particles. Thus, the highest particle and second highest particle would have more similar heights than the highest particle and the 100th highest particle. As such, it would be expected that the first and second highest superabrasive particles would fall within a narrower particle height distribution that the highest 1% of superabrasive particles.

Therefore, because the specification clearly describes at least one method of how tip heights can be measured and because it would be expected that the first and second highest particles would have more similar heights than the highest 1% of tips, the Applicant respectfully submits that claims 11-15 are not indefinite. The Applicant respectfully requests that these rejections be withdrawn.

Claim Rejections - 35 U.S.C. § 103

Before discussing the obviousness rejection herein, it is thought proper to briefly state what is required to sustain such a rejection. The issue under 35 U.S.C. § 103 is whether the USPTO has stated a case of *prima facie* obviousness. The Applicant does not deem it necessary to recite the entire case law standard required in order to establish a *prima facie* case of obviousness. However, the Applicant would like to briefly remind the Examiner that a *prima facie* case of obviousness generally includes establishing 1) that the asserted references as modified or combined teach or suggest each and every element of the claimed invention, 2) that the asserted references as modified or combined provide a sufficient likelihood of successfully making the modification or combination, and 3) a reason for the modification or combination asserted. Under the guidelines in the MPEP, an Examiner must establish that the reference teaches or suggests

each and every claim element or explain "why the difference(s) between the prior art and the claimed invention would have been obvious." See MPEP § 2143.03 and MPEP § 2141.III.

Additionally, under *KSR*, and as outlined under the MPEP § 2143, additional rationales include (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of known technique to improve similar devices (methods, or products) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) "obvious to try" - choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; (f) known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and (g) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. Additionally, the obviousness inquiry asks "whether the claim inventions are rendered obvious by the teachings of the prior art as a whole." *In re Chevalier*, 500 Fed. Appx. 932, 934 (Fed. Cir. 2013).

Claims 1-10 and 16-24

In the Office Action the Examiner rejected claims 1-10 and 16-24 under pre-AIA U.S.C. § 103(a) as allegedly unpatentable over U.S. Pub. No. 2010/0248595 to Dinh-Ngoc. The Applicant respectfully disagrees and traverses this rejection.

It is noted that this application is being examined under pre-AIA first to invent provisions. Therefore, with respect to independent claim 1, it is further noted that the current application claims priority to back to U.S. patent application number 11/560,817 (hereafter the '817 application), filed November 16, 2006, and other applications which clearly pre-date Dinh-Ngoc, and in which the claim limitations of independent claim 1 are fully supported. For example, the '817 application recites "It may also be beneficial for the superabrasive particles to protrude … to a predetermined height or series of heights that is/are along a designated profile." See '817 application, page 13, lines 3-5. Further, the '817 application recites "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." See '817 application, page 14, lines 14-15. Accordingly, Dinh-Ngoc does not qualify as prior art to independent claim 1 and associated dependent claims 2-10. Therefore, the Examiner has not established a *prima facie* case of obviousness over claims 1-10. The Applicant respectfully requests that the rejection of claims 1-10 under 35 U.S.C. 103 be withdrawn.

With respect to independent claim 16, the Examiner states that Dinh-Ngoc "does not disclose cutting depth as set forth in [the] claim. Please note that the claimed limitations of 'cutting depth' is treated as the same as the tip variation because the tip height of abrasive particles is the cutting depth as the pad dresser is pressed into the polishing pad." The Applicant respectfully disagrees with the Examiner's assertion. However, the Examiner's argument is moot. The current application claims priority to the '817 application and other applications that pre-date Dinh-Ngoc. As previously discussed, the '817 application pre-dates Dinh-Ngoc with respect to the tip variation limitations. Further, the '817 application pre-dates Dinh-Ngoc with respect to the cutting depth limitation of claim 16. For example, the '817 application recites "In yet another specific aspect, the predetermined height may produce a cutting depth of from about 10 micron to about 20 microns when used to abrade a workpiece. In yet another aspect, the predetermined height may produce a depth of up to or more than 50 or 100 microns." Therefore, with respect to at least the cutting depth limitation, Dinh-Ngoc does not qualify as prior art. As such, Dinh-Ngoc does not provide a prior art teaching of each and every claim element of independent claim 16, and associated dependent claims 17-22. Therefore, the Examiner has failed to establish a *prima facie* case of obviousness over claims 16-22. The Applicant respectfully requests that the rejection of claims 16-22 under 35 U.S.C. 103 be withdrawn.

With respect to claim 23, the Examiner takes the same position as that outlined above with respect to independent claim 16. However, as already described above, the Examiner has failed to establish a *prima facie* case of obviousness over claim 16. Claim 23 describes a method of dressing a CMP pad using the CMP pad dresser of claim 16. Therefore, because the CMP pad dresser of claim 16 is not obvious in view of Dinh-Ngoc, neither is a method of using the CMP pad dresser of claim 16. Therefore, the Examiner has failed to establish a *prima facie* case of

obviousness over claim 23. The Applicant respectfully requests that the rejection of claim 23 under 35 U.S.C. 103 be withdrawn.

With respect to claim 24, the Examiner again takes the same position as described above with respect to independent claim 16. Again, the current application claims priority to applications that pre-date Dinh-Ngoc and in which the cutting depth limitation of claim 24 is fully supported (as described above). Therefore, Dinh-Ngoc does not qualify as prior art with respect to these claim limitations. Therefore, the Examiner has failed to establish a *prima facie* case of obviousness over claim 24. The Applicant respectfully requests that the rejection of claim 24 under 35 U.S.C. 103 be withdrawn.

Claims 5-7, 11-15, and 16-24

Claims 5-7, 11-15, and 16-24 have been rejected as obvious under pre-AIA 35 U.S.C. 103(a) as being allegedly unpatentable over Dinh-Ngoc in view of U.S. Pub. No. 2008/0292869 to Sung. The Applicant respectfully disagrees.

With respect to claims 5-7, as discussed above, the current application claims priority to applications, such as the '817 application, that pre-date Dinh-Ngoc, and in which the limitations of independent claim 1 are fully supported. It is noted that the '817 application also pre-dates Sung. Therefore, Sung also does not qualify as prior art to the claim limitations of independent claim 1, or dependent claims 5-7. As such, the Examiner has failed to establish a *prima facie* case of obviousness over claims 5-7. The Applicant respectfully requests that the rejection of claims 5-7 under 35 U.S.C. 103 be withdrawn.

With respect to claims 11-15, independent claim 11 has been amended to include the limitation "wherein a tip of each of the plurality of superabrasive particles aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns." As previously discussed, this claim limitation is fully supported in the '817 application, from which the current application claims priority. Because the '817 application pre-dates both Dinh-Ngoc and Sung, these references do not provide prior art teachings for at least this newly added claim limitation. Therefore, independent claim 11 and associated dependent claims 12-15 are not

obvious over Dinh-Ngoc in view of Sung. The Applicant respectfully requests that the rejection of claims 11-15 under 35 U.S.C. 103 be withdrawn.

With respect to claims 16-24, the same arguments outlined above apply here. The current application claims priority back to applications, such as the '817 application, that pre-date both Dinh-Ngoc and Sung, and in which various claim limitations of claims 16-24 are fully supported. As such, the Examiner has failed to establish a *prima facie* case of obviousness for claims 16-24. The Applicant respectfully requests that the rejection of claims 16-24 under 35 U.S.C. 103 be withdrawn.

CONCLUSION

In view of the foregoing, the Applicant asserts that the pending claims present allowable subject matter and the allowance thereof is respectfully requested. If any impediment remains to examination after consideration of the above-recited remarks, which could be removed during a telephone interview, the Examiner is invited to telephone the undersigned attorney, at (801) 566-6633 so that such issues may be resolved as expeditiously as possible.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 20-0100.

DATED this 2nd day of May, 2016.

Respectfully submitted,

THORPE, NORTH & WESTERN, LLP

/David W. Osborne/

David W. Osborne
Reg. No. 44,989
8180 South 700 East, Suite 350
Sandy, UT 84070
Telephone: (801) 566-6633
Facsimile: (801) 566-0750

DWO/JB

Electronic Patent Application Fee Transmittal

Application Number:	14506476
Filing Date:	03-Oct-2014
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Filer:	David William Osborne/Nicole Solomon
Attorney Docket Number:	02074-24012.NP.CIP2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
			Total in USD ($)	**700**

Electronic Acknowledgement Receipt

EFS ID:	25663003
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Nicole Solomon
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	02-MAY-2016
Filing Date:	03-OCT-2014
Time Stamp:	20:24:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$700
RAM confirmation Number	20952
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		24012_NP_CIP2_Response.pdf	106435 c903e30790145ffd62ea7894791a7363f656a27f	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	12

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30748 b1cf6c443a74acf31132af3e352dac4bd85ed3c4	no	2

Warnings:

Information:

Total Files Size (in bytes):	137183

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/506,476	Filing Date 10/03/2014	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **05/02/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 24	Minus	** 24	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/SHAREILL COLES/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

20551 7590 07/15/2016

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER
NGUYEN, GEORGE BINH MINH

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
07/15/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@tnw.com
rich@tnw.com
annette.fields@tnw.com

Office Action Summary	Application No. 14/506,476	Applicant(s) SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05/02/2016*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-24* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *11-15* is/are allowed.

7)☒ Claim(s) *1-10 and 16-24* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *10/03/2014* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *11/19/2015*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Receipt is acknowledged of Applicant's amendment filed on May 02, 2016.

Claims 1-24 are presented for examination.

This application has been filed with formal drawings which are acceptable to the examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented 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. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-10 and 16-24 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Nabeya'2004/0048557.

In re claims 1, 2, 3, 4, Nabeya'557 discloses a CMP pad dresser #5 comprising a support substrate #7a; and a plurality of superabrasive particles #50 and #51 secured to the support substrate #7a with each superabrasive particles extending away from the support substrate to a protrusion distance #S1, wherein a highest protruding tip of each of the plurality of superabrasive particles align along a designated profile with a tip variation (Fig. 6).

However, Nabeya'557 does not disclose the tip variation range as set forth in the claim.

Nevertheless, regarding to the tip variation range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claims 5-7, 16-17, and 23-24, Nabeya'557 does not disclose cutting depth range as set forth in claim. Please note that the claimed limitations of "cutting depth" is treated as the same as the tip variation because the tip height of abrasive particles is the cutting depth as the pad dresser is pressed into the polishing pad.

Therefore, regarding to the cutting depth range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where

the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claim 8, Nabeya'557 discloses a configuration of plane in Fig. 6.

In re claim 9, Nabeya'557 discloses a predetermined pattern of abrasive arrangement in Fig. 5.

In re claim 10, Nabeya'557 does not disclose the distribution space range as set forth in the claim. Therefore, regarding to the distribution space range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claims 18-21, regarding to the amount of abrasive grains range set forth in the claims, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the range set forth in the claims, since it has been held that where the general conditions of a claim are discloses in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claim 22, it would have been obvious to one skilled in the art at the time the invention was made to have modified Nabeya'557 dresser with the combination of amount of abrasive particles with a particular protrusion distance of 30 microns or less in order to achieve designated profiles configurations depending on the particular use of the abrading tool.

Response to Arguments

Applicant's arguments, see page 8 of the amendment, filed 05/02/2016, with respect to the rejection(s) of claim(s) 1-24 under Dinh-Ngoc'595 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Nabeya'557.

Allowable Subject Matter

Claims 11-15 are allowed.

The following is an examiner's statement of reasons for allowance: the specific limitations of "wherein the difference in protrusion distance … within about 80 microns or less" in the combination as claimed in claim 11 are not anticipated nor made obvious by the prior art of record in the examiner's opinion.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Please see PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GEORGE NGUYEN whose telephone number is

(571)272-4491. The examiner can normally be reached on Monday -Friday from 8 AM-4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hail Joseph can be reached on 571-272-4485. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

George Nguyen
Primary Examiner
Art Unit 3723

/GEORGE NGUYEN/
Primary Examiner, Art Unit 3723

Notice of References Cited	Application/Control No. 14/506,476	Applicant(s)/Patent Under Reexamination SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2,152,392 A	03-1939	TONE FRANK J	B24D11/00	451/511
*	B	US-2,201,195 A	05-1940	MELTON ROMIE L	B24D11/005	451/539
*	C	US-2,204,826 A	06-1940	HERMANN SCHNEIDER	B24D7/00	451/539
*	D	US-2,410,506 A	11-1946	KIRCHNER HENRY P	B24D11/00	451/539
*	E	US-3,787,273 A	01-1974	Okrepkie; John	B24D11/02	156/279
*	F	US-4,901,480 A	02-1990	Dillon; Laurence A.	B24B13/01	407/118
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

PTO/SB/08B (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet		of	

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		U.S. Application No. 13/846,740; Filing date March 18, 2013; Chien-Min Sung; Office Action dated November 4, 2015.	

Examiner Signature	/GEORGE B NGUYEN/	Date Considered	05/24/2016

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **Send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.B.N/

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	Art Unit
	GEORGE NGUYEN	3723

CPC- SEARCHED		
Symbol	Date	Examiner
B24B53/07;53/017;53/12;37/04;37/042;57/02	10/28/2015	GN
updated search above	7/7/2016	GN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
451	443,444,548,56	10/28/2015	GN

SEARCH NOTES		
Search Notes	Date	Examiner
updated parent search 13/802,112	10/28/2015	GN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Please see East search history	10/28/2015	GN

	/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	48	(US-20120244790-$ or US-20120302146-$ or US-20130165023-$ or US-20010046835-$ or US-20070066194-$ or US-20020139680-$ or US-20070175765-$ or US-20030084894-$ or US-20040112359-$ or US-20070051354-$ or US-20070051355-$ or US-20090283089-$ or US-20110296766-$ or US-20120192499-$ or US-20120220208-$ or US-20120260582-$ or US-20020173234-$ or US-20050095959-$ or US-20060068691-$ or US-20060073774-$).did. or (US-6517424-$ or US-7300338-$ or US-5492771-$ or US-5511718-$ or US-5976205-$ or US-7124753-$ or US-7771498-$ or US-8104464-$ or US-6884155-$ or US-7201645-$ or US-7241206-$ or US-7258708-$ or US-7285039-$ or US-7393264-$ or US-7473162-$ or US-7491116-$ or US-7494404-$ or US-7544117-$ or US-7651386-$ or US-7690971-$ or US-7749050-$ or US-7901272-$ or US-8043145-$ or US-8142261-$ or US-8298043-$ or US-8298048-$).did. or (US-8414362-$ or US-8449357-$).did.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:32
S2	6	("20070232074" | "20080271384" | "20090073774" | "7067903" | "7198553" | "7651386").PN.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:42
S3	10	("20040180617" | "20080076338" | "20100015898" | "6899592" | "7150677").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:42
S4	6	("0238946" | "0296756" | "7791188").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:43
S5	843	451/443.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 09:39

S6	462	451/444.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:02
S7	84	("20070049185" | "6136043" | "3990124" | "4818515" | "6402603" | "6626747" | "7641538" | "20020068518" | "20040198206" | "4925457" | "6022266" | "6416878" | "6511713" | "RE26879" | "20080248734" | "20100022174" | "7467989" | "20060010780" | "5919084" | "6099603" | "7217172" | "7124753" | "5049165" | "5304223" | "5511718" | "5833724" | "6096107" | "6575353" | "20050214201" | "5921856" | "20060254154" | "5791975" | "5863306" | "6159087" | "6347982" | "20050260922" | "20040037948" | "5219462" | "6136143" | "20060010780" | "5152917" | "5669943" | "5842912" | "6679243" | "6769975" | "6234883" | "6309433" | "20020072302" | "20060213128" | "20050215188" | "20060073774" | "2175073" | "5645474" | "5683289" | "20050276979" | "20020197947" | "5492771" | "6358133" | "6368198" | "6537140" | "6572446" | "7258708" | "20080132153" | "20020173234" | "4968326" | "20020173234" | "4222204" | "4951423" | "5851138" | "7575503" | "6123612" | "6286498" | "20080004743" | "20070060026" | "5382189" | "6261167" | "6887138" | "20030036341" | "5014468" | "5980678" | "6293980" | "6818029" | "6039641" | "20050118820" | "20100022174").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 10:14
S8	1658	451/548.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:21
S9	4663	51/309.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:46
S10	180	S9 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2013/07/09 10:47

			DERWENT; IBM_TDB			
S11	2468	51/295.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:31
S12	86	S11 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:32
S13	1378	451/56.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S14	204	S13 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S15	180	("1854071" | "1988065" | "0187593" | "2027087" | "2027307" | "2033991" | "2035521" | "2075354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659" | "20040009742" | "20040060243" | "20040079033" | "20040107648" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181" | "20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918" | "20070295267" | "20080096479" | "20080171503" | "20080292869" | "20090068937" | "20090093195" | "20090145045" | "20090283089" | "20100139174" | "20100186479" | "20100221990" | "20100248596" |	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:47

		"20110212670" | "20110275288" | "20110296766" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3905571" | "3982358" | "4028576" | "4078906" | "4149881" | "4182628" | "4188194" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4662896" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326").pn.				
S16	159	("5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492774" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5674572" | "5725421" | "5746931" | "5772756" | "5779743" | "5791975" | "5801073" | "5815891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6159286" | "6179886" | "6190240" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6478831" | "6497853"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:49

		"6544599" | "6551176" | "6605798" | "6607423" | "6616725" | "6616752" | "6626167" | "6627168" | "6646725" | "6672943" | "6679243" | "6694847" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7201645" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7585366" | "7651386" | "7658666" | "7690971" | "RE20660" | "RE35812").PN.				
S17	672	first near2 monolayer near2 second	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:42
S18	81761	rigid near2 support	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S19	0	S17 with S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S20	341	sung-chien-min.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:47
S24	655	b24b53/07.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:04
S25	3143	b24b53/017.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:07
S26	608	451/443.ccls.	USPAT	OR	OFF	2014/02/24 11:31
S27	331	451/444.ccls.	USPAT	OR	OFF	2014/02/24 11:34
S28	912	451/548.ccls.	USPAT	OR	OFF	2014/02/24

						11:37
S29	1838	b24b53/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:40
S34	6	("20040203325" | "20070266639" | "20100203811" | "20100248595" | "20120241943" | "6196911").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/02/25 09:10
S35	204	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305" | "20070266639" | "1988065" | "0187593" | "2652951" | "2725693" | "2811960" | "2876086" | "2952951" | "20030054746" | "20030114094" | "20040060243" | "20040107648" | "20050060941" | "20070295267" | "20080076338" | "20090283089" | "20100186479" | "3416560" | "3625666" | "3631638" | "4525179" | "4797241" | "4916869" | "4954139" | "5024680" | "5092082" | "5151107" | "5194071" | "5247765" | "5314513" | "5496386" | "5560754" | "5620489" | "5669943" | "5885137" | "5902173" | "6001008" | "6001174" | "6027659" | "6054183" | "6258138" | "6371842" | "6616752" | "6899592" | "6905571" | "7124753" | "7465217" | "7585366" | "8104464" | "20100261419" | "2307461" | "2268663" | "20060128288" | "20110212670" | "3127715" | "3440774" | "3894673" | "4201601" | "4551195" | "4908046" | "5022895" | "5133782" | "5195404" | "5243790" | "5248317" | "5443032" | "5486131" | "5500248" | "5518443" | "5609286" | "5772756" | "5820450" | "5916011" | "5921856" | "5961373" | "5976205" | "5985228" | "6190240" | "6224469" | "6258237" | "6286498" | "6325709" | "6354918" | "6409580" | "6544599" | "6749485" | "6884155" | "7033408" | "7258708" | "7658666" | "6722952" | "20040203325" | "6692547" | "7494404" | "20060143991" | "20070051354" | "20070249270" | "20110293905" |	USPAT	OR	OFF	2014/04/01 13:58

		"20120192499" | "3067551" | "3276852" | "3372010" | "3608134" | "4155721" | "4188194" | "4229186" | "4481016" | "4547257" | "4617181" | "4669522" | "4680199" | "4849602" | "4866888" | "4925457" | "4949511" | "5049165" | "5116568" | "5195403" | "5266236" | "5374293" | "5492771" | "5527424" | "5660894" | "5855314" | "6024824" | "6206942" | "6478831" | "6629884" | "6672943" | "6679243" | "6694847" | "6818029" | "6935365" | "7651386" | "6458018" | "20100203811" | "2318570" | "20030084894" | "20050215188" | "20050260939" | "20060073774" | "20060254154" | "20070051355" | "20070066194" | "20070155298" | "20090093195" | "3121981" | "3630699" | "3664662" | "3852078" | "4149881" | "4355489" | "4629373" | "4749514" | "5037451" | "5137543" | "5232320" | "5246884" | "5273730" | "5364423" | "5454343" | "5746931" | "5779743" | "5976001" | "5980852" | "5980982" | "6299508" | "6371838" | "6945857" | "7044990" | "7261621" | "RE20660" | "6125612" | "6354929" | "20100248595" | "2078354" | "2187624" | "2281558" | "2612348" | "2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S36	252	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305" | "20070266639" | "1988065" | "0187593" | "2652951" | "2725693" | "2811960" | "2876086" | "2952951" | "20030054746" | "20030114094" | "20040060243" | "20040107648" | "20050060941" | "20070295267" |	US-PGPUB; USPAT	OR	OFF	2014/04/01 13:58

"20080076338" | "20090283089" |
"20100186479" | "3416560" |
"3625666" | "3631638" | "4525179" |
"4797241" | "4916869" | "4954139" |
"5024680" | "5092082" | "5151107" |
"5194071" | "5247765" | "5314513" |
"5496386" | "5560754" | "5620489" |
"5669943" | "5885137" | "5902173" |
"6001008" | "6001174" | "6027659" |
"6054183" | "6258138" | "6371842" |
"6616752" | "6899592" | "6905571" |
"7124753" | "7465217" | "7585366" |
"8104464" | "20100261419" |
"2307461" | "2268663" |
"20060128288" | "20110212670" |
"3127715" | "3440774" | "3894673" |
"4201601" | "4551195" | "4908046" |
"5022895" | "5133782" | "5195404" |
"5243790" | "5248317" | "5443032" |
"5486131" | "5500248" | "5518443" |
"5609286" | "5772756" | "5820450" |
"5916011" | "5921856" | "5961373" |
"5976205" | "5985228" | "6190240" |
"6224469" | "6258237" | "6286498" |
"6325709" | "6354918" | "6409580" |
"6544599" | "6749485" | "6884155" |
"7033408" | "7258708" | "7658666" |
"6722952" | "20040203325" |
"6692547" | "7494404" |
"20060143991" | "20070051354" |
"20070249270" | "20110293905" |
"20120192499" | "3067551" |
"3276852" | "3372010" | "3608134" |
"4155721" | "4188194" | "4229186" |
"4481016" | "4547257" | "4617181" |
"4669522" | "4680199" | "4849602" |
"4866888" | "4925457" | "4949511" |
"5049165" | "5116568" | "5195403" |
"5266236" | "5374293" | "5492771" |
"5527424" | "5660894" | "5855314" |
"6024824" | "6206942" | "6478831" |
"6629884" | "6672943" | "6679243" |
"6694847" | "6818029" | "6935365" |
"7651386" | "6458018" |
"20100203811" | "2318570" |
"20030084894" | "20050215188" |
"20050260939" | "20060073774" |
"20060254154" | "20070051355" |
"20070066194" | "20070155298" |
"20090093195" | "3121981" |
"3630699" | "3664662" | "3852078" |
"4149881" | "4355489" | "4629373" |
"4749514" | "5037451" | "5137543" |
"5232320" | "5246884" | "5273730" |
"5364423" | "5454343" | "5746931" |
"5779743" | "5976001" | "5980852" |
"5980982" | "6299508" | "6371838" |
"6945857" | "7044990" | "7261621" |
"RE20660" | "6125612" | "6354929" |
"20100248595" | "2078354" |
"2187624" | "2281558" | "2612348" |
"2867086" | "2947608" |
"20020127962" | "20020173234" |
"20030207659" | "20050118939" |

