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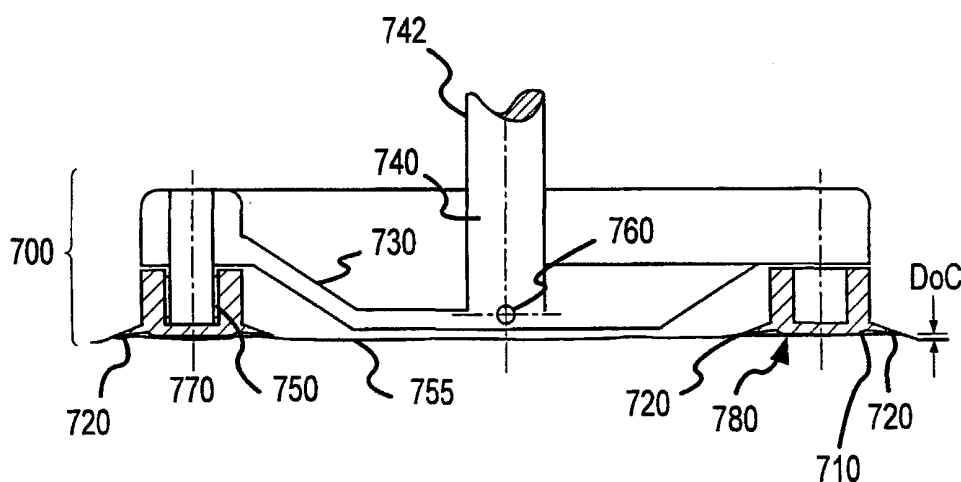
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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR NON-ABRASIVE CONDITIONING OF POLISHING PADS



(57) Abstract: A method and apparatus for resurfacing a polishing pad using non-abrasive techniques. These techniques include shaving, milling, or planing the upper working surface of the polishing pad using an edged cutting tool to alter the microtexture and micro-topology of the surface to produce a desired surface contour or planarity. This precise conditioning of the microscopic features of the polishing pad surface controls dishing in workpieces during polishing. A pad conditioning tool (700) is comprised of multiple cutters (710) with resharpenable or replaceable sharp edges (720) attached to a housing (730) that includes a bore (740) for receiving a spindle (742). The cutters are moveably mounted to the assembly via bearings (750) that allow the cutters (710) to rotate freely with respect to housing (730). The cutters (710) may also be geared to rotate about their own axis (770) under the effects of a drive motor. The cutters (710) each have a planar area (780) proximate to the cutting edges to allow for "floating" or self-leveling of the cutters.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/05941

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B24B37/04 B24B53/007 B24B49/10 B26D3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B24B B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 18697 A (SPEEDFAM CORP) 13 July 1995 (1995-07-13) page 2, line 30 -page 3, line 24; figure 3 page 5, line 26 -page 6, line 15; figure 2 ---	1,2,4,5, 7,8, 10-12, 14,29,31
Y	---	30
X	EP 0 092 818 A (DISCO ABRASIVE SYSTEMS LTD) 2 November 1983 (1983-11-02)	15-22
Y	page 4, line 9 -page 6, line 31; figure 1 ---	5-13,30
Y	EP 0 879 677 A (R P S R L) 25 November 1998 (1998-11-25) column 3, line 17 -column 4, line 3; figure 1 --- -/--	5-13



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

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04 01 2001

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 081 051 A (MATTINGLY WAYNE A ET AL) 14 January 1992 (1992-01-14) column 5, line 45 -column 6, line 9; figure 4 ---	15
A	US 5 531 635 A (MOGI KATSUMI ET AL) 2 July 1996 (1996-07-02) column 1, line 59 - line 65 ---	15
A	US 5 578 362 A (REINHARDT HEINZ F ET AL) 26 November 1996 (1996-11-26) column 11, line 19 - line 59; figure 11 -----	29

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/05941

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-22, 29-31

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-22, 29-31

Cutting tool and methods to use it for conditioning a polishing pad.

1.1. Claims: 1-4

Method to condition a polishing pad using a cutting tool

1.2. Claims: 5-14

Cutting tool with multiple cutters

1.3. Claims: 15-22

Cutting tool with a single blade

1.4. Claims: 29-31

Method to polish a wafer using an "in-situ" conditioned pad

2. Claims: 23-28

Speed and position control system for a cutting tool

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/05941

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9518697 A	13-07-1995	US 5486131 A DE 4480510 T JP 9510146 T	23-01-1996 11-12-1997 14-10-1997
EP 0092818 A	02-11-1983	JP 58184727 A JP 63012741 B DE 3364665 D KR 9001663 B US 4947598 A	28-10-1983 22-03-1988 28-08-1986 17-03-1990 14-08-1990
EP 0879677 A	25-11-1998	IT M0970074 A	26-10-1998
US 5081051 A	14-01-1992	NONE	
US 5531635 A	02-07-1996	JP 3036348 B JP 7256554 A FR 2717727 A	24-04-2000 09-10-1995 29-09-1995
US 5578362 A	26-11-1996	US 6069080 A US 5900164 A AU 4798493 A CN 1082567 A DE 69319435 D DE 69319435 T EP 0656031 A EP 0829328 A JP 3013105 B JP 8500622 T KR 191227 B SG 43335 A WO 9404599 A	30-05-2000 04-05-1999 15-03-1994 23-02-1994 06-08-1998 25-02-1999 07-06-1995 18-03-1998 28-02-2000 23-01-1996 15-06-1999 17-10-1997 03-03-1994