

## DESCRIPTION

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From 1971 forward, the CLAIMS documents include all information found on the front page of a U.S. patent document, plus exemplary and non-exemplary claims. The complete specification is included for patents issued from 1976 forward. Documents covering 1950-1970 contain basic bibliographic data and exemplary claims (chemical patents only). Business-method patent indexing is available from 2001 forward. In-depth controlled indexing for chemical and chemically-significant patents is provided for the years 1950-2010. Since published pre-grant publications often do not include assignees, IFI generates Probable Assignee names algorithmically using various sources such as reassignment data. U.S. Classification, International Patent Classification (version 8), and the new Cooperative Patent Classification (CPC) are provided. Thesaurus details are provided for the 3 classification systems. Provisional application data is also included.

Post-issuance legal status information for U.S. patents is provided from 1980 forward. The information is obtained from the U.S. Patent & Trademark Office and from the USPTO *Official Gazette*. Coverage includes: certificates of correction, reassignment data, reexamination requests, certificates, and reexamination claims, term extensions, expirations for non-payment of fees, reinstatements, reissue requests, adverse decisions on interference actions, and disclaimer/ dedication data. Legal status information typically contains the date of the legal action, the date it was recorded in the *Official Gazette* and any additional applicable information such as request number, descriptive text, etc. Calculated expiration dates are also available. This is proprietary information produced by IFI CLAIMS® Patent Services.

Pre- and post-issuance reassignment information includes the former assignee (i.e., assignor), new assignee, reassignment action (e.g., full interest, quarter interest, etc.), date of reassignment, reel and frame number of the USPTO microfilm record, and the correspondence address.

### Date Coverage

1950+ chemical patents  
1963+ electrical and mechanical patents  
December 1976+ design and plant patents  
March 2001+ pre-grant published applications  
1980+ legal status and reassignment data

### Update Frequency

Twice weekly

### Geographic Coverage

International

### Document Types

Patents

### Publisher

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TI

**RECORDING MEDIA HAVING PROTECTIVE OVERCOATS OF HIGHLY TETRAHEDRAL AMORPHOUS CARBON AND METHODS FOR THEIR PRODUCTION**

INV,PA,CO  
PBC,PN,PD

Li, Eric; Vijayen, Veerasamy; Weiler, Manfred (Inventors). United Mobile Corporation; United Module Corp (Assignees). **US 6805891 B2**. (Published 19 Oct 2004).

- Bibliographic information
- Claims
- Legal status
- Specification
- Cited references
- Citing patents

AB, TX

**Abstract (summary)** [Translate](#)

The invention provides systems and methods for the deposition of an improved diamond-like carbon material, particularly for the production of magnetic recording media. The diamond-like carbon material of the present invention is highly tetrahedral, that is, it features a large number of the sp<sup>3</sup> carbon carbon bonds which are found within a diamond crystal lattice. The material is also amorphous, providing a combination of short-range order with long-range disorder, and can be deposited as films which are ultrasmooth and continuous at thicknesses substantially lower than known amorphous carbon coating materials. The carbon protective coatings of the present invention will often be hydrogenated. In a preferred method for depositing of these materials, capacitive coupling forms a highly uniform, selectively energized stream of ions from a dense, inductively ionized plasma. Such inductive ionization is enhanced by a relatively slow moving (or "quasi-static") magnetic field, which promotes resonant ionization and ion beam homogenization.

**Indexing (details)** [Cite](#)

PA, CO

**Assignee** [United Mobile Corporation](#) (U.S. Company or Corporation)  
Los Altos, CA, US  
Standardized: [United Module Corp](#) (058622)

PA, CO  
INV

**Inventor**  
[Li, Eric](#)  
Palo Alto, CA, US  
[Vijayen, Veerasamy](#)  
San Jose, CA, US  
[Weiler, Manfred](#)  
Elbersdorf, DE

PBC, PN, KC, PD

**Publication number** [US 6805891 B2](#) (19 October 2004)

APC, APN, APD

**Application number** [US 2003350498](#) (23 January 2003)

**Related publication**

DT, APC, APNA,  
APDA

Publication type	Publication number	Publication date	Application number	Application date
Provisional application			<a href="#">US 6018793 P</a>	31 May 1996
Pre - grant publication	<a href="#">US 20030148103 A1</a>	07 August 2003		
Division	<a href="#">US 5858477 A</a> (Granted)	12 January 1999	<a href="#">US 1996761336</a>	10 December 1996
Division	<a href="#">US 6537668 B1</a> (Granted)	25 March 2003	<a href="#">US 1998165513</a>	02 October 1998