		"20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S37	87	("6258201" | "6293854" | "6319108" | "6394886" | "6605798" | "6755720" | "7201645" | "7404857" | "7198553" | "2033991" | "2194253" | "20040079033" | "20060079162" | "20060135050" | "20070254566" | "20110275288" | "3293012" | "4182628" | "4211294" | "4273561" | "4341532" | "4945686" | "5000273" | "5011513" | "5030276" | "5043120" | "5203881" | "5264011" | "5380390" | "5453106" | "5833519" | "6281129" | "6284556" | "6439986" | "6551176" | "6607423" | "6627168" | "6824455" | "7323049" | "7384436" | "20070232074" | "20040180617" | "20100015898" | "1854071" | "2035521" | "2334572" | "20040009742" | "20060258276" | "20070093181" | "20070128994" | "20070264918" | "20090145045" | "20100248596" | "4228214" | "4289503" | "4712552" | "4770907" | "4927619" | "5131924" | "5194070" | "5197249" | "5271547" | "5492774" | "5551959" | "5560745" | "5725421" | "5791975" | "5801073" | "6039641" | "6123612" | "6368198" | "6446740" | "6616725" | "6835365" | "6979357" | "7066795" | "7690971" | "RE35812" | "20080271384" | "0238946").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/04/01 14:03
S38	48	(US-20120302146-$ or US-20130165023-$ or US-20120244790-$ or US-20010046835-$ or US-20070066194-$ or US-20070060026-$ or US-20070264918-$ or US-20080171503-$ or US-20080292869-$ or US-20100139174-$ or US-20100221990-$ or US-20110212670-$ or US-20060068691-$ or US-20070215486-$ or US-20070289223-$ or US-20020139680-$ or US-20070175765-$ or US-20020173234-$).did. or (US-6517424-$ or US-7300338-$ or US-7651386-$ or US-7690971-$ or US-7901272-$ or US-8414362-$ or US-5976205-$ or US-7241206-$ or US-7393264-$ or US-7494404-$ or US-5492771-$ or US-5511718-$ or US-6884155-$ or US-7124753-$ or US-7201645-$ or US-7258708-$ or US-7285039-$ or US-7473162-$ or US-7491116-$ or US-7544117-$ or US-	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:23

		7771498-$ or US-8043145-$ or US-8104464-$ or US-8142261-$ or US-8298043-$).did. or (US-8298048-$ or US-8449357-$ or US-8491358-$ or US-8678878-$).did.				
S39	1	"7198553".pn.	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:41
S40	1203	tip adj (level leveling)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:42
S41	113033	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S42	8	S40 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S43	14761	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:52
S44	3	S40 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:53
S45	1212	tip adj (level leveling leveled)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:54
S46	8	S45 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:54
S47	59	protrusion adj difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2014/05/07 13:42

			DERWENT; IBM_TDB			
S48	4102	heat near2 pressure near2 bonding	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 13:59
S49	9	S48 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:00
S50	263	sintering adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:05
S51	3	S50 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S52	4	S50 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S53	1160	adhesive near2 transfer near2 sheet	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S54	12	S53 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S55	971	aperture near2 template	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:09
S56	0	S53 with S55	US-PGPUB; USPAT; USOCR;	OR	OFF	2014/05/07 16:10

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S57	0	S53 same S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S58	44	("2223063" | "2642654" | "3817719" | "3894673" | "4018576" | "4042559" | "4311489" | "4378975" | "4621031" | "4652275" | "4799939" | "4925457" | "5000273" | "5049165" | "5131924" | "5203880" | "5203881" | "5251802" | "5264011" | "5304342" | "5380390" | "5486131" | "5492188" | "5511718" | "5569062" | "5605499" | "5707276" | "5782679" | "5832360" | "5833021" | "5871060" | "6039641" | "6123612" | "6361423" | "6434946" | "6679243").PN. OR ("7198553").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/05/08 22:41
S59	53542	hot adj pressing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S60	14766	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S61	581	S59 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S62	126	warping adj (reducing reduction minimizing mininized)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S63	0	S62 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S64	113048	"451"/$.ccls.	US-PGPUB;	OR	OFF	2014/05/09

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			08:51
S65	0	S62 and S64	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:52
S66	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:43
S67	13	("20040235406" | "20060213128" | "20080014845" | "20090094902" | "20110076925" | "20110104989" | "20110192652" | "20120244790" | "20130225052" | "3593382" | "6299521" | "6372001" | "8545583").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:44
S68	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:46
S69	5	("20020182401" | "20110252710" | "7507267" | "7954483" | "8377158").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:48
S70	2	("5919084" | "6159286").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:50
S71	59	("1854071" | "1875930" | "1988065" | "2027087" | "2027307" | "2033991" | "2035521" | "2078354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2307461" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20010046835" | "20020042200" | "20020127962" | "20020139680" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:00
S72	26	("20040009742" | "20040060243" | "20040079033" | "20040091627" | "20040107648" | "20040180617" | "20040203325" | "20040238946" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:01
S73	59	("20070128994" | "20070155298" | "20070249270" | "20070254566" |	US-PGPUB; USPAT;	OR	OFF	2014/10/30 10:03

		"20070264918" | "20070266639" | "20070295267" | "20080076338" | "20080096479" | "20080171503" | "20080248305" | "20080271384" | "20080292869" | "20080296756" | "20090068937" | "20090145045" | "20090283089" | "20100015898" | "20100022174" | "20100139174" | "20100186479" | "20100203811" | "20100221990" | "20100248595" | "20100248596" | "20100261419" | "20110212670" | "20110275288" | "20110293905" | "20110296766" | "20120192499" | "20120241943" | "20120244790" | "20120260582" | "20120302146" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666").PN.	USOCR			
S74	112	("3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:05
S75	71	("3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" |	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:07

		"4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247").PN.				
S76	164	("5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492771" | "5492774" | "5496386" | "5500248" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5669943" | "5674572" | "5725421" | "5746931" | "5772756" | "5776214" | "5779743" | "5791975" | "5801073" | "5816891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976001" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6125612" | "6179886" | "6190240" | "6196911" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918" | "6354929" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6458018" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616752" | "6626167" | "6627168" | "6629884" | "6672943" | "6692547" | "6722952" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6899592" | "6905571" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7150677" | "7198553" | "7201645" | "7247577" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7494404"	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:10

		"7585366" | "7641538" | "7651386" | "7658666" | "7662896" | "7690971" | "7791188" | "7840305" | "8104464" | "8393934" | "8398466" | "RE20660" | "RE35812").PN.				
S77	159296	cmp	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S78	1380104	pad	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S79	434842	dresser conditioner	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S80	3851	superabrasive	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S81	114947	monolayer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S82	1806819	matrix	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S83	609495	protrusion	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S84	1632039	tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59

S85	3944964	difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S86	12687	asperities	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S87	12692	cutting adj depth	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S88	3	S77 and S78 and S79 and S80 and S81 and S82 and S83 and S84 and S85 and S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:01
S89	3	S86 same S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:17
S90	36	S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:18
S91	2031	node adj size	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:50
S92	61	S91 same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:50
S93	15740	(line adj width) same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2014/10/31 10:59

			DERWENT; IBM_TDB			
S94	8820	(line adj width) with semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S95	114233	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S96	52	S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S97	198	oxidative adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:39
S98	1	S97 same slurry	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:40
S99	1	S95 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:41
S100	700	451/443.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:36
S101	381	451/444.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:37
S102	1446	451/548.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:40
S103	988	451/56.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:42
S104	140	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:45
S105	874	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:46
S106	458	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:48
S107	1018	b24b37/04.cpc.	USPAT;	OR	OFF	2015/05/06

			EPO			13:50
S108	1108	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:52
S109	679	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:54
S110	35	("20020014041" | "20020164928" | "20030092357" | "20040023610" | "20050032469" | "20050095959" | "20050118939" | "20050227590" | "20070232074" | "20080153398" | "20090073774" | "20090123705" | "20090215363" | "20110293905" | "20120192499" | "20120260582" | "20120302146" | "3664662" | "3706650" | "4151154" | "4405411" | "4737162" | "4863573" | "5224469" | "5868806" | "6159087" | "6200360" | "6312324" | "6416878" | "6769969" | "6837979" | "7067903" | "7651368" | "7762872").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:43
S111	1	("6193770").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:44
S112	1	"9138862".pn.	USPAT	OR	OFF	2015/10/27 11:58
S113	1	"8974270".pn.	USPAT	OR	OFF	2015/10/27 11:58
S114	1	"8622787".pn.	USPAT	OR	OFF	2015/10/27 11:59
S115	1	"8393934".pn.	USPAT	OR	OFF	2015/10/27 11:59
S116	142	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:56
S117	893	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:57
S118	0	b24b3/125.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:58
S119	459	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:59
S120	1028	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:00
S121	1133	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:01
S122	684	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:03
S123	1	"20040048557".pn.	US-PGPUB	OR	OFF	2016/05/24 21:24
S124	1	"7762872".PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/05/25 08:43
S125	9354	tip adj cutting	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:04

S126	8125	(superabrasive abrasive) adj particle	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S127	0	S125 with S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S128	16723	cutting adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S129	6	S128 with S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S130	91	("20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030084894" | "20030114094" | "20030207659" | "20050060941" | "20050118939" | "20050260939" | "20060079160" | "20060143991" | "20060254154" | "20070051355" | "20070066194" | "20070264918" | "3743489" | "3767371" | "3852078" | "4481016" | "4662896" | "4849602" | "4923490" | "4925457" | "4954139" | "5049165" | "5137543" | "5190568" | "5195403" | "5195404" | "5232320" | "5247765" | "5374293" | "5380390" | "5453106" | "5486131" | "5505272" | "5527424" | "5536202" | "5547417" | "5560745" | "5560754" | "5851138" | "5921856" | "5924917" | "5975988" | "6001008" | "6027659" | "6054183" | "6093280" | "6190240" | "6213856" | "6217413" | "6224469" | "6281129" | "6293854" | "6299508" | "6319108" | "6346202" | "6354918" | "6368198" | "6371838" | "6371842" | "6439986" | "6446740" | "6478831" | "6626167" | "6672943" | "6694847" | "6755720" | "6818029" | "6824455" | "6884155" | "6945857" | "7021995" | "7033408" | "7044990" | "7066795" | "7201645" | "7258708" | "7261621" | "7465217").PN. OR ("7762872").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/05/25 09:11
S131	19655	height near2 variation	US-PGPUB; USPAT;	OR	OFF	2016/05/25 09:55

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S132	343	particle adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S133	0	S131 same S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S134	39	S131 and S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S135	419	451/539.ccls.	USPAT; USOCR	OR	OFF	2016/05/25 11:54
S136	637	451/539.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S137	16723	cutting adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S138	224432	S136 ans S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S139	0	S136 and S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:56
S140	2557	451/548-551.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2016/05/25 12:44

			DERWENT; IBM_TDB			
S141	8	S140 and S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:44
S142	343	particle adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:47
S143	7	S136 and S142	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:47
S144	5883	apex near2 tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:54
S145	9925	451/526-551.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:54
S146	14	S144 and S145	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:55

7/7/2016 4:01:17 PM
C:\Users\gnguyen\Documents\EAST\Workspaces\14506476.wsp

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	
Attorney Docket Number	02074-24012.NP.CIP2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		2004/0048557	03/11/2004	Nabeya	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]- Number[4] – Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	/GEORGE B NGUYEN/	Date Considered	05/24/2016

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.B.N/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ART UNIT: 3723 EXAMINER: George Binh Minh Nguyen FIRST NAMED INVENTOR: Chien-Min Sung SERIAL NO.: 14/506,476 FILED: 10/03/2014 CONF. NO.: 9471 FOR: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS DOCKET NO.: 02074-24012.NP.CIP2	**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8** DATE OF DEPOSIT: **November 15, 2016** I hereby certify that this paper or fee (along with any paper or fee referred to as being attached or enclosed) is being submitted on the date indicated above via: ☒ EFS Web ☐ facsimile to _____ ☐ the United States Postal Service with sufficient postage as first class mail addressed to: Mail Stop _____, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. /Nicole Solomon/ Nicole Solomon

RESPONSE UNDER 37 C.F.R. § 1.111

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

Dear Sir:

In response to the communication mailed on July 15, 2015, please reconsider this application in view of the remarks provided herein. A petition for a 1-month extension of time and associated fees is submitted herewith.

CLAIM LISTING

1-10. (Canceled)

11. (Previously presented) A CMP pad dresser, comprising:

a rigid support substrate; and

a monolayer of a plurality of superabrasive particles coupled to the support substrate, wherein each superabrasive particle in the monolayer extends away from the support substrate to a protrusion distance, wherein a tip of each of the plurality of superabrasive particles aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns, and 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, 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.

12. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than or equal to about 10 microns.

13. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip is less than ~~or equal to~~ about 10 microns.

14. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the 10th highest protruding tip is less than or equal to about 20 microns.

15. (Original) The dresser of claim 11, wherein the difference in protrusion distance between the highest protruding tip and the 100th highest protruding tip is less than or equal to about 40 microns.

16. (currently amended) ~~A CMP pad~~ The dresser of claim 11, ~~comprising:~~

~~a rigid support substrate; and~~

~~a monolayer of a plurality of superabrasive particles coupled to the support substrate,~~ wherein the plurality of superabrasive particles includes a plurality of working superabrasive particles, such that rotating the dresser against a CMP pad cuts asperities into the CMP pad having a cutting depth of less than or equal to about 50 microns.

17. (Original) The dresser of claim 16, wherein the cutting depth is from about 10 microns to about 50 microns.

18. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes at least 100 working superabrasive particles.

19. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes at least 1000 working superabrasive particles.

20. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes from about 1000 to about 6000 working superabrasive particles.

21. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles includes from about 2000 to about 5000 working superabrasive particles.

22. (Original) The dresser of claim 16, wherein the plurality of working superabrasive particles include at least about 1000 working superabrasive particles that protrude from the rigid support substrate to distances within about 30 microns of one another.

23-24. (canceled)

25. (New) The dresser of claim 11, wherein the highest protruding tip of each of the plurality of

superabrasive particles align along the designated profile with a tip variation of from about 10 microns to about 50 microns.

26. (New) The dresser of claim 11, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of from about 20 microns to about 40 microns.

27. (New) The dresser of claim 11, wherein the highest protruding tip of each of the plurality of superabrasive particles align along the designated profile with a tip variation of less than about 20 microns.

28. (New) The dresser of claim 11, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of less than about 20 microns when used to abrade a CMP pad.

29. (New) The dresser of claim 11, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of from about 1 micron to about 20 microns when used to abrade a CMP pad.

30. (New) The dresser of claim 11, wherein the protrusions of the plurality of superabrasive particles produce cutting depths of from about 10 microns to about 20 microns when used to abrade a CMP pad.

31. (New) The dresser of claim 11, wherein the designated profile includes a configuration selected from the group consisting of a plane, a slope, a curved shape, a dome shape, and combinations thereof.

32. (New) The dresser of claim 11, wherein the plurality of superabrasive particles is arranged across the support substrate in a predetermined pattern.

33. (New) The dresser of claim 32, wherein the predetermined pattern includes an even distribution of the plurality of superabrasive particles spaced at a distance of from about 100 microns to about 800 microns.

REMARKS

The Applicant expresses appreciation to the Examiner for consideration of the subject patent application. This communication is in response to the Office Action mailed on July 15, 2016. In the Office Action the Examiner rejected claims 1-10 and 16-24 under 35 § USC 103 as allegedly obvious in view of the cited references, and further indicated claims 11-15 to be allowed. By the present amendment, claims 1-10, 23, and 24 have been canceled. Claims 2-9 have been substantially re-presented as new claims 25-33 which depend from allowed claim 11. Additionally, claim 16 has been amended to depend from allowed claim 11. Finally, claim 13 has been amended to distinguish it from claim 12, as it was discovered that claims 12 and 13 were previously identical and therefore duplicative. Applicant respectfully submits that all claims ultimately depend from allowed claim 11 and that no new subject matter has been added.

CONCLUSION

In view of the foregoing, the Applicant asserts that all pending claims present allowable subject matter and the allowance thereof is respectfully requested. If any impediment remains to examination after consideration of the above-recited remarks, which could be removed during a telephone interview, the Examiner is invited to telephone the undersigned attorney, at (801) 566-6633 so that such issues may be resolved as expeditiously as possible.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 20-0100.

DATED this 15th day of November, 2016.

Respectfully submitted,

THORPE, NORTH & WESTERN, LLP

/David W. Osborne/

David W. Osborne
Reg. No. 44,989
8180 South 700 East, Suite 350
Sandy, UT 84070
Telephone: (801) 566-6633
Facsimile: (801) 566-0750

DWO/JB

Electronic Patent Application Fee Transmittal

Application Number:	14506476
Filing Date:	03-Oct-2014
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Filer:	David William Osborne/Nicole Solomon
Attorney Docket Number:	02074-24012.NP.CIP2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	2251	1	100	100
Miscellaneous:				
			Total in USD ($)	**100**

Electronic Acknowledgement Receipt

EFS ID:	27522844
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Nicole Solomon
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	15-NOV-2016
Filing Date:	03-OCT-2014
Time Stamp:	19:59:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$100
RAM confirmation Number	111616INTEFSW20003100
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		24012_NP_CIP2_Response.pdf	71632 32c1d75ab65c9a8dba59f56afa0b57e780ad8f02	yes	7

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	5
Applicant Arguments/Remarks Made in an Amendment	6	7

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30705 8b1fcfca541f630a5c60421323c1a54ec12e5e9d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	102337		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/506,476	Filing Date 10/03/2014	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **11/15/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 21	Minus	** 24	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***5	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
STEFANIE BRYCE

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

20551 7590 12/14/2016

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER
NGUYEN, GEORGE BINH MINH

ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 12/14/2016

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

TITLE OF INVENTION: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/14/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

20551 7590 12/14/2016
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

TITLE OF INVENTION: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/14/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, GEORGE BINH MINH	3723	451-443000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Ex. 1003, Page 249

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

20551 7590 12/14/2016

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER	
NGUYEN, GEORGE BINH MINH	
ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 12/14/2016

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice Requiring Inventor's Oath or Declaration	Application No. 14/506,476	Applicant(s) Chien-Min Sung	
	Examiner NGUYEN, GEORGE BINH MINH	Art Unit 3723	

This notice is an attachment to the Notice of Allowability (PTOL-37), or the Notice of Allowability For A Design Application (PTOL-37D).

An inventor's oath or declaration in compliance with 37 CFR 1.63 or 1.64 executed by or with respect to each inventor has not yet been submitted.

An oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each inventor (for any inventor for which a compliant oath, declaration, or substitute statement has not yet been submitted) MUST be filed no later than the date on which the issue fee is paid. See 35 U.S.C. 115(f). Failure to timely comply will result in ABANDONMENT of this application.

A properly executed inventor's oath to declaration has not been received for the following inventor(s):

If applicant previously filed one or more oaths, declarations, or substitute statements, applicant may have received an informational notice regarding deficiencies therein.

The following deficiencies are noted:

INFORMAL ACTION PROBLEMS

- A properly executed inventor's oath or declaration has not been received for the following inventor(s): **Chien-Min Sung**.
  Applicant may submit the inventor's oath or declaration at any time before the Notice of Allowance and Fee(s) Due, PTOL-85, is mailed.

