A Guide to Patent Searching
Using Publicly Accessible Databases

Indian Institute of Technology Jodhpur

India

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Foreword

Indian Institute of Technology, Jodhpur, India issued its Intellectual Property Rights Policy in December 2019. Among other nuances in the IIT Jodhpur IPR Policy, every postgraduate student and PhD researcher is expected to conduct a holistic literature search covering all forms of literature including patent documents, create and formally submit a comprehensive technology landscape on her/his research project prior to starting the research and also with the synopsis at the end of the research, to be submitted as a partial requirement of the thesis / dissertation.

It was therefore thought essential to expose all the postgraduate students, PhD researchers and Faculty in IIT Jodhpur to basics of patent searching and how to derive technology-based information from patent documents for the preparation of their respective technology landscapes.

Professor Prabuddha Ganguli, Advisor, IIT Jodhpur designed "Patent Searching Training Workshops" and conducted a series of workshops with technical support of Patent Search Experts from the Unit for Research and Development of Information Products (URDIP), Pune, India, which is one of the Council of Scientific and Industrial Research (CSIR). Three Hundred and Sixty Post graduate Students, PhD Researchers, and One Hundred and Fifteen Faculty Members in IIT Jodhpur participated in these workshops during February-March 2020.

It was decided to produce a hand-holding "Guide to Patent Searching" that would serve as a friendly lead companion to each researcher, as they set-out on their "patent searching journey".

I am pleased release this document titled, "A Guide for Patent Searching Using Publicly Accessible Databases", authored by Professor Prabuddha Ganguli, with technical inputs from Mr. Venkataraman Parthasarathy & Mr. Nishad Deshpande, Unit for Research and Development of Information Products (URDIP). I am grateful to Dr. Kishore Sreenivasan, Director, URDIP for his support extended to IIT Jodhpur in this venture.

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I hope the document will find wide usage among the academic and research community and help to enhance the quality of research in our institutions.

Professor Santanu Chaudhury
Director, Indian Institute of Technology, Jodhpur.
April 2020

Background

Every researcher identifies a technical problem to be solved. It is likely that the problem is known and several earlier workers have explored solutions to the said problem. Alternately, the research problem may be new, but bears similarity to problems in a non-related field from which some leads to the solution may be explored and exploited. It is also possible that the problem is totally new and therefore no solutions exist in the public domain.

In all such cases, an exhaustive literature search is imperative to understand the contours of the existing knowledge in the context of the defined problem. Most researchers are quite contented with literature searches covering books, journals, and other digital and non-digital public knowledge sources.

What is a Patent

Let us begin by understanding what a patent is.

In simple terms, a Patent is

- A *grant* by a Sovereign or State to a person giving exclusive right to Stop others from "making., using, exercising, vending, offering for sale" an invention for a limited period of time, in exchange for disclosing the invention in a patent specification
  Such that any one trained in the art can reproduce the invention

- Patent gives right to the patentee to exclude others from using the Patentee's Invention without the patentee's permission

- Patent Owner has a qualified right to use his own invention. If the laws of the country granting the patent requires the patentee to take clearances from any other statutory body such as for safety, environmental protection, defence, etc, then the patentee can use his invention only after acquiring such clearances.

The following important points from the above statements may be noted:

- ➢ The grant of a patent is given by a Sovereign or State. As a country grants the patent, the right is valid only in that country. Therefore, if the inventor wants such a right in other countries, then he will have to apply for the patent in those countries and have the patent granted in those countries.
- ➢ The right is a negative right, i.e. to Stop others from "making., using, exercising, vending, offering for sale" the invention without the patentee's permission in the country in which the patent is granted.
- ➢ The patent right is for a limited period. The period is 20 years from the date of filing the patent application (provided the patent application gets granted). Further, the patentee has to pay an annual renewal fee to the patent office in

that country to retain the right in that country for that period. After the 20-year period, the patent falls in the public domain and anyone is free to make use of the patented invention without the permission of the patentee.

Further, if the patentee fails to pay the renewal fee (within the specified period), his right lapses and the invention falls in the public domain and anyone can then freely use the patent.

➢ It is to be noted that the invention is to be disclosed in a "patent specification" such that a person skilled in the art can reproduce the invention.

An invention is first disclosed in a patent application.

It is generally accepted that 70% of the information in a patent document is not published in any other literature. Hence if one does not search patents, one may miss out on a very large volume of relevant literature in a particular filed of technology.

This is significant as the disclosure is done in a specified manner, in a specified format, in such detail, that a person skilled in the art should be able to reproduce it. A patent specification is therefore one of the most structured documents of technical disclosure. It is to be appreciated that publications in journals, books and in other forms, the disclosures are generally not done in such detail.

A patent specification because of its detailed disclosure (unlike in a publication) also becomes a source to identify the technical solutions to problems provided by others, analyse their pitfalls, the approaches taken in the prior art to overcome them, and yet leaving several limitations thereby creating opportunities for incremental (or even breakthrough) innovations to fill the existing technology gaps.

Patent Document…
Largest Single Source for Technical Information
- Structured document with detailed disclosure of the invention
- First disclosure of an invention is made in a patent application
- Covers all fields of technologies
- Patents are classified according to the technologies covered, every field is indexed and hence retrievable
- Patent Databases are publicly accessible (both free and paid)

Every field of a patent specification is indexed and hence can be retrieved in a digital search. All fields of technologies are classified in an International Patent Classification Scheme (IPC) and hence in a search, the documents can be searched / identified / retrieved using the IPC codes which will be illustrated in a later part of this document.

Further, a patent application undergoes an examination at the patent offices. The examination process is done in detail to establish the "novelty", "inventive step" and "industrial applicability / usefulness/ utility". The entire examination process is transparent and all the correspondence between the patent examiner and the patent applicant are also made publicly available to the public in the patent office websites.

Every patent application (whether examined or in the process of examination) is published after 18 months of its filing date and is accessible to the public. Therefore, the first time one is able to access information in a patent database is at least 18 months old.

Further, every patent when granted, is also published in the patent office website. From this publication, one is able to identify the changes that have been made in the patent application during the course of the examination.

Anatomy of a Patent Specification

A patent document contains information that covers Bibliographic, technical and legal.

Patent Document

- Cover page with Bibliographic Information, Abstract and a figure if relevant
- Text structured as follows:
    - ➢ Background and Prior art …defining the problem, reference to prior literature including patents, identifying the gaps in technology to be addressed
    - ➢ Summary of the invention… defining the gap in technology being addressed & enlisting the various objects of the invention
    - ➢ Detailed Description…describing the invention in detail with reference to figures if relevant. Also providing the variants of the invention with the best working examples known to the inventor(s). Results in the form of tables and figures (including gene sequences), constructions, molecular structures, etc.
    - ➢ Claims…verbalised boundaries of the invention for which the protection is sought (in a patent application) or claimed (in a granted patent)

The ***cover page for patents / patent applications in most countries*** with bibliographic details contain the following information:

The country in which the patent application has been made / granted, the patent application number / granted number, date of which the patent was filed, the title of the patent application / granted patent, the inventors, the assignee(s), abstract, a diagram illustrating the invention (where relevant), the priority date and the country in which the patent application publication of the document, date on was first filed, the national and international patent classification numbers, field indexing numbers for retrieval purposes. In some countries, the literature and patent references cited by the examiners are also included in the cover page.