DT, PBC, KCA,  
PNA, PDA

CPC

**CPC classification** [H01J 37/32357](#) (main); [C03C 17/22](#); [C03C 2217/282](#); [C03C 2218/151](#); [C23C 16/26](#); [C23C 16/486](#); [G11B 5/72](#); [G11B 5/8408](#); [H01J 27/18](#); [H01J 37/08](#); [H01J 37/32091](#); [H01J 2237/0815](#)  
[More details](#) ▼

IPC

**IPC classification** Version 8: [C03C 17/22](#); [G11B 5/72](#); [G11B 5/84](#); [H01J 27/16](#); [H01J 27/18](#); [H01J 37/08](#)  
Version 1-7: [G11B 5/72](#) (main)

Fewer details ▲

IPC version 8:

IPC

Class code	Level	Value	Position	Status	Version	Action	Source	Office
<a href="#">C03C 17/22</a>	A	I		R	20060101	20051008	M	EP
<a href="#">G11B 5/72</a>	A	I		R	20060101	20051008	M	EP
<a href="#">G11B 5/72</a>	C	I		R	20060101	20051008	M	EP
<a href="#">G11B 5/84</a>	A	I		R	20060101	20051008	M	EP
<a href="#">G11B 5/84</a>	C	I		R	20060101	20051008	M	EP
<a href="#">H01J 27/16</a>	C	I		R	20060101	20051008	M	EP
<a href="#">H01J 27/18</a>	A	I		R	20060101	20051008	M	EP
<a href="#">H01J 37/08</a>	A	I		R	20060101	20051008	M	EP
<a href="#">H01J 37/08</a>	C	I		R	20060101	20051008	M	EP

IPC (versions 1-7):

Class code	Rank	Version	Type
<a href="#">G11B 5/72<sup>†</sup></a>			Main
<sup>†</sup> Class code is 'As published'			

USCL

**US classification**

[428/835](#) (main); [426/336](#) (main); [428/408](#); [428/835.4](#); [G9B/5.28](#); [G9B/5.3](#); [428/408](#); [428/694TC](#)

LRP

**Legal representative**

Townsend and Townsend and Crew LLP

EXM

**Examiner**

Resan, Stevan A  
USPTO Art Unit: 1773

FOS

**US field of search**

US class: [428/336](#); [428/408](#); [428/694TC](#)

LA

**Publication language**

English

**Document features**

6 citing patents  
20 Drawings  
14 claims; 11 legal status entries

DTYPE

**Document type**

Utility Patent; Chemical Patent; Granted Patent; Certificate of Correction; Expiration; Reassignment; Reexamination Request; Reexamination certificate; Provisional Application

**Notes**

INDEXED FROM APPLICATION

**Word count**

11103

**Source attribution**

IFI CLAIMS US Patents and Legal Status, © Publisher specific

AN

**Accession number**

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FAV

**First available**

2012-10-11

UD

**Updates**

2012-10-11  
2013-10-14

PUB

**Database**

IFI CLAIMS® US Patents and Legal Status (1950 - current)

[Bibliographic information](#)

[Claims](#)

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CLMRX

**Reexamined claims**

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT: Claims 1-14 are cancelled. (1. Magnetic recording media comprising: a substrate; a magnetic layer disposed over the substrate; and a protective layer disposed over the magnetic layer, the protective layer comprising a highly tetrahedral amorphous carbon having a thickness of less than 80 E.)

**As published claims**

Exemplary Claim(s): 1

Independent Claim Number(s): 1,13,14

D R A W I N G

CLMM,CLM

1. Magnetic recording media comprising:  
a substrate;  
a magnetic layer disposed over the substrate; and  
a protective layer disposed over the magnetic layer, the protective layer comprising a highly tetrahedral amorphous carbon having a thickness of less than 80 Å .

CLM

2. A recording media as in claim 1, wherein the highly tetrahedral amorphous carbon of the protective layer includes more than about 35% sp<sup>3</sup> carbon carbon bonds.

3. A recording media as in claim 1, wherein the highly tetrahedral amorphous carbon of the protective layer includes more than about 70% sp<sup>3</sup> carbon carbon bonds.