Questions relating to this Notice should be directed to the Application Assistance Unit at 571-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/506,476	Applicant(s) SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *applicant's amendment filed on 11/15/16*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *11-22, 25-32*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/GEORGE NGUYEN/
Primary Examiner, Art Unit 3723

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	Art Unit
	GEORGE NGUYEN	3723

CPC- SEARCHED		
Symbol	Date	Examiner
B24B53/07;53/017;53/12;37/04;37/042;57/02	10/28/2015	GN
updated search above	7/7/2016	GN
B24D3/00	12/9/2016	GN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
451	443,444,548,56	10/28/2015	GN

SEARCH NOTES		
Search Notes	Date	Examiner
updated parent search 13/802,112	10/28/2015	GN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Please see East search history	10/28/2015	GN

	/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	938	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2016/12/09 09:21
L2	473	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2016/12/09 09:22
L3	107	b24d3/00.cpc.	USPAT; EPO	OR	OFF	2016/12/09 09:25
S1	48	(US-20120244790-$ or US-20120302146-$ or US-20130165023-$ or US-20010046835-$ or US-20070066194-$ or US-20020139680-$ or US-20070175765-$ or US-20030084894-$ or US-20040112359-$ or US-20070051354-$ or US-20070051355-$ or US-20090283089-$ or US-20110296766-$ or US-20120192499-$ or US-20120220208-$ or US-20120260582-$ or US-20020173234-$ or US-20050095959-$ or US-20060068691-$ or US-20060073774-$).did. or (US-6517424-$ or US-7300338-$ or US-5492771-$ or US-5511718-$ or US-5976205-$ or US-7124753-$ or US-7771498-$ or US-8104464-$ or US-6884155-$ or US-7201645-$ or US-7241206-$ or US-7258708-$ or US-7285039-$ or US-7393264-$ or US-7473162-$ or US-7491116-$ or US-7494404-$ or US-7544117-$ or US-7651386-$ or US-7690971-$ or US-7749050-$ or US-7901272-$ or US-8043145-$ or US-8142261-$ or US-8298043-$ or US-8298048-$).did. or (US-8414362-$ or US-8449357-$).did.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:32
S2	6	("20070232074" | "20080271384" | "20090073774" | "7067903" | "7198553" | "7651386").PN.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:42
S3	10	("20040180617" | "20080076338" | "20100015898" | "6899592" | "7150677").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:42
S4	6	("0238946" | "0296756" | "7791188").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:43

S5	843	451/443.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 09:39
S6	462	451/444.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:02
S7	84	("20070049185" | "6136043" | "3990124" | "4818515" | "6402603" | "6626747" | "7641538" | "20020068518" | "20040198206" | "4925457" | "6022266" | "6416878" | "6511713" | "RE26879" | "20080248734" | "20100022174" | "7467989" | "20060010780" | "5919084" | "6099603" | "7217172" | "7124753" | "5049165" | "5304223" | "5511718" | "5833724" | "6096107" | "6575353" | "20050214201" | "5921856" | "20060254154" | "5791975" | "5863306" | "6159087" | "6347982" | "20050260922" | "20040037948" | "5219462" | "6136143" | "20060010780" | "5152917" | "5669943" | "5842912" | "6679243" | "6769975" | "6234883" | "6309433" | "20020072302" | "20060213128" | "20050215188" | "20060073774" | "2175073" | "5645474" | "5683289" | "20050276979" | "20020197947" | "5492771" | "6358133" | "6368198" | "6537140" | "6572446" | "7258708" | "20080132153" | "20020173234" | "4968326" | "20020173234" | "4222204" | "4951423" | "5851138" | "7575503" | "6123612" | "6286498" | "20080004743" | "20070060026" | "5382189" | "6261167" | "6887138" | "20030036341" | "5014468" | "5980678" | "6293980" | "6818029" | "6039641" | "20050118820" | "20100022174").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 10:14
S8	1658	451/548.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:21
S9	4663	51/309.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2013/07/09 10:46

			IBM_TDB			
S10	180	S9 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:47
S11	2468	51/295.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:31
S12	86	S11 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:32
S13	1378	451/56.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S14	204	S13 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S15	180	("1854071" | "1988065" | "0187593" | "2027087" | "2027307" | "2033991" | "2035521" | "2075354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659" | "20040009742" | "20040060243" | "20040079033" | "20040107648" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181" | "20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:47

		"20070295267" | "20080096479" | "20080171503" | "20080292869" | "20090068937" | "20090093195" | "20090145045" | "20090283089" | "20100139174" | "20100186479" | "20100221990" | "20100248596" | "20110212670" | "20110275288" | "20110296766" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3905571" | "3982358" | "4028576" | "4078906" | "4149881" | "4182628" | "4188194" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4662896" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326").pn.				
S16	159	("5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492774" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5674572" | "5725421" | "5746931" | "5772756" | "5779743" | "5791975" | "5801073" | "5815891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6159286" | "6179886" | "6190240" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:49

		"6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616725" | "6616752" | "6626167" | "6627168" | "6646725" | "6672943" | "6679243" | "6694847" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7201645" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7585366" | "7651386" | "7658666" | "7690971" | "RE20660" | "RE35812").PN.				
S17	672	first near2 monolayer near2 second	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:42
S18	81761	rigid near2 support	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S19	0	S17 with S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S20	341	sung-chien-min.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:47
S24	655	b24b53/07.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:04
S25	3143	b24b53/017.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:07

S26	608	451/443.ccls.	USPAT	OR	OFF	2014/02/24 11:31
S27	331	451/444.ccls.	USPAT	OR	OFF	2014/02/24 11:34
S28	912	451/548.ccls.	USPAT	OR	OFF	2014/02/24 11:37
S29	1838	b24b53/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:40
S34	6	("20040203325" | "20070266639" | "20100203811" | "20100248595" | "20120241943" | "6196911").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/02/25 09:10
S35	204	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305" | "20070266639" | "1988065" | "0187593" | "2652951" | "2725693" | "2811960" | "2876086" | "2952951" | "20030054746" | "20030114094" | "20040060243" | "20040107648" | "20050060941" | "20070295267" | "20080076338" | "20090283089" | "20100186479" | "3416560" | "3625666" | "3631638" | "4525179" | "4797241" | "4916869" | "4954139" | "5024680" | "5092082" | "5151107" | "5194071" | "5247765" | "5314513" | "5496386" | "5560754" | "5620489" | "5669943" | "5885137" | "5902173" | "6001008" | "6001174" | "6027659" | "6054183" | "6258138" | "6371842" | "6616752" | "6899592" | "6905571" | "7124753" | "7465217" | "7585366" | "8104464" | "20100261419" | "2307461" | "2268663" | "20060128288" | "20110212670" | "3127715" | "3440774" | "3894673" | "4201601" | "4551195" | "4908046" | "5022895" | "5133782" | "5195404" | "5243790" | "5248317" | "5443032" | "5486131" | "5500248" | "5518443" | "5609286" | "5772756" | "5820450" | "5916011" | "5921856" | "5961373" | "5976205" | "5985228" | "6190240" | "6224469" | "6258237" | "6286498" | "6325709" | "6354918" | "6409580" |	USPAT	OR	OFF	2014/04/01 13:58

		"6544599" | "6749485" | "6884155" | "7033408" | "7258708" | "7658666" | "6722952" | "20040203325" | "6692547" | "7494404" | "20060143991" | "20070051354" | "20070249270" | "20110293905" | "20120192499" | "3067551" | "3276852" | "3372010" | "3608134" | "4155721" | "4188194" | "4229186" | "4481016" | "4547257" | "4617181" | "4669522" | "4680199" | "4849602" | "4866888" | "4925457" | "4949511" | "5049165" | "5116568" | "5195403" | "5266236" | "5374293" | "5492771" | "5527424" | "5660894" | "5855314" | "6024824" | "6206942" | "6478831" | "6629884" | "6672943" | "6679243" | "6694847" | "6818029" | "6935365" | "7651386" | "6458018" | "20100203811" | "2318570" | "20030084894" | "20050215188" | "20050260939" | "20060073774" | "20060254154" | "20070051355" | "20070066194" | "20070155298" | "20090093195" | "3121981" | "3630699" | "3664662" | "3852078" | "4149881" | "4355489" | "4629373" | "4749514" | "5037451" | "5137543" | "5232320" | "5246884" | "5273730" | "5364423" | "5454343" | "5746931" | "5779743" | "5976001" | "5980852" | "5980982" | "6299508" | "6371838" | "6945857" | "7044990" | "7261621" | "RE20660" | "6125612" | "6354929" | "20100248595" | "2078354" | "2187624" | "2281558" | "2612348" | "2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S36	252	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305"	US-PGPUB; USPAT	OR	OFF	2014/04/01 13:58

"20070266639" | "1988065" |
"0187593" | "2652951" | "2725693" |
"2811960" | "2876086" | "2952951" |
"20030054746" | "20030114094" |
"20040060243" | "20040107648" |
"20050060941" | "20070295267" |
"20080076338" | "20090283089" |
"20100186479" | "3416560" |
"3625666" | "3631638" | "4525179" |
"4797241" | "4916869" | "4954139" |
"5024680" | "5092082" | "5151107" |
"5194071" | "5247765" | "5314513" |
"5496386" | "5560754" | "5620489" |
"5669943" | "5885137" | "5902173" |
"6001008" | "6001174" | "6027659" |
"6054183" | "6258138" | "6371842" |
"6616752" | "6899592" | "6905571" |
"7124753" | "7465217" | "7585366" |
"8104464" | "20100261419" |
"2307461" | "2268663" |
"20060128288" | "20110212670" |
"3127715" | "3440774" | "3894673" |
"4201601" | "4551195" | "4908046" |
"5022895" | "5133782" | "5195404" |
"5243790" | "5248317" | "5443032" |
"5486131" | "5500248" | "5518443" |
"5609286" | "5772756" | "5820450" |
"5916011" | "5921856" | "5961373" |
"5976205" | "5985228" | "6190240" |
"6224469" | "6258237" | "6286498" |
"6325709" | "6354918" | "6409580" |
"6544599" | "6749485" | "6884155" |
"7033408" | "7258708" | "7658666" |
"6722952" | "20040203325" |
"6692547" | "7494404" |
"20060143991" | "20070051354" |
"20070249270" | "20110293905" |
"20120192499" | "3067551" |
"3276852" | "3372010" | "3608134" |
"4155721" | "4188194" | "4229186" |
"4481016" | "4547257" | "4617181" |
"4669522" | "4680199" | "4849602" |
"4866888" | "4925457" | "4949511" |
"5049165" | "5116568" | "5195403" |
"5266236" | "5374293" | "5492771" |
"5527424" | "5660894" | "5855314" |
"6024824" | "6206942" | "6478831" |
"6629884" | "6672943" | "6679243" |
"6694847" | "6818029" | "6935365" |
"7651386" | "6458018" |
"20100203811" | "2318570" |
"20030084894" | "20050215188" |
"20050260939" | "20060073774" |
"20060254154" | "20070051355" |
"20070066194" | "20070155298" |
"20090093195" | "3121981" |
"3630699" | "3664662" | "3852078" |
"4149881" | "4355489" | "4629373" |
"4749514" | "5037451" | "5137543" |
"5232320" | "5246884" | "5273730" |
"5364423" | "5454343" | "5746931" |
"5779743" | "5976001" | "5980852" |
"5980982" | "6299508" | "6371838" |
"6945857" | "7044990" | "7261621" |

		"RE20660" | "6125612" | "6354929" | "20100248595" | "2078354" | "2187624" | "2281558" | "2612348" | "2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S37	87	("6258201" | "6293854" | "6319108" | "6394886" | "6605798" | "6755720" | "7201645" | "7404857" | "7198553" | "2033991" | "2194253" | "20040079033" | "20060079162" | "20060135050" | "20070254566" | "20110275288" | "3293012" | "4182628" | "4211294" | "4273561" | "4341532" | "4945686" | "5000273" | "5011513" | "5030276" | "5043120" | "5203881" | "5264011" | "5380390" | "5453106" | "5833519" | "6281129" | "6284556" | "6439986" | "6551176" | "6607423" | "6627168" | "6824455" | "7323049" | "7384436" | "20070232074" | "20040180617" | "20100015898" | "1854071" | "2035521" | "2334572" | "20040009742" | "20060258276" | "20070093181" | "20070128994" | "20070264918" | "20090145045" | "20100248596" | "4228214" | "4289503" | "4712552" | "4770907" | "4927619" | "5131924" | "5194070" | "5197249" | "5271547" | "5492774" | "5551959" | "5560745" | "5725421" | "5791975" | "5801073" | "6039641" | "6123612" | "6368198" | "6446740" | "6616725" | "6835365" | "6979357" | "7066795" | "7690971" | "RE35812" | "20080271384" | "0238946").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/04/01 14:03
S38	48	(US-20120302146-$ or US-20130165023-$ or US-20120244790-$ or US-20010046835-$ or US-20070066194-$ or US-20070060026-$ or US-20070264918-$ or US-20080171503-$ or US-20080292869-$ or US-20100139174-$ or US-20100221990-$ or US-20110212670-$ or US-20060068691-$ or US-20070215486-$ or US-20070289223-$ or US-20020139680-$ or US-20070175765-$ or US-20020173234-$).did. or (US-6517424-$ or US-7300338-$ or US-7651386-$ or US-7690971-$ or US-7901272-$ or US-8414362-$ or US-5976205-$ or US-7241206-$ or US-7393264-$ or US-	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:23

		7494404-$ or US-5492771-$ or US-5511718-$ or US-6884155-$ or US-7124753-$ or US-7201645-$ or US-7258708-$ or US-7285039-$ or US-7473162-$ or US-7491116-$ or US-7544117-$ or US-7749050-$ or US-7771498-$ or US-8043145-$ or US-8104464-$ or US-8142261-$ or US-8298043-$).did. or (US-8298048-$ or US-8449357-$ or US-8491358-$ or US-8678878-$).did.				
S39	1	"7198553".pn.	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:41
S40	1203	tip adj (level leveling)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:42
S41	113033	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S42	8	S40 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S43	14761	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:52
S44	3	S40 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:53
S45	1212	tip adj (level leveling leveled)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:54
S46	8	S45 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2014/05/07 12:54

			IBM_TDB			
S47	59	protrusion adj difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 13:42
S48	4102	heat near2 pressure near2 bonding	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 13:59
S49	9	S48 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:00
S50	263	sintering adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:05
S51	3	S50 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S52	4	S50 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S53	1160	adhesive near2 transfer near2 sheet	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S54	12	S53 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S55	971	aperture near2 template	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2014/05/07 16:09

			EPO; JPO; DERWENT; IBM_TDB			
S56	0	S53 with S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S57	0	S53 same S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S58	44	("2223063" | "2642654" | "3817719" | "3894673" | "4018576" | "4042559" | "4311489" | "4378975" | "4621031" | "4652275" | "4799939" | "4925457" | "5000273" | "5049165" | "5131924" | "5203880" | "5203881" | "5251802" | "5264011" | "5304342" | "5380390" | "5486131" | "5492188" | "5511718" | "5569062" | "5605499" | "5707276" | "5782679" | "5832360" | "5833021" | "5871060" | "6039641" | "6123612" | "6361423" | "6434946" | "6679243").PN. OR ("7198553").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/05/08 22:41
S59	53542	hot adj pressing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S60	14766	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S61	581	S59 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S62	126	warping adj (reducing reduction minimizing mininized)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S63	0	S62 and S60	US-PGPUB; USPAT;	OR	OFF	2014/05/09 08:51

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S64	113048	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S65	0	S62 and S64	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:52
S66	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:43
S67	13	("20040235406" | "20060213128" | "20080014845" | "20090094902" | "20110076925" | "20110104989" | "20110192652" | "20120244790" | "20130225052" | "3593382" | "6299521" | "6372001" | "8545583").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:44
S68	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:46
S69	5	("20020182401" | "20110252710" | "7507267" | "7954483" | "8377158").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:48
S70	2	("5919084" | "6159286").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:50
S71	59	("1854071" | "1875930" | "1988065" | "2027087" | "2027307" | "2033991" | "2035521" | "2078354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2307461" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20010046835" | "20020042200" | "20020127962" | "20020139680" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:00
S72	26	("20040009742" | "20040060243" | "20040079033" | "20040091627" | "20040107648" | "20040180617" | "20040203325" | "20040238946" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" |	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:01

		"20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181").PN.				
S73	59	("20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918" | "20070266639" | "20070295267" | "20080076338" | "20080096479" | "20080171503" | "20080248305" | "20080271384" | "20080292869" | "20080296756" | "20090068937" | "20090145045" | "20090283089" | "20100015898" | "20100022174" | "20100139174" | "20100186479" | "20100203811" | "20100221990" | "20100248595" | "20100248596" | "20100261419" | "20110212670" | "20110275288" | "20110293905" | "20110296766" | "20120192499" | "20120241943" | "20120244790" | "20120260582" | "20120302146" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:03
S74	112	("3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:05
S75	71	("3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" |	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:07

		"4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247").PN.				
S76	164	("5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492771" | "5492774" | "5496386" | "5500248" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5669943" | "5674572" | "5725421" | "5746931" | "5772756" | "5776214" | "5779743" | "5791975" | "5801073" | "5816891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976001" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6125612" | "6179886" | "6190240" | "6196911" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918" | "6354929" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6458018" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616752" | "6626167" | "6627168" | "6629884" | "6672943" | "6692547" | "6722952" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6899592"	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:10

		"6905571" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7150677" | "7198553" | "7201645" | "7247577" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7494404" | "7585366" | "7641538" | "7651386" | "7658666" | "7662896" | "7690971" | "7791188" | "7840305" | "8104464" | "8393934" | "8398466" | "RE20660" | "RE35812").PN.				
S77	159296	cmp	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S78	1380104	pad	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S79	434842	dresser conditioner	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S80	3851	superabrasive	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S81	114947	monolayer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S82	1806819	matrix	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S83	609495	protrusion	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59

S84	1632039	tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S85	3944964	difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S86	12687	asperities	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S87	12692	cutting adj depth	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S88	3	S77 and S78 and S79 and S80 and S81 and S82 and S83 and S84 and S85 and S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:01
S89	3	S86 same S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:17
S90	36	S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:18
S91	2031	node adj size	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:50
S92	61	S91 same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2014/10/31 10:50

			DERWENT; IBM_TDB			
S93	15740	(line adj width) same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:59
S94	8820	(line adj width) with semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S95	114233	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S96	52	S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S97	198	oxidative adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:39
S98	1	S97 same slurry	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:40
S99	1	S95 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:41
S100	700	451/443.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:36
S101	381	451/444.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:37
S102	1446	451/548.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:40
S103	988	451/56.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:42
S104	140	b24b53/07.cpc.	USPAT;	OR	OFF	2015/05/06

			EPO			13:45
S105	874	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:46
S106	458	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:48
S107	1018	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:50
S108	1108	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:52
S109	679	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:54
S110	35	("20020014041" | "20020164928" | "20030092357" | "20040023610" | "20050032469" | "20050095959" | "20050118939" | "20050227590" | "20070232074" | "20080153398" | "20090073774" | "20090123705" | "20090215363" | "20110293905" | "20120192499" | "20120260582" | "20120302146" | "3664662" | "3706650" | "4151154" | "4405411" | "4737162" | "4863573" | "5224469" | "5868806" | "6159087" | "6200360" | "6312324" | "6416878" | "6769969" | "6837979" | "7067903" | "7651368" | "7762872").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:43
S111	1	("6193770").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:44
S112	1	"9138862".pn.	USPAT	OR	OFF	2015/10/27 11:58
S113	1	"8974270".pn.	USPAT	OR	OFF	2015/10/27 11:58
S114	1	"8622787".pn.	USPAT	OR	OFF	2015/10/27 11:59
S115	1	"8393934".pn.	USPAT	OR	OFF	2015/10/27 11:59
S116	142	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:56
S117	893	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:57
S118	0	b24b3/125.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:58
S119	459	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:59
S120	1028	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:00
S121	1133	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:01
S122	684	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:03
S123	1	"20040048557".pn.	US-PGPUB	OR	OFF	2016/05/24 21:24
S124	1	"7762872".PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/05/25 08:43

S125	9354	tip adj cutting	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:04
S126	8125	(superabrasive abrasive) adj particle	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S127	0	S125 with S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S128	16723	cutting adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S129	6	S128 with S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S130	91	("20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030084894" | "20030114094" | "20030207659" | "20050060941" | "20050118939" | "20050260939" | "20060079160" | "20060143991" | "20060254154" | "20070051355" | "20070066194" | "20070264918" | "3743489" | "3767371" | "3852078" | "4481016" | "4662896" | "4849602" | "4923490" | "4925457" | "4954139" | "5049165" | "5137543" | "5190568" | "5195403" | "5195404" | "5232320" | "5247765" | "5374293" | "5380390" | "5453106" | "5486131" | "5505272" | "5527424" | "5536202" | "5547417" | "5560745" | "5560754" | "5851138" | "5921856" | "5924917" | "5975988" | "6001008" | "6027659" | "6054183" | "6093280" | "6190240" | "6213856" | "6217413" | "6224469" | "6281129" | "6293854" | "6299508" | "6319108" | "6346202" | "6354918" | "6368198" | "6371838" | "6371842" | "6439986" | "6446740" | "6478831" | "6626167" | "6672943" | "6694847" | "6755720" | "6818029" | "6824455" | "6884155" |	US-PGPUB; USPAT; USOCR	OR	OFF	2016/05/25 09:11

		"6945857" | "7021995" | "7033408" | "7044990" | "7066795" | "7201645" | "7258708" | "7261621" | "7465217").PN. OR ("7762872").URPN.				
S131	19655	height near2 variation	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:55
S132	343	particle adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S133	0	S131 same S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S134	39	S131 and S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S135	419	451/539.ccls.	USPAT; USOCR	OR	OFF	2016/05/25 11:54
S136	637	451/539.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S137	16723	cutting adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S138	224432	S136 ans S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S139	0	S136 and S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2016/05/25 11:56

			DERWENT; IBM_TDB			
S140	2557	451/548-551.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:44
S141	8	S140 and S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:44
S142	343	particle adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:47
S143	7	S136 and S142	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:47
S144	5883	apex near2 tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:54
S145	9925	451/526-551.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:54
S146	14	S144 and S145	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:55

12/ 9/ 2016 9:28:47 AM
C:\ Users\ gnguyen\ Documents\ EAST\ Workspaces\ 14506476.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

CPC							
Symbol						**Type**	**Version**
B24B		53	/	017		F	2013-01-01
B24B		53	/	12		I	2013-01-01
B24D		3	/	00		I	2013-01-01
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 19	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723 (Primary Examiner) (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
451	443	B	2	4	B	53 / 00 (2006.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

NONE	Total Claims Allowed:	
(Assistant Examiner) (Date)	19	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner) (Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	6	17												
-	2	7	18												
-	3	8	19												
-	4	9	20												
-	5	10	21												
-	6	11	22												
-	7	-	23												
-	8	-	24												
-	9	12	25												
-	10	13	26												
-	11	14	27												
1	12	15	28												
2	13	16	29												
3	14	17	30												
4	15	18	31												
5	16	19	32												

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 19	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723 (Primary Examiner) (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

20551 7590 01/13/2017

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER
NGUYEN, GEORGE BINH MINH

ART UNIT	PAPER NUMBER
3723	

NOTIFICATION DATE	DELIVERY MODE
01/13/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@tnw.com
rich@tnw.com
annette.fields@tnw.com

Corrected Notice of Allowability	Application No. 14/506,476	Applicant(s) SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to _____.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *11-22 and 25-33*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/GEORGE NGUYEN/
Primary Examiner, Art Unit 3723

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

CPC						
Symbol					**Type**	**Version**
B24B		53	/	017	F	2013-01-01
B24B		53	/	12	I	2013-01-01
B24D		3	/	00	I	2013-01-01
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723	01/09/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
451	443	B 2 4 B 53 / 00 (2006.01.01)	

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723	01/09/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	7	17	21	33										
-	2	8	18												
-	3	9	19												
-	4	10	20												
-	5	11	21												
-	6	12	22												
-	7	-	23												
-	8	-	24												
-	9	13	25												
-	10	14	26												
1	11	15	27												
2	12	16	28												
3	13	17	29												
4	14	18	30												
5	15	19	31												
6	16	20	32												

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 21	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723 (Primary Examiner)	01/09/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

PTO/SB/30EFS (03-09)
Approved for use through 04/30/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	14/506,476	Filing Date	2014-10-03	Docket Number (if applicable)	02074-24012.NP.CIP2	Art Unit	3723
First Named Inventor	Chien-Min Sung			Examiner Name	George Binh Minh Nguyen		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 200100

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (03-09)
Approved for use through 04/30/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/David W. Osborne/	Date (YYYY-MM-DD)	2017-03-14
Name	David W. Osborne	Registration Number	44989

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

ART UNIT: 3723 EXAMINER: George Binh Minh Nguyen FIRST NAMED INVENTOR: Chien-Min Sung SERIAL NO.: 14/506,476 FILED: 10/3/2014 CONF. NO.: 9471 FOR: CMP PAD DRESSER HAVING LEVELED TIPS AND ASSOCIATED METHODS DOCKET NO.: 02074-24012.NP.CIP2	**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8** DATE OF DEPOSIT: **March 14, 2017** I hereby certify that this paper or fee (along with any paper or fee referred to as being attached or enclosed) is being submitted on the date indicated above via: ☒ EFS Web ☐ facsimile to _____ ☐ the United States Postal Service with sufficient postage as first class mail addressed to: Mail Stop _____, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. /Nicole Solomon/ Nicole Solomon

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §§ 1.56, 1.97 and 1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

Pursuant to the duty of disclosure under 37 C.F.R. §§ 1.56, 1.97 and 1.98, the Applicant requests consideration of this Information Disclosure Statement, which is being submitted in accordance with:

☒ 37 C.F.R. § 1.97(b)(1) or (3), within three months of the filing date of the application, or before a first office action on the merits, whichever occurs last;

☐ 37 C.F.R. § 1.97(c), after a first office action on the merits, but before a Final Office Action or a Notice of Allowance, whichever occurs first, and is accompanied by **EITHER** a statement in accordance with 37 C.F.R. § 1.97(e), **OR** the fee set forth in 37 C.F.R. § 1.17(p); or

☐ 37 C.F.R. § 1.97(d), after a Final Office Action, Notice of Allowance or Ex parte Quayle action, whichever occurs first, but on or before payment of the issue fee, and is accompanied

by **BOTH** a statement in accordance with 37 C.F.R. § 1.97(e), **AND** the fee set forth in 37 C.F.R. § 1.17(p).