An illustration of a cover page of a published US Patent Application and a US Granted Patent for an invention related to engineering are illustrated to appreciate the bibliographic details.
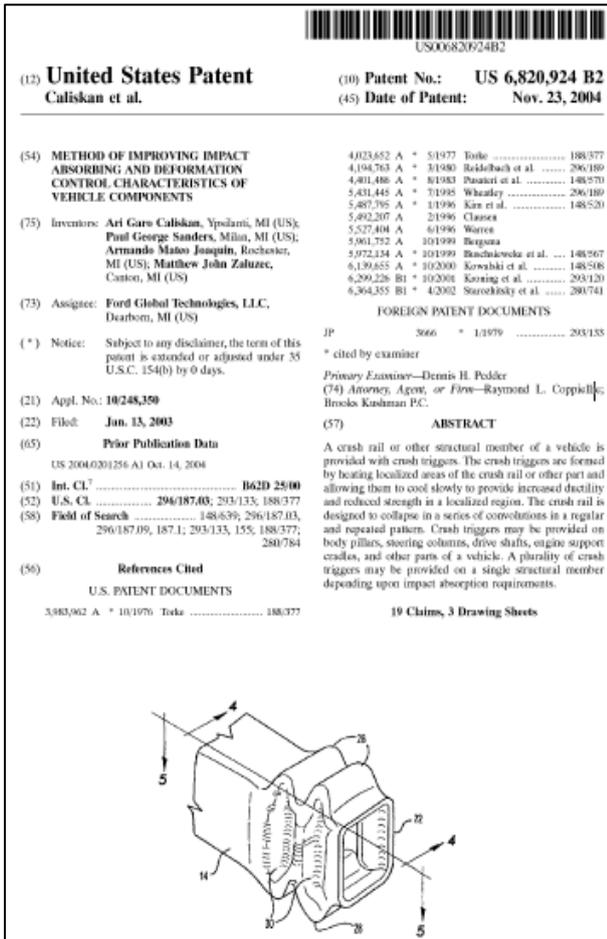
Cover page of US Granted Patent

Cover page of the corresponding
US Patent Application

Granted patent no. is US6820924 B2

Pub. no. is 20040201256 A1

Suffix B denote a granted patent

Suffix A indicates that it is not yet granted by is still a published patent application

Note the references cited by the examiner

Note no references by examiner as it is not yet examined

Note the figure is more detailed

Note the figure lacks details

Note the filing no. and date

Note the filing no. and date

Note 19 claims and 3 drawing sheets. 31 claims in the patent applications were

There were 31 claims in the specification though not mentioned in the cover

amended to 19 during the examination

One should therefore study the patent application and the examination reports to understand why the claims were amended. This will give a clue to the technical aspects and the inventive step vis-à-vis the prior art.

The patent specification in the field of the invention and summary of the invention identifies the problem the invention solves and what the invention does and what effect

the invention produces. The detailed description provides details of how the invention constructed, what materials or methods are used in the construction of the invention, and illustrates through a set of examples the best method of working the invention so that a person skilled in the art can reproduce the invention.

*It is advised to read the patent document (download patent **US6820924 B2)** to appreciate the manner in which the details of an invention that is disclosed and claimed.*

Boolean operators and constructing strategies for searching using keywords

Boolean operators are used to combine and / or exclude keywords in a search strategy.

The AND operator restricts the number of hits
The OR operator expands the number of hits
The NOT operator also restricts the number of hits

A AND B   A OR B   A NOT B

http://www.jonasfransson.com/8-search-technique/
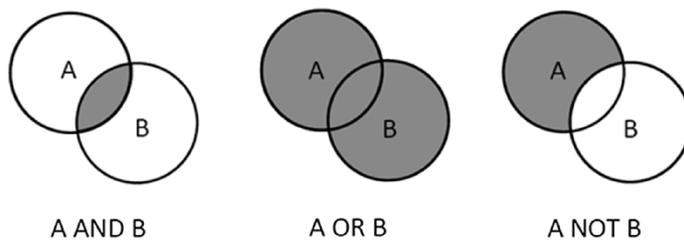
The commonly used Boolean operators are: **"AND", "ANDNOT" (or simply "NOT"), "OR", "XOR", "NEAR", "ADJ", "SAME".**

The use of these operators is illustrated in the Box below:

tennis AND ball	➔	documents having both the word "tennis" and "ball"
tennis ANDNOT ball	➔	documents having the word "tennis" **but not** "ball"
tennis OR ball	➔	documents having **either** the word "tennis" or "ball" **or both**
tennis XOR ball	➔	documents having **either** the word "tennis" or "ball" **but not both**

Truncations called a wildcard operator, may be used to truncate words (i.e. shortened to their primary root or stem, by reducing its length) and is represented usually by an asterisk (*), a question mark (?), a dollar sign ($), or a percent sign (%) depending on the search engine of the patent database being searched. This increases the coverage of the search. An example of the use of truncation is illustrated in the Box below:

elect* ➜	all documents having words based on the word stem "elect," e.g., "electricity", "electrical", "electron" (but will also include words such as "election", "electoral", etc., which might not be relevant to a specific search, e.g., for electricity-related technology)

Nesting is an operation done by use of parentheses ( ) to organize search queries in order to resolve potentially confusing search syntax. An example of the use of Nesting is given in the Box below:

tennis AND ball OR racket	➜	two potential search outcomes to be resolved
(tennis AND ball) OR racket	➜	documents having either the words "tennis" and "ball" or the word "racket"
tennis AND (ball OR racket)	➜	documents having the word "tennis" and either the word "ball" or "racket"

Phrases are created by using quotation marks (« ») to surround a single search. If a group of words is surrounded with quotation marks («), everything surrounded by those quotation marks will be treated as a single search term. This allows one to search for a multi-word phrase rather than specifying each word as a separate term. This is illustrated in the Box below:

tennis ball	➜	documents having both the words "tennis" and "ball" (by default often treated as an "AND" clause)
"tennis ball"	➜	documents having the phrase "tennis ball"

NEAR operator …… used to include variations on phrases containing two terms in any order (e.g., "metal cutting", "cutting metal", "cutting of metal", and "cutting through metal") but to exclude documents in which the terms appear out of context with each other, which might occur if the "AND" operator is used. The use of this operator is illustrated in the box below:

tennis NEAR ball	➡	documents having both the words <tennis> and <ball> within a certain number of words of each other. A numerical following NEAR specifies the number of words of each other

The **NEAR** operator can also be used with a numerical (e.g. 1, 2,3, 4,5) after NEAR to define the maximum distance between the search terms. For example, NEAR5 specifies that the two terms in any order should be within 5 words distance.

Ordered proximity operator such as BEFORE(insert a numerical) may be used to indicate that the two words have to be ordered in a particular way and the distance between the two words in that order should be within the numerical indicated after BEFORE. The use of this operator is illustrated with an example in the box below:

Ordered: Search terms must be in given order (and
within specified distance)

corn BEFORE5 fertilizer (in PATENTSCOPE)

A process is provided for the dry treatment of agricultural products such as corn and tobacco to remove fertilizer-derived nitrate. The process involves a short duration contact of the agricultural product with HC1 gas under conditions which minimize generation of non-volatile chlorocarbons that could form by interaction of the agricultural product with the gaseous products of the reaction of the HC1 with the nitrate.

ADJ operator ……used to link terms close to each other and in the same order

SAME operator ……used to identify terms in the same paragraph.

Introducing Patent Classification Systems

In the Patent System, all fields of technologies have assigned atleast one classification term indicating the subject to which the invention relates and may also be assigned further classification and indexing terms to give further details of the contents. Such a classification helps to slot every invention to a specific set of fields of technologies according to their subject matter. As these are indexed, they become searchable independent of the language in which the patent is written or even the words/ expressions used to represent the features of the invention. These classifications are done by the professionals in the patent offices and hence possess a fairly high degree of uniformity.