4. A recording media as in claim 1, wherein the sp<sup>3</sup> carbon carbon bonds are at least in part formed by directing an energized stream of carbon ions toward the substrate.

[claims and legal status truncated in the sample document]

Bibliographic information	Claims	Legal status	Specification	Cited references	Citing patents
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EXPD,LD,LS

Gazette date	Description	Notes/additional information
	Patent Status	Expired - Fee Related
	Calculated Expiration	Calculated expiration date: 2018 Oct 02
2012 Dec 11	Expiration	Expiration: 2012 Oct 19
	Reexamination certificate	Requestor: Third Party Requester: Western Digital Technologies Inc., Lake Forest, CA; (Att'y Is: David C. McPhie, Irell & Manella, LLP, Newport Beach, CA) Real Party in Interest: Same As Third Party Requester  Request number: 95/000337 Date: 2008 Jan 04  Sequence number: 0152  Reexamination certificate number: C16805891 Date: 2010 Mar 23
2008 Mar 11	Reexamination Requested	Requestor: Third Party Requester: Western Digital Technologies Inc, Lake Forest, CA; (Att'y Is: David C. McPhie, Irell & Manella, LLP, Newport Beach, CA) Real Party in Interest: Same As Third Party Requester  Request number: 95/000337 Date: 2008 Jan 04
	Certificate of Correction	2005 Mar 22

PAOR,CO

PARE,CO

RR

REA  
LD,LS

2008 Apr 09	Post-Issuance reassignment: CONFIRMATION OF PATENT ASSIGNMENT	Assignor: United Module Corporation (signed 20070207)  Assignee: Stormedia Texas Llc, 100 E. FERGUSON, SUITE 1100, TYLER, TX, 75702  Correspondence: JULIEN ADAMS, 201 SANTA MONICA BLVD., SUITE 600, SANTA MONICA, CA 90401 Reel/Frame: 020773/0451
2008 Apr 09	Post-Issuance reassignment: QUITCLAIM	Assignor: Akashic Memories Corporation (signed 20070111) Stormedia Incorporated (signed 20070111)  Assignee: United Module Corporation, 978 HIGHLANDS CIRCLE, LOS ALTOS, CA, 94024  Correspondence: JULIEN ADAMS, 201 SANTA MONICA BLVD., SUITE 600, SANTA MONICA, CA 90401 Reel/Frame: 020773/0569
2008 Apr 09	Post-Issuance reassignment: ASSIGNMENT OF ASSIGNORS INTEREST	Assignor: United Module Corporation (signed 20070119)  Assignee: Stormedia Texas Llc, 100 E. FERGUSON, SUITE 1100, TYLER, TX, 75702  Correspondence: JULIEN ADAMS, 201 SANTA MONICA BLVD., SUITE 600, SANTA MONICA, CA 90401 Reel/Frame: 020773/0611

Bibliographic information

Claims

Legal status

Specification

Cited references

Citing patents

### CROSS REFERENCE TO RELATED APPLICATIONS

SPEC, TX

This application is a divisional of and claims the benefit of priority from U.S. patent application Ser. No. 09/165,513, filed Oct. 2, 1998, which is a divisional of U.S. patent application Ser. No. 08/761,336, now U.S. Pat. No. 5,858,477, filed Dec. 10, 1996, which is a continuation-in-part of and claims priority from U.S. Provisional Patent Applications Serial No. 60/018,793, filed May 31, 1996, and Serial No. 60/018,746, filed May 31, 1996, the full disclosures of which are incorporated herein by reference.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates generally to thin films and methods for their deposition, and more particularly, provides diamond-like films, plasma beam deposition systems, and methods useful for production of diamond-like protective overcoats on magnetic recording media and other industrial applications.

In recent years, there has been considerable interest in the deposition of a group of materials referred to as diamond-like carbon. Diamond-like carbon can generally be defined as a metastable, high density form of amorphous carbon. Diamond-like carbon is valued for its high mechanical hardness, low friction, optical transparency, and chemical inertness.

Deposition of diamond-like carbon films often involves chemical vapor deposition techniques, the deposition processes often being plasma enhanced. Known diamond-like films often include carbon with hydrogen, fluorine, or some other agent. The durability and advantageous electrical properties of diamond-like carbon films have led to numerous proposals to apply these films to semiconductors, optics, and a wide variety of other industrial uses. Unfortunately, the cost and complexity of providing these advantageous diamond-like carbon films using known chemical vapor deposition processes has somewhat limited their use. Furthermore, while a wide variety of diamond-like carbon coating films have been deposited in laboratories, many of these films have been found to have less than ideal material characteristics.