SUBMISSIONS

Please find enclosed, pursuant to 37 C.F.R. §§ 1.97 and 1.98:

☒ Form **PTO/SB/08A** and/or **PTO/SB/08B** listing the references submitted for consideration, which contains a list of all patents, publications and all other items that have come to the attention of one or more of the individuals designated in 37 C.F.R. § 1.56(c).

☐ Legible copies of the listed non-patent documents, unpublished U.S. applications and foreign documents or their relevant portions are included.

☐ All English translations of each non-English reference, if any, within the possession, custody, control or availability of anyone designated in 37 C.F.R. § 1.56(c) (see 37 C.F.R. §1.98 are included.

☐ For all listed references that are not either in the English language, or accompanied by a translation into English, a concise explanation of relevance as required under 37 C.F.R. § 1.98(a)(3) is enclosed attached to each.

Copies of references listed on the enclosed PTO/SB/08A and/or PTO/SB/08B are **not** enclosed:

☐ because, under 37 C.F.R. § 1.98.(d), they were previously cited by or submitted to the Office in application number _____, which is relied upon for an earlier filing date under 37 C.F.R. § 1.20.

☐ because they are substantially cumulative of an enclosed reference.

STATEMENT IN ACCORDANCE WITH 37 C.F.R. § 1.97(e)

☐ I hereby certify that each item contained in the information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement.

☐ I hereby certify that no item contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of the information disclosure statement.

REMARKS

While no representation is made that any of these references may be "prior art" within the meaning of that term in accordance with 37 C.F.R. §§ 102 or 103, the enclosed list of references is disclosed so as to comply with the duty of disclosure set forth in 37 C.F.R. § 1.56.

Moreover, while no representation is made that a specific search of office files or patent office records has been conducted or that no better art exists, the undersigned attorney of record believes that the references listed, together with any other references which may have been previously submitted or listed, are the closest to the claimed invention (taken in its entirety) of which the undersigned is presently aware, and no art which is closer to the claimed invention (taken in its entirety) has been knowingly withheld.

☐ Check No. ____ in the amount of $ ____(amount in § 1.17(p)) constituting the submission fee set forth in 37 C.F.R. § 1.17(p) is enclosed.

In the event that 37 C.F.R. § 1.97(c) applies and the Examiner is not satisfied that the Statement meets the requirements of 37 C.F.R. § 1.97(e), or in any other event remediable by a fee, please credit any over payment or charge any additional fees to Deposit Account No. 20-0100 of the undersigned.

Dated this 14th day of March, 2017.

Respectfully submitted,

/David W. Osborne/

David W. Osborne
Attorney for Applicant
Registration No. 44989

THORPE NORTH & WESTERN, LLP
Customer No. 20,551
P.O. Box 1219
Sandy, Utah 84091-1219
Telephone: (801) 566-6633

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of | |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	George Binh Minh Nguyen
Attorney Docket Number	02074-24012.NP.CIP2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US 2002/0077037 A1	06-20-2002	Tietz	
		US 6419574 B1	07-16-2002	Takahashi et al.	
		US 2007/0167117 A1	07-19-2007	Moon et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]- Number[4] – Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English langnage Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	14506476
Filing Date:	03-Oct-2014
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Filer:	David William Osborne/Nicole Solomon
Attorney Docket Number:	02074-24012.NP.CIP2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1st Request	2801	1	600	600
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt

EFS ID:	28627448
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Nicole Solomon
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	14-MAR-2017
Filing Date:	03-OCT-2014
Time Stamp:	17:13:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$600
RAM confirmation Number	031517INTEFSW17140700
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	24012_NP_CIP2_Executed_Declaration.pdf	44101 9d9a730ee1e731f3212d09512de2aecb8b955b8c	no	1
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	24012_NP_CIP2_RCE.pdf	697662 eefd7b579b2ab1558fafe67ed2f61d8deb7273d2	no	3
Warnings:					
Information:					
3	Transmittal Letter	24012_NP_CIP2_Transmittal.pdf	72661 577604f9ea00f91124379088e2ee716938713e69	no	4
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	24012_NP_CIP2_IDS_A.pdf	74697 6b0e59da2ce687f47fa50b56a5898d94f02c2049	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
5	Fee Worksheet (SB06)	fee-info.pdf	30576 d594cddf5dc23382a12827494dd515692e352f45	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	919697		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket Number: 02074-24012.NP.CIP2 Substitute Form PTO/AIA/01

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	CMP Pad Dresser Having Leveled Tips and Associated Methods

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application or,

☑ United States application or PCT international application number 14/506,476

filed on 3/10/2014

The above-identified application was made or authorized to be made by me.

I have reviewed and understand the contents of the above-identified application, including the claims. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

LEGAL NAME OF INVENTOR

Inventor: Chien-Min Sung Date (Optional): 6/22/15

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

PLUS Search Results for S/N 14506476, Searched Mon Mar 27 10:13:38 EDT 2017

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

7651386 99
7690971 99
7901272 99
7901272 99
8414362 99
8449357 99
8974270 99
9138862 99
20070060026 99
20070264918 99
20080171503 99
20080292869 99
20090098814 99
20100139174 99
20100221990 99
20110212670 99
20120302146 99
20140099868 99
20140308883 99
20150133036 99
20150306734 99
20160263723 99
20160279758 99
6517424 83
6884155 83
7124753 83
7201645 83
7241206 83
7258708 83
7285039 83
7300338 83
7393264 83
7473162 83
7491116 83
7494404 83
7544117 83
7749050 83
7771498 83
8043145 83
8043145 83
8104464 83
8142261 83
8298043 83
8298048 83
8491358 83
8678878 83
8777699 83
8920214 83
9132526 83
9199357 83

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

20551 7590 04/11/2017

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER
NGUYEN, GEORGE BINH MINH

ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 04/11/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

TITLE OF INVENTION: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	07/11/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

20551 7590 04/11/2017
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

TITLE OF INVENTION: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	07/11/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, GEORGE BINH MINH	3723	451-443000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Ex. 1003, Page 301

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

20551 7590 04/11/2017

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

EXAMINER	
NGUYEN, GEORGE BINH MINH	
ART UNIT	PAPER NUMBER
3723	

DATE MAILED: 04/11/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/506,476	Applicant(s) SUNG, CHIEN-MIN	
	Examiner GEORGE NGUYEN	Art Unit 3723	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the RCE filed on 3/14/17*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *11-22, 25-33*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 3/14/2017
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/GEORGE NGUYEN/
Primary Examiner, Art Unit 3723

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

CPC						
Symbol					**Type**	**Version**
B24B		53	/	017	F	2013-01-01
B24B		53	/	12	I	2013-01-01
B24D		3	/	00	I	2013-01-01
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723	03/27/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
451	443	B	2	4	B	53 / 00 (2006.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723	03/27/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	**Art Unit**
	GEORGE NGUYEN	3723

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	7	17	21	33										
-	2	8	18												
-	3	9	19												
-	4	10	20												
-	5	11	21												
-	6	12	22												
-	7	-	23												
-	8	-	24												
-	9	13	25												
-	10	14	26												
1	11	15	27												
2	12	16	28												
3	13	17	29												
4	14	18	30												
5	15	19	31												
6	16	20	32												

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 21	
/GEORGE NGUYEN/ Primary Examiner.Art Unit 3723 (Primary Examiner)	03/27/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | | of |

Complete if Known	
Application Number	14/506,476
Filing Date	10/3/2014
First Named Inventor	Chien-Min Sung
Art Unit	3723
Examiner Name	George Binh Minh Nguyen
Attorney Docket Number	02074-24012.NP.CIP2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US 2002/0077037 A1	06-20-2002	Tietz	
		US 6419574 B1	07-16-2002	Takahashi et al.	
		US 2007/0167117 A1	07-19-2007	Moon et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]- Number[4] – Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	/GEORGE B NGUYEN/	Date Considered	03/27/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentially is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.B.N/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	3	("20020077037" | "6419574" | "20070167117").PN.	US-PGPUB; USPAT	OR	OFF	2017/03/27 10:27
S1	48	(US-20120244790-$ or US-20120302146-$ or US-20130165023-$ or US-20010046835-$ or US-20070066194-$ or US-20020139680-$ or US-20070175765-$ or US-20030084894-$ or US-20040112359-$ or US-20070051354-$ or US-20070051355-$ or US-20090283089-$ or US-20110296766-$ or US-20120192499-$ or US-20120220208-$ or US-20120260582-$ or US-20020173234-$ or US-20050095959-$ or US-20060068691-$ or US-20060073774-$).did. or (US-6517424-$ or US-7300338-$ or US-5492771-$ or US-5511718-$ or US-5976205-$ or US-7124753-$ or US-7771498-$ or US-8104464-$ or US-6884155-$ or US-7201645-$ or US-7241206-$ or US-7258708-$ or US-7285039-$ or US-7393264-$ or US-7473162-$ or US-7491116-$ or US-7494404-$ or US-7544117-$ or US-7651386-$ or US-7690971-$ or US-7749050-$ or US-7901272-$ or US-8043145-$ or US-8142261-$ or US-8298043-$ or US-8298048-$).did. or (US-8414362-$ or US-8449357-$).did.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:32
S2	6	("20070232074" | "20080271384" | "20090073774" | "7067903" | "7198553" | "7651386").PN.	US-PGPUB; USPAT	OR	OFF	2013/07/09 08:42
S3	10	("20040180617" | "20080076338" | "20100015898" | "6899592" | "7150677").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:42
S4	6	("0238946" | "0296756" | "7791188").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 08:43
S5	843	451/443.ccls.	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2013/07/09 09:39

			EPO; JPO; DERWENT; IBM_TDB			
S6	462	451/444.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:02
S7	84	("20070049185" | "6136043" | "3990124" | "4818515" | "6402603" | "6626747" | "7641538" | "20020068518" | "20040198206" | "4925457" | "6022266" | "6416878" | "6511713" | "RE26879" | "20080248734" | "20100022174" | "7467989" | "20060010780" | "5919084" | "6099603" | "7217172" | "7124753" | "5049165" | "5304223" | "5511718" | "5833724" | "6096107" | "6575353" | "20050214201" | "5921856" | "20060254154" | "5791975" | "5863306" | "6159087" | "6347982" | "20050260922" | "20040037948" | "5219462" | "6136143" | "20060010780" | "5152917" | "5669943" | "5842912" | "6679243" | "6769975" | "6234883" | "6309433" | "20020072302" | "20060213128" | "20050215188" | "20060073774" | "2175073" | "5645474" | "5683289" | "20050276979" | "20020197947" | "5492771" | "6358133" | "6368198" | "6537140" | "6572446" | "7258708" | "20080132153" | "20020173234" | "4968326" | "20020173234" | "4222204" | "4951423" | "5851138" | "7575503" | "6123612" | "6286498" | "20080004743" | "20070060026" | "5382189" | "6261167" | "6887138" | "20030036341" | "5014468" | "5980678" | "6293980" | "6818029" | "6039641" | "20050118820" | "20100022174").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 10:14
S8	1658	451/548.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:21
S9	4663	51/309.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 10:46
S10	180	S9 and (flatness warping)	US-PGPUB; USPAT;	OR	OFF	2013/07/09 10:47

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S11	2468	51/295.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:31
S12	86	S11 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:32
S13	1378	451/56.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S14	204	S13 and (flatness warping)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/09 12:37
S15	180	("1854071" | "1988065" | "0187593" | "2027087" | "2027307" | "2033991" | "2035521" | "2075354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659" | "20040009742" | "20040060243" | "20040079033" | "20040107648" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181" | "20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918" | "20070295267" | "20080096479" | "20080171503" | "20080292869" | "20090068937" | "20090093195" |	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:47

		"20090145045" | "20090283089" | "20100139174" | "20100186479" | "20100221990" | "20100248596" | "20110212670" | "20110275288" | "20110296766" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3905571" | "3982358" | "4028576" | "4078906" | "4149881" | "4182628" | "4188194" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4662896" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326").pn.				
S16	159	("5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492774" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5674572" | "5725421" | "5746931" | "5772756" | "5779743" | "5791975" | "5801073" | "5815891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6159286" | "6179886" | "6190240" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918"	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/09 12:49

		"6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616725" | "6616752" | "6626167" | "6627168" | "6646725" | "6672943" | "6679243" | "6694847" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7201645" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7585366" | "7651386" | "7658666" | "7690971" | "RE20660" | "RE35812").PN.				
S17	672	first near2 monolayer near2 second	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:42
S18	81761	rigid near2 support	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S19	0	S17 with S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:43
S20	341	sung-chien-min.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/16 11:47
S24	655	b24b53/07.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:04
S25	3143	b24b53/017.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:07
S26	608	451/443.ccls.	USPAT	OR	OFF	2014/02/24 11:31

S27	331	451/444.ccls.	USPAT	OR	OFF	2014/02/24 11:34
S28	912	451/548.ccls.	USPAT	OR	OFF	2014/02/24 11:37
S29	1838	b24b53/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/24 11:40
S34	6	("20040203325" | "20070266639" | "20100203811" | "20100248595" | "20120241943" | "6196911").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/02/25 09:10
S35	204	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305" | "20070266639" | "1988065" | "0187593" | "2652951" | "2725693" | "2811960" | "2876086" | "2952951" | "20030054746" | "20030114094" | "20040060243" | "20040107648" | "20050060941" | "20070295267" | "20080076338" | "20090283089" | "20100186479" | "3416560" | "3625666" | "3631638" | "4525179" | "4797241" | "4916869" | "4954139" | "5024680" | "5092082" | "5151107" | "5194071" | "5247765" | "5314513" | "5496386" | "5560754" | "5620489" | "5669943" | "5885137" | "5902173" | "6001008" | "6001174" | "6027659" | "6054183" | "6258138" | "6371842" | "6616752" | "6899592" | "6905571" | "7124753" | "7465217" | "7585366" | "8104464" | "20100261419" | "2307461" | "2268663" | "20060128288" | "20110212670" | "3127715" | "3440774" | "3894673" | "4201601" | "4551195" | "4908046" | "5022895" | "5133782" | "5195404" | "5243790" | "5248317" | "5443032" | "5486131" | "5500248" | "5518443" | "5609286" | "5772756" | "5820450" | "5916011" | "5921856" | "5961373" | "5976205" | "5985228" | "6190240" | "6224469" | "6258237" | "6286498" | "6325709" | "6354918" | "6409580" | "6544599" | "6749485" | "6884155" | "7033408" | "7258708" | "7658666" | "6722952" | "20040203325" |	USPAT	OR	OFF	2014/04/01 13:58

		"6692547" | "7494404" | "20060143991" | "20070051354" | "20070249270" | "20110293905" | "20120192499" | "3067551" | "3276852" | "3372010" | "3608134" | "4155721" | "4188194" | "4229186" | "4481016" | "4547257" | "4617181" | "4669522" | "4680199" | "4849602" | "4866888" | "4925457" | "4949511" | "5049165" | "5116568" | "5195403" | "5266236" | "5374293" | "5492771" | "5527424" | "5660894" | "5855314" | "6024824" | "6206942" | "6478831" | "6629884" | "6672943" | "6679243" | "6694847" | "6818029" | "6935365" | "7651386" | "6458018" | "20100203811" | "2318570" | "20030084894" | "20050215188" | "20050260939" | "20060073774" | "20060254154" | "20070051355" | "20070066194" | "20070155298" | "20090093195" | "3121981" | "3630699" | "3664662" | "3852078" | "4149881" | "4355489" | "4629373" | "4749514" | "5037451" | "5137543" | "5232320" | "5246884" | "5273730" | "5364423" | "5454343" | "5746931" | "5779743" | "5976001" | "5980852" | "5980982" | "6299508" | "6371838" | "6945857" | "7044990" | "7261621" | "RE20660" | "6125612" | "6354929" | "20100248595" | "2078354" | "2187624" | "2281558" | "2612348" | "2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S36	252	("2027087" | "2027307" | "2184348" | "20010003884" | "20010009844" | "20020042200" | "20040091627" | "20050032462" | "20080096479" | "20080171503" | "20080292869" | "20100139174" | "20110296766" | "3146560" | "3802130" | "3982358" | "4018576" | "4610699" | "4632817" | "4780274" | "4828582" | "4923490" | "5295402" | "5328548" | "5536202" | "5674572" | "5924917" | "5975988" | "6106382" | "6217413" | "6346202" | "6497853" | "6626167" | "6712552" | "6790126" | "7021995" | "7150677" | "7368013" | "7641538" | "7840305" | "20070266639" | "1988065" | "0187593" | "2652951" | "2725693" | "2811960" | "2876086" | "2952951"	US-PGPUB; USPAT	OR	OFF	2014/04/01 13:58

"20030054746" | "20030114094" |
"20040060243" | "20040107648" |
"20050060941" | "20070295267" |
"20080076338" | "20090283089" |
"20100186479" | "3416560" |
"3625666" | "3631638" | "4525179" |
"4797241" | "4916869" | "4954139" |
"5024680" | "5092082" | "5151107" |
"5194071" | "5247765" | "5314513" |
"5496386" | "5560754" | "5620489" |
"5669943" | "5885137" | "5902173" |
"6001008" | "6001174" | "6027659" |
"6054183" | "6258138" | "6371842" |
"6616752" | "6899592" | "6905571" |
"7124753" | "7465217" | "7585366" |
"8104464" | "20100261419" |
"2307461" | "2268663" |
"20060128288" | "20110212670" |
"3127715" | "3440774" | "3894673" |
"4201601" | "4551195" | "4908046" |
"5022895" | "5133782" | "5195404" |
"5243790" | "5248317" | "5443032" |
"5486131" | "5500248" | "5518443" |
"5609286" | "5772756" | "5820450" |
"5916011" | "5921856" | "5961373" |
"5976205" | "5985228" | "6190240" |
"6224469" | "6258237" | "6286498" |
"6325709" | "6354918" | "6409580" |
"6544599" | "6749485" | "6884155" |
"7033408" | "7258708" | "7658666" |
"6722952" | "20040203325" |
"6692547" | "7494404" |
"20060143991" | "20070051354" |
"20070249270" | "20110293905" |
"20120192499" | "3067551" |
"3276852" | "3372010" | "3608134" |
"4155721" | "4188194" | "4229186" |
"4481016" | "4547257" | "4617181" |
"4669522" | "4680199" | "4849602" |
"4866888" | "4925457" | "4949511" |
"5049165" | "5116568" | "5195403" |
"5266236" | "5374293" | "5492771" |
"5527424" | "5660894" | "5855314" |
"6024824" | "6206942" | "6478831" |
"6629884" | "6672943" | "6679243" |
"6694847" | "6818029" | "6935365" |
"7651386" | "6458018" |
"20100203811" | "2318570" |
"20030084894" | "20050215188" |
"20050260939" | "20060073774" |
"20060254154" | "20070051355" |
"20070066194" | "20070155298" |
"20090093195" | "3121981" |
"3630699" | "3664662" | "3852078" |
"4149881" | "4355489" | "4629373" |
"4749514" | "5037451" | "5137543" |
"5232320" | "5246884" | "5273730" |
"5364423" | "5454343" | "5746931" |
"5779743" | "5976001" | "5980852" |
"5980982" | "6299508" | "6371838" |
"6945857" | "7044990" | "7261621" |
"RE20660" | "6125612" | "6354929" |
"20100248595" | "2078354" |
"2187624" | "2281558" | "2612348" |

		"2867086" | "2947608" | "20020127962" | "20020173234" | "20030207659" | "20050118939" | "20060079160" | "20070060026" | "20090068937" | "20100221990" | "3743489" | "3767371" | "4078906" | "4211924" | "4287168" | "4565034" | "4662896" | "4776861" | "4883500" | "4943488" | "4968326" | "5092910" | "5164247" | "5176155" | "5190568" | "5458754" | "5505272" | "5547417" | "5776214" | "5851138" | "6030595" | "6093280" | "6179886").pn.				
S37	87	("6258201" | "6293854" | "6319108" | "6394886" | "6605798" | "6755720" | "7201645" | "7404857" | "7198553" | "2033991" | "2194253" | "20040079033" | "20060079162" | "20060135050" | "20070254566" | "20110275288" | "3293012" | "4182628" | "4211294" | "4273561" | "4341532" | "4945686" | "5000273" | "5011513" | "5030276" | "5043120" | "5203881" | "5264011" | "5380390" | "5453106" | "5833519" | "6281129" | "6284556" | "6439986" | "6551176" | "6607423" | "6627168" | "6824455" | "7323049" | "7384436" | "20070232074" | "20040180617" | "20100015898" | "1854071" | "2035521" | "2334572" | "20040009742" | "20060258276" | "20070093181" | "20070128994" | "20070264918" | "20090145045" | "20100248596" | "4228214" | "4289503" | "4712552" | "4770907" | "4927619" | "5131924" | "5194070" | "5197249" | "5271547" | "5492774" | "5551959" | "5560745" | "5725421" | "5791975" | "5801073" | "6039641" | "6123612" | "6368198" | "6446740" | "6616725" | "6835365" | "6979357" | "7066795" | "7690971" | "RE35812" | "20080271384" | "0238946").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/04/01 14:03
S38	48	(US-20120302146-$ or US-20130165023-$ or US-20120244790-$ or US-20010046835-$ or US-20070066194-$ or US-20070060026-$ or US-20070264918-$ or US-20080171503-$ or US-20080292869-$ or US-20100139174-$ or US-20100221990-$ or US-20110212670-$ or US-20060068691-$ or US-20070215486-$ or US-20070289223-$ or US-20020139680-$ or US-20070175765-$ or US-20020173234-$).did. or (US-6517424-$ or US-7300338-$ or US-7651386-$ or US-7690971-$ or US-7901272-$ or US-8414362-$ or US-5976205-$ or US-7241206-$ or US-7393264-$ or US-7494404-$ or US-5492771-$ or US-5511718-$ or US-6884155-$ or US-7124753-$ or US-7201645-$ or US-	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:23