Various countries have their patent classification systems. However, there are three patent classifications systems that are most commonly used namely, i) International Patent Classification (IPC) System, administered by the World Intellectual Property Organisation (WIPO); ii) Cooperative Patent Classification System (CPC), jointly developed by the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO); iii) US Patent Classification System (USPC) developed and followed by the USPTO.

The CPC has come into force from February 1, 2020 in the EPO and the USPTO.

Therefore, while conducting searches in these databases, one has to be careful to select the appropriate patent classification system and the conventions for their representations in each of the patent databases.

International Patent Classification System (IPC)

The official **Guide to the IPC** provides comprehensive information on the IPC. It is available for download on the WIPO website of the IPC at [https://www.wipo.int/classifications/ipc/en/general/]
The version of IPC 2020 :
https://www.wipo.int/edocs/pubdocs/en/wipo_guide_ipc_2020.pdf

This is an internationally accepted hierarchical system for classifying technologies that are disclosed in patent documents. All technologies are classified into 8 Sections, which are further subdivided into classes, subclasses and groups.

This classification system serves as an effective search tool for the retrieval of patent documents and ordering patent documents in order to facilitate access to the technological and legal information.

When one does key word searches, the choice of the words is important. The patent attorneys use various expressions / jargons to convey the same concept / word. For example, Swimming pool is replaced by "water retaining recreational structure"; Balloon expressed as "spherical device filled with gas for recreational purposes"; Paper bin as "arrangement for the disposal of refuse"; Shoe as "footwear"; Helmet as "head protector", "hardhat", "headgear", etc.

Therefore, the choice of the "key words" would determine result of a patent search. Most technical persons are not too familiar with the techno-legal jargons used by lawyers. The IPC codes provide a "terminology / jargon independent" tool for patent searches. Further, the IPC codes provide standardized application to documents (by experts of patent offices) and is available for (old) patent documents where no full text of claims / description is available. Also, concept searches can be done easily.

Very often, the search results giving too many search results are targeted and narrowed by combining key words with IPC codes. This aspect will be illustrated in the section dealing with searches using different databases later in this document.

It is to be appreciated that patents are written in various languages and hence selection of appropriate key words is difficult. Under such circumstances, the IPC Codes which are language independent becomes a useful search tool.
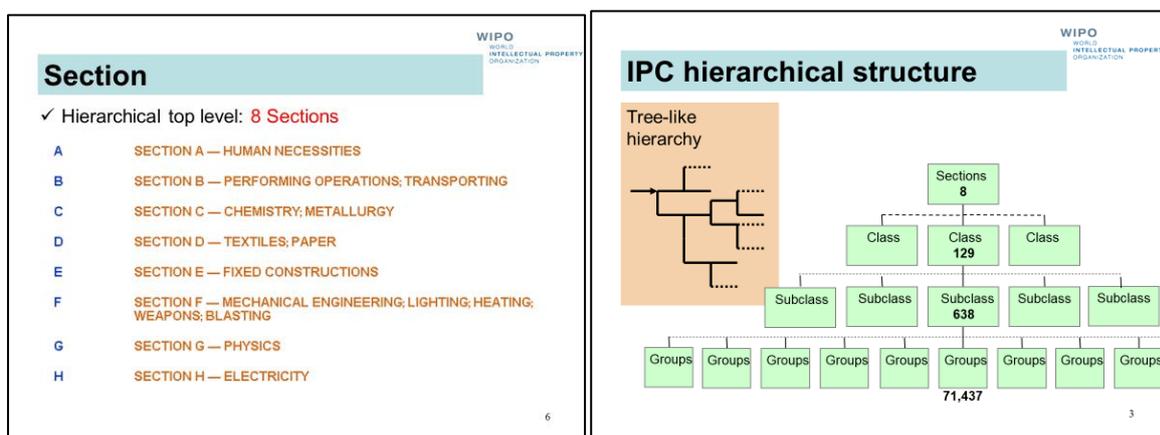
WIPO WORLD INTELLECTUAL PROPERTY ORGANIZATION

Symbols and Titles

✓ Each IPC place/entry (section, class, subclass, group) is characterized by Symbol and Title.

Symbol = succession of upper case letters and numbers
Title = phrase describing the technical content (scope)

Example:

Section	A	Human Necessities
Class	A47	Furniture; Domestic articles …
Subclass	A47H	Furnishings for windows or doors
Group	A47H 1/00	Curtain suspension devices

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WIPO WORLD INTELLECTUAL PROPERTY ORGANIZATION

Scope of IPC Group

Example:

Section:	A	HUMAN NECESSITIES
Class:	A47	FURNITURE …
Subclass:	A47C	CHAIRS
Main group:	A47C1/00	Chairs adapted for special purposes
one-dot subgroup:	1/02	• Reclining or easy chairs
two-dot subgroup:	1/022	• • having independently-adjustable supporting parts
three-dot subgroup:	1/028	• • • for changing a straight chair into an easy chair
four-dot subgroup:	1/029	• • • • by changing the length or the inclination of the legs

A47C1/029 reads
"Reclining or easy chairs
having independently-adjustable supporting parts
for changing a straight chair into an easy chair
by changing the length or the inclination of the legs"

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WIPO WORLD INTELLECTUAL PROPERTY ORGANIZATION

Special Purpose Chairs

A47C 1/00	Chairs adapted for special purposes
A47C 1/02	· Reclining or easy chairs
A47C 1/04	· Hairdressers' or similar chairs
A47C 1/12	· Theatre, auditorium, or similar chairs
A47C 1/121	· · having tipping-up seats
A47C 1/122	· · · tipping-up sideways
A47C 1/124	· · Separate chairs, connectible together into a row
A47C 1/126	· · stowable in floor or wall
A47C 1/13	· · Indicators; Devices for reserving or the like
A47C 1/14	· Beach chairs

Targeted Patent Searches can be carried out using the specific IPC codes if properly identified from the IPC Classification

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A method of splicing or joining rope

Subclass D07B covers ROPES	B65H HANDLING THIN OR FILAMENTARY MATERIAL, e.g. SHEETS, WEBS, CAB
D07B ROPES OR CABLES IN GENERAL	...
(joining ropes or cables to one another or to other objects B65H 69/00, F16G 11/00; mechanical finishing or dressing of ropes D02J; decorative ropes or cords D04D; suspension cables for bridges E01D 19/16; specially adapted for driving, or for being driven by, pulleys or other gearing elements F16G 9/00; electric cables or joints insofar as electrical aspects are essential H01B, H01R)	B65H 69/00 Methods of, or devices for, interconnecting successive lengths of material; ...
	B65H 69/02 · by means of adhesives
	B65H 69/04 · by knotting
Note that B65H 69/00 also covers (joining ropes to one another) in the subclass title	B65H 69/06 · by splicing
	B65H 69/08 · by welding

Therefore patent searches have to be done in both the IPC codes to get comprehensive search results

As is seen in the above presentation, to conduct a search on Special Purpose Chairs, the first step is to identify the section in which chairs would be classified. As it is a human need, the Section is obviously "A". As chair is a furniture, the class is A47. In A47, one then drills down to the subclass of chairs which is 47C. Then one proceeds to the groups of "Chairs adapted for special purposes" which can be identified from the main group A47C 1/00 followed by the various subgroups as indicated in the presentation. Targeted searches for the relevant patents can be done using the appropriate subgroup if properly identified.

