Patent Database: Their Importance in Prior Art Documentation and Patent Search

Vikram Singh[†1], Kajal Chakraborty[2] and Lavina Vincent[2]

[1]Intellectual Property and Technology Management Unit, ICAR, New Delhi -110 012, India
[2]Central Marine Fisheries Research Institute, Kochi – 682 018, India

In knowledge based economies the nation's economic status depends on the production, distribution and use of knowledge and information. The recent trend in the economic growth of nations is mainly determined by innovative technological know-how of the individuals. Intellectual property has gained attention in this era of knowledge. The vast amount of data generated through the application of intellectual assets is managed with the help of various *in- silico* tools. In recent days, the patent databases have gained importance due to the detailed information available on the granted patent and other details, such as, legal status of the patent applications, which are not available through any other literature search. This review paper attempts to describe different types of patent databases available, their unique features, strengths, weakness and their major purpose. This paper details the information on how to access a patent database, the relevance of patent information obtained from these databases in prior art search, patent analysis, and the drawbacks present in these patent databases.

Keywords: Patent database, prior art search, patent information, patent analysis

The beginning of 21st Century saw the rise of global economy where knowledge was given more importance. The term "knowledge" signifies the application of human creativity and innovation for the upliftment of the economy of the Nation. In this competitive world where creativity and innovations are necessary, it is also important to protect one's own ideas, products and designs from being copied or utilized without proper authorization. Intellectual property rights (IPR) play a major role in the protection of knowledge, creativity and skill, thereby rewarding the innovation and value creation. The global IP regime maintains a balance between the welfares of the creator of IP, entrepreneurs and the society. Patents are described as a form of IP, which give exclusive rights to an inventor for a specific period of time, generally not exceeding 20 years in exchange for detailed public disclosure of the invention. The disclosure of patents has long been an important part of the intellectual property regime. It gives the public access to information regarding new technologies in order to stimulate innovation and contribute to the economic growth.[1]

Patent documents are a rich source of technical, legal and business information and an important resource for researchers and inventors, entrepreneurs, commercial enterprises and patent professionals.[2] It also provides information that has not been published in scientific journals or conference proceedings. About 80 per cent of patent information have known not been published elsewhere.[3,4] Searching patent documents is a part of prior art search. After filing a patent application and formal examination, the patent office carries out a search of the prior art. A prior art search is to search all relevant technological information publicly known at the time of filing of the patent application or when applicable, at the time of the priority filing. This involves collection and compilation of information disclosed to the public about an invention before a given date supported by different National and International Patent Office's, namely, Indian Patent Office (IPO), Chinese Patent office (SIPO), Japanese Patent Office (JPO), European Patent Office (EPO), Korean Intellectual Property Office (KIPO), United States Patent and Trademark Office (USPTO), World Intellectual Property Organization (WIPO) etc. The non-patent literature, such as, newspapers, magazines, books, manuals, conference proceedings, scientific papers, product literature and other public documents are important source of information for prior art search. According to the WIPO, prior art search is done by the patent office after formal examination of the patent. But it is appropriate on the part of the inventor to carry out the prior art search before commencing the work, or before filing patent application. The prior

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[†]Corresponding author: Email: kmnmvs@gmail.com

art search in the patent processing will speed up patent prosecution, avoid duplication of research, generate new ideas for Research and Development (R&D), assist in allocating R&D funds, plan new products, find the legal status of patent applications, update new technological trends, monitor competitor's research activities and prevent infringement actions.[5,6,7] Therefore, if the inventor does the prior art search in advance, he/she can effectively utilize the finding during the process of invention and filing patent application. The inventor will also benefit from the information compiled globally with respect to the invention by prioritising the budget and time for research work, which can appropriately support new information in a patent driven knowledge regime.

In the current IP regime, millions of patents are spread across different databases that are integrated through online web sources. The patent information required for prior art search is available through these patent databases. Therefore, searching patent databases is one of the important steps in prior art search. There are different types of patent databases available *i.e.* online free patent information, commercial, multinational, national etc. The patent information available on these databases is classified as structured and unstructured data. The unstructured patent data covers text including the patent title, abstract, claims, and description. The structured patent data holds information, such as, inventor of the patent, assignee of the patent, and citation.[8,9] Searching patent databases to find relevant patents is supported by various data and text mining tools. Patent Informatics involves scrutinizing patent data to discover the patent intelligence using automated tools such as visualization, citation analysis, text mining and other techniques. [10,11] However, it is of note that presently no database has complete coverage of the entire set of published patent documents .[12]

The present review paper aims to provide detailed information on different patent offices and databases, searching protocols for patent databases, patent analysis, and strength/weaknesses of various patent databases from the point of view of a client doing prior art search.

Data Source

The data used in this review paper is from online open source. In this study, standard search engines were relied for collection and compilation of secondary information. The various open source databases, which can be utilized for prior art search,

were documented in Table 1 with the web source and details. The protocol for patent search has been explained as a flow chart (Figure 1). The details on accessibility of the databases were provided in the reference section. Most of the databases provide their latest date of updation, gestation period and next possible date of updation. Some of the available online resources have been utilized for explaining the prior art documentation and patent search process. The cases dealt here can be replicated by following the protocol discussed.

Major Patent Offices and Their Databases

USPTO, EPO and JPO are the three major patent offices, which together account for about 90 per cent of the patent applications. These patent offices have their independent patent application databases.[13] Other than the trilateral patent database; WIPO also provides platform for intellectual property services and information. Lately SIPO, IPO and KIPO have played major role in providing patent information through their patent databases.