A very different form of amorphous carbon is generally applied as a protective overcoat for magnetic recording media. Magnetic recording disks generally comprise a substrate having a magnetic layer and a number of underlayers and overlayers deposited thereon. The nature and composition of each layer is selected to provide

[specification truncated in the sample document]

## Cited patents

This patent's list of citations includes the patents below (backwards citations).

## Cited by unknown (38 patents)

Publication number	Publication date	Assignee	Inventor	Classification	Description
US 4123316	1978 Oct 31	Hitachi Ltd JP	Tsuchimoto	438/731; B01J 15/00	PLASMA PROCESSOR
US 4226666	1980 Jan 01	International Business Machines Corp	Winters et al.	216/63; H01L 21/302	ETCHING METHOD EMPLOYING RADIATION AND NOBLE GAS HALIDE
US 4749608	1988 Jun 07	TDK K K JP	Nakayama et al.	428/216; G11B 5/72	MAGNETIC RECORDING MEDIUM
US 4822466	1989 Apr 18	Houston, University of	Rabalais et al.	204/192.15; C30B 25/02	CHEMICALLY BONDED DIAMOND FILMS AND METHOD FOR PRODUCING SAME
US 5017835	1991 May 21	Unassigned Or Assigned To Individual	Oechsner	315/111.81; H01J 27/16	High-frequency ion source
US 5064809	1991 Nov 12	Troy Investments Inc	Hed	505/329; H01L 39/22	Method of making a Josephson junction with a diamond-like carbon insulating barrier
US 5082359	1992 Jan 21	TEL Epion Inc	Kirkpatrick	359/642; C23C 16/02	Diamond films and method of growing diamond films on nondiamond substrates

## Cited literature

This patent's list of citations includes the literature references below (backwards citations).

Tip: Use the **Look up citation** search form to find these documents, after selecting all databases.

## Cited by unknown (23 references)

1. Aisenberg, S. et al., "Ion-Beam Deposition of Thin Films of Diamondlike Carbon," J. Appl. Phys., vol. 42, No. 7, Jun. 1971, pp. 2953-2958.
2. Boxman, R.L. et al., "Recent Progress in Filtered Vacuum Arc Deposition," Paper submitted, Int. Conf. Metallurgical Coatings and Thin Films, San Diego, Apr. 1996.
3. Chhowalla, M. et al. "Stationary Carbon Cathodic Arc: Plasma and Film Characterization," J. Appl. Phys., vol. 79, No. 5, pp. 2237-2244, 1996.
4. Chowalla, M. et al. "Deposition of Smooth Tetrahedral Amorphous Carbon :Thin Films Using a Cathodic Arc Without a Macroparticle Filter," Appl. Phys. Lett., vol. 67, No. 7, pp. 894-896, 1995.
5. Fuchs, Armin, Thesis (1987).
6. Grill, A., et al., "Diamondlike Carbon Deposited by DC PACVD," Diamond Films and Techn., vol. 1, No. 4, (1992), pp. 219-233.
7. Grill, A., et al., "Diamondlike Carbon Films by rf Plasma-Assisted Chemical Vapor Deposition from Acetylene," IBM J. Res. Develop., vol. 34, No. 6, Nov. 1990, pp. 849-
8. Kuhn, M., et al., "Deposition of Carbon Films By A Filtered Cathodic Arc," Diamond and Related Materials, vol. 2, No. 10, Aug. 1993, pp. 1350-1354.

[cited patents, cited references and citing patents truncated in the sample record]

CTPN,CTDA,  
CTPA,CTINV

PAR,REF

NPL,REF

## Citing patents (6)

This patent is cited by the patents below (forwards citations).

Publication number	Publication date	Assignee	Inventor	Classification	Description
US 7034285	2006 Apr 25	Ebara Corp JP	Samukawa, Seiji	250/251; H05H 3/00	Beam source and beam processing apparatus
US 7361421	2008 Apr 22	Panasonic Corp JP	Ohchi, Yukikazu	428/835.7; C10M 111/00	Lubricant, magnetic recording medium and production method of magnetic recording medium
US 7417255	2008 Aug 26	Intel Corp	Ravi, Kramadhathi V.	257/77; H01L 21/00	Methods of forming a high conductivity diamond film and structures formed thereby
US 7501330	2009 Mar 10	Intel Corp	Ravi, Kramadhathi V.	438/473; H01L 21/00	Methods of forming a high conductivity diamond film and structures formed thereby

CGPN,CGDA,  
CGPA,CGINV  
PAR,REF

## SEARCH FIELDS

Field Name	Field Code	Example	Description and Notes
Abstract	AB	ab("amorphous carbon")	Use adjacency and/or Boolean operators to narrow search results.
Abstract present	ABANY	"wafer furnace*" AND abany(yes)	Add: <i>AND ABANY(YES)</i> to a query to limit retrieval to documents with abstracts.
Accession number	AN	an(04144519)	A unique document identification number assigned by the information provider.
All fields	ALL	all(protein*)	Searches all fields <i>except</i> the full text. Use proximity and/or Boolean operators to narrow search results.
All fields + text	--	protein*	Searching without a field code searches all fields, including the full text.
Any number	PNUM	pnum(6805891)	Includes publication, application, priority application, related publication, and related application numbers. Enhanced/variant forms of the number are also searchable. For cited and citing publication numbers, use CTPN and CGPN.
Application country	APC	apc(US) apc(ZA)	Includes application, priority application, and related application country.
Application date	APD	apd(20030123) apd(200301) apd(2003)	Searches the main application date only.
Application dates – all	APDA	apda(19960531)	Includes application, priority, and related application dates.
Application number	APN	apn(US2003350498)	Searches the main/application number only. Retrieves only normalized and original source numbers.

Field Name	Field Code	Example	Description and Notes
Application numbers – all	APNA	apna("US 6018793")	Includes application, priority application, and related application numbers.
Assignor	PAOR	paor(akashic memories)	An assignor is a former assignee transferring rights to a new assignee (PARE). Assignor is only available for US patents and is displayed on the legal status tabs.
Author	AU	au("Weiler, Manfred")	Author names in patent databases are inventors but can be searched using the AU field code.
Cited and citing patent references	PAR	par(US 4822466) par("high conductivity diamond film") par((panasonic OR hitachi) AND (high conductivity) AND (US 4822466 or US 7553694))	Includes all cited and citing patent content. In IFI Claims, also searched cited/citing numbers, dates, assignees, inventors and descriptions. Excludes literature references.
Cited assignee	CTPA	ctpa(hitachi)	The assignee of a cited patent in the document
Cited inventor	CTINV	ctinv(Nakayama)	The inventor of a cited patent in the document. Note that cited inventors are listed with last name only
Cited non-patent literature	NPL	npl((diamondlike OR "diamond like") AND carbon AND Aisenberg)	Searches the cited literature references.
Cited patent publication date	CTDA	ctda(19880607)	The publication date of a cited patent in the document
Cited patent publication number	CTPN	ctpn(US 4822466)	The patent number of a cited patent in the document. Includes enhanced/variant forms of the number.
Cited references – all	REF	ref((diamondlike OR "diamond like") AND "EP 700033")	Includes cited/citing patent and cited literature references.
Citing assignee	CGPA	cgpa(Panasonic)	The assignee of a patent that has cited the document
Citing inventor	CGINV	cginv(Ohchi, Yukikazu) cginv(Ohchi)	The inventor of a patent that has cited the document. Complete names of citing inventors can be searched
Citing patent publication date	CGDA	cgda(20080422)	The publication date of a patent that has cited the document.
Citing patent publication number	CGPN	cgpn(US 7553694)	The publication number of a patent that has cited the document. Includes enhanced/variant forms of the number.
Claims	CLM	clm("sp3 carbon carbon bonds")	Claims are the legal text describing the patent.
Claim- Main	CLMM	clmm("thickness of less than 80 A")	Searches the main or exemplary claim text only
Claim - Reexamination	CLMRX	clmrx("tetrahedral amorphous carbon")	Searches the claims text of the results of reexamination
Classification – CPC <sup>1</sup>	CPC	cpc("H01J 37/32357") cpc("H01J 37") cpc(H01J) cpc(H01) cpc(H)	The Cooperative Patent Classification (CPC) is available for searching from March 2013 forward.
Classification – IPC <sup>2</sup>	IPC	ipc("H01J 37/08") ipc("H01J 37") ipc("H01J") ipc(H01) ipc(H)	International Patent Class codes. IPC Versions 1-7 are used prior to 2006. The Reformed IPC (IPCR/8) is used from 2006 forward.
Classification – US	USCL	uscl("428/835.4") uscl(428) uscl.exact("G9B/5.28")	National Class codes (United States). Note that truncating the subclass is not recommended since the US classification is not hierarchical.
Company information	CO	co(stormedia) co("United Module co**")	Includes the as-published patent assignee, probable assignee, new assignee and assignor.

<sup>1</sup> The Cooperative Patent Classification (CPC) was introduced in January 2013. It is structurally similar to the International Patent Classification (IPC), and is searched the same way using the CPC field code. CPC attributes are the same as the IPC attributes with the exception of the Value attribute (I - Inventive, A - Additional). Note that the attributes are not searchable.

<sup>2</sup> Some records may contain IPCR/8 codes as well as earlier versions of IPC codes, indicating that an older patent has been reclassified. Each IPCR/8 classification code is also assigned a series of attributes. These include level (A - Advanced, C - Core), value (I - Inventive, N - Non-inventive), position (F - First, L - Later), status (B - Basic, R - Reclassified, V - Various, D - Deleted), version date, action date, source (H - Human, M - Machine, G - Generated), and assigning office. Attributes are not indexed for searching.



Field Name	Field Code	Example	Description and Notes
Document text	TX	tx("ion beam*") tx(light PRE/1 emit* AND particle*)	Includes abstract, claims, and specification. Use adjacency and/or Boolean operators to narrow search results.
Document type	DTYPE	dtype(Granted) dtype("chemical patent")	Includes US patent document types. See also Related publication and application types
Examiner	EXM	exm(stevan resan) exm(1773)	Includes examiner and assistant examiner if any and examiner reference code (USPTO Art Unit).
Expiration date	EXPD	expd(20270228) expd(202702) expd(2027)	The calculated expiration date of the patent plus any expiration date due to the expiration of its term or for non-payment of fees. Can also be searched using field code LD.
Family ID – complete	CFID	cfid(112919734)	Family IDs are based on common priorities and are database-specific. The IFI CLAIMS family ID only retrieves the published application and its granted patent, and it does not retrieve continuations or divisions.
Field of Search	CLFS	clfs("428/408") clfs(a01*)	Contains US and IPC classifications applied by US classification examiners as the field of search
First available	FAV	fav(20130125)	Indicates the first time a document was loaded in a specific database. It will not change regardless of how many times the document is subsequently reloaded.
From database <sup>3</sup>	FDB	protein AND fdb(1008361) protein AND fdb(ificlaimslegalstatus)	Useful in multi-database searches to isolate documents from a single database. FDB cannot be searched on its own; specify at least one search term then AND it with FDB. See also PUB for identifying databases by name.
Full text	FT	ft(photogenerated)	Also searchable as TX.
Full text present	FTANY	protein* AND ftany(yes)	Add: <i>AND FTANY(YES)</i> to a query to limit your search to documents with full text (i.e., Specification). Applies to full text databases only.
Inventor	INV	inv("Weiler, Manfred") inv(manfred Weiler)	Inventor names are also searchable using the AU field code.
Inventor country	ICO	ico(DE) ico(CA)	Searches the 2-letter code of the inventor's country
Inventor location	ILO	ilo(Palo alto) ilo(CA) AND ico(US)	Searches the inventor's city or 2-letter code of the inventor's state
Language	LN	ln(english)	All documents are in English.
Language of abstract	SL	sl(english)	
Legal representative	LRP	lrp(lee AND hayes)	The legal representative, attorney, agent, or firm who represents the patent assignee.
Legal representative location	LRL	lrl(Spokane)	Includes mailing address if available.
Legal status	LS	ls(calculated expiration) ls("post issuance reassignment")	Searches legal status gazette date, description and notes (does not search labels in Notes column).
Legal status description	LSC	lsc(reexamination)	Searches the legal status description. Use the LNK operator to retrieve related legal status data from a specific legal status entry.
Legal status date	LD	ld(20121211) ld(20121019)	Includes the Gazette date and any other legal status date.
New assignee (Reassignment)	PARE	pare("stormedia Texas llc")	The name of the patent assignee who is receiving transfer rights from an assignor (PAOR) in a reassignment. Searchable and displayable on the Legal status tab.
Number of citing patents	NCBP	ncbp(6)	NCBP is a non-numeric field – symbols are not allowed.
Number of claims	NOC	noc(14)	NOC is a numeric field and supports the use of symbols such as "greater than" (>), "less than" (<).

<sup>3</sup> FDB searches the database ID. Click the "Field codes" hyperlink at the top right of the Advanced Search page. Click "Search syntax and field codes", then click on "FDB command" to get a list of database names and codes that can be searched with FDB.

Field Name	Field Code	Example	Description and Notes
Number of legal status entries	NLS	nls(11)	NLS is a numeric field.
Patent assignee	PA	pa("United Mobile Corporation") pa("United Module Corp") pa(058622) pa(Microsoft)	Searches the assignee name in the "as published" or standardized form. Also searches assignee code and probable assignee.
Patent assignee code	PACD	pacd(058622)	Searches patent assignee code as defined by information provider
Patent assignee country	ACO	aco(US)	The mailing address country for the patent assignee consisting of the ISO-standard 2-letter country code
Patent assignee location	ALO	alo("los altos" AND ca)	Searches the 2-letter state postal code and/or city names
Patent assignor (reassignment)	PAOR	paor("Akashic Memories")	An assignor is a former assignee transferring rights to a new assignee (PARE) in a reassignment. Searchable and displayable on the Legal status tab.
Patent publication country	PBC	pbcb(US) pbcb(WO)	Searches the 2-letter ISO standard country code for the main and related patent publication countries
Patent publication country and kind code - main	KC	kc(US B2) kc(US)	The kind code indicates the publication level of a patent document. KC searches the main publication country with kind code or the country only.
Patent publication country and kind code - all	KCA	kca(US B*) kca(US)	The kind code indicates the publication level of a patent document. KCA searches the main or related publication country with kind code or the country only.
Patent publication date	PD	pd(20041019) pd(2004-10-19) pd(200410) pd(2004)	Searches the main publication date. Dates may be searched as a range. Also searchable via the Look Up Patent tool.
Patent publication dates – all	PDA	pda(20030807) pda(2003-08-07) pda(200308) pda(2003)	Includes main and related publication dates.
Patent publication number	PN	pn(US6805891) pn(US 6805891 b2)	Searches only the main publication number. Only normalized and original source numbers are retrieved.
Patent publication numbers – all	PNA	pna("US 20030148103") pna(US 3776809) pna(FR 2005160)	Includes main publication numbers, related publication numbers such as continuations and divisions, and non-US equivalent publication numbers (1950-1978). Only normalized and original source numbers are retrieved.
Patent specification	SPEC	spec("diamond like carbon")	Also searchable with TX
Patent title	TI	ti("recording media") ti("shelf life")	Includes title and subtitle. See also TIO to search the original title only.
Priority application country	PPC	ppc(za)	The 2-letter ISO-standard country code associated with the priority application number(s)
Priority application date	PRD	prd(20061031) prd(2006-10-31) prd(200610) prd(2006)	Searches the 8-digit date assigned to a priority application number.
Priority application number	PRN	prn(ZA 20069073) prn(za 2002*)	The priority application number is the number assigned to the original or first application. Retrieves only the normalized or original source numbers, but can be truncated.
Probable assignee	PAP	pap(microsoft)	Searches probable assignee in pre-grant publications Also searches with PA.
Publication title	PUB	protein AND pub("ifi claims")	The publication title in this database is the database name.
Publication type	PT	pt(government)	The only publication type in IFI Claims is "Government & Official Publications".
Reassignment date	RAD	rad(20080409)	Searches the Gazette/recorded date only for reassignment data. Note that the signed date is searched using LS only.
Reassignment information	REA	rea(" JULIEN ADAMS" AND "santa monica" AND quitclaim)	Searches new assignee, assignor, correspondence, reassignment gazette date, reel/frame, and assignment description.

Field Name	Field Code	Example	Description and Notes
Reel and frame	RR	rr(020773/0611)	Reel/frame data for US reassignments
Related publication/ application type	DT	dt("pre grant publication") dt(provisional) dt("continuation in part") dt(pct)	Searches types of related publications and applications, such as PCT, Continuation in part, etc.
Title only	TIO	an(10102016) AND tio("protein crystals")	Searches only the original title and not the subtitle. Use TI to search both.
Updates	UD	ud(20131105)	The date(s) the record was loaded as a result of an update provided by the supplier.

### **SEARCH FIELDS – IFI indexing (these fields do not display at the present time)**

Field Name	Field Code	Example	Description and Notes
Botanical term	SU	su(fuchsiahybrida OR "rose quartet")	Searches plant variety and Latin plant name
Business method term	SU	su(compressed data)	
IFI Collection Term	SUBST	subst("pesticides AND biocides")	
IFI Compound Term	SUBST	subst("carbon dioxide") subst(050201)	Searches term and/or term number
IFI General term	SUBST	subst(aspergillus) subst(000432)	Searches term and/or term number
IFI Uniterm fragment	SUBST	subst("bromine inorganic") subst(030026)	Searches term and/or term number
Substance	SUBST	subst(choline)	
Trade name	TN	tn(prozac)	Trade names are occasionally provided as part of term extensions. Also searchable with field code LS

### **SEARCH TOOLS**

Field codes are used to search document fields, as shown in the sample document. Field codes may be used in searches entered on the **Basic Search**, **Advanced**, **Command Line** and **Look Up Patent** search pages. **Limit options**, **Look up lists**, **Patent families option**, **"Narrow results by" filters**, and **Look up patent** tools are available for searching. Some data can be searched using more than one tool.

#### **Limit options**

Limit options are quick and easy ways of searching certain common concepts. You can use the check box on the Advanced Search page for **Full text**. Or, use the field codes **FTANY(YES)** or **ABANY(YES)** to limit your search.

The Advanced search page also contains a short list of choices for **Document type** and dates. **Date limiters** are available in which you can select single dates or ranges for date of **publication** and **updated**.

#### **Look up lists**

Browse the contents of certain fields by using Look Up lists. These are particularly useful for validating spellings or the presence of specific data. Terms found in the course of browsing may be selected and automatically added to the Advanced Search boxes. Look Up lists are available in the Advanced Search drop-down fields for: **Inventor**, **Patent assignee**, **Publication kind code**, **Legal status (LS)**, **Classification (IPC)**, **Classification (US)**, **Patent assignor**, and **Patent assignee (Reassigned)**.

## Patent families option

Condense your results to one patent per family by using the patent families search tool on the right-hand panel of the results page. Click “Show one member per family” to reduce the list of results to 1 publication for each patent family. Click “Show all results” to reinstate the full list of results. This option applies to US patent publications from March 2001 forward, when the USPTO began publishing pre-grant applications and granted patents.

## “Narrow results by” filters

The results display is accompanied by a list of “Narrow results by” options shown on the right-hand panel. Click on any of these filters to see a ranked list showing the most frequently occurring terms in your results. Click on the term to apply it to (“narrow”) your search results. Narrow results by filters include:

**Full text, Patent assignee, Patent assignee country, Inventor, Patent publication country, Publication kind code, Classification (IPC), Classification (CPC), Classification (US), Legal status, Database** (present when searching multiple databases), and **Publication date (slider)**

## Look up patent

If you need help finding a patent, use the Look Up Patent page to enter any known patent details including: Number, Patent title, Assignee, Inventor, any free-text search terms, Publication date, and Application date.

## DOCUMENT FORMATS

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Document format	Description
Brief view <sup>+</sup>	Original patent title, assignee, inventor, patent number and kind, date, database name. Available online only.
Detailed view <sup>+</sup>	Brief view plus a 3-line KWIC window.
KWIC (Keyword in context)	Detailed view plus all occurrences of your search terms, highlighted within the fields where the terms occur.
Preview <sup>+</sup>	Brief view plus the abstract, IPCs and US class codes. Available online only.
Brief citation	Bibliographic information: title, assignee, probable assignee, inventor, publication number and date, application number and date, related filing details, IPC, CPC and US classifications, legal representative, examiners, field of search, publication language (English), document features, document type, word count, source attribution, accession number, document URL, update dates, database name.
Citation/Abstract	Bibliographic information, abstract, claims, legal status, cited references, citing patents.
Full text	The complete document: bibliographic information, abstract, claims, legal status, specification, cited references and citing patents. Clicking on the title in the result listing also provides the complete document.

<sup>+</sup> Transactional accounts do not display the assignee, inventor, patent number and kind in the brief view, detailed view and preview formats.

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