Similarly, in the other example of method of splicing or joining rope two different subclasses were identified. Therefore, searches have to be done in both the subclasses to obtain the patents dealing with this technical subject.

The simplest way to get the IPC codes for the subject you are intending to search is to go to the IPC home page on:

https://www.wipo.int/classifications/ipc/ipcpub/?notion=scheme&version=20200101&symbol=none&menulang=en&lang=en&viewmode=f&fipcpc=no&showdeleted=yes&indexes=no&headings=yes&notes=yes&direction=o2n&initial=A&cwid=none&tree=no&searchmode=smart

Then click on search, enter the words in the search box and you will get all the relevant IPC codes for the subject you have entered. In the present case, we typed reclining chair and obtained all the relevant IPC codes for this subject.

Each one of the IPC codes is ordered by relevance, each one representing a specific aspect of "Special Purpose Chairs". A47C 1/02 deals with reclining chairs. A47C1/028 deals with "arrangements for changing a straight chair into an easy chair".

Let us examine the International Classification (IPC) given in the cover page of the US Granted Patent discussed earlier namely of US6820924 B2. The IPC given is B62D 25/00.

When we click on the scheme and then on the left-hand side input this "IPC" we get the following window:

Please note that the patent in question is dealing with Super structure subunits in vehicles and the groups provide the finer distinctions in the technology with regard to the parts, etc.

The IPC covers practically every field of technology and is regularly revised as new technologies evolve. For example, when nanotechnology and its applications became a reality, the IPC introduced a new IPC code for this technology namely B82B with a set of subclasses and groups as is illustrated in the Box below:

IPC Patent Code	Title
B82Y5	Nanobiotechnology or nano-medicine
B82Y10	Nanotechnology for information processing, storage and transmission
B82Y15	Nanotechnology for interacting, sensing and actuating
B82Y20	Nanotechnology for optics
B82Y25	Nanomagnetism
B82Y30	Nanotechnology for materials and surface science
B82Y35	Methods or apparatus for measurement or analysis of nanostructures
B82Y40	Manufacture or treatment of nanostructures

However, if you are interest to study the IPC in more details, **go to the IPC Training material available in** https://www.wipo.int/classifications/ipc/en/training/

In the training material WIPO has presented examples pertain to different technical fields (mechanics, electricity and chemistry) and address a variety of different aspects of increasing complexity which are related to the use of the IPC for classification. They are primarily based on examples of real patent applications having family members in different languages, or, in some cases, on artificial examples.

Cooperative Patent Classification (CPC)

https://www.cooperativepatentclassification.org/index

The CPC has been jointly developed by the European Patent Office (EPO) and the

United States Patent and Trademark Office (USPTO). The CPC is substantially based on the previous European classification system (ECLA), which itself was a more specific and detailed version of the International Patent Classification (IPC) system. The CPC system has over 250,000 categories of subjects related to diverse technologies. CPC has come into force in the EPO and USPTO from February 1, 2020.

The migration to CPC was developed based in large part on the existing European Classification System (ECLA) modified to ensure compliance with the International Patent Classification system (IPC) standards administered by the World Intellectual Property Organization (WIPO).

The Cooperative Patent Classification (CPC) is an extension of the IPC, divided into nine sections, A-H (as in IPC), and Y (extra in CPC), which in turn are sub-divided into classes, sub-classes, groups and sub-groups.

The nine CPC sections	
A	Human necessities
B	Performing operations; transporting
C	Chemistry; metallurgy
D	Textiles; paper
E	Fixed constructions
F	Mechanical engineering; lighting; heating; weapons; blasting engines or pumps
G	Physics
H	Electricity
Y	General tagging of new technological developments; general tagging of cross-sectional technologies spanning over several sections of the IPC; technical subjects covered by former USPC cross-reference art collections [XRACs] and digests

CPC   COOPERATIVE PATENT CLASSIFICATION

Y   GENERAL TAGGING OF NEW TECHNOLOGICAL DEVELOPMENTS; GENERAL TAGGING OF CROSS-SECTIONAL TECHNOLOGIES SPANNING OVER SEVERAL SECTIONS OF THE IPC; TECHNICAL SUBJECTS COVERED BY FORMER USPC CROSS-REFERENCE ART COLLECTIONS [XRACs] AND DIGESTS

NOTES

1. In this section, classes Y02 and Y04 are only to be used for tagging documents which are already classified or indexed elsewhere and which relate in a broad sense to specific major technical fields, these fields being defined by the notes following the title of the subclasses of this section.
2. As the primary purpose of the tagging according to Note (1) is to monitor new technological development and to tag cross-sectional technologies that do not fit in a single other section of the IPC, the tagging codes of this section do not in any way replace the classification or indexing codes of the other sections.
3. Class Y10 has been introduced in July 2012 in view of the CPC to accommodate for technical subjects formerly covered by USPC cross-reference art collections [XRACs] and digests

Y02   TECHNOLOGIES OR APPLICATIONS FOR MITIGATION OR ADAPTATION AGAINST CLIMATE CHANGE

NOTES

1. This class covers selected technologies, which control, reduce or prevent anthropogenic emissions of greenhouse gases [GHG], in the framework of the Kyoto Protocol and the Paris Agreement, and also technologies which allow adapting to the adverse effects of climate change.
2. If appropriate, a document can receive more than one indexing code of this class.

Y02A   TECHNOLOGIES FOR ADAPTATION TO CLIMATE CHANGE

NOTE

This subclass covers technologies for adaptation to climate change, i.e. technologies that allow adapting to the adverse effects of climate change in human, industrial (including agriculture and livestock) and economic activities.

Y02B	CLIMATE CHANGE MITIGATION TECHNOLOGIES RELATED TO BUILDINGS, e.g. HOUSING, HOUSE APPLIANCES OR RELATED END-USER APPLICATIONS
Y02C	CAPTURE, STORAGE, SEQUESTRATION OR DISPOSAL OF GREENHOUSE GASE [GHG]
Y02D	CLIMATE CHANGE MITIGATION TECHNOLOGIES IN INFORMATION AND COMMUNICATION TECHNOLOGIES [ICT], I.E. INFORMATION AND COMMUNICATION TECHNOLOGIES AIMING AT THE REDUCTION OF THIR OWN ENERGY USE

NOTES

1. This subclass covers information and communication technologies [ICT] whose purpose is to minimize the use of energy during the operation of the involved ICT equipment.
2. This subclass does not cover the use of an ICT technology supporting energy efficient operation of a further piece of equipment, nor the reuse or recycling of ICT equipment.

Y02E	REDUCTION OF GREENHOUSE GAS [GHG] EMISSIONS, RELATED TO ENERGY GENERATION, TRANSMISSION OR DISTRIBUTION

Y02P	CLIMATE CHANGE MITIGATION TECHNOLOGIES IN THE PRODUCTION OR PROCESSING OF GOODS

NOTE

This subclass covers climate change mitigation technologies in any kind of industrial processing or production activity, including the agroalimentary industry, agriculture, fishing, ranching and the like.