WIPO

The WIPO is a global forum for protecting IP and resolving IP disputes. It is a self-funding agency of the United Nations, established in 1967, and currently having 188 member states. WIPO provides information on different types of IP, such as, copyright, patent, trademarks, industrial designs, and geographical indicators. For patent search and analysis WIPO uses the help of a separate database *PATENTSCOPE*, which provides access to international Patent Cooperation Treaty (PCT) applications. It also offers information on patent documents of WIPO member state regional patent offices. *PATENTSCOPE* helps to search 46 million patent documents including 2.7 million PCT applications.

USPTO

USPTO is under the U.S. Department of Commerce. The office has a collection of issued patents in U.S. since 1790 and published patent application data from March 2001. The preservation and distribution of patent information by the USPTO promotes the industrial and technological progress of various nations. USPTO contains separate patent databases to access patent full text and images of granted patents and patent applications. The following are the different free databases maintained by USPTO for patent search:

Table 1– List of patent database, strength and weakness of the individual database

S.No.	Database	Website	Information available	Strength	Weakness	Purpose served
			MAJOR PATENT DATABASES			
1.	*PATENTS-COPE* - (WIPO)	http://www.wipo.int/patentscope/en/	*PATENTSCOPE* - search 45 million patent documents + 2.7 million published international patent applications (PCT). Overall data coverage in *PATENTSCOPE* - 44,970,000 records (PCT - 2,652,401 + national offices - 42,307,897).	The search results are sorted in order of application date or relevance. Supported with statistical machine translation tool. Information on legal status is also available. Provide links to various national databases. Provide full text searching capability. No limitation on the number of patent search results.	Data coverage is low compared to *Espacenet* and *Depatisnet*[28]. Problems in retrieiving information using patent number search. No options available to filter the results based on publication dates/applicants etc.	Provides the user statistical analysis of the search and also provides information on the top patent offices, IPC, publication dates, etc. displayed in graphical format. Better patent data export capability.
2.	*PatFT* - United States Patent and Trademark Office (USPTO)	http://www.uspto.gov/patent	PatFT - Patent Full-Text and *Image Database* for patents issued from 1976 to the present and PDF images for all patents from 1790 to the present.	Offers integrated machine translation to translate patent documents. Provide patent legal status information. Advanced search options to search entire database from 1790 to present status.	Full text searches and other search tools only for US patents.	Various tools available to access US patents like - AppFT Patent applications database - GPSN Global Patent Search Network - PAIR Patent Application Information Retrieval.
3.	*Espacenet* - European Patent Office (EPO)	https://www.epo.org	*Espacenet* - Access to more than 90 million patent documents worldwide. *Global Patent Index* (GPI) - Advanced tool for searching EPO's worldwide patent data – a complementary tool to *Espacenet*	Provide browsing options to search functions of the Cooperative Patent Classification (CPC); a unique feature compared to other patent search system. Provide patent legal status information Direct links to cited documents of the patent publication. Offers integrated machine translation to translate patent documents.	Full text search only for EP and WO documents. Problems in retrieving information using patent number search. The maximum search terms per field are limited compared to other databases.	Free patent database with the largest coverage. Provide more tools and features to get better patent search results.
			REGIONAL/NATIONAL– MULTINATIONAL– FREE PATENT DATABASES[29]			
4.	*JplatPat* - Japan Patent Office (JPO)	http://www.jpo.go.jp/ https://www.j-platpat.inpit.go.jp/web/all/top/BTmTopEnglishPage	Japanese platform for patent information – available on the website of the National Centre for Industrial Property Information and Training (INPIT) - database for patent information search free of charge.	Retrieve information about published, granted and unexamined Japanese and PCT patents. Access to tools like Patent Map Guidance (PMGS) & retrieve information from PAJ (Patent Abstracts of Japan) by keywords.	Full text searches and other search tools only for JP and PCT documents.	Various tools available to access JP patents & PCT documents.