		7258708-$ or US-7285039-$ or US-7473162-$ or US-7491116-$ or US-7544117-$ or US-7749050-$ or US-7771498-$ or US-8043145-$ or US-8104464-$ or US-8142261-$ or US-8298043-$).did. or (US-8298048-$ or US-8449357-$ or US-8491358-$ or US-8678878-$).did.				
S39	1	"7198553".pn.	US-PGPUB; USPAT	OR	OFF	2014/04/01 15:41
S40	1203	tip adj (level leveling)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:42
S41	113033	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S42	8	S40 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 11:43
S43	14761	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:52
S44	3	S40 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:53
S45	1212	tip adj (level leveling leveled)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:54
S46	8	S45 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 12:54
S47	59	protrusion adj difference	US-PGPUB; USPAT;	OR	OFF	2014/05/07 13:42

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S48	4102	heat near2 pressure near2 bonding	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 13:59
S49	9	S48 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:00
S50	263	sintering adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:05
S51	3	S50 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S52	4	S50 and S41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 14:06
S53	1160	adhesive near2 transfer near2 sheet	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S54	12	S53 and S43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 15:46
S55	971	aperture near2 template	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:09

S56	0	S53 with S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S57	0	S53 same S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/07 16:10
S58	44	("2223063" | "2642654" | "3817719" | "3894673" | "4018576" | "4042559" | "4311489" | "4378975" | "4621031" | "4652275" | "4799939" | "4925457" | "5000273" | "5049165" | "5131924" | "5203880" | "5203881" | "5251802" | "5264011" | "5304342" | "5380390" | "5486131" | "5492188" | "5511718" | "5569062" | "5605499" | "5707276" | "5782679" | "5832360" | "5833021" | "5871060" | "6039641" | "6123612" | "6361423" | "6434946" | "6679243").PN. OR ("7198553").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/05/08 22:41
S59	53542	hot adj pressing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S60	14766	"51"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S61	581	S59 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:18
S62	126	warping adj (reducing reduction minimizing mininized)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S63	0	S62 and S60	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2014/05/09 08:51

			IBM_TDB			
S64	113048	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:51
S65	0	S62 and S64	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/05/09 08:52
S66	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:43
S67	13	("20040235406" | "20060213128" | "20080014845" | "20090094902" | "20110076925" | "20110104989" | "20110192652" | "20120244790" | "20130225052" | "3593382" | "6299521" | "6372001" | "8545583").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:44
S68	4	("20080014845" | "20090094902" | "20110104989" | "20130225052").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:46
S69	5	("20020182401" | "20110252710" | "7507267" | "7954483" | "8377158").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:48
S70	2	("5919084" | "6159286").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 09:50
S71	59	("1854071" | "1875930" | "1988065" | "2027087" | "2027307" | "2033991" | "2035521" | "2078354" | "2184348" | "2187624" | "2194253" | "2268663" | "2281558" | "2307461" | "2318570" | "2334572" | "2612348" | "2652951" | "2725693" | "2811960" | "2867086" | "2876086" | "2947608" | "2952951" | "20010003884" | "20010009844" | "20010046835" | "20020042200" | "20020127962" | "20020139680" | "20020173234" | "20030054746" | "20030084894" | "20030114094" | "20030207659").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:00
S72	26	("20040009742" | "20040060243" | "20040079033" | "20040091627" | "20040107648" | "20040180617" | "20040203325" | "20040238946" | "20050032462" | "20050060941" | "20050118939" | "20050215188" | "20050260939" | "20060073774" | "20060079160" | "20060079162" | "20060128288" | "20060135050" | "20060143991" | "20060254154" | "20060258276" | "20070051354" | "20070051355" | "20070060026" | "20070066194" | "20070093181").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:01

S73	59	("20070128994" | "20070155298" | "20070249270" | "20070254566" | "20070264918" | "20070266639" | "20070295267" | "20080076338" | "20080096479" | "20080171503" | "20080248305" | "20080271384" | "20080292869" | "20080296756" | "20090068937" | "20090145045" | "20090283089" | "20100015898" | "20100022174" | "20100139174" | "20100186479" | "20100203811" | "20100221990" | "20100248595" | "20100248596" | "20100261419" | "20110212670" | "20110275288" | "20110293905" | "20110296766" | "20120192499" | "20120241943" | "20120244790" | "20120260582" | "20120302146" | "3067551" | "3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:03
S74	112	("3121981" | "3127715" | "3146560" | "3276852" | "3293012" | "3372010" | "3377411" | "3416560" | "3440774" | "3608134" | "3625666" | "3630699" | "3631638" | "3743489" | "3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" | "4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247" | "5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:05
S75	71	("3767371" | "3802130" | "3819814" | "3852078" | "3894673" | "3982358" | "4018576" | "4078906" | "4149881" | "4155721" | "4182628" | "4188194" | "4201601" | "4211294" | "4211924" | "4224380" | "4228214" | "4229186" | "4273561" | "4287168" | "4289503" |	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:07

		"4341532" | "4355489" | "4481016" | "4525179" | "4547257" | "4551195" | "4565034" | "4610699" | "4617181" | "4629373" | "4632817" | "4669522" | "4680199" | "4712552" | "4749514" | "4770907" | "4776861" | "4780274" | "4797241" | "4828582" | "4849602" | "4866888" | "4883500" | "4908046" | "4916869" | "4923490" | "4925457" | "4927619" | "4943488" | "4945686" | "4949511" | "4954139" | "4968326" | "5000273" | "5011513" | "5022895" | "5024680" | "5030276" | "5037451" | "5043120" | "5049165" | "5092082" | "5092910" | "5116568" | "5131924" | "5133782" | "5137543" | "5151107" | "5164247").PN.				
S76	164	("5176155" | "5190568" | "5194070" | "5194071" | "5195403" | "5195404" | "5197249" | "5203881" | "5232320" | "5243790" | "5246884" | "5247765" | "5248317" | "5264011" | "5266236" | "5271547" | "5273730" | "5295402" | "5314513" | "5328548" | "5364423" | "5374293" | "5380390" | "5443032" | "5453106" | "5454343" | "5458754" | "5486131" | "5492771" | "5492774" | "5496386" | "5500248" | "5505272" | "5518443" | "5527424" | "5536202" | "5547417" | "5551959" | "5560745" | "5560754" | "5609286" | "5620489" | "5660894" | "5669943" | "5674572" | "5725421" | "5746931" | "5772756" | "5776214" | "5779743" | "5791975" | "5801073" | "5816891" | "5820450" | "5833519" | "5851138" | "5855314" | "5885137" | "5902173" | "5916011" | "5921856" | "5924917" | "5961373" | "5975988" | "5976001" | "5976205" | "5980852" | "5980982" | "5985228" | "6001008" | "6001174" | "6024824" | "6027659" | "6030595" | "6039641" | "6054183" | "6093280" | "6106382" | "6123612" | "6125612" | "6179886" | "6190240" | "6196911" | "6206942" | "6213856" | "6217413" | "6224469" | "6258138" | "6258201" | "6258237" | "6281129" | "6284556" | "6286498" | "6293854" | "6299508" | "6319108" | "6325709" | "6346202" | "6354918" | "6354929" | "6368198" | "6371838" | "6371842" | "6394886" | "6409580" | "6439986" | "6446740" | "6458018" | "6478831" | "6497853" | "6544599" | "6551176" | "6605798" | "6607423" | "6616752" | "6626167" | "6627168" | "6629884" | "6672943" | "6692547" | "6722952" | "6749485" | "6755720" | "6790126" | "6818029" | "6824455" | "6835365" | "6884155" | "6899592" | "6905571" | "6935365" | "6945857" | "6979357" | "7021995" | "7033408" | "7044990" | "7066795" | "7124753" | "7150677" | "7198553" | "7201645" |	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/30 10:10

		"7247577" | "7258708" | "7261621" | "7323049" | "7368013" | "7384436" | "7404857" | "7465217" | "7494404" | "7585366" | "7641538" | "7651386" | "7658666" | "7662896" | "7690971" | "7791188" | "7840305" | "8104464" | "8393934" | "8398466" | "RE20660" | "RE35812").PN.				
S77	159296	cmp	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S78	1380104	pad	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S79	434842	dresser conditioner	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S80	3851	superabrasive	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S81	114947	monolayer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:58
S82	1806819	matrix	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S83	609495	protrusion	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S84	1632039	tip	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2014/10/31 09:59

			EPO; JPO; DERWENT; IBM_TDB			
S85	3944964	difference	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 09:59
S86	12687	asperities	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S87	12692	cutting adj depth	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:00
S88	3	S77 and S78 and S79 and S80 and S81 and S82 and S83 and S84 and S85 and S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:01
S89	3	S86 same S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:17
S90	36	S86 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:18
S91	2031	node adj size	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:50
S92	61	S91 same semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 10:50
S93	15740	(line adj width) same semiconductor	US-PGPUB; USPAT;	OR	OFF	2014/10/31 10:59

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S94	8820	(line adj width) with semiconductor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S95	114233	"451"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S96	52	S94 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:00
S97	198	oxidative adj compound	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:39
S98	1	S97 same slurry	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:40
S99	1	S95 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/10/31 11:41
S100	700	451/443.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:36
S101	381	451/444.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:37
S102	1446	451/548.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:40
S103	988	451/56.ccls.	USPAT; USOCR	OR	OFF	2015/05/06 13:42
S104	140	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:45
S105	874	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:46

S106	458	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:48
S107	1018	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:50
S108	1108	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:52
S109	679	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/05/06 13:54
S110	35	("20020014041" | "20020164928" | "20030092357" | "20040023610" | "20050032469" | "20050095959" | "20050118939" | "20050227590" | "20070232074" | "20080153398" | "20090073774" | "20090123705" | "20090215363" | "20110293905" | "20120192499" | "20120260582" | "20120302146" | "3664662" | "3706650" | "4151154" | "4405411" | "4737162" | "4863573" | "5224469" | "5868806" | "6159087" | "6200360" | "6312324" | "6416878" | "6769969" | "6837979" | "7067903" | "7651368" | "7762872").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:43
S111	1	("6193770").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/05/06 14:44
S112	1	"9138862".pn.	USPAT	OR	OFF	2015/10/27 11:58
S113	1	"8974270".pn.	USPAT	OR	OFF	2015/10/27 11:58
S114	1	"8622787".pn.	USPAT	OR	OFF	2015/10/27 11:59
S115	1	"8393934".pn.	USPAT	OR	OFF	2015/10/27 11:59
S116	142	b24b53/07.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:56
S117	893	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:57
S118	0	b24b3/125.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:58
S119	459	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2015/10/28 08:59
S120	1028	b24b37/04.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:00
S121	1133	b24b37/042.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:01
S122	684	b24b57/02.cpc.	USPAT; EPO	OR	OFF	2015/10/28 09:03
S123	1	"20040048557".pn.	US-PGPUB	OR	OFF	2016/05/24 21:24
S124	1	"7762872".PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/05/25 08:43
S125	9354	tip adj cutting	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2016/05/25 09:04

			EPO; JPO; DERWENT; IBM_TDB			
S126	8125	(superabrasive abrasive) adj particle	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S127	0	S125 with S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S128	16723	cutting adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S129	6	S128 with S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:06
S130	91	("20010009844" | "20020042200" | "20020127962" | "20020173234" | "20030084894" | "20030114094" | "20030207659" | "20050060941" | "20050118939" | "20050260939" | "20060079160" | "20060143991" | "20060254154" | "20070051355" | "20070066194" | "20070264918" | "3743489" | "3767371" | "3852078" | "4481016" | "4662896" | "4849602" | "4923490" | "4925457" | "4954139" | "5049165" | "5137543" | "5190568" | "5195403" | "5195404" | "5232320" | "5247765" | "5374293" | "5380390" | "5453106" | "5486131" | "5505272" | "5527424" | "5536202" | "5547417" | "5560745" | "5560754" | "5851138" | "5921856" | "5924917" | "5975988" | "6001008" | "6027659" | "6054183" | "6093280" | "6190240" | "6213856" | "6217413" | "6224469" | "6281129" | "6293854" | "6299508" | "6319108" | "6346202" | "6354918" | "6368198" | "6371838" | "6371842" | "6439986" | "6446740" | "6478831" | "6626167" | "6672943" | "6694847" | "6755720" | "6818029" | "6824455" | "6884155" | "6945857" | "7021995" | "7033408" | "7044990" | "7066795" | "7201645" | "7258708" | "7261621" | "7465217").PN. OR	US-PGPUB; USPAT; USOCR	OR	OFF	2016/05/25 09:11

		("7762872").URPN.				
S131	19655	height near2 variation	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:55
S132	343	particle adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S133	0	S131 same S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S134	39	S131 and S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 09:56
S135	419	451/539.ccls.	USPAT; USOCR	OR	OFF	2016/05/25 11:54
S136	637	451/539.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S137	16723	cutting adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S138	224432	S136 ans S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:55
S139	0	S136 and S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 11:56
S140	2557	451/548-551.ccls.	US-PGPUB;	OR	OFF	2016/05/25

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			12:44
S141	8	S140 and S137	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:44
S142	343	particle adj tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:47
S143	7	S136 and S142	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:47
S144	5883	apex near2 tip	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:54
S145	9925	451/526-551.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:54
S146	14	S144 and S145	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/25 12:55
S147	938	b24b53/017.cpc.	USPAT; EPO	OR	OFF	2016/12/09 09:21
S148	473	b24b53/12.cpc.	USPAT; EPO	OR	OFF	2016/12/09 09:22
S149	107	b24d3/00.cpc.	USPAT; EPO	OR	OFF	2016/12/09 09:25

3/27/2017 10:44:59 AM
C:\Users\gnguyen\Documents\EAST\Workspaces\14506476.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14506476	SUNG, CHIEN-MIN
	Examiner	Art Unit
	GEORGE NGUYEN	3723

CPC- SEARCHED		
Symbol	Date	Examiner
B24B53/07;53/017;53/12;37/04;37/042;57/02	10/28/2015	GN
updated search above	7/7/2016	GN
B24D3/00	12/9/2016	GN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
451	443,444,548,56	10/28/2015	GN

SEARCH NOTES		
Search Notes	Date	Examiner
updated parent search 13/802,112	10/28/2015	GN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Please see East search history	10/28/2015	GN

PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22314-1450
or Fax **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note Use Block 1 for any change of address)

Thorpe North & Western, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Nicole Solomon	(Depositor's Name)
/Nicole Solomon/	(S-signature)
July 6, 2017	(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2	9471

TITLE OF INVENTION: CMP Pad Dresser Having Leveled Tips and Associated Methods

APPLN: TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	07/11/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, GEORGE BINH MINH	3723	451-443000

1. Change of correspondence address or indication of "Fee Address" (37CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered attorney or agent. If no name is listed, no name will be printed

1. Thorpe North & Western, LLP
2. David W. Osborne
3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.
1a. NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fees(s): **(Please first reapply and previously paid fee shown above)**
☐ A check is enclosed
☑ Payment be credit card. Form PTO-2038 is attached
☑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 02-0100 (enclose an extra copy of this form)

5. Change of Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29 NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27 NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status. NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /David W. Osborne/ Date July 6, 2017

Typed or printed name David W. Osborne Registration No. 44989

Electronic Patent Application Fee Transmittal

Application Number:	14506476
Filing Date:	03-Oct-2014
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Filer:	David William Osborne/Nicole Solomon
Attorney Docket Number:	02074-24012.NP.CIP2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**480**

Electronic Acknowledgement Receipt

EFS ID:	29710247
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	David William Osborne/Nicole Solomon
Filer Authorized By:	David William Osborne
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	06-JUL-2017
Filing Date:	03-OCT-2014
Time Stamp:	19:44:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$480
RAM confirmation Number	070717INTEFSW19452600
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	24012_NP_CIP2_Issue_fee.pdf	82898 2a3ac4874e86de9ee401d308bb43691e851cadf4	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30700 a5c2c1eb9ec24d4df9402e049ca380a31171568a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	113598		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/506,476	08/08/2017	9724802	02074-24012.NP.CIP2	9471

20551 7590 07/19/2017

THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Chien-Min Sung, Tansui, TAIWAN;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
20cv247-RGA	2/20/2020	District of Delaware

PLAINTIFF	DEFENDANT
CHIEN-MIN SUNG	KINIK COMPANY

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 9,724,802 B2	8/8/2017	Chien-Min Sung
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
see attached Order

CLERK	(BY) DEPUTY CLERK	DATE
John A. Cerino	N. Schmyer	8/16/2021

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

PTO/AIA/81A (02-15)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT - POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Patent Number	9,724,802
Issue Date	August 8, 2017
First Named Inventor	Chien-Min SUNG
Title	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
Attorney Docket No.	

I hereby revoke all previous powers of attorney given in the above-identified patent.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the Customer Number identified in the box at right as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

134688

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified patent to:

☒ The address associated with the above-identified Customer Number.

OR

☐ The address associated with the Customer Number identified in the box at right.

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☒ Applicant.

OR

☐ Patent owner.

Statement under 37 CFR 3.73(c) (Form PTO/AIA/96) submitted herewith or filed on _____

SIGNATURE of Applicant or Patent Owner

Signature		Date	2021/5/18
Name	Dr. Chien-Min Sung	Telephone	886-13337586919
Title and Company			

NOTE: Signatures of all the applicants or patent owners of the entire interest or their representative(s) are required. If more than one signature is required, submit multiple forms, check the box below, and identify the total number of forms submitted in the blank below.

☐ A total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Chien-Min SUNG

Application No./Patent No.: 9,724,802 Filed/Issue Date: August 8, 2017

Titled: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

Chien-Min SUNG, a individual

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Chien-Min SUNG To: KINIK Company

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: KINIK Company To: Chien-Min SUNG

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/James M. Lennon/	2021-08-19
Signature	Date
James M. Lennon	56815
Printed or Typed Name	Title or Registration Number

U.S. PATENT ASSIGNMENT

To the extent that KINIK COMPANY ("Assignor"), a corporation organized and existing under the laws of Republic of China (R.O.C.), with a place of business at No. 64 Zhongshan Road, Yingge District, New Taipei City 23942, Taiwan (R.O.C.), is the owner of the following (i) and (ii), or to the extent Assignor owns, controls or has the right to practice, license, or enforce any such patent or patents at any time: (i) United States Patent listed in Schedule A; (ii) any continuations, divisional, continuations-in-part, extensions, substitutions, reissues, renewals and all results of oppositions, reexaminations, supplemental examinations, requests for continued examination and other review procedures of any of the foregoing in subsection (i) (together the "Assigned Patents").

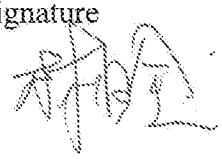
WHEREAS, Dr. Chien-Min Sung ("Assignee") is the rightful owner of the Assigned Patents but is desirous of acquiring complete and clear title in and to the Assigned Patents to the extent that Assignee does not already own such title in and to the Assigned Patents.

WHEREAS, Assignor has asserted certain ownership of its right, title, and interest in and to the Assigned Patents but has now disclaimed that Assignor has such right, title, and interest in and to the Assigned Patents subject to and without prejudice to any of the rights and interests of each of the Parties pursuant to the terms of the Settlement Transcript prepared by the Intellectual Property Court of Taiwan and agreed and executed by the Parties on 13 August 2021 before the judge of the said court (the "Settlement Transcript").

WHEREAS, Assignor desires to sell, assign, and transfer all its right, title, and interest, if any, in the Assigned Patents to Assignee, and Assignee desires to obtain all such right, title, and interest in the Assigned Patents from Assignor.

NOW, THEREFORE, in consideration of good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, to the extent Assignor is the owner of or asserts certain ownership of any right, title and/or interest in the Assigned Patents, Assignor hereby sells, assigns, transfers and conveys unto Assignee, its permitted successors and assigns, all of Assignor's right, title, and interest in and to the Assigned Patents, together with all claims, demands, or causes of action that Assignor has or might have by reason of any infringement of the Assigned Patents prior to the effective date of this assignment, including the right to sue and collect damages for all past, present and future infringement and all lost profits resulting therefrom.

IN WITNESS WHEREOF, this Agreement has been executed by duly authorized representatives of the Parties on the dates below.

Signature	Signature
Dr. Chien-Min Sung	
Name	Name Po Chun Lin
Date:	Date: Aug/13/2021

SCHEDULE A

9868100

9724802

8777699

9138862

8974270

Electronic Acknowledgement Receipt

EFS ID:	43554336
Application Number:	14506476
International Application Number:	
Confirmation Number:	9471
Title of Invention:	CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS
First Named Inventor/Applicant Name:	Chien-Min Sung
Customer Number:	20551
Filer:	James Michael Lennon/Jennifer Picini
Filer Authorized By:	James Michael Lennon
Attorney Docket Number:	02074-24012.NP.CIP2
Receipt Date:	19-AUG-2021
Filing Date:	03-OCT-2014
Time Stamp:	16:01:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	9724802-POA-signed.pdf	525590 567e7e0dff080ccc4c9bba16fe821b1ea24af8e1	no	1

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	9724802-373c-statement.pdf	104622 677ee918414d3ec3e69adb4b5cea95356dd59a59	no	2
Warnings:					
Information:					
3	Miscellaneous Incoming Letter	9138862-assignment-Sung-to-Kinik.pdf	2168239 ac53f7008aff6b97f7ee8b6ae9d81b69eaf3be4e	no	37
Warnings:					
Information:					
4	Miscellaneous Incoming Letter	Assignment-Kinik-to-Sung.pdf	2172382 d39afb19dbeecf15c7054343429dd21b2c9dc08e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4970833		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Joint Venture Agreement

This Agreement is made between Mr. Frank S. Lin, representing China Grinding Wheel Corp. (CGW), and Dr. Chien-Min Sung (Sung) on the mutual commitment to establish a joint venture for manufacturing diamond tools. Whereas CGW is willing to contribute all resources to support this joint venture, and Sung is willing to contribute all technologies required by this joint venture. Now therefore, both parties have agreed to the following:

1. The joint venture will be a subsidiary of CGW. It will be managed by Mr. Lin or his designate.

2. The ownership of this joint venture is 2/3 for CGW; and 1/3 for Sung.

3. The joint venture will manufacture brazed diamond tools, new diamond sawblades, diamond composites, and other superabrasives products as designated by Sung.

4. Sung is in the process of preparing certain patent applications for his technologies. If granted, Sung will own these patent rights. However, CGW can use these patents without paying royalty.

5. The return for this joint venture for Sung is 7% of all revenues and sales as derived from this joint venture. Payment will be made semi-annually. All other returns or losses belong to CGW.

6. CGW has the option to purchase Sung's share of this joint venture after 10 years in operation. It is agreed that the price of this purchase is 1/3 of the total revenue that could be derived from this joint venture in the preceding year. If CGW decides not to purchase Sung's share after 10 years of operation, Sung will

林三正 12/28 正林印心　宋健民 10/28/85

continue to receive 7% from the total revenue each year, payable every 6 months. However upon reaching the 17th year of the operation of the joint venture, All Sung's share will automatically be transferred to CGW at no cost. From then on, the joint venture will become a wholly owned subsidiary of CGW.

7. Sung will also be hired as the Chief Engineer of CGW. In this capacity, he is reporting directly to the General Manager of CGW.

8. Sung's salary as an employee of CGW and the above mentioned joint venture will be NT 250K per month with 15 months to be paid each year. It is agreed that this salary will automatically increase ~~7%~~ 4 for every 12 months of employment at CGW. 朱健民/10/29/85

ten thousand NT dollars

朱健民 11/4/85

The above agreed items serve as the guidelines for the joint venture and employment. It is understood that detailed execution of these guidelines will be worked out by mutual negotiation based on good faith. Furthermore, these guidelines can be modified, if necessary, by future amendments that are signed by both CGW and Sung. It is understood that both CGW and Sung must fulfill this Agreement faithfully, and neither party can modify or terminate this Agreement unilaterally.

Stipulated and agreed, signed by:

林心正 正林印心 Date 10/28-85

Frank S. Lin, General Manager, China Grinding Wheel Corp.

朱健民 Date 10/28/85

Chien-Min Sung

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Mail Stop Assignment Recordation Services
Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Transmittal of English Translation of the "Joint Venture Agreement"

Dear Sir:

Attached is an English translation of the "Joint Venture Agreement", which was signed on August 21, 2002. I hereby attest that this translation is a true and accurate translation of the Joint Venture Agreement, to the best of my abilities and knowledge.

Respectfully submitted,

Date: Feb. 20, 2013

Chien-Hao Lu

Translator of Baker & McKenzie Taipei
15F 168 Dun-Hua North Road, Taipei, Taiwan

[Translation]

Joint Venture Agreement

By entering into this Agreement, Mr. Frank S. Lin (林心正), the general manager and representative of Kinik Company ("**Kinik**"), and Dr. Chien-Min Sung (宋健民) ("**Mr. Sung**") have mutually covenanted to cooperate in the production and marketing of diamond products. Whereas Kinik desires to provide necessary resources other than technologies to support this Joint Venture and Mr. Sung agrees to provide the technologies necessary in the Joint Venture, now therefore, the parties agree to the following:

1. This Joint Venture will be implemented by a subsidiary jointly formed by the parties, to be operated and administered by Mr. Lin or a person designated by Mr. Lin.

2. Two thirds of the capital required for establishment of the subsidiary for this Joint Venture shall be contributed by Kinik, with the value of the technologies provided by Mr. Sung stands for the other one third of the capital.

3. This Joint Venture will produce the products advised by Mr. Sung for development and manufacturing subject to approval of Kinik.

4. During the implementation of the Joint Venture, Mr. Sung will prepare to file applications for certain patents on his technologies. If the patent application filed by Mr. Sung is approved, he will be the owner of the approved patent, provided that Kinik shall be able to use the patent on a royalty free basis.

5. In addition that this Joint Venture may be implemented by the new company jointly formed by the parties, it may also be implemented in an independent operating unit to be formed within Kinik, provided that in the latter case, for the products described in Paragraph 3, Kinik shall pay the royalties at 7% of the "annual net operating revenues" for the terms agreed to by the parties according to the Agreement, to Mr. Sung as compensation for use of his patents. Net operating revenues shall be calculated and payment of royalties shall be made on a biannual basis. Other incomes or losses shall all be the incomes or losses of Kinik.

6. This Joint Venture will use the patents owned by Mr. Sung, including ROC Invention Patent No. 115958 "metal bond diamond tools that contain uniform or patterned distribution of diamond grits and method of manufacture thereof", and Patent No. 125249 "brazed diamond tools by infiltration", and the two US patents granted to Mr. Sung, i.e. US 6,039,641 "BRAZED DIAMOND TOOLS BY INFILTRATION" and US 6,286,498 B1 "METAL BOND DIAMOND TOOLS THAT CONTAIN UNIFORM OR PATTERNED DISTRIBUTION OF DIAMOND GRITS AND METHOD OF MANUFACTURE THEREOF". If Mr. Sung is granted a new patent, Kinik may enter

CHL
Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0484

into a separate Joint Venture Agreement for that patent, if necessary, consistent with the spirit of this Agreement as the basis of implementation.

7. The implementation period under this Joint Venture is seventeen (17) years, provided that after ten (10) years of implementation of this Joint Venture (i.e. 2007), Kinik will have the option to buy back all the shares or rights owned by or entitled to Mr. Sung in the project (excluding the shares purchased by Mr. Sung in his own name). Upon exercise of the option, the project will be deemed early terminated. The two methods of implementation described in Paragraph 5 are agreed to as follows:

   (1) A new company jointly established by the parties

   Kinik's exercise price of the option shall be one third of the overall revenues that may be generated by the Joint Venture in the previous year (i.e. 2006). Mr. Sung shall complete the transfer of the shares to Kinik within three (3) days after receipt of Kinik's payment for purchase of his shares. If Kinik decides not to exercise its option, the following terms shall apply:

   A. If the new company jointly established by the parties is not a listed/OTC company

   From that year to the 17th anniversary of implementation of the Joint Venture (i.e. from 2007 to 2013), Kinik shall in the manner described in Paragraph 5 pay Mr. Sung the royalties on 14 occasions, and Mr. Sung shall divide the shares he holds then in early 2007 into 14 equal parts, with one part to be transferred to Kinik every time he receives the payment from Kinik. All gratuitous stock distributed during the same period of time shall be owned by Kinik. In other words, at the end of the 17th year of implementation of the Joint Venture, all shares owned by Mr. Sung shall be completely transferred to Kinik for the price as calculated in Paragraph 5 from 2007 to 2013. Thenceforward, this Joint Venture shall completely belong to Kinki's subsidiary.

   B. If the new company jointly established by the parties is a listed/OTC company

   In this case, Mr. Sung may elect to sell all his shares at once or on several occasions at the stock exchange/OTC market at the time and for the price he chooses in his discretion. Where it is deemed necessary, Kinik may buy back the shares sold by Mr. Sung in the stock exchange/OTC market. This Agreement automatically terminates on the date when Mr. Sung has sold all his shares. If otherwise, this Agreement shall continue to be effective until December 31, 2013.

CHL
Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0485

(2) An independent operation unit formed within Kinik

In this case, Kinik's exercise price of the option shall be the same as described in the above paragraph. If Kinik chooses not to exercise its option, Mr. Sung may start to receive royalties from Kinik in the amount as calculated in Paragraph 5 from the first day of the project until the end of the 17th year of implementation of the Joint Venture, i.e. from 2007 to 2013.

8. At the end of the 17th year of implementation of this Joint Venture or upon early termination due to Kinik's exercise of its option in the 10th year, both Kinik and the new company jointly established by the parties under this Agreement may continue to use the patents described in Paragraph 6 on a royalty free basis.

9. Mr. Sung will be appointed as the chief engineer of Kinik and he will in this capacity directly report to the general manager of Kinik.

10. Mr. Sung's starting monthly salary will be NT$ 250,000. Other matters relating to salary and compensation shall be governed by Kinik's human resources policy.

11. This Agreement was originally entered into on October 28, 1996. The first amendment was on August 21, 2002.

The above agreement is a general guideline for this Joint Venture and employment. A detailed implementation of the guideline should be subject to good faith trust and determination through mutual discussions and negotiations. Further, when necessary, the guideline may be modified through the amendment to be signed by Kinik and Mr. Sung. Both Kinik and Mr. Sung shall faithfully perform this Agreement, and neither party may unilaterally revise or terminate this Agreement.

Note: The patents granted to Mr. Sung in and outside Taiwan as described in Paragraphs 4, 6 and 8 may be used by Kinik on a non-exclusive license basis.

Signed by:
Frank S. Lin (林心正),
General Manager of Kinik Company

Chien-Min Sung (宋健民)

Date: August 21, 2002

CHL
Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0486

Joint Venture Agreement

本契約書為代表中國砂輪企業股份有限公司的總經理林心正先生(以下簡稱中砂)和宋健民博士(以下簡稱宋先生)對合作生產及銷售鑽石產品所簽訂的互相承諾。鑒於中砂願意提供技術以外必要資源支持這項 Joint Venture，宋先生願意提供在 Joint Venture 中需要的技術。因此，兩方同意如下：

1. 這項 Joint Venture 將由雙方共同成立的子公司來執行，並由林心正或是其指派之人經營管理之。
2. 這項 Joint Venture 所成立的子公司，設立資本額的三分之二由中砂出資，另三分之一則為宋先生的技術價值。
3. 這項 Joint Venture 將生產由宋先生建議並經中砂同意開發製造之產品。
4. 宋先生會在 Joint Venture 的執行中為他的技術準備特定專利之申請，如果所申請之專利獲准，宋先生將擁有獲准專利之專利權。然而，中砂可以使用該專利而免付使用之權利金。
5. 這項 Joint Venture 除由雙方共同成立之新公司執行外，尚可在中砂公司內設立獨立之營運單位執行，惟採後者方式執行者，則中砂須就第 3 點所言產品，在雙方依本約約定期限內，就「每年度營業收入淨額」之 7%計算權利金，支付宋先生作為使用宋先生專利之報償，並將每隔半年結算營收淨額及付款，其它的收入或損失屬於中砂。
6. 這項 Joint Venture 使用宋先生所有之專利包括中華民國發明第一一五九五八號「具規則性排列之磨料顆粒的研磨工具及其製造方法」及第一二五二四九號「以滲透法硬焊之鑽石研磨工具」及宋先生在美國取得的二項專利，專利號碼分別為 6,039,641「BRAZED DIAMOND TOOLS BY INFILTRATION」及 US 6,286,498 B1「METAL BOND DIAMOND TOOLS THAT CONTAIN UNIFORM OR PATTEREND DISTRIBUTION OF DIAMOND GRITS AND METHOD OF MANUFACTURE THEREOF」。如宋先生有新取得之專利權，則中砂可視需要依本約之精神另與宋先生簽訂其他之 Joint Venture Agreement 作為執行依據。
7. 這項 Joint Venture 執行期間定為十七年，但是中砂在這項 Joint Venture 執行十年後(即民國九十六年)有選擇權決定是否購回宋先生在本計畫中持有之全數股份或權利(宋先生自行購入之股份不計)，該選擇權執行的同時，視同本計畫提前結束。依第 5 點之二種執行方式約定如下：

(1)雙方共同成立新公司

中砂執行選擇權之價格為先前的一年中(即民國九十五年)該 Joint Venture 可能帶來之全部營收的三分之一，宋先生在收取中砂購股價款後三日內應完成股票過戶予中砂。假如屆時中砂決定不執行選擇權，則約定如下：

A.雙方共同成立之新公司未上市(櫃)者

自當年起至該Joint Venture執行到達第十七年止(即自民國九十六年起至民國一〇二年止)，中砂將依第 5 點所言方式，支付宋先生共計十四次權利金，而

PATENT
REEL: 033566 FRAME: 0487

宋先生將他民國九十六年期初當時所有持股分成十四等份，於每次收到中砂支付款項時，過戶一等份的股份給中砂，期間所有無償配股均屬中砂所有。即在本 Joint Venture 執行到達第十七年終止時，宋先生的所有股份將以民國九十六年起至民國一〇二年止，雙方依第 5 點所言方式計算價值作價轉讓為中砂所有。從此爾後，這項 Joint Venture 將完全隸屬於中砂之子公司。

B.雙方共同成立之新公司已上市(櫃)者

則宋先生得自行選擇時機及價格，於集中(櫃檯買賣)市場一次或多次出售其全數持股。中砂可視需要自集中(櫃檯買賣)市場買回宋先生釋出之股份。待宋先生將持股全數出售日即視為本約自動終止。本約有效日至民國一〇二年十二月三十一日止。

(2)中砂公司內設立獨立營運單位

中砂執行選擇權之價格與前段所述相同，如中砂放棄執行，則宋先生可依第 5 點所言計價方式，自計畫開始日起向中砂收取權利金至本 Joint Venture 執行到達第十七年終止時，即民國九十六年起至民國一〇二年止。

8. 本 Joint Venture 執行到達第十七年終止或在第十年因中砂選擇權執行而提前結束時，第 6 點所言之專利權，中砂公司或雙方依本約共同成立的新公司將可持續使用且免支付使用之權利金。
9. 宋先生也將被聘請為中砂之總工程師。以此資格，他將直接向中砂之總經理報告。
10. 宋先生的薪水，起薪將每個月支付新台幣 250,000 元，其它薪資有關事項則依照中砂之人事管理規定辦理。
11. 本約原始訂定於民國八十五年十月二十八日，第一次修訂於民國九十一年八月二十一日。

以上的同意事項是這項 Joint Venture 和聘僱的處理原則。該處理原則之詳細執行將是基於良好的信任前提下，經由相互的交涉磋商來決定進行。再者此外，假如需要，該處理原則是可被未來由中砂和宋先生雙方簽署的修正案來修改。中砂和宋先生雙方必須誠實地履行這份契約書，同時任何一方不可單獨地修改或終止此契約。

附註：本約之第 4 項、第 6 項及第 8 項所言中砂使用宋健民國內外專利的權利為非專屬授權。

約定同意人簽名：

林心正 林心正印 日期 91.8.21.

林 心 正 總經理 中國砂輪企業股份有限公司

宋健民 日期 91.8.21

宋 健 民

中 華 民 國 九十一 年 八 月 二十一 日

PATENT
REEL: 033566 FRAME: 0488

Ex. 1003, Page 354

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Mail Stop Assignment Recordation Services
Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Transmittal of English Translation of

the "Supplemental JV Terms and Conditions"

Dear Sir:

Attached is an English translation of the "Supplemental JV Terms and Conditions", which was signed on October 15, 2008. I hereby attest that this translation is a true and accurate translation of the Supplemental JV Terms and Conditions, to the best of my abilities and knowledge.

Respectfully submitted,

Date: Feb. 20, 2013

Chien-Hao Lu

Translator of Baker & McKenzie Taipei
15F 168 Dun-Hua North Road, Taipei, Taiwan

[Translation]

Supplemental JV Terms and Conditions

These Supplemental JV Terms and Conditions supplement the Joint Venture Agreement entered into by and between Kinik Company ("**Party A**" or the "**Company**") and Dr. Chien-Min Sung (宋健民) ("**Party B**" or "**Dr. Sung**") in October 1996, as amended in August 2002 (stamps were affixed again on the same agreement in February 2003) (the "**JV**"). The rights and obligations under the JV may only be exercised by the parties to the JV. Party A and Party B on a good faith basis agree that the following terms and conditions shall be the basis of implementation starting the effective date.

1. **Term of JV**

Except otherwise negotiated by the parties to for termination or extension, the JV shall expire on October 28, 2013. The rights and obligations of the parties under the JV shall therefore terminate on the same date, except that Party A's obligation to pay royalties to Party B for the products or technologies developed according to the JV existing prior to expiry of the JV shall be subject to the expiry date for an individual product as agreed to, not subject to the expiry date of the JV.

2. **Definition of JV Products or Technologies**

The JV products and technologies include any and all products and technologies studies and developed according to the JV, subject to the Company's approval, by Dr. Sung based on the proprietary technologies he owns, in a joint effort with the required resources available by the Company.

3. **Intellectual Property Rights**

(1) The ownership of the intellectual property in the products or technologies developed according to the JV shall be registered to Party B, and Party A shall have a preferred right to use these products and technologies.

(2) If Party A uses the above intellectual property rights in the development of products or technologies (the "**IPR Used by Party A**"), Party A shall own two thirds of the entitlement benefits and value of these intellectual property rights. For the rights and obligations to the obligations and costs not as part of the development costs arising from these intellectual property rights, unless otherwise provided by law, Party A and Party B shall each bear the obligations and costs at the ratio of 2:1.

(3) While Party B grants a license of the intellectual property rights to the products

207099-v2\TPEDMS

CHL
Feb 20 2013

PATENT
REEL: 033566 FRAME: 0490

Ex. 1003, Page 356

or technologies developed under the JV to Party A on a non-exclusive basis, Party B shall not damage Party A's benefits when licensing the IPR Used by Party A to a third party. If Party B intends to license the other intellectual property rights to a third party, it shall first reimburse Party A with all the costs paid on its behalf, plus a reasonable interest.

(4) If the parties agree to assign or license to a third party the IPR Used by Party A, the consideration paid by the third-party assignee or licensee, after deducting necessary costs, shall be allocated between Party A and Party B at the ratio of 2:1.

(5) After termination of the JV, for any and all patents arising from implementation of the JV and owned in the name of Party B, except the patents used for mass production of products agreed to by the parties, Party B shall reimburse Party A any and all costs paid by Party A for these patents, plus a reasonable interest. After that, the entitlement benefits and value of these patents shall completely belong to Party B. As to the patents for which no reimbursement has been made by Party B, Party B shall agree to transfer the patents to Party A free of charge within one (1) week, with the costs of transfer payable by Party A. Party A should guarantee that:

a. if these patents are used on products in the future, payment will be made to Party B according to the terms and conditions set forth under Paragraph 4 "Party B's Compensation" of the Supplemental Terms and Conditions; and

b. if these patents are assigned or licensed to a third party in the future, Party B will receive one third of the consideration paid by the third-party assignee or licensee, after deducting necessary costs.

4. **Party B's Compensation**

(1) For its use of Party B's proprietary technology, Party A shall pay Party B a compensation in the form of royalty payment.

(2) According to the JV, for those as defined in Article 2 above, if they are the products manufactured by the Company, except the products described in Article 6 of the JV, amended in 2002, that are subject to payment of 7% of the sales revenues, the Company shall pay the royalties to Dr. Sung at the following percentage rate based on the net sales depending on the gross profit margin of an individual product, payable after settlement of accounts on a semi-annual basis.

CHL
Feb. 20, 2013

Gross Profit Margin	Payment Percentage
80% (including) and above	8%
50% (including) to 80%	7%
40% (including) to 50%	6%
30% (including) to 40%	5%
Below 30%	4%

(3) Party A shall provide the detailed list of calculation of royalties for the JV products to Party B on a regular basis. Party B shall have the right to visit Party A's premises to audit the manufacturing activities and sales process of the JV products.

(4) For the products developed by the parties that have been commercialized and are in the mass production stage during the term of the JV, starting the month when the monthly sales of a product reaches NT$ 1 million, Party A shall pay the royalties to Party B for a period of fifteen (15) years or the valid term of the patent, whichever is shorter. Notwithstanding the above, for the products described in Article 6 of the JV, first amended in August 2002, Party A shall pay the royalties to Party B only until December 31, 2013.

(5) When the period during which Party A should pay royalties for an individual product expires and patent remains valid, except for Party A's waiver, Party B shall transfer the patent to Party A at no charge within one (1) week, with the costs of the transfer to be borne by Party A.

5. **Miscellaneous Provisions**

(1) For the forward-looking research studies relating to the business development of the Company conducted by Party B, Party A shall provide as many resources as possible to support Dr. Sung's technological or product development plans, including an annual patent budget of NT$ 20 million, provided that Party A shall not pay for any patent-related work more than the above amount.

(2) For the JV products developed by Party B, Party A may assess the benefits before arranging for manufacturing and production of the products by other business units or in special projects, and Dr. Sung should be granted a full power and authority to manage the technical guidance to these products and may supervise the costs that may potentially arise.

(3) If the parties agree that the operator of an individual JV product should be an independent company, Party A shall contribute two thirds of the capital for incorporation of the company, with the value of Party B's technologies stand for

CHL
Feb. 20, 2013

one third of the capital contribution. The company established for this purpose should diligently comply with all applicable laws and regulations. The parties may also transact their rights with each other.

(4) If Party B dies or there is a beginning of succession before the expiry of the term for which the royalties for an individual product is payable, the successor of Party B shall agree to perform the applicable terms and conditions governing Party B under the Supplemental Terms and Conditions before the royalties payable to Party B may be transferred to his successor. If otherwise, the successor shall not receive the royalties through succession.

(5) For any matters not provided for under this Supplemental Terms and Conditions, the parties shall negotiate on a bona fide basis or enter into a separate agreement.

6. **Effective Date**

The parties agree that the Supplemental JV Terms and Conditions shall take effect on October 15, 2008.

Signed by:

Party A: Kinik Company

Representative: Frank S. Lin (林心正), Chairman of Board Director

Register No.: 03089008

Party B: Chien-Min Sung (宋健民)

National I.D. No.: F103338169

Date: October 15, 2008

CHL
Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0493

JV 增補條款

本 JV 增補條款為原中國砂輪企業股份有限公司(以下簡稱甲方或公司)與宋健民博士(以下簡稱乙方或宋博士)於民國 85 年 10 月訂定及民國 91 年 8 月修訂(同一份契約於 92 年 2 月重新用印)(以下稱本 JV)之延續，該 JV 權利義務之行使對象以雙方為限，甲、乙方業持善意，同意以下條款於生效日後，作為執行依據：

一、JV 期限

除雙方另行協商提前終止或延長外，本 JV 至民國 102 年 10 月 28 日到期，因此與本 JV 有關雙方所約定之權利義務，均止於該日，惟於本 JV 到期前依本 JV 所發展之產品或技術，甲方對乙方仍有權利金支付之義務者，到期日受個別產品之約定，不受 JV 到期日限制。

二、JV 產品或技術定義

依 JV 約定，經公司同意開發，由宋博士依其所有之專屬技術，配合公司提供所需資源共同研究發展之的產品或技術屬之。

三、智慧財產權

(一)依本 JV 所發展產品或技術之智慧財產權所有權登記為乙方名義，甲方擁有優先使用權。

(二)若甲方使用上述智慧財產權於產品或技術發展時(以下簡稱甲方使用之智慧財產權)，則甲方擁有該等智慧財產權三分之二之權利利益及價值。對於此等智慧財產權所衍生之非屬開發成本之義務及費用以外之權利與義務，除法律另有規定外，甲、乙方各自應負擔的比例為二比一。

(三)依本 JV 所發展產品或技術之智慧財產權，雖乙方對甲方非專屬授權，然甲方使用之智慧財產權，乙方對外授權該項智慧財產權時不得傷害甲方利益。其餘智財權乙方對外授權時，應先返還甲方代為支付之所有費用並加計合理利息。

(四)如雙方同意出讓或對外授權使用甲方使用智慧財產權，對方所付之對價，扣除必要成本後，其三分之二歸屬甲方所有，三分之一則歸屬乙方。

(五)本 JV 終止後，所有因執行本 JV 所產生由乙方名義持有之專利權，除已經雙方同意進行量產製造產品使用之專利權外，乙方應返還甲方為該等專利權所支付之一切費用加計合理利息，此後該等專利權之權益利益及價值完全歸屬乙方所有。屬乙方未返還價款之專利權，乙方同意一週內無償過戶予甲方，過戶費用由甲方支付，甲方承諾：

(1)如未來使用該等專利權於產品，則將依本增補條款四、乙方之報酬所約定方式支付乙方。

(2)如未來出讓或對外授權該等專利權，則將對方所付之對價，扣除必要成本後，將支付乙方三分之一。

四、乙方之報酬

(一)甲方對使用乙方專屬技術之報酬，以支付權利金方式為之。

(二)基於 JV 之約定，符合上列第二條定義者，針對該屬公司所製造的產品，除民國 91 年修訂 JV 內第 6 條所稱產品仍需付銷售額的 7%外，公司應就各產品毛利率情形，以銷貨淨額為計算基礎，依以下所訂比率，支付宋博士權利金，

並於每半年結算後支付。

毛利率範圍	支付比率
80%(含)以上	8%
50%(含)~80%	7%
40%(含)~50%	6%
30%(含)~40%	5%
30%以下	4%

(三)甲方必須定期提供 JV 產品權利金計算明細給乙方，乙方有權到甲方現場稽核 JV 產品的製造及銷售過程。

(四)在 JV 有效期間雙方所發展並導入之商業化量產產品，自各產品每月銷售淨額達新台幣 100 萬元該月起算，甲方應對乙方支付權利金之期限為十五年，但不得逾專利權有效期限。惟 91 年 8 月第一次修訂 JV 內第 6 條所稱產品，甲方對乙方之權利金支付期限至民國 102 年 12 月 31 日止。

(五)當甲方為個別產品所支付權利金期限終了時，如專利權仍為有效者，除甲方同意放棄外，乙方應於一週內無償將所使用專利權過戶予甲方，過戶所需之費用由甲方支付。

五、其他

(一)甲方對乙方所為與公司業務發展有關具有前瞻性的研究，應儘量提供資源，支持宋博士的技術或產品開發計劃，包括編列每年二千萬元的專利費用，專利費用超支部份甲方不需支付。

(二)甲方對乙方所開發之 JV 產品，得擁有改善後安排其他事業部或專業代生產製造，而宋博士對該類產品的技術指導有完全的管理權，並得監督其成本之發生。

(三)如經雙方同意要以獨立公司作為個別 JV 產品之營運者，該公司設立資本額的三分之二由甲方出資，另三分之一則為乙方的技術權值。公司於設立後，應恪守相關法律之規範。雙方之權利亦可相互交易。

(四)如乙方於個別產品所支付權利金期限終了前過世或有其他繼承開始之事實，乙方繼承人需同意履行乙方於本增補條款之相關約定後，乙方的權利金方可移轉給其繼承人，餘則不得繼承。

(五)雙方對本增補條款未盡事宜，仍應本善意協商或另行約定。

六、生效日

本 JV 增補條款雙方同意自民國 97 年 10 月 15 日正式生效。

立約人：甲方

中國砂輪企業股份有限公司

代表人：董事長 [redacted]

統一編號：03089008

乙方

宋健民

身份證字號：F103338169

中　華　民　國　九　十　七　年　十　月　十　五　日

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Mail Stop Assignment Recordation Services
Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Transmittal of English Translation of the "Memorandum"

Dear Sir:

Attached is an English translation of the "Memorandum", which was signed on January 7, 2010. I hereby attest that this translation is a true and accurate translation of the Memorandum, to the best of my abilities and knowledge.

Respectfully submitted,

Date: Feb. 20, 2013

Chien-Hao Lu

Chien-Hao Lu

Translator of Baker & McKenzie Taipei
15F 168 Dun-Hua North Road, Taipei, Taiwan

[Translation]

Memorandum

This Memorandum is an integral part of the Supplemental JV Terms and Conditions entered into by and between Kinik Company ("**Party A**" or the "**Company**") and Dr. Chien-Min Sung (宋健民) ("**Party B**" or "**Dr. Song**") on October 15, 2008. Whereas Party B intends to use with external third party the joint JV accomplishments produced by both Party A and Party B for development of business, now therefore, the parties agree to the following:

1. The four (4) external parties currently cooperating with Party B are Tai Diam, Jin Diam, Sino Diamond, and ST Micro.

2. Except ST Mrcro, which will be separately negotiated with, Party B shall in a bona fide manner list the JV patents co-owned by Party A and Party B proposed to be used in the other three cooperation plans above, and deliver the patent valuation conducted by at least two (2) external impartial entities, which shall issue a written valuation report stating the result of its valuation. The parties shall then negotiate and determine the final patent value.

3. For Party B's external cooperation plans, Party A intends to sell the value of thc JV patents it owns to Party B. As such, Party B is liable to pay to Party A. Starting the month in which transfer of the value of the JV patents agreed to by the parties occurs, Party B shall no longer pay any fees relating to such patents.

4. With regard to any individual JV patent, Party A and Party B shall be entitled to the value of the patent, deducting the costs paid by Party A for the above patent plus reasonable interest and profits, i.e. thc determined final patent value described in Paragraph 2, at the ratio of 2:1. Party B shall pay Party A the costs, plus reasonable interest and profits, for the above patent before paying Party A two thirds of the remaining patent value, in installments to be separately agreed to.

5. After Party B has paid all the amounts payable to Party A, he shall completely own the patent to which Party A shall not claim any rights.

6. With regard to the cooperation plan with Sino Diamond, Party B shall first pay the costs and interest and profits in the amount of NT$ 5 million to Party A. After the patent valuation, two thirds of the amount above NT$ 5 million will be paid to Party A in installment.

7. For matters not provided for above, the written provisions on the JV between

CHC Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0497

the parties shall apply.

Signed by:

Party A: Kinik Company

Lin Xin-Zheng (林心正), Board Director

Register No.: 03089008

Party B: Chien-Min Sung (宋健民)

National I.D. No.: F103338169

Date: January 7, 2010

CHL Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0498

備忘錄

本備忘錄為原中國砂輪企業股份有限公司(以下簡稱甲方或公司)與宋健民博士(以下簡稱乙方或宋博士) 於民國 97 年 10 月 15 日所簽訂 JV 增補條款之一部份，緣因乙方擬與外部第三者採用甲、乙雙方共同的 JV 成果，作為未來業務的發展，因而甲、乙雙方同意如下：

一、乙方目前合作之外部對象包括中國鄭州台鑽科技(Tai Diam)、南通晶鑽(Jin Diam)、江蘇鑫鑽(Sino Diamond)及深州嵩洋微電子(ST Micro)等四個。

二、除深州嵩洋微電子(ST Micro)擇期另議外，乙方應本誠信舉出上述其餘三個合作案擬採用甲、乙雙方共同的 JV 專利權，並交付至少二家外部公正單位做專利權鑑價，結果應出具書面鑑價報告，由雙方議定並確認最終專利權價值。

三、對於乙方的外部合作案，甲方擬出售所屬的 JV 專利權權利價值於乙方，基於此，乙方對甲方有支付義務。甲、乙雙方議定共同的 JV 專利權價值移轉日當月起，甲方不再支付往後有關該專利權之任何費用。

四、甲、乙雙方持有任一 JV 專利權的權利，為扣除甲方已支付前述專利權的成本加計合理的利息及利潤後，分配率為二比一。即第二點所述專利權最終議定價值，乙方應先支付甲方已支付前述專利權的成本加計合理的利息及利潤後，剩餘專利權價值的三分之二應再分期支付予甲方，期別另議。

五、當乙方付完應付之款項予甲方後，即完全持有該專利權，甲方不得再主張該等專利之任何權利。

六、對於江蘇鑫鑽(Sino Diamond)之合作案，乙方將先支付甲方新台幣伍佰萬元所屬的成本及利息、利潤，待專利權鑑價後，高於伍佰萬元以上金額之三分之二將分期支付甲方。

七、以上如有未盡之處，則從雙方所有訴諸文字之 JV 相關約定。

立約人：甲方

中國砂輪企業股份有限公司

代表人：董事長 林[illegible]

統一編號：03089008

乙方

宋健民

身份證字號：F103338169

中　華　民　國　九　十　九　年　一　月　七　日

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Mail Stop Assignment Recordation Services
Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Transmittal of English Translation of "Memorandum (2)"

Dear Sir:

Attached is an English translation of "Memorandum (2)", which was signed on May 1, 2010. I hereby attest that this translation is a true and accurate translation of Memorandum (2), to the best of my abilities and knowledge.

Respectfully submitted,

Date: Feb. 20, 2013

Chien-Hao Lu

Translator of Baker & McKenzie Taipei
15F 168 Dun-Hua North Road, Taipei, Taiwan

[Translation]

Memorandum (2)

This Memorandum is an integral part of the Supplemental JV Terms and Conditions entered into by and between Kinik Company ("**Party A**" or the "**Company**") and Dr. Chien-Min Sung (宋健民) ("**Party B**" or "**Dr. Sung**") on October 15, 2008. Whereas Party B intends to use with external third party the joint JV accomplishments produced by both Party A and Party B for development of business, now therefore, the parties agree to the following:

1. With regard to Party B's cooperation plan with Sino Diamond, Party B will pay Party A NT$ 18,000,000 in the consideration of Party B's provision of technical guidance to Sino Diamond. The two ROC patents registered in the name of Party A (Patent Certificate No. 1255161 and 1263475) will be transferred to and registered in the name of Party B, provided that the patents and technologies in question remain part of the JV of the parties. The rights and obligations of the parties shall be subject to the terms and conditions in the JV. It is agreed Party B pays the above amount to Party A in the following manner:

   (1) On the date of signing of the contract, Party B pays Party A NT$ 10,000,000, which may be deducted from the DG royalties for the second half of 2009.

   (2) The remaining NT$ 8,000,000 will be divided into two equal parts, i.e. NT$ 4,000,000 for each, with each part to be deducted from the DG royalties for the first and second half of 2010.

2. To prevent any adverse impact on Party A due to Party B's cooperation with external third party, starting May 1, 2010 Dr. Sung will no longer act as the general manager of the Diamond Technology Center (DTC) of the Company and will be reappointed as the technical advisor to the Company, for a term until the expiry date of the JV between the parties.

3. Starting May 1, 2010 Party A appoints and authorizes Party B with full power and authority to administer the DTC and all JV technologies. Party B has all the power and authority required for management of the DTC, including budgeting, hiring of staff,

CHC Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0501

Ex. 1003, Page 367

salary approval and performance evaluation, and organizational structure adjustment within the DTC. Party B shall follow the Company's policies in his management of the DTC. Party B's salary and compensation, benefits and equipment and costs required for performance of business shall all be at the same level as before the reappointment. For the DTC, Party B shall come up with a research and development plan that benefits both the parties. Upon approval of the plan by Party A, Party A shall be fully supportive of the plan within the budget for the plan.

4. The parties agree to act in a bona fide manner and to have Party B to define the products and submit a commercially feasible plan for Party A's review and approval before the plan is implemented. The compensation payable to Party B for all the commercialized JV products developed at the DTC, whether patented or not, by Party A shall be in compliance with Article 4 of the Supplemental JV Terms and Conditions.

5. In view of the JV relationship between the parties, for matters not provided for above, the written provisions on the JV between the parties shall apply.

Parties:

Party A: Kinik Company
Representative: Thomas Hsieh (謝榮哲), CEO
Register No.: 03089008

Party B: Chien-Min Sung (宋健民)
National ID No.: F103338169

Date: May 1, 2010

CHL
Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0502

Note

With regard to Article 1 of Memorandum (2), Kinik Company ("**Party A**" or the "**Company**") and Dr. Chien-Min Sung (宋健民) ("**Party B**" or "**Mr. Sung**") separately agree to the following:

(1) With regard to the cooperation between Party B and Sino Diamond described in Article 1 of this memorandum, if Sino Diamond fails to substantially invest in the equipment, therefore invalidating the cooperation between Party B and Sino Diamond, Party A shall return all the money it has received from Party B.

(2) The two ROC patents registered in the name of Party A (Patent Certificate No. 1255161 and 1263475) will not be transferred to or registered in the name of Party B until Sino Diamond has substantially invested in the equipment.

(3) This note shall cease to be effective upon the actual implementation of the cooperation plan between Party B and Sino Diamond.

Parties:

Party A: Kinik Company
Representative: Thomas Hsieh (謝榮哲), CEO
Register No.: 03089008

Party B: Chien-Min Sung (宋健民)
National ID No.: F103338169

Date: May 1, 2010

CHL
Feb. 20, 2013

208555-v1\TPEDMS

備忘錄(二)

本備忘錄為原中國砂輪企業股份有限公司(以下簡稱甲方或公司)與宋健民博士(以下簡稱乙方或宋博士) 於民國 97 年 10 月 15 日所簽訂 JV 增補條款之一部份，緣因乙方擬與外部第三者採用甲、乙雙方共同的 JV 成果，作為未來業務的發展，因而甲、乙雙方同意如下：

一、對於乙方與江蘇鑫鋒(Sino Diamond)之合作案，乙方需支付甲方新台幣 18,000,000 元，作為乙方對江蘇鑫鋒技術指導之對價，原登記於甲方名下之二個台灣專利(證書號碼為 I255161 及 I263475)將轉登記於乙方名下，然該等專利權、技術仍屬雙方 JV 之一部份，雙方之權利義務仍從 JV 約定，乙方支付甲方之方式約定如下：

(一)於訂約日支付甲方新台幣 10,000,000 元，得由 98 年下期的 DG 權利金中扣除。

(二)餘款 8,000,000 元，於 99 年上下二期之 DG 權利金中，分別扣除新台幣 4,000,000 元。

二、為不使乙方與外部第三者之合作對甲方造成不利影響，自西元 2010 年 5 月 1 日起，宋博士不再擔任甲方公司鑽石科技中心總經理一職，改任甲方公司之技術顧問，該顧問一職聘任日期止於雙方 JV 到期日。

三、甲方自西元 2010 年 5 月 1 日起委託乙方全權管理鑽石科技中心(DTC)及所有 JV 的技術，乙方擁有管理 DTC 需要的所有職權，包括預算編列、人員的任用、核薪及考核權，DTC 內部組織調整等，乙方執行對鑽石科技中心之管理應從甲方公司制度規定，乙方的薪酬、福利、及執行業務所需之配備及費用支出均比照未轉任顧問前之水準。乙方對於 DTC 應訂定有利於甲乙雙方之研發計劃，經甲方同意後，配合該計劃之預算，甲方應予充分支持。

四、雙方同意各本善意，在 JV 期限到期前，由乙方完成產品，提出商業化之計劃經甲方審核同意後，交付執行。所有 DTC 研發的 JV 商業化產品，不論有無專利，甲方應付乙方的報酬從 JV 增補條款第四條之約定。

五、基於甲乙雙方的 JV 關係，以上如有未盡之處，則從雙方所有協議之原 JV 相關約定。

立約人：甲方

中國砂輪企業股份有限公司

代表人：執行長 謝宗哲

統一編號：03089008

乙方

宋健民

身份證字號：F103338169

中　華　民　國　九　十　九　年　五　月　一　日

附註

中國砂輪企業股份有限公司(以下簡稱甲方或公司)與宋健民博士(以下簡稱乙方或宋博士)就備忘錄(二)之第一條，另行約定如下：

(一) 本備忘錄第一條所稱乙方與江蘇鑫鑽(Sino Diamond)之合作一案，如江蘇鑫鑽(Sino Diamond)未進行實質設備投資，而使乙方與江蘇鑫鑽(Sino Diamond)之合作失效，則甲方收取乙方之款項則原數退還。

(二) 學登記於甲方名下之二個台灣專利(證書號碼為 I255161 及 I263475)將於江蘇鑫鑽(Sino Diamond)進行實質設備投資後，方得轉登記於乙方名下。

(三) 本附註於乙方與江蘇鑫鑽(Sino Diamond)之合作一案實際執行後即失效。

立約人：甲方
中國砂輪企業股份有限公司
代表人：執行長 周榮智
統一編號：03089008

乙方
宋健民
身份證字號：F103338169

中　華　民　國　九　十　九　年　五　月　一　日

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Mail Stop Assignment Recordation Services
Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Transmittal of English Translation of "Memorandum (3)"

Dear Sir:

Attached is an English translation of "Memorandum (3)", which was signed on January 21, 2011. I hereby attest that this translation is a true and accurate translation of Memorandum (3), to the best of my abilities and knowledge.

Respectfully submitted,

Date: Feb. 20, 2013

Chien-Hao Lu

Translator of Baker & McKenzie Taipei
15F 168 Dun-Hua North Road, Taipei, Taiwan

[Translation]

Memorandum (3)

This Memorandum is an integral part of the Supplemental JV Terms and Conditions entered into by and between Kinik Company ("Party A" or the "Company") and Dr. Chien-Min Sung (宋健民) ("Party B" or "Dr. Sung") on October 15, 2008. Whereas the JV between the parties will expire on October 28, 2013, in order to perform the patent liquidation in the way previously agreed to by the parties, Party A and Party B agree to the following:

1. The parties agree to early liquidate part of the patent technologies subject to the following conditions:

   (1) For the JV patent technology for Dia-Metal heat spreader (refer to Attachment 1 for details), Party B shall pay Party A NT$ 19 million (refer to Attachment 5 for details about basis of calculation) as the full payment for purchase of Party A's JV rights. After liquidation between the parties, this patent technology shall be completely owned by Party B. After this memorandum takes effect, Party A shall not pay any money relating to this patent.

   (2) The parties agree to cross license the DLC related patents (see Attachment 2 for details). The parties agree that either party may freely use, on a royalty free basis, these patents and Party A shall no longer maintain the DLC patents in the name of Party B after this memorandum takes effect. Also, Party A promises not to license any patents it owns in Attachment 2 to any company in China. The parties may negotiate to jointly license these patents to third party, and Party A and Party B further agree to receive any payment arising from the licensing at the ratio of 2:1 as for all other JV rights in the past. In the event Party B intends to file an infringement litigation against another company, to the extent that Party A's interest will not be jeopardized, Party A would agree to cooperate with Party B.

   (3) The patents in Attachment 3 will be transferred to Party B within one (1) week after the effective date. Starting the month in which the transfer is completed, Party A shall no longer maintain these patents.

2. Starting the effective date of this memorandum in 2011, no more hiring will take place at the Diamond Technology Center (DTC) and any leaving staff will not be replaced with new hire. The only research unit to remain is the Advanced Diamond Disk unit, for which the annual budget shall not exceed

208596-v1\TPEDMS

CHL
Feb. 20, 2013

PATENT
REEL: 033566 FRAME: 0507

NT$ 3.5 million. Also, the annual maximum allowance for patent maintenance and related expense under Part B's name shall be limited to NT$ 10 million. The annual maximum allowance for R&D outsourcing is limited to NT$ 1 million. The budget shall be used mainly on the research of the Advanced Diamond Disks. Subject to the generality of the above, Dr. Sung shall have the discretion to determine the use of the above budget, which is subject to a total cap (NT$ 12,833,000 for 2011, NT$ 14,500,000 for 2012, and NT$ 11,917,000 for 2013). Notwithstanding the above, the reporting and expenditure of the budget for the DTC are subject to the Company's policies and regulations. Starting this day, for the performance of the JV by the parties, except for the technologies and products relating to diamond disk, no new patent application shall be filed. Party B further agrees that the DTC will be merged into an independent unit within Party A's R&D department.

3. Dr. Sung shall continue to be employed by Party A as consultant and receive the consulting fee of NT$ 140,000 on a monthly basis and is entitled to year-end bonus, for a term until the expiry date of the JV. Articles 3 and 4 of Memorandum (2) signed by the parties on May 1, 2010, and Article 5 (Miscellaneous Provisions), paragraph 1, of the Supplemental JV Terms and Conditions signed on October 15, 2008 shall become ineffective on the effective date of this agreement.

4. The non-compete clause signed with Kinik shall not apply to the staff of the DTC who have joined Ritedia Corporation along with Dr. Sung before December 31, 2011.

5. With the help of a reduced size of the DTC and cut-down expenditures, until the expiry of the JV, Party A may save one third of its expenses. As such, Party A agrees to use the savings to offset the amount for the patent of Dia-Metal heat spreader under the JV payable by Party B to Party A as in Article 1, paragraph (1) above.

6. Party A will keep Party B's office and the secretarial staff for his use until the expiry of the JV.

7. Starting this day, the patents in the JV not in use or in need by Party A or that Party B intends not to keep shall be sold through a contracted third party. Until the buyer is confirmed, Party B agrees to transfer these patents to Party A free of charge for the patents to be sold in the name of Party A. The income from the sale shall be first used to reimburse Party A for the money it has spent on acquiring the patents and a reasonable interest (based on the average base interest rates published by the five major

CHL
Feb. 20, 2013

banks), plus a 15% profit. The transaction cost of the patents shall then be deducted from the remaining amount. If there are still profits, one third of them shall be received by Party B. The parties agree to unconditionally stop maintaining the patents that have not been sold and those that are pending for approval as of expiry of the JV.

8. Unless Party A breaches the JV terms and conditions, Party B agrees to ensure Party A may continue its operation of the diamond disk products (DG), and Party B shall not damage Party A's benefits through patent litigation or licensing to a third party with a malicious intent, and shall transfer the relevant patents (see Article 6 of the JV, as amended in 2002, for details) to Party A without charge. In the event of a violation of the above, Party A may claim damage against Party B. Further, for the diamond disk products with the ODD patent (refer to Attachment 4 for details) currently in use by Party A, if Party A's annual business revenue is less than NT$ 50 million, Party B's license to Party A shall be switched to non-exclusive license, and the two thirds of the income received from Party B's license of the ODD diamond disk products to third party shall be received by Party A. When Party A has paid the royalties for the ODD diamond disk products for fifteen (15) years, as stated in the JV agreement by the parties, Party B shall unconditionally transfer the patent to Party A on the expiry date and the patent shall be solely owned by Party A thenceforward. Upon expiry of the JV in 2013, Party B may elect to early liquidate the ODD patents in a manner agreed to by the parties.

9. As determined, the products under the JV for which royalties are payable are limited to the products manufactured by Kinik using the JV patents. For all the products manufactured by Kinik using the JV patents, it shall always pay the royalties to Party B according to the Supplemental JV Terms and Conditions without excuse.

10. In view of the JV relationship between the parties, for matters not provided for above, the written provisions on the JV between the parties shall apply. The parties hereby reemphasize that until the expiry of the JV, the terms and conditions signed by the parties, which the parties have not agreed to invalidate, shall continue to be effective and at the same time all the amendments to the agreements shall not take effect retroactively.

11. The parties agree that this memorandum takes effect upon the establishment of Ritedia Corporation.

CHL

Feb. 20, 2013

Parties:

Party A: Kinik Company
Representative: Thomas Hsieh (謝榮哲), CEO
Register No.: 03089008

Party B: Chien-Min Sung (宋健民)
National ID No.: F103338169

Date: January 21, 2011

CHL
Feb. 20, 2013

208596-v1\TPEDMS

備忘錄(三)

本備忘錄為原中國砂輪企業股份有限公司(以下簡稱甲方或中砂公司)與宋健民博士(以下簡稱乙方或宋博士) 於民國 97 年 10 月 15 日所簽訂 JV 增補條款之一部份，緣因雙方 JV 期限將於民國 102 年 10 月 28 日屆滿，為履行雙方過去共同同意的專利權清算方式，因而甲、乙雙方同意如下：

一、雙方同意依下列條件，提前清算部份專利技術：

(1)Dia-Metal heat spreader(鑽石金屬散熱片) JV 專利技術(內容詳附件一)，乙方將支付甲方新台幣 1,900 萬(計算基礎詳附件五)，以購買甲方之 JV 權利，雙方結清後，該項專利技術完全歸乙方所有，本備忘錄生效後甲方不再支付任何有關該等專利的支出。

(2) DLC 相關專利(內容詳附件二)：雙方同意交互授權，雙方同意彼此得自由使用，不收取任何權利金，同時屬乙方名下之 DLC 專利在本備忘錄生效後，甲方不再維護。另甲方承諾附件二所持有的專利，不對中國地區的公司授權。甲、乙雙方得經過協商共同對外授權，並同意以過去 JV 權利分配比例 2：1 分配。如乙方擬對他公司提起侵權訴訟，在不違反甲方利益前提下，甲方願配合之。

(3)附件三專利甲方在生效日起一週內將移轉予乙方，並自完成移轉日當月起，甲方不再維護。

二、鑽石科技中心(DTC)自 2011 年本備忘錄生效日，人力凍結遇缺不補，只保留先進鑽石碟研究單位，該單位每年預算不得超過新台幣 350 萬元，另每年乙方名下的專利維護及相關費上限每年為新台幣 1,000 萬元，委外研究費每年上限為新台幣 1 00 萬元，主要經費將用於先進鑽石碟之研究。宋博士在不違反上述原則下，對該等經費的使用有決定權，上述經費之支出採總量管制(民國 100 年之總量為 12,833 仟元、民國 101 年總量為 14,500 仟元、民國 102 年總量為 11,917 仟元)，惟鑽石科技中心之經費報支用仍應從甲方公司制度規定辦理。即日起雙方 JV 之履行，除鑽石碟相關技術及產品外，將不再申請新的專利。另乙方同意 DTC 併入甲方之研發部門內之獨立單位。

三、宋博士仍將為甲方聘任為顧問一職，月支領新台幣 140,000 元顧問費及年終獎金，任期至 JV 到期日止，雙方於本年 5 月 1 日簽訂之備忘錄(二)之第三及四條及 97 年 10 月 15 日簽訂之 JV 增補條款第五其他之第(一)項自合約生效日起均失其效力。

四、鑽石科技中心(DTC)人員於民國 100 年 12 月 31 日前隨宋博士加入鍊鑽公司者，其

PATENT
REEL: 033566 FRAME: 0511

Ex. 1003, Page 377

在中砂公司所簽之競業禁止條款將不適用。

五、因 DTC 縮減規模及支出到 JV 到期前，將為甲方節省數額之三分之一，甲方同意用來抵償第一項第一款乙方應付甲方的 JV 鑽石金屬散熱片專利清算金額。

六、甲方將保留乙方之辦公室及秘書人員供其使用至 JV 到期止。

七、JV 非屬甲方使用、需要或非乙方擬保留之專利，即日起將委外出售，洽定對象出售前乙方同意無償過戶於甲方，由甲方名義出售，出售價款應優先清償甲方過去因獲取該專利權所為投入之所有支出及合理利息(五大銀行平均基準利率)並加計 15% 利潤後，再扣除專利權的交易成本，如尚有獲利則其三分之一歸屬乙方所有。該等專利到 JV 到期日仍未售出者及申請中未獲權者，雙方同意無條件放棄繼續維護。

八、除甲方違反 JV 約定，乙方同意確保甲方鑽石碟產品(DG)未來的營運，不得以專利權訴訟或惡意對他方授權侵犯甲方利益，並將於 JV 到期時將相關專利(詳 91 年 JV 修訂版第 6 條)無償移轉給甲方，如有違者，甲方得向乙方求償。另目前甲方使用之 ODD 專利(詳附件四)鑽石碟產品，甲方年營業額如達不到新台幣 5,000 萬元，則乙方對甲方之授權轉為非專屬授權，而乙方對外授權 ODD 鑽石碟所收取之對價，其三分之二屬甲方所有，如甲方支付 ODD 鑽石碟產品權利金達 15 年時，該項專利將依照雙方 JV 約定，乙方應於到期日無條件移轉於甲方，自此完全歸屬甲方所有。民國 102 年 JV 到期時，乙方得選擇提前依雙方 JV 約定方式清算 ODD 專利。

九、JV 應支付權利金產品的認定，僅限於中砂公司使用 JV 專利權所生產的產品。凡中砂公司使用 JV 專利製造之產品，應依 JV 增補條款之約定支付乙方權利金，甲方不得拒絕。

十、基於甲乙雙方的 JV 關係，以上如有未盡之處，則從雙方所有訴諸文字之 JV 相關約定。雙方在此重申，在 JV 到期前雙方所簽未協議失效的約定內容仍然有效同時歷次修約不追溯既往。

十一、本備忘錄雙方約定於錸鑽公司成立後生效。

立約人：甲方

中國砂輪企[illegible]司

代表人：執行長 謝榮哲 謝榮哲

統一編號：03089008

乙方

宋健民 宋健民

身份證字號：F103338169

中 華 民 國 1 0 0 年 1 月 2 1 日

PATENT
REEL: 033566 FRAME: 0512

Ex. 1003, Page 378

附件一：Patent list of Dia/metal

專利名稱	案號	國家	20項大分類	案件狀態
電子元件用散熱件及其製法	P-068176	台灣	Class 03 -Dia-Metal heat spreader，	核准案
具有熱傳導梯度的鑽石複合物散熱片及其製法	P-071487	大陸	Class 03 -Dia-Metal heat spreader，	核准案
具有熱傳導梯度之鑽石複合物散熱片及其製法	P-071486	台灣	Class 03 -Dia-Metal heat spreader，	核准案
碳複合物散熱器及其相關方法	P-079090	台灣	Class 03 -Dia-Metal heat spreader，	核准案
印刷電路板之散熱方法及其裝置	P-086253	台灣	Class 03 -Dia-Metal heat spreader，	審查中
具有單層鑽石顆粒的均熱板、其熱管理系統及其相關方法	P-093647	台灣	Class 03 -Dia-Metal heat spreader，	審查中
具有單層鑽石顆粒的均熱板及其相關方法	P-093658	大陸	Class 03 -Dia-Metal heat spreader，	審查中
Diamond Composite Heat Spreader and Associated Methods	00802-21154	美國	Class 03 -Dia-Metal heat spreader，	核准案
Carbonaceous Composite Heat Spreader and Associated Methods	00802-21154.CIP	美國	Class 03 -Dia-Metal heat spreader，	核准案
Carbonaceous Composite Heat Spreader and Associated Methods	00802-21154.CIP.CON	美國	Class 03 -Dia-Metal heat spreader，	審查中
Method For Carbonaceous Composite Head Spreader	00802-21154.CIP.CON.DIV	美國	Class 03 -Dia-Metal heat spreader，	審查中
Diamond Composite Heat Spreader Having Thermal Conductivity Gradients & Associated Methods	00802-21154.CIP2	美國	Class 03 -Dia-Metal heat spreader，	核准案
Diamond Composite Heat Spreader Having Thermal Conductivity Gradients & Associated Methods	00802-21154.CIP2.DIV	美國	Class 03 -Dia-Metal heat spreader，	核准案
Diamond-Silicon Composite Heat Spreaders	00802-21154.CIP6	美國	Class 03 -Dia-Metal heat spreader，	審查中
Diamond Composite Heat Spreader and Associated Methods	00802-21154.DIV	美國	Class 03 -Dia-Metal heat spreader，	核准案
Methods and Devices for Cooling Printed Circuit Boards	00802-32709	美國	Class 03 -Dia-Metal heat spreader，	審查中
Methods and Devices for Cooling Printed Circuit Boards	00802-32709.PCT	PCT	Class 03 -Dia-Metal heat spreader，	審查中
Heat Spreader Having Single Layer of Diamond Particles and Associated Methods	00802-32738	美國	Class 03 -Dia-Metal heat spreader，	核准案
Heat Spreader Having Single Layer of Diamond Particles and Associated Methods	00802-32738.CON	美國	Class 03 -Dia-Metal heat spreader，	審查中
Nanodiamond Powder/Metal Composite Films For Cooling Electronic Devices	00802-32753	美國	Class 03 -Dia-Metal heat spreader，	審查中
Methods and Devices for Cooling Electronics (Copper Sandwich Monolayer Diamond Heat Spreaders DiaCu)	00802-32820.PROV	美國	Class 03 -Dia-Metal heat spreader，	審查中
Methods and Devices for Cooling Electronics (Copper Sandwich Monolayer Diamond Heat Spreaders DiaCu)	00802-32820.CIP	美國	Class 03 -Dia-Metal heat spreader，	審查中

PATENT
REEL: 033566 FRAME: 0513

附件二：DLC 交互授權專利清單

專利編號	發明人	專利名稱	
093139329	甘明吉,宋健民,胡紹中	高導熱效率電路板(二)	KINIK
094100821	甘明吉,宋健民,胡紹中	高導熱性印刷電路板	
094107997	甘明吉,宋健民,胡紹中	高散熱效率之散熱裝置	
096108157	甘明吉,胡紹中,宋健民	具高散熱性的發光二極體裝置	
096136526	甘明吉,黃世耀,胡紹中	高散熱封裝載板	
096136526	甘明吉,黃世耀,胡紹中	高散熱封裝載板	
097112351	甘明吉,胡紹中,宋健民	用於承載電子元件之載板結構及其製作方法	
097112351	甘明吉,胡紹中,宋健民	用於承載電子元件之載板結構及其製作方法	
097112351	甘明吉,胡紹中,宋健民	用於承載電子元件之載板結構及其製作方法	
097114999	甘明吉,胡紹中	高導熱性電路載板及其製作方法	
097114999	甘明吉,胡紹中	高導熱性電路載板及其製作方法	
098124331	甘明吉,胡紹中,宋健民	高專熱性電路載板	
098124331	甘明吉,胡紹中,宋健民	高導熱性電路載板	
099108884	胡紹中,甘明吉,宋健民	基板之製作方法及其結構	
099108884	胡紹中,甘明吉,宋健民	基板之製作方法及其結構	
099108884	胡紹中,甘明吉,宋健民	基板之製作方法及其結構	
準備申請中	甘明吉,宋健民,胡紹中,陳嘉延	應用於觸控面板玻璃基板之表面處理	
095129328	甘明吉,胡紹中,宋健民	印刷電路板之散熱方法及其裝置	宋博
098101357	宋健民	鑽石層隔熱電路及其相關方法	
098101357	宋健民	熱動力電子裝置、冷卻電子裝置的方法及發光二極管	
099123237	宋健民,甘明吉,胡紹中	具有低漏電流和高熱傳導性之多層基板、具有發光二極體裝置及其相關方法	
099123237	宋健民,甘明吉,胡紹中	具有低漏電流和高熱傳導性之多層基板、具有發光二極體裝置及其相關方法	
11/201,772	宋健民	Diamond-Like Carbon Coated Devices	
-	宋健民	Diamond-Like Carbon Coated Devices	
11/706,867	宋健民	Diamond Insulated Circuits and Associated Methods	
-	宋健民	DLC Radiation Absorber And Associated Methods	
11/706,871	宋健民	Methods of Cooling Electronic Circuits and Associated Devices	
12/787,074	宋健民	Composite Insulative Layer for Electrically Conductive Substrates	
-	宋健民	DLC Touch Panel Surfaces and Associated Methods	

PATENT
REEL: 033566 FRAME: 0514

附件三：甲方擬移轉專利清單

專利名稱	專利號碼	智慧局申請案號	國家	發明人	案件狀態
高導熱性印刷電路板	I255161	093139329	台灣	甘明吉,宋健民,胡紹中	核准案
具高導熱性電路板	I263475	094122341	台灣	胡紹中,甘明吉	核准案
高導熱性鑽石鋁複合材料	I306083	094134919	台灣	宋健民,胡紹中,甘明吉	核准案
一種熱傳導裝置的製造方法及其結構	n/a	099137898	台灣	胡紹中,洪興,林弘正,林逸樵,宋健民	審查案
一種熱傳導裝置的製造方法及其結構	n/a	099137898	大陸	胡紹中,洪興,林弘正,林逸樵,宋健民	審查案

PATENT
REEL: 033566 FRAME: 0515

附件四：ODD 專利清單

專利名稱	案號	國家	發明人	案件狀態
於有機材料中結合超級磨粒的方法	P-081532, TW 95133055	台灣	宋健民	核准案
於有機材料中結合超級磨粒的方法	P-087087, TW 95133055	大陸	宋健民	審查案
在有機基質中結合超研磨顆粒的方法	P-087876, TW 97118854	台灣	宋健民	審查案
具有拼圖式研磨片段的 CMP 拋光墊修整器及其相關方法	P-089105, TW 97137069	台灣	宋健民,宋恩齊	審查案
具有混合研磨表面的 CMP 拋光墊修整器及其相關方法	P-089926, TW 98111100	台灣	宋健民	審查案
具有混合研磨表面的 CMP 拋光墊修整器及其相關方法	P-089928, TW 98111100	大陸	宋健民	審查案
拋光墊修整器	P1365, TW 97151746	台灣	宋健民	審查案
拋光墊修整器	P1387, TW 97151546	大陸	宋健民	審查案
定向超研磨顆粒於表面的方法及其相關工具	P-089678, TW 97147039	台灣	宋健民	審查案
具有表面修飾之超研磨顆粒的超研磨工具及其相關方法	P-094380, TW 99105781	台灣	宋健民	審查案
具有表面修飾之超研磨顆粒的超研磨工具及其相關方法	P-094381, TW 99105781	大陸	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023	美國	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.CON	美國	宋健民	核准案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.CON2	美國	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.CON3	美國	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.DIV	美國	宋健民	核准案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.DIV.CON	美國	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.PCT	PCT	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.PCT.JP	日本	宋健民	審查案
Methods of Bonding Superabrasive Particles In An Organic Matrix	00802-25023.PCT.KR	韓國	宋健民	審查案
Methods of Bonding Superabrasive Particles in an Organic Matrix	00802-32735	美國	宋健民	審查案
Methods For Orienting Diamond Particles In A Viscous Matrix And Associated Tools	00802-32778.NP	美國	宋健民	審查案
CMP Pad Conditioners with Mosaic Abrasive Segments and Associated Methods	00802-32779.NP	美國	宋健民	審查案
CMP Pad Conditioners with Mosaic Abrasive Segments and Associated Methods	00802-32779.NP.CIP	美國	宋健民	審查案
CMP Pad Conditioners with Mosaic Abrasive Segments and Associated Methods	00802-32779.NP.CIP2	美國	宋健民	審查案
CMP Pad Conditioners with Mosaic Abrasive Segments and Associated Methods	00802-32779.PCT	PCT	宋健民	審查案
Methods of Detecting and Eliminating Killer Asperities in CMP Pad Dressers and Corresponding Dresser Devices	00802-32810.NP	美國	宋健民	審查案

PATENT
REEL: 033566 FRAME: 0516

Ex. 1003, Page 382

RECORDED: 08/19/2014

附件五：專利價值之計算

分類	專利申請費用	研發費用	研發費用(1/3)	總成本	
鉻鑽-DLC	5,785,801	49,544,524		55,330,325	交互授權+無權利金
鉻鑽-鑽鋼	9,528,161	19,722,459	6,574,153	16,102,314	提前清算
利潤(15%)				2,415,347	
98(全年)				322,046	
99(全年)				328,487	
總計				19,168,195	

	JV 年預算	年可節省
顧問費	1,960,000	4,540,000
先進鑽石膜	3,500,000	
委外研究	1,000,000	2,000,000
專利費	10,000,000	10,000,000
其他人事費		3,600,000
耗材		1,000,000
合計	16,460,000	21,140,000

100/3/1~102/10/27 共可節省	56,180,274
1/3 回饋	18,726,758

PATENT
REEL: 033566 FRAME: 0517

Ex. 1003, Page 383

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/506,476	10/03/2014	Chien-Min Sung	

CONFIRMATION NO. 9471

134688
Devlin Law Firm
1526 Gilpin Ave.
Wilmington, DE 19806

POA ACCEPTANCE LETTER

OC000000127882126

Date Mailed: 08/23/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/19/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/vostuart/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/506,476	10/03/2014	Chien-Min Sung	02074-24012.NP.CIP2

CONFIRMATION NO. 9471

POWER OF ATTORNEY NOTICE

20551
THORPE NORTH & WESTERN, LLP.
P.O. Box 1219
SANDY, UT 84091-1219

OC000000127882110

Date Mailed: 08/23/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/19/2021.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/vostuart/

Trials@uspto.gov
571-272-7822

Paper No. 9
Date: August 27, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KINIK COMPANY,
Petitioner,

v.

CHIEN-MIN SUNG,
Patent Owner.

IPR2021-00638
Patent 9,724,802 B2

Before PHILLIP J. KAUFFMAN, TIMOTHY J. GOODSON, and JASON W. MELVIN, *Administrative Patent Judges*.

MELVIN, *Administrative Patent Judge*.

DECISION
Settlement Prior to Institution of Trial
37 C.F.R. §§ 42.71, 42.74

I. DISCUSSION

Petitioner, Kinik Company, and Patent Owner, Chien-Min Sung (collectively "Parties"), request that the Petition for *inter partes* review in this proceeding be dismissed pursuant to settlement. Paper 8 ("Motion"). The Parties filed a copy of their Settlement Agreement. Ex. 1030.[1] The Parties state that the Settlement Agreement "resolves all underlying disputes with respect to U.S. Patent No. 9,724,802," the patent challenged in this proceeding. Motion 1. They note also that the district-court litigation between the parties "has now been dismissed with prejudice." *Id.* at 2.

This proceeding is at an early stage, and we have not yet decided whether to institute a trial in this proceeding. In view of the early stage of this proceeding and the settlement between the Parties, we determine that good cause exists to dismiss the Petition.

This Order does not constitute a final written decision pursuant to 35 U.S.C. § 318(a).

II. ORDER

Accordingly, it is

ORDERED that the Joint Motion to Dismiss the Petition is *granted*, and the petition in IPR2021-00638 is *dismissed*.

[1] The parties indicate that Exhibit 1030 is a certified translation of "court transcripts consisting of the Settlement Agreement between Sung and Kinik executed before the Intellectual Property Court of Taiwan." Motion 1 n.1.

Trials@uspto.gov
571-272-7822

Paper No. <x>
Date: <xxx>

PETITIONER:

Brian C. McCormack
Mackenzie Martin
D. Yoon Chae
BAKER & McKENZIE LLP
brian.mccormack@bakermckenzie.com
mackenzie.martin@bakermckenzie.com
yoon.chae@bakermckenzie.com

PATENT OWNER:

Timothy Devlin
Alex Chan
DEVLIN LAW FIRM LLC
Td-ptab@devlinlawfirm.com
achan@devlinlawfirm.com

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

ACKNOWLEDGEMENT OF LOSS OF ENTITLEMENT TO ENTITY STATUS DISCOUNT

APPLICATION #	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET #	REQUEST ID
14/506,476	10/03/2014	Chien-Min Sung		52441

The entity status change request below filed through Patent Center on 12/07/2022 has been accepted.

Certifications

APPLICANT CHANGING TO REGULAR UNDISCOUNTED FEE STATUS

Signature

I certify, in accordance with 37 CFR 1.4(d)(4), that I am one of the signatories making the entity status change.

Signature	Name	Registration #
/James M Lennon/	James Lennon	56815

111

RECEIVED
CENTRAL FAX CENTER
DEC 07 2022

FAX

TO:	Office of Petitions	FROM:	Jennifer Picini
FAX:	571-273-8300	FAX:	
PHONE:	571-272-3282	PHONE:	302-486-3402
SUBJECT:	Petition for Review by the Office of Petitions	DATE:	December 7, 2022

COMMENTS Documents included:
Notice of Loss of Entitlement to Small Entity Status – US 9,724,802 (1 page)
Credit Card Authorization (1 page)

RECEIVED
CENTRAL FAX CENTER
DEC 07 2022

USPTO
RECEIPTS ACCOUNTING
DIVISION
13023534251

2022 DEC 13 PM 12: 38

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Sung

Confirmation No.: 9471

Application No.: 14/506,476

Art Unit: 3723

Filing Date: October 3, 2014

For: CMP PAD DRESSERS HAVING LEVELED TIPS AND ASSOCIATED METHODS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Notice of Loss of Entitlement to Small Entity Status

Applicant hereby submits Notice of Loss of Entitlement to Small Entity Status. Small entity status was established in good faith, and fees as a small entity were paid in good faith, but it was recently discovered that entitlement to small entity status was lost and that through error the Office was not notified of the loss of entitlement to small entity status. This was a good faith error without deceptive intent. Applicant submits that this good faith error shall be excused pursuant to 37 CFR § 1.28 as Applicant herewith is complying with the separate submission and itemization requirements of paragraphs (c)(1) and (c)(2) of 37 CFR § 1.28, and the deficiency payment requirement of paragraph (c)(2) of 37 CFR § 1.28.

The fee deficiency is calculated below and has been submitted.

Date Paid	Fee Code	Amount Paid	2022 Amount	Deficiency
7/21/2021	2551	$1000	$2000	**$1000**
7/21/2021	2554	$250	$500	**$250**
			Total Due	**$1250**

The Office is invited to telephone the undersigned attorney to resolve any outstanding issues.

Date: December 7, 2022

Respectfully Submitted,
/James M. Lennon/
James M. Lennon
Customer No. 134688
Devlin Law Firm LLC
1526 Gilpin Ave.
Wilmington, DE 19806