Y02T	CLIMATE CHANGE MITIGATION TECHNOLOGIES RELATED TO TRANSPORTATION
Y02W	CLIMATE CHANGE MITIGATION TECHNOLOGIES RELATED TO WASTEWATEI TREATMENT OR WASTE MANAGEMENT
Y04	INFORMATION OR COMMUNICATION TECHNOLOGIES HAVING AN IMPACT ON OTHER TECHNOLOGY AREAS
Y04S	SYSTEMS INTEGRATING TECHNOLOGIES RELATED TO POWER NETWORK OPERATION, COMMUNICATION OR INFORMATION TECHNOLOGIES FOR IMPROVING THE ELECTRICAL POWER GENERATION, TRANSMISSION, DISTRIBUTION, MANAGEMENT OR USAGE, i.e. SMART GRIDS
Y10	TECHNICAL SUBJECTS COVERED BY FORMER USPC
Y10S	TECHNICAL SUBJECTS COVERED BY FORMER USPC CROSS-REFERENCE ART COLLECTIONS [XRACs] AND DIGESTS

NOTE

This subclass has been introduced in July 2012 in view of the CPC to accommodate for technical subjects formerly covered by USPC cross-reference art collections [XRACs] and digests

Y10T	TECHNICAL SUBJECTS COVERED BY FORMER US CLASSIFICATION

NOTE

This subclass has been introduced in January 2015 in view of the CPC to accommodate for technical subjects formerly covered by USPC

The "Y" Section in CPC therefore specifically addresses the emerging technologies so that patents related to these fields can be easily searched.

Searching Patent Databases

The commonly searched free patent databases are:

Database	URL	Details
United States Patents and Trademark Office	https://www.uspto.gov/	US Patent Applications Published; US Granted Patents; Prosecution History (PAIRS)
Espacenet European Patent Office (EPO)	https://worldwide.espacenet.com/	Patent database covering over 100 countries. Also, Possible to access patent prosecution history in the EPO On-line Translation also available
WIPO Patentscope	https://patentscope.wipo.int/search/en/search.jsf	PCT Publications Online translation also available
Indian Patent Office	http://ipindia.nic.in/patents.htm	Patent Applications made in India and granted patents in India. Possible to access the patent prosecution history.
Google Patents	https://patents.google.com/	Covers patent publications and granted patents in Japan, China, WIPO(PCT), Europe, Germany, Canada.
Freepatents online	http://www.freepatentsonline.com/	U.S., EPO, Japan, and WO (PCT)
Patent Lens	http://www.patentlens.net/	Full text of PCT (1978-present), USPTO (published patent applications and granted patents (1976-present), EPO (1980-present) and IP Australia (patent applications and granted patents 1998-present)

These databases allow searches using:

> ➢ Keywords
> ➢ Patent classification (IPC)
> ➢ Dates (e.g., priority date, application date, publication date, grant date)
> ➢ Patent reference or identification numbers (application number, publication number, patent number)
> ➢ Names of applicants/assignees or inventors

Though the general principles of searching are applicable in all the databases, it is to be appreciated that each database has its own search engine with their respective nuances. Hence it is advisable to go to the website and first familiarise on their respective nuances. Each website has a help desk and / or has a familarisation video to hand-hold the users.

Practical Exercises: Searching Patent Databases

Espacenet:
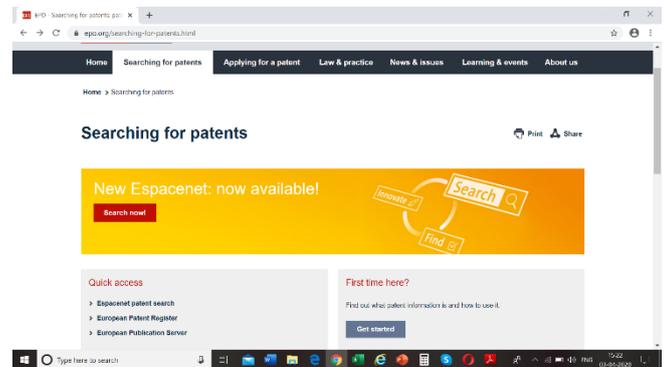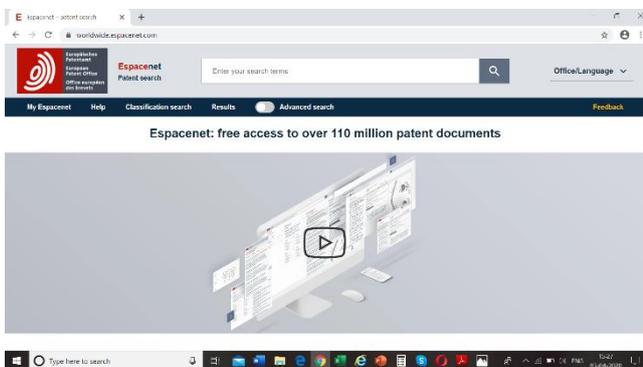
https://worldwide.espacenet.com/   [home page]
https://www.epo.org/searching-for-patents.html
https://worldwide.espacenet.com/?locale=en_EP

It is advisable for each user of Espacenet to see the video online and take the patent information tour which consists of four learning units. Each of them has an introductory video and two or three theory chapters. At the end of each chapter there are exercises for you to test what you have learnt. [https://e-courses.epo.org/wbts/pi_tour/index.html]

To search go to   https://worldwide.espacenet.com/?locale=en_EP

15

On the left side of the screen there are three options, namely "smart search", "advanced search" and "classification search".

Let's define a problem and then conduct a patent search in Espacenet.

Problem: What is the prior art for conversion of sugar to ethanol by fermentation?

First using the "advanced search" option, we can input the following key words:

Ethanol production from sugar fermentation.

We get 28 hits as shown in the screen.

Then we refine the search with the keywords: ethanol production from sugar and yeast.

We get 10 hits as shown in the screen.
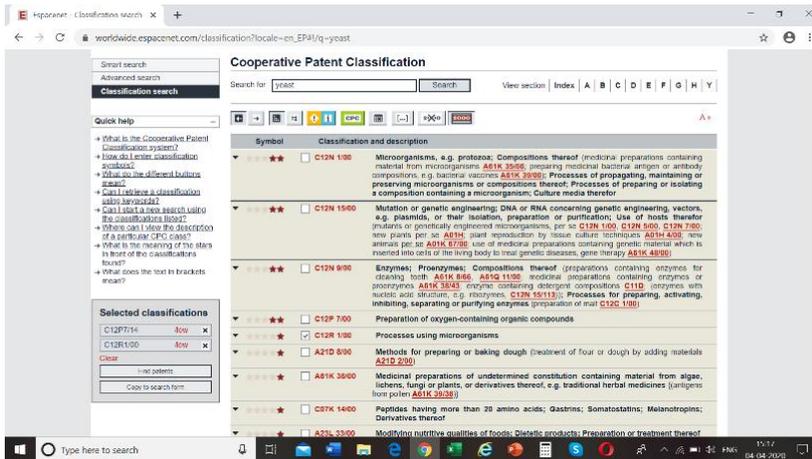
We then click on the classification search and input the word yeast to find out the classification. The search gives a result shown in the screen.

Note that the classification search was done under the Cooperative Patent Classification (CPC) which is followed by the European Patent Office. Going down the screen, under preparation of oxygen containing compounds (ethanol is an oxygen containing compound), the classification is C12P 7/00.
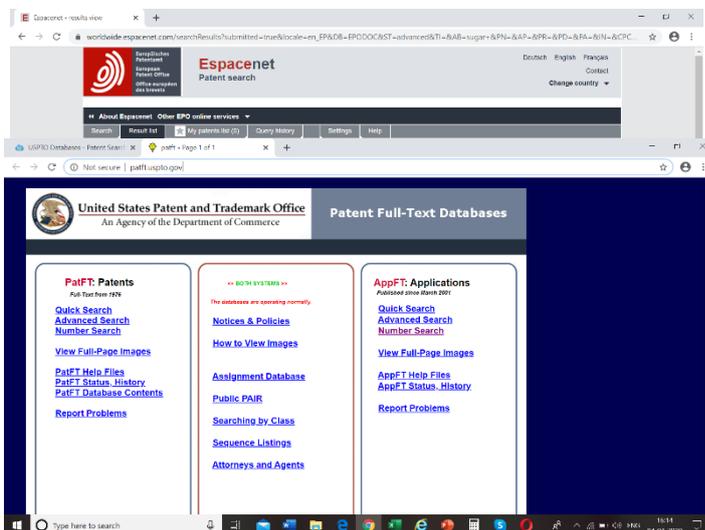
We now combine the classification and the key word sugar in title or abstract with C12P7/00 in the CPC (in the advanced search).