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S.No.	Database	Website	Information available	Strength	Weakness	Purpose served
				Information on legal status available and provide English translations of Japanese patents and utility models.		
5.	*SIPO* - China	http://english.sipo. gov.cn/ http://www.pss-system.gov.cn/ sipopublicsearch/ ensearch/ searchEn HomeIndexAC.do	SIPO possess various patent documents from 94 patent institutions + full text patent descriptions published by 40 patent agencies. Total of 51622 patents published in China are made public.	Chinese Patent Machine Translation System(CPMT) available. Retrieve information. about published, granted and unexamined Chinese and PCT patents.	Full text searches and other search tools only for Chinese and PCT documents.	Various tools available to access Chinese patents & PCT documents.
6.	*INPAIRS* - India	http://ipindia services.gov.in/ patentsearch/search/ index.aspx	Access to patent document published and applied in Indian patent office. Provide tools and links to check published application, application status, patent agent register, patent fees.	Access to PCT information Links to other international patent database websites.	Full text searches and other search tools only for Indian patents and PCT documents.	Numerous tools available to access patents applied, published and granted in India Access to PCT documents.
7.	*DEPATIS* - Germany	https://depatisnet. dpma.de/Depatis Net/	Searches on patent publications from around the world. Includes internal *DEPATIS* electronic document archive of German patent information system. IPC reclassifications are displayed in the result list.	Covers nearly 90 million patent documents. Can successfully retrieve information using patent number search.	Full text searches only for DE patents. The search result does not have keyword highlighting. Do not have options to translate the patent publications.	Free patent database with largest coverage Can perform complex search tasks.
8.	*AusPAT* - Australia	http://pericles. ipaustralia.gov.au/ ols/auspat/	Access Australian patent records dating back to 1904.	View up to 165 discrete data elements for each application. Quick, structured and advanced search options.	Limited data coverage – approximately 7% of world patenting activity. Access to only Australian patents.	Provide up-to-date information about Australian patents.
9.	*CPD* – Canadian Patent Database	http://www.ic.gc. ca/opic-cipo/cpd/eng/ introduction.html	Access 95 years of patent descriptions and images. Database is updated every Saturday.	Search, retrieve and study more than 2,220,000 patent documents. Conduct searches in both English and French.	Full text searches and other search tools only for Canadian patents.	Various tools available to access Canadian patents.
10.	Czech Republic	http://www.upv. cz/en/client-services/online-databases/patent-and-utility-model-databases.html	Contains patent applications published since 1991.	Quick, structured and advanced search options. Links to national and foreign online patent databases.	Limited data coverage since 1991.	Provides access to various national and foreign patent databases.
11.	*EAPATIS* - Eurasian Patent Organization (EAPO)	http://www.eapatis. com/ensearch/	60 million descriptions of patent documents. Contains patent documents from EAPO, WIPO, EPO, USPTO,	CISPATENT is a joint product of Common wealth Independent States and the Eurasian Patent Office.	Limited data coverage only since 1997.	Over 20 local databases (DB) constantly updated are supported by *EAPATIS*.

Contd.

Table 1– List of patent database, strength and weakness of the individual database

S.No.	Database	Website	Information available	Strength	Weakness	Purpose served
			USSR and Russia (since 1924).			A multi-aspect patent search in several official languages at the same time.
12.	Finland	http://patent.prh.fi/ patinfo/default 2.asp	Contains public patent applications since early 1970's and Public utility model applications since 1992.	Bibliography, processing, payment and legal status data and links to patents granted since 2009. Links to the electronic application folders for applications filed since 2001. Link to the *Espacenet* service.	Limited data coverage.	Provide more tools and features to get better patent search results.
13.	Ireland	http://www.patentso ffice.ie/en/patents_s earching.aspx	Access to patent document published and applied in Irish patent office.	Provide tools and links to check application status, protection abroad, patent agents, and patent fees. Retrieve information about published, granted and unexamined Irish and European patents.	Full text searches and other search tools only for Irish and European patents.	Various tools available to access Irish and European patents.
14.	*IPONZ* - New Zealand	http://www.iponz.go vt.nz/cms	Online tool to search the New Zealand Patent Register + published patent abstracts or IPONZ summary information back to 1979.	Retrieve information about published, granted and unexamined New Zealand patents.	Full text searches and other search tools only for New Zealand patents. Multilingual search and translation tool absent.	Various tools available to access New Zealand patents.
15.	*KIPRIS* – Korean Intellectual Property Rights Information Service	http://eng.kipris.or.k r/enghome/main.jsp	Access to over 2.1 million published applications and patents registered.	Translated Korean patent abstracts. Links to national and foreign online patent databases.	Special search analysis tools are limited. To activate machine translation tool fee/ subscription required.	Various tools available to access Korean patents.
16.	*IPOS* - Singapore	https://www.ip2.sg/ RPS/WP/CM/Searc hSimpleP.aspx?Sear chCategory=PT	Access to information related to IP applications and registrations at Intellectual Property Office of Singapore.	Provide tools and links to check published application, application status, and international patent classification of Singapore patents.	Full text searches and other search tools only for Singapore patents.	Various tools available to access Singapore patents.
17.	Industrial Property Office of Slovak Republic	http://www.upv.sk/? databases-and-registers http://data.indprop.g ov.sk/Patenty/index. php?jazyk=en&typd okumentu=patenty& new=1	The IPO Slovak Republic makes available patent documents of Slovakia & Czech. Patent documents starting from 213521 are available.	Link to the *Espacenet* service.	Full text searches and other search tools only for patent documents of Slovakia & Czech.	Various tools available to access patent documents of Slovakia & Czech.
18.	Slovenia Intellectual Property Office (SIPO)	http://www2.uil-sipo.si/dse.htm	Bibliographic data of granted patents.	Retrieve information about published, granted and unexamined Slovenian and foreign patents.	Full text searches and other search tools only for Slovenian patent documents.	Various tools available to access Slovenian patent documents. *Contd.*

Table 1– List of patent database, strength and weakness of the individual database