We get 8 targeted hits from over 100 million documents from over 100 countries.

These can be marked, saved and downloaded. Further, on options bar next to the quick help, one can compact the results, export them in the form of on the top of there is an option to download the results in the form of CSV/XLX report.

You can click on the document to download it. One can also use the patent translate facility in the ESPACENET.

US Patent and Trademark Office (USPTO):

https://www.uspto.gov/

http://patft.uspto.gov/netahtml/PTO/index.html

https://www.uspto.gov/patents-application-process/search-patents

The home page on the top left presents the various options for search in PaFT Patents (granted patents) and AppFT (published patent applications). Further the options for quick search and advanced search are possible

The screen shots of the quick search. Also note below the multiple fields that are supported by the quick search. Search can be conducted using the terms and Boolean operators in any of the fields selected for the search.
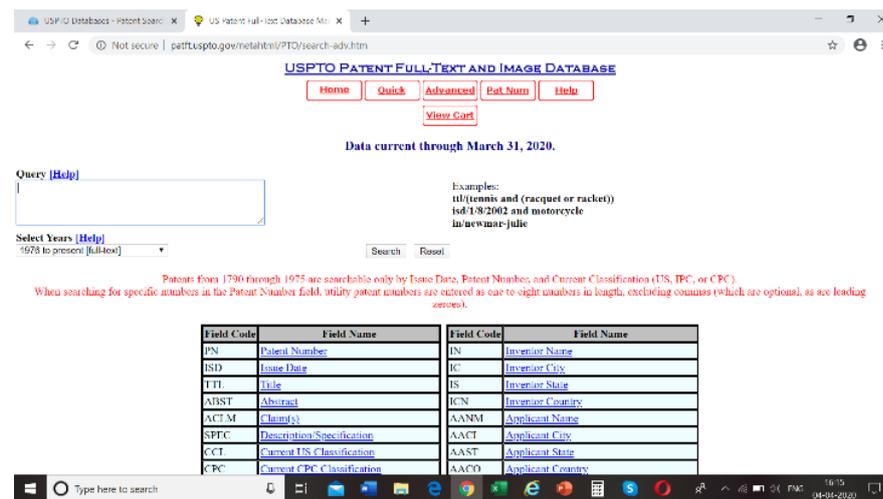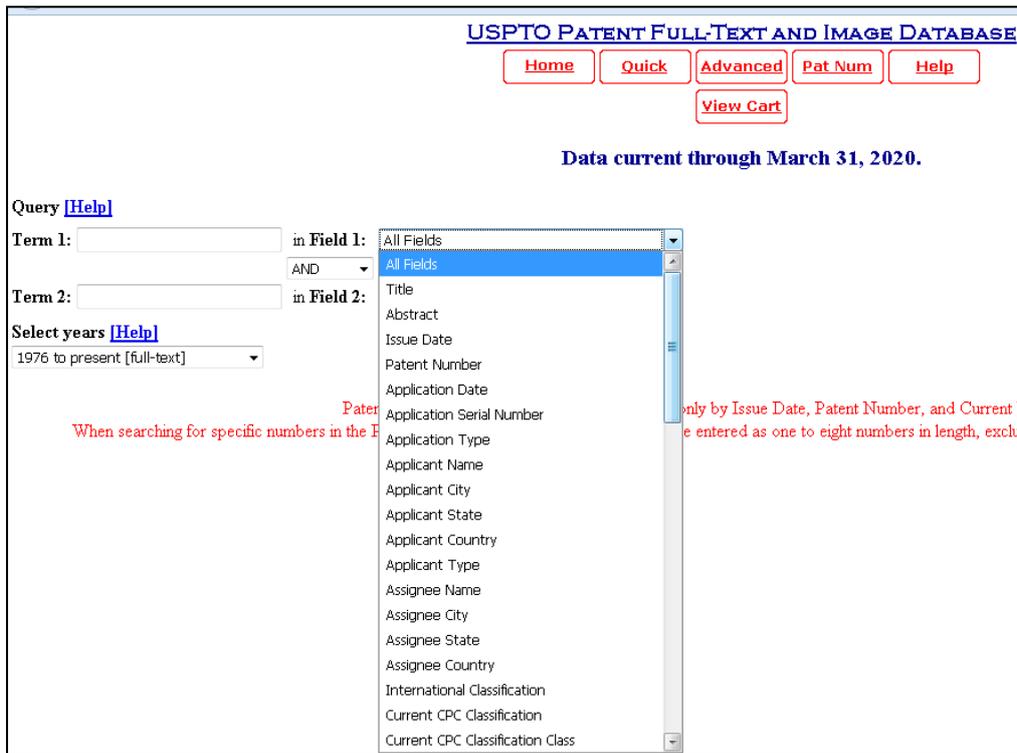
The adjacent screenshot is for the advanced search in which a string of terms can be combined using Boolean Operators in a manner indicated in the right half of window. Search can be done using the field codes as indicated.

We shall now illustrate how searches are done in the USPTO both for simple search and advance search.

Problem: What is the prior art for conversion of xylose sugar to ethanol using a yeast strain?
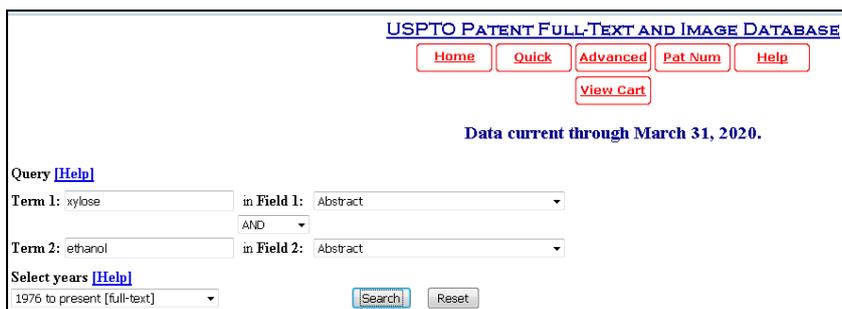
We use the quick search option by inputting xylose and ethanol as two terms and search in the field "abstract".

The result is given in the screenshot below:

Results of Search in US Patent Collection db for:
ABST/xylose AND ABST/ethanol: 139 patents.
*Hits **1** through **50** out of **139***

Next 50 Hits

Jump To

Refine Search   ABST/xylose AND ABST/ethanol

PAT. NO.		Title
1	10,533,196	Xylose utilizing oleaginous yeast
2	10,385,345	Yeast expressing saccharolytic enzymes for consolidated bioprocessing using starch and cellulose
3	10,308,908	Method of producing ethanol using continuous culture and continuous culture apparatus
4	10,301,653	Microorganisms that co-consume glucose with non-glucose carbohydrates and methods of use
5	10,294,484	Yeast expressing saccharolytic enzymes for consolidated bioprocessing using starch and cellulose
6	10,155,953	Expression cartridge for the transformation of eukaryotic cells, method for transforming eukaryotic cells, and thus produced biofuel and/or biochemical
7	10,100,320	Pentose sugar fermenting cell
8	10,047,380	Genetically modified strain of S. cerevisiae engineered to ferment xylose and arabinose

Clicking on the relevant title / patent number retrieves the patent specification as indicated.