S.No.	Database	Website	Information available	Strength	Weakness	Purpose served
				Links to national and foreign online patent databases.		
19.	*Swissreg* - Switzerland	https://www. swissreg.ch/ https://www. swissreg.ch/ srclient/faces/jsp/ start.jsp	Swiss + European patents available. All Swiss patents filed after January 1978 are included. Earlier patents are also partially included.	Links to other patent databases like *Espacenet*.	Perform online searches of published Swiss patent applications and patents which have been granted, having effect in Switzerland and Lichtenstein only.	Various tools available to access and search Swiss patent applications.
20.	*IPSum* - United Kingdom	https://www.ipo.gov .uk/p-ipsum.htm	View patent status and get up to date information of UK patent applications. Search published patent applications and registered UK patents.	Links to other patent databases like *Espacenet*.	Special search analysis tools are limited.	Provide more tools and features to get better UK published and registered patent search results.
21.	IP.com	http://ip.com/	Intellectual property solutions provider.	Helps organizations to make complex business decisions for their innovations. Access to *InnovationQ*, Prior Art Database, IP Professional Services, IP Portfolio Management and IP Analytics tools.	Multilingual and translation tool absent.	Specialist in patent information, IP document retrieval, patent analytics, patent archiving and competitive intelligence systems.
22.	*MAREC* – Information Retreival Facility	http://www.ir-facility.org/prototyp es/marec	Collection of 19 million patent applications and granted patents from EP, WO, US, and JP sources during 1976 to June 2008.	Contains documents in 19 languages with 19,386,697 documents in XML format with a uniform patent numbering scheme and citation format.	Data set of downloadable patents from 1970 to 2008.	Used for offline patent search.
23.	Patents.com	http://www.patents.c om/	Free patent search site conducts patent search, file patent application, helps to find a patent attorney, search available technology through patent exchange.	Options to file patent – fee based Search patents for sale or lease Options to hire patent attorneys.	Special search analysis tools are limited. Multilingual and translation tool absent.	Access to hire patent attorneys.
24.	Google Patents	http://www.google.c om/advanced_patent _search	Access to granted patents and published patent applications from USPTO, EPO and WIPO. Contains 8 million patents and provides.	Quick access to images (thumbnails and full size); downloadable PDFs; Google search features; full text of older patents; links to "prior art" and Ask Patents.	Multilingual and translation tool absent. Special search analysis tools are limited.	Better patent data export capability.
25.	Free Patents Online	http://www.freepate ntsonline.com	Quick open access to text, images, and patent families in one page.	Access to ACCLAIMiP – Patent analysis software that can analyze data with a variety of tools - lists, patent landscaping, matrices, maps and	Multilingual search and translation tool absent	Patent analysis results - automated landscapes, dashboards, custom data integration, and unparalleled data transparency for

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			graphs. Links to national and foreign online patent databases.			innovation management.
			COMMERCIAL – FEE BASED PATENT DATABASES [30,31,32]			
26.	Thomson Reuters	http://www.thomsonreuters.com/ http://thomsonreuters.com/en/products-services/intellectual-property/patent-research-and-analysis.html http://www.thomsoninnovation.com http://thomsonreuters.com/products_services/legal/legal_products/intellectual_property/DWPI http://thomsonreuters.com/en/products-services/intellectual-property/patent-research-and-analysis/agro-patent-fast-alert.html http://thomsonreuters.com/en/products-services/pharma-life-sciences/chemistry-research/ip-data-feeds.html http://www.micropatent.com/static/	Complete source for global patent data + scientific literature + business information + news content in one platform - analytical, charting and mapping tools - share information with colleagues worldwide - reduce development time and time to market. Access to patent research and analysis databases such as: Thomson Innovation Thomson Data Analyzer Micropatent. Agro Patent Fast Alert IP Data Feeds: Markush Structures. Derwent World Patents Index (DPWI): DWPI contains over 18.9 million unique inventions - 41 million patent documents - from 41 major patent issuing authorities worldwide – can access other related databases; Derwent Patents Citation Index (DPCI), Derwent Innovations Index (DII)	Access to non-patent data both scientific literature and a business news database. Import patent and non-patent content - analyze data with a variety of tools - produce a variety of analyses, including lists, matrices, maps and graphs. Evaluate IP opportunities and risks - get a global view of your technology area. Examine the competitive landscape - gain insight into your IP portfolio - pinpoint potential business partners - spot potential patent infringement. Provides weekly updates on agrochemical patent applications from European, PCT, Japan and USPTO. Hierarchical corporate tree and patent family grouping tools available.	The database score low on innovative features as newer entrant Innography.	Leading providers of information in business and science. Access to DWPI – Derwent World Patent Index & *INPADOC* legal status data. Text clustering & graphical text analysis of results. Graphical citation analysis an statistical results analysis
27.	Questel – Orbit.com	http://www.questel.orbit.com http://www.qpat.com/#WelcomePage	Questel offers more than 500 databases for specialists in patents, trademarks, designs, and domain names	FamPat - Main patent database covers more than 93 offices - comprehensive family coverage of worldwide patent publications - generate more precise results - quicker to scan and understand. Provide advanced search interface which helps in cross-language semantic search and highlights the search terms. Provides graphical representation of the various family/citation relationships (PatCitation)	Access to non-patent literature search is limited.	Questel Similar Patent Search (SPS): Semantic search application to find patents that are similar to your concepts or ideas. 'ANALYZE' tool helps in identification of top assignees and cited patents. Citation mapping, interactive graphs, graphical analysis of patent families

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S.No.	Database	Website	Information available	Strength	Weakness	Purpose served
28.	*MineSoft - PatBase*	http://www. minesoft.com http://www. patbase.com	Pat Base : Global Family Database – Access to 90+ million patent and related documents from over 100 countries, updated weekly. 48 million searchable patent family records.	Available in 7 different languages. Patent searching and analysis related Minesoft Products: PatBase, PatBase Express, PatBase Analytics, Patent Order, Patent Archive, Legal StatusTracker, Patent Tracker, Cite Tracker, Patent Family, Tempus IP	Access to non-patent literature search is limited	Specialist in patent information, IP document retrieval, patent analytics, patent archiving and competitive intelligence systems. Graphical 3D result analysis, Citation tree analysis and graphical patent family analysis.
29.	ProQuest Dialog™	http://www.proquest .com/products-services/ProQuest-Dialog-Patents-Collection.html	Most comprehensive full-text patents offering 33 full-text & 69 bibliographic patent authorities; 3 patent families — Derwent, PQD INPADOC, LNU	Basic, Advanced and Command Line search options– all in one user-friendly interface.	Access to non-patent literature search is limited.	Complete prior art searching - Refined workflow tools - Detailed patent investigation - Identify and track new inventors - Global customer support.
30.	Science and Technical Network (STN)	www.stn-international.com https://www.stn. org/stn/ www.cas.org	STN - operated jointly by Chemical Abstracts service (CAS) and FIZ Karlsruhe worldwide. Access the world's scientific information on one integrated platform to maximize efficiency and synergy - CAS collection, Thomson Reuters' Derwent World Patents Index, CAplusSM, INPADOC, etc.	CAS number search interface to retrieve information on chemical compounds. Patent family grouping. Access to MARPAT – Markush structure database & CAPlus content.	Special search tools are limited. Machine translation tool absent.	Cross content search of patent and non-patent data. Sequence similarity, chemical structure and markush structure search.
31.	Equerion	http://www. equerioncorp.com/ www.ipquester.com http://www. lexisnexis.com/en-us/products/total-patent.page http://www.inventia global.com/homepa ge.aspx http://www. unumbio.com/	Multidisciplinary and flexible group of companies, resources and associates around the world providing online information services and systems on patents.	Unumbio - offers the creation, correction, digitalization, transformation and maintenance of patent databases and content. Inventia - offers PCT and non-PCT patent translations in 60 languages, patent drawing preparation and document legalization services in over 110 countries. LexisNexis® (TotalPatent®): - Analyze patent data quickly and easily - access to 30 full-text and 100 bibliographic patent authorities, searchable; multiple search options including	Access to non-patent literature search is limited.	Provide integrative access to multiple tools to handle patent applications, legislation, rules of different countries, maintenance of patent databases, tools to analyze patent data and machine translation tool.

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S.No.	Database	Website	Information available	Strength	Weakness	Purpose served
				a true semantic search - integrated and linked to various patent analysis tools.		
32.	PatSeer	http://patseer.com/	Search 92 million + records in patent database – 102 + countries.	Unique capabilities include multi-dimensional (X v Y) analysis, hierarchical categorization, citation & family Trees, co-citation Analysis, etc.	Access to non-patent literature search is limited.	Build accurate assignee portfolio searches. Integrated search result filters Hybrid patent database.
33.	Molecular Connections Patent Information Retrieval System - MCPaIRS	http://www.mcpairs.com/app/# http://www.molecular connections.com/pss/	Data coverage from 1981 to till date and updated in 7 days.	Supported by patent literature databases i.e. PatBase, Thomson Innovation, Questel Orbit, STN, Sci Finder, Lexis Nexis, etc and Non-Patent Literature databases SnapView - Easy refinement and visualization of results. Flexible search options and easy-to-use search forms.	Data coverage is limited.	Allows the user to search for full texts of granted patents and published applications from India.

Patent search using Keywords or phrases, Patent classification, Date of filling, Patent reference or identification numbers, Names of applicants/assignees or inventors, Invention, title etc

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Major Patent Databases WIPO (PatentScope), USPTO (PatFT, AppFT), EPO (Espacenet) & JPO (J-PlatPat)

⇩

Comparative patent search at regional level in free online national patent databases such as, AusPAT, DEPATIS, INPAIRS, SIPO, etc.

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For value added services - Patent family based data, Manually corrected bibliographic data, Graphical patent family analysis, Identification of top assignees, Top classifications, etc. access commercial databases - Thomson Reuters, Questel – Orbit.com, MineSoft, Equerion, etc.

⇩

Patent search result shortlisted – patent information retrieved and processed

⇩

Processed patent information undergoes analysis – Novelty detection, Patent quality, Infringement analysis, Competitive analysis, Patent family analysis, Technology planning, etc.
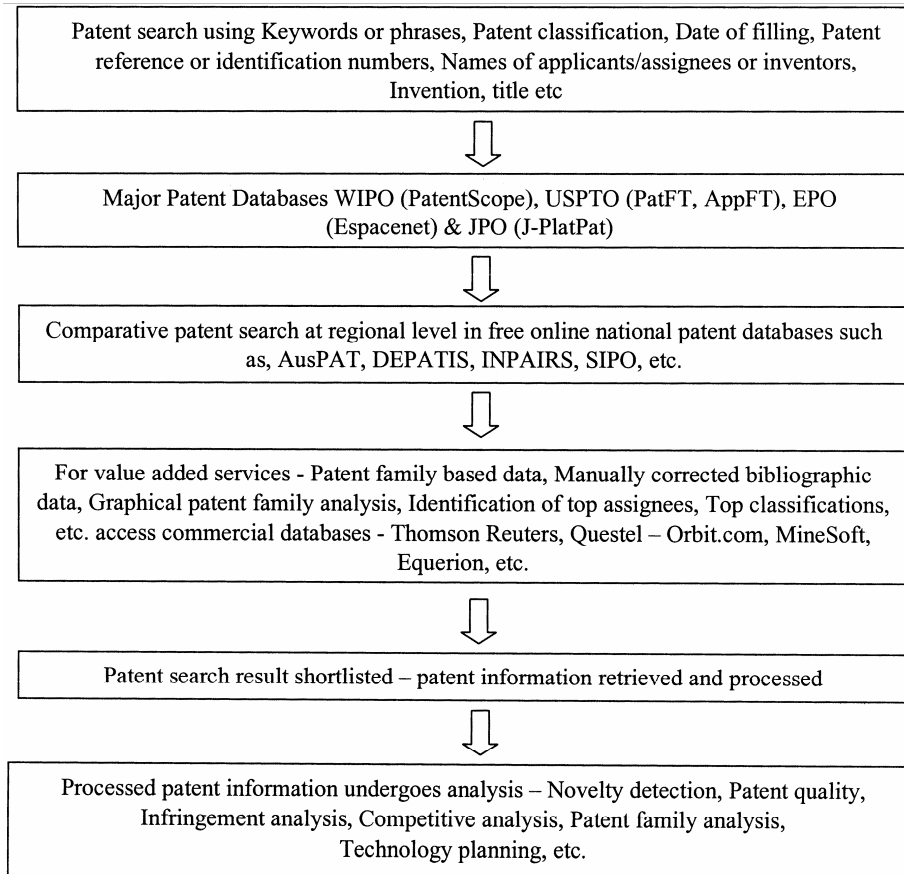
Fig. 1– Flowchart depicting various steps involved in patent search and analysis

- **PatFT** – Patent Full-Text and Image Database comprises of full text of patents issued from 1976 and PDF images of patents from 1790 to till date.
- **AppFT** - Patent Application Full-Text and Image Database helps to search in published patent applications for full text.
- **GPSN -** Global Patent Search Network helps to search full text of multiple international patents mostly available from State Intellectual Property Office (SIPO) of China. Information on published applications, granted patents and utility models during 1985 – 2012 can be retrieved. Translated versions of Chinese patents are also available. The information is updated regularly to include recent developments.
- **PAIR -** Patent Application Information Retrieval helps the patentees to retrieve information regarding their patent application status.

EPO

It is a national patent office where patent applicants can seek protection in member states of European Patent Convention (EPC). The EPO provides raw data i.e. bibliographic data from 70 countries and 40 patent authorities for expert patent searchers. The data provided is updated on weekly basis. The EPO's Asian Patent Information Services provide translated versions of patents thereby helping in searching original language patent databases. The EPO database also provides information on the legal status and important reminders for the entire patent application process.[13] Patent search is mainly done with the help of *ESPACENET* database at the EPO. Through *ESPACENET* one can freely access more than 90 million patent documents worldwide 1836 onwards. The other data retrieved on patent search in *ESPACENET* are patent family information, legal status information, citations, links to file other Asian patents, etc. The database also provides option to search functions of the Cooperative Patent Classification (CPC); a unique feature compared to other patent search system. *ESPACENET* provides more comprehensive tools and features to obtain better patent search results.

JPO

The JPO database contains data on patent applications filed in Japan. The National Centre for Industrial Property Information and Training (INPIT) is an independent administrative institution that provides information on industrial property. INPIT gathers and preserves information on industrial property throughout the world and offers the data for consultations. The JPO retrieves reference materials related to patents during patent search from Japanese platform for patent information (J-PlatPat), which is maintained by INPIT. The Japanese patent databasae JplatPat grant access to tools like Patent Map Guidance (PMGS) & retrieve information from PAJ (Patent Abstracts of Japan) by keywords.

SIPO

The SIPO office of the People's Republic of China possess various patent documents from 94 patent institutions and full text patent descriptions published by 40 patent agencies. More than 50,000 patents published in China are made public through the Chinese Patent Office database SIPO. The database has Chinese Patent Machine Translation System (CPMT), and also useful in retrieving information about published, granted and unexamined Chinese and PCT patents.

IPO

The patent system in India is administered under the control of the Controller General of Patents, Designs and Trademarks. The office of the Controller General functions under the Department of Industrial Policy and Promotion, Ministry of Commerce and Industries. The Controller General's office is in Mumbai and there are four patent offices in India at Delhi, Mumbai, Kolkata and Chennai. The Indian Patents and Designs Act was formed in 1911, but it came into force on 20th April 1972 with modifications to support the modern technological development. The Patent Act of 1970 was subjected to amendments in 1999, 2002 and 2005. The Indian Government currently follows the Patents Act, 2005 with regard to the protection of patents within India.[14] The Indian patent database *INPAIRS* provides access to patent document published and applied at IPO. The database has tools and links to check published patent applications, application status, patent agent register, patent fees, etc.

KIPO

KIPO is the government department responsible for handling intellectual property (IP) related issues in South Korea. The major work is to promote the creation and utilization of IP, enhance IPR protection

both locally and abroad, foster human resources specializing in IP, and promote IP awareness throughout the world. At KIPO 204, 589 patent applications were filed till 2013 with an 8.3% growth rate every year. The Korean Intellectual Property Rights Information Service (KIPRIS) also provides access to over 2.1 million published applications and patents registered in Korea. The database has tools to translate the Korean patent abstracts and links to major national and foreign online patent databases.

Patent Databases

It is a repository of data related to the issued patents and published applications. All the relevant data related to patents, *i.e.* patent number, claims, specification, review, reference etc., are collected and maintained in a patent database. The first large public patent database was launched by USPTO in November 1995. The USPTO database now contains information regarding 326,033 granted patents and 615,243 patent applications as per United States (US) Patent Statistics Chart, 2014.[15] The database is updated weekly on every Tuesday when new patents are issued. The EPO's *ESPACENET* system is the largest public database, which contains more than 90 million patent documents from 80 countries, containing information about inventions and technical developments from 1836 onwards.[16] The commercial online patent databases appeared in the early 1980s, followed by Compact Disc-Read Only Memory (CD-ROMs) a few years later. Currently there are more than 100 free and subscription patent and patent-related databases on the World Wide Web. The list of different types of patent databases available is given in Table 1.

National and Multinational Patent Databases

Patent offices of various countries collect, maintain and store all the information about the patent applications filed and granted in their respective areas. This information is stored in patent databases which is freely available online. These databases also contains link to patent database of other countries. They provide full text, CD ROMs, and search tools for accessing the patent information stored in patent database.[17] Multinational patent databases are the most comprehensive database of patent documents available in the world. They provide access to patent-related publications; provide multilingual support, contains bibliographic collections, co-citation analysis, machine translations, PDFs, drawings, simple/extended families

with legal status, corporate tree, etc. The various regional, national and multinational patent databases are freely available and their websites are listed in Table 1.

Commercial Patent Databases

There are many commercial patent databases that offer more useful services, such as, translations of patent information, additional systematic classification based on chemical structures, reactions, biological sequences, etc. These commercial databases provide value added services such as patent family based data, manually corrected bibliographic data, graphical patent family analysis, identification of top assignees, top classifications, and top countries of filing, etc. The major commercial fee based patent databases are listed in Table

Patent Databases in Indian Context

In India, the IPR related issues came into prominence after a while when global community started implementing it. As India started moving into a global trade regime, the necessity of Indian patent databases also rose into prominence. There are few relevant patent databases in Indian context. The major databases in this regard are:

INPAIRS Version 2 – It is freely accessible online patent search engine maintained by Government of India to search Indian patents. The patents filed and granted in India can be accessed through *INPAIRS*. The database also provides information on published applications and application status. We can also access the Patent Agent Register and the Patent validity with renewal fee. The database also provides access to PCT patents using the international patent number. There is patent search engine help tool, which helps to easily access the database for patent information.

MCPaIRS (Molecular Connections Patent Information Retrieval System) – It is a commercial patent database maintained by Molecular Connections. *MCPaIRS* helps to search the full text of patents published in India. The data is processed by experts and is available for use through web interface. The database comprises an elegant front page with bibliographic details, application status, legal status information, etc. for all patents. The database contains patent information from 1981 and is updated weekly. It is also supported by commercial patent literature databases i.e. PatBase, Thomson Innovation, Questel Orbit, STN, SciFinder, Lexis Nexis, etc. and Non-Patent Literature databases.

EKASWA A, B and C Database – These are the first Indian patent searchable databases available in CD-ROM and Web. *Ekaswa A* contains patent applications filed in India from January 1995 to December 2004. *Ekaswa B* contains patent applications notified for opposition in India from January 1995 to December 2004. *Ekaswa C* has access to patent applications published in Official Journal of Patent Office published from January 2005 to June 2007. This database is managed by Technology Information, Forecasting and Assessment Council (TIFAC)

INPAT (Indian Patent Database) – It is a bibliographic database which provides information on 52,624 patents granted in India during the period spanning between 1975-2002. The database delivers information on patent title, applicant(s) name(s), inventor(s) name(s), patent number, application number, application date, publication date, IPC code, etc.[18]

Searching a Patent Database

The awareness on how to search a patent database is essential in order to get maximum information on several areas of patent search. There are different tasks for which patent search are conducted, such as:

(i) Patentability search – This is the first step in patent search in order to check whether your invention is valid, original and also to check whether there exist inventions similar to yours. Thus it would be best if we conduct patentability search before the development of the invention.

(ii) State-of-the-art search – The search is done to get information related to prior technology in particular fields. The researcher or the inventor will get a better idea about prior inventions in their new technical field of research. The state of the art search will help to widen scope or to conduct more effective and strategic research work.

(iii) Monitoring/legal status search – It helps to monitor the legal status of a granted patent or patent application.

(iv) Bibliographic search – The search is done to get background information on the work done in the specified area in chronological order. The search is performed as personal background search, history search, and chronological search.

(v) Infringement search – An infringement search is done to check whether our patented product can infringe already existing patents in other countries. It will monitor the claims of non-terminated patent to check for infringement.

(vi) Validity search – It helps the inventor to monitor the validity of non-terminated patents. The search will also help to get knowledge on the technological defects in the patent which can hamper its validity before termination. The validity search requires the usage of advanced analysis techniques in order to determine the relevance of patent claims and its originality.

(vii) Patent to product mapping search – This is a comprehensive method to get information on technology development trends, competitor styles, market involvement, product growth, and determining the scope and utilization of information for patent procurement through examination and mapping of data to enable research and development.[7,19,20]

For an effective prior art search in various patent databases, the patentee should have a basic idea about the terms and techniques related to the invention. This awareness will ease patent search.[12] The several search criteria's to retrieve patent information are keywords or phrases, patent classification Systems i.e., International Patent Classification (IPC), Coopérative Patent Classification (CPC), etc., date of filling/grant/publication etc., patent reference or identification numbers (application number, patent number, PCT number) and names of applicants/ assignees or inventors and invention title.

The detailed patent search will help the applicant/patentee to answers various questions regarding his invention like what does the invention do? What should be the end result of the invention? How does it work? etc. The patent databases can be searched normally using keywords or phrases describing the technology or invention. However, keyword searching in patent databases is sometimes problematic. When we search using English keywords in patent databases using foreign languages we won't get accurate search result, e.g. If we conduct a keyword search in JPO patent documents about half the total issued patents are undetectable to keyword searches. Multinational patent databases like *PatentScope* and *Espacenet* cover patents in many languages hence it would be more useful for keyword searches.

The best way to search in patent database without any error is to perform classification search. The patent

offices worldwide have developed classification systems - a standard system to identify technology groups to which the innovation belongs. The three commonly used patent classifications are the U.S. Patent Classification, International Patent Classification and the European Classification. The Cooperative Patent Classification (CPC) up-to-date and internationally compatible classification scheme covers the USPTO and EPO patent documents. These classification systems are based on the international nature of the patents and hence are independent of languages. Searching patent documents by patent classification will help to overcome the pitfalls caused by keyword searching.

Searching of patent documents is a step-by-step process; initially the search should be done in broad and related area followed by fine and more focused searches. Patent information is obtained through various patent databases and there are patent search tutorials available in most free online patent databases. To begin with patent search; the major patent databases i.e. USPTO, WIPO (*PatentScope*), EPO (*Espacenet*) and JPO should be accessed. Similar searches should also be done in different regional and national patent databases to do a comparative study and get more information related to our invention at regional level. For value added services such as, patent family based data, manually corrected bibliographic data, graphical patent family analysis, identification of top assignees, top classifications, top countries of filing, etc. it would be better to access commercial fee based databases.

Patent Analysis

After retrieving and processing the patent information from patent databases, patent analysis is done which will help to determine the novelty of inventions, also to know the strengths, weakness; and competitiveness with our competitors.[21] The patent analysis is useful in recognizing upcoming technological trends. Technological competitiveness, using IP information helps in valuing the advances of a firm in a specific time interval.[22] It can also free patent experts from the strenuous task of manually analysing patent documents to determine the quality of patents and speed up the analysis process. The series of steps involved in patent analysis are - extracting patents from patent databases, extracting data from patents and analyse the extracted data to make reasonable conclusions.

There are several public and private sector organizations interested in analysing patents – to

determine the novelty in patents, to predict technological developments in their respective domains, to identify infringements, to develop a strategic technology improvement plan, to determine the quality of the patent for R&D, for technological road mapping, to identify voids and hotspots in their respective technological realms and to identify competitors.[23] The end results of patent analysis are the development of patent maps, data clusters and patent networks. Patent map helps to picture the connections among the patents by creating maps through keywords or phrases.[24] Patent networks signify the relationship among the nodes of patents.[25] Data clustering is used to group data into clusters or into categories to obtain patent data according to relevance.[26]

Many of the enterprises currently have patent database managers who collect, manage and store patent information from original patent database in their own servers. They tag the information in databases; provide innovative analytical and searching tools to retrieve data accurately. The patent database managers help to manage the entire patent search in a shorter time span by performing widespread accessing and evaluating the patent information stored in numerous patent databases. They provide more refined patent information after analyzing the data using search and analysis tools, multilingual services and visualization tools.[17]

What Is Lacking?

The coverage and quality of patent database is one of the core challenges in conducting patent searches on both free online and commercial patent databases. No single patent database has complete coverage of all patent documents[12] and therefore, the client should access multiple national, multinational and commercial patent databases. The patent databases are not updated regularly. There are multilingual issues while accessing regional/national patent databases. Occasionally there is a lack of access and links to other related patent databases. Many of existing website links of patent database shows errors. The commercial patent databases have access to many analytical tools but are very expensive.

Many of the free online databases lacks with detailed information on patents filed back in history i.e. during the 50's and 60's. Even though online patent databases provide sufficient free IP data but, it does not guarantee the accuracy or completeness of the information, nor accept any obligation for errors or omissions or their consequences. During the

process of patent search, the comprehensive coverage and value added services are provided mostly by commercial patent databases. The service charge of these commercial patent databases is very high, and sometimes based on the time of search period, which led to the development of a second tier of patent databases, such as, *Micropatent*, *Delphion*, etc. with reasonable monthly and yearly services.[27] But currently many of these platforms i.e. *Delphion* and Aureka have retired or have developed tie ups with commercial patent databases, thereby making patent search more expensive. The regional/ national patent databases lack multilingual support, which makes less accession of these databases for patent information. Many of the national patent databases were also constrained by appropriate tools to access international patent documents.

Conclusion

The patent databases are useful but the search results should be processed and verified by carrying out proportional study from other sources before ending up with major conclusions. There are many online free and commercial patent databases available for patent search. These databases contain all the information related to patent not published in any other literature. It is appropriate to carry out a comparative search in regional/ national and multinational databases. To refine or to do value added searches, various commercial patent databases are the most appropriate option. Presently the large amount of patent information from different patent databases are retrieved, and being managed by database managers, who with the help of *in−silco* tools can analyze and refine patent search making it faster and user friendly. The current patent regime has undergone many significant changes by employing a combination of human know-how and data processing *in−silco* tools to retrieve the patent information. The major changes have been reflected in strengthening patent rights, intensifying their coverage, and enabling their implementation.

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