(1 of 139)

United States Patent   10,533,196
Knoshaug , et al.   January 14, 2020

Xylose utilizing oleaginous yeast

Abstract

Presented herein are oleaginous strains of yeast such as Saccharomyces cerevisiae that have been modified to allow for **xylose** utilization. Such strains are also modified to allow for higher lipid accumulation utilizing a broad range of sugar monomers such as those released during pretreatment and enzymatic saccharification of lignocellulosic biomass. Methods of producing lipids and **ethanol** using these yeast strains are also disclosed.

Inventors:	Knoshaug; Eric P. (Golden, CO), Zhang; Min (Lakewood, CO), Singh; Arjun (Lakewood, CO), Guarnieri; Michael T. (Denver, CO)
Applicant:	Name City State Country Type
	Alliance for Sustainable Energy, LLC Golden CO US
Assignee:	Alliance for Sustainable Energy, LLC (Golden, CO)
Family ID:	58408590
Appl. No.:	15/282,591
Filed:	September 30, 2016

Prior Publication Data

Document Identifier	Publication Date
US 20170088866 A1	Mar 30, 2017

Related U.S. Patent Documents

Note that the Abstract mentions **Saccharomyces cerevisiae for the fermentation.**

Using this information, we can now do an advanced search using Xylose and Saccharomyces

We now proceed to illustrate the features of Advanced Search.

USPTO PATENT FULL-TEXT AND IMAGE DATABASE

Home   Quick   Advanced   Pat Num   Help

View Cart

Data current through March 31, 2020.

Query [Help]

Examples:
ttl/(tennis and (racquet or racket))
isd/1/8/2002 and motorcycle
in/newmar-julie

Select Years [Help]
1976 to present [full-text]   ▼   Search   Reset

Space for query syntax input

Need knowledge of syntax involving specific codes for various fields

List of codes for various fields:

Field Code	Field Name	Field Code	Field Name
PN	Patent Number	IN	Inventor Name
ISD	Issue Date	IC	Inventor City
TTL	Title	IS	Inventor State
ABST	Abstract	ICN	Inventor Country
ACLM	Claim(s)	AANM	Applicant Name
SPEC	Description/Specification	AACI	Applicant City
CCL	Current US Classification	AAST	Applicant State
CPC	Current CPC Classification	AACO	Applicant Country
CPCL	Current CPC Classification Class	AAAT	Applicant Type
ICL	International Classification	LREP	Attorney or Agent
APN	Application Serial Number	AN	Assignee Name
APD	Application Date	AC	Assignee City
APT	Application Type	AS	Assignee State
GOVT	Government Interest	ACN	Assignee Country
FMID	Patent Family ID	EXP	Primary Examiner
PARN	Parent Case Information	EXA	Assistant Examiner
RLAP	Related US App. Data	REF	Referenced By
RLFD	Related Application Filing Date	FREF	Foreign References
PRIR	Foreign Priority	OREF	Other References
PRAD	Priority Filing Date	COFC	Certificate of Correction
PCT	PCT Information	REEX	Re-Examination Certificate
PTAD	PCT Filing Date	PTAB	PTAB Trial Certificate
PT3D	PCT 371c124 Date	SEC	Supplemental Exam Certificate
PPPD	Prior Published Document Date	ILRN	International Registration Number
REIS	Reissue Data	ILRD	International Registration Date
RPAF	Reissued Patent Application Filing Date	ILPD	International Registration Publication Date
AFFF	130(b) Affirmation Flag	ILFD	Hague International Filing Date
AFFT	130(b) Affirmation Statement		

Advanced Search Query

ABST/(xylose AND ethanol AND Saccharomyces)

The Result of the advanced search is given in the Screen Shot Below

We need to explore how to use Cooperative Patent Classification (CPC) for such a search in the USPTO

URL for CPC codes https://www.uspto.gov/web/patents/classification/cpc/html/cpc.html
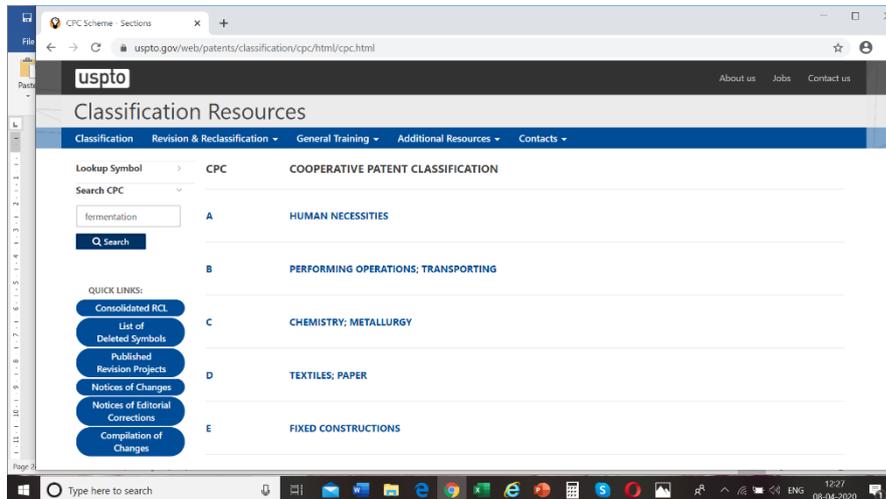
At first, we have to identify the CPC Code for Fermentation using microorganisms. Further in earlier simple search we have also identified Saccharomyces cerevisiae as the microorganism for the fermentation. One can type fermentation in the search and on clicking the search icon, a window with all the CPC Codes for fermentation opens. C12P is the code for fermentation. C12P can be further examined for the subgroups in the CPC as shown in the screenshot.

CPC Definition - C12C BEER; PREPARATION OF BEER BY **FERMENTATION** (ageing or ripening by storing C...
https://www.uspto.gov/web/patents/classification/cpc/html/defC12C.htmlC12C BEER; PREPARATION OF BEER BY **FERMENTATION** (ageing or ripening by storing C12H...reducing the alcohol content after **fermentation** C12H 3/00 ...

CPC Definition - C12P **FERMENTATION** OR ENZYME-USING PROCESSES TO SYNTHESISE A DESIRED CHEMICAL COM...
https://www.uspto.gov/web/patents/classification/cpc/html/defC12P.htmlLast Updated Version: 2020.01 C12P **FERMENTATION** OR ENZYME-USING PROCESSES TO SYNTHESISE...amplification reactions C12Q 1/6844; **fermentation** processes ...

CPC Definition - C12F RECOVERY OF BY-PRODUCTS OF **FERMENTED** SOLUTIONS (removal of yeast from wine...
https://www.uspto.gov/web/patents/classification/cpc/html/defC12F.html...02 C12F RECOVERY OF BY-PRODUCTS OF **FERMENTED** SOLUTIONS (removal of yeast from...rectification or recovery of by-products of **fermented** solutions ...
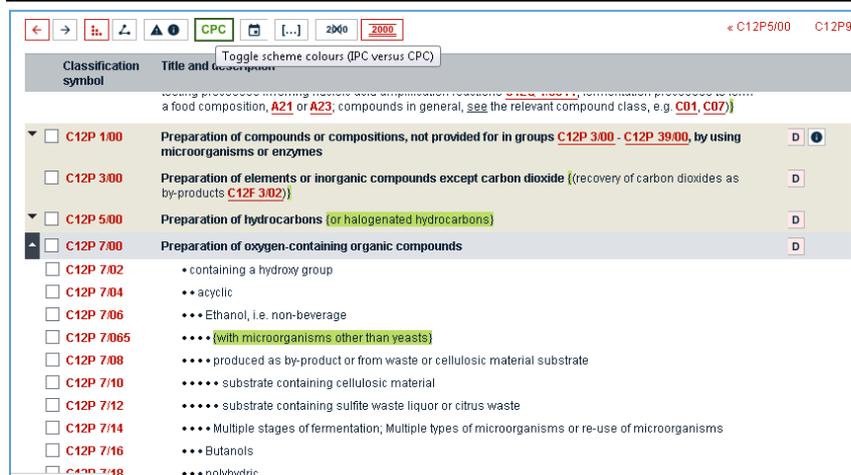
Note that C12P 7/00 is the code for preparation of oxygen containing compounds and C12P 7/065 is code for preparation of these compounds using microorganisms other than yeasts.

An advanced search carried out using this CPC as C12P7 in combination with keywords xylose and ethanol in the abstract does not give any hits.

No hits for C12P7

This means that the CPC Code has not been entered correctly. Adding the digits of the specific subgroups is necessary. By correcting the CPC code, we get 5 hits as indicated below.

One needs to add more digits for specific subgroups eg C12P7/00 OR C12P7/10

However, if there is need to search for any of the subgroups, then we can make use of truncation operator '$'.

Using this operator will return patents having IPC codes with any of the subgroups under that specific group eg If C12P7$ is used in search query, it will return patents with C12P7/00 OR C12P7/02 OR C12P7/06 OR C12P7/10 etc

However, one has to use the patent calssification scheme with caution as inappropriate use may result in very restricted results, which could be misguiding.

PATENTSCOPE

https://patentscope.wipo.int/search/en/search.jsf

The PATENTSCOPE database provides access to international Patent Cooperation Treaty (PCT) applications in full text format on the day of publication, as well as to patent documents of participating national and regional patent offices. It is to be appreciated that the PCT Patent Applications are published 18 months after the priority date (i.e. date on which the patent application was first filed in any PCT Country).

URL for users guide: https://patentscope.wipo.int/search/help/en/users_guide.pdf
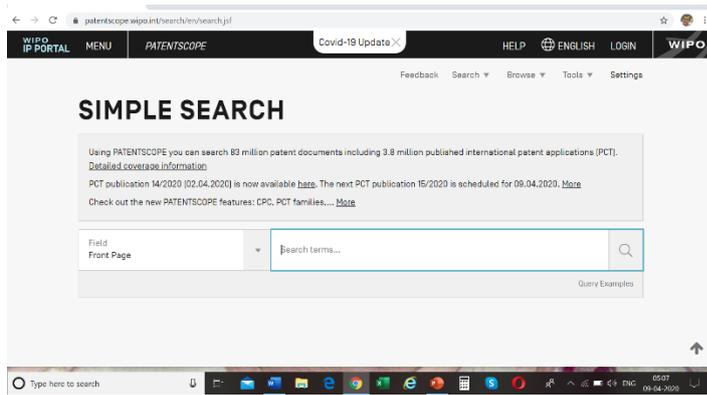
The information may be searched by entering keywords, names of applicants, international patent classification and many other search criteria in multiple languages.

Further, the PATENTSCOPE provides access to more than 83 million patent documents with options for Simple Search, Advanced Search, Field Combination, Cross Lingual Expansion and Chemical Compounds Structure (with login). Clicking on the Tool one gets options such as WIPO translate (to obtain machine translation of the patent documents in a wide range of languages), WIPO Pearl (to conduct a linguistic search giving access to scientific and technical terms derived from patents), IPC Green (facilitates searches for patent information relating to Environmentally Sound Technologies (ESTs)), Patent Register Portal which acts as a gateway to online patent registers and gazettes and to legal-status-related information from over 200 jurisdictions and patent information collections.

We now proceed to familiarise ourselves with the searching options and process in the PATENTSCOPE database.
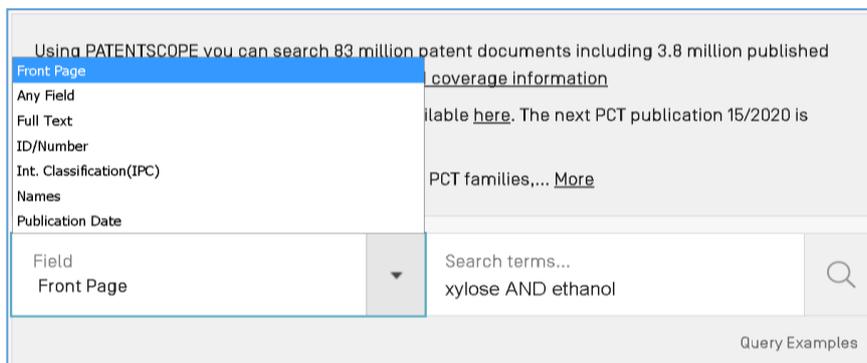
The URL https://patentscope.wipo.int/search/en/search.jsf presents the Simple Search Window as default with options for use of key words and search in a variety of fields, such as, front page, full text.

We shall conduct a search on the production of ethanol from Xylose.

The search terms are Xylose and Ethanol. The search is conducted in the field "Front Page"
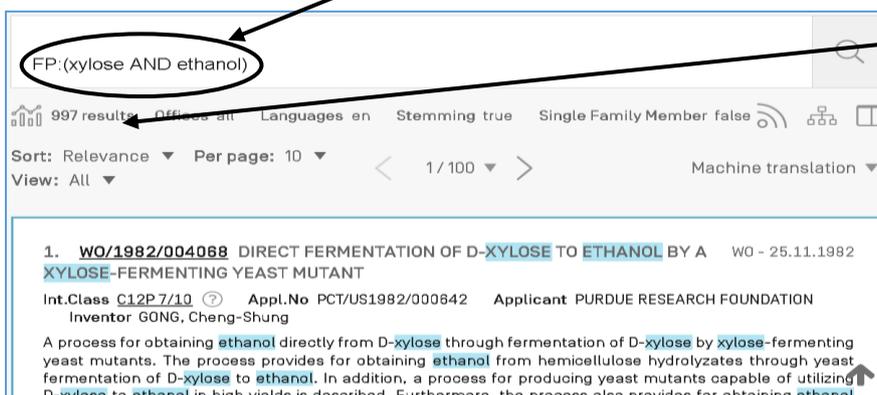
The search yields 997 hits as is shown in the screenshot. Each document can be opened by clicking on the publication number.

1. WO1982004068 – DIRECT FERMENTATION OF D-XYLOSE TO ETHANOL BY A XYLOSE-FERMENTING YEAST MUTANT

PCT Biblio. Data   Description   Claims   Drawings   National Phase   Notices   Documents

PermaLink   Machine translation ▼

Publication Number
WO1982/004068

Publication Date
25.11.1982

International Application No.
PCT/US1982/000642

International Filing Date
13.05.1982

IPC
C12P 7/10 2006.01

CPC
C12P 7/10   C12R 1/72   C12R 1/865
Y02E 50/16   Y10S 435/921   Y10S 435/942

Applicants
PURDUE RESEARCH FOUNDATION [US/US];
Purdue University West Lafayette, IN 47907, US

Inventors
GONG, Cheng-Shung; US

Title
[EN] DIRECT FERMENTATION OF D-XYLOSE TO ETHANOL BY A XYLOSE-FERMENTING YEAST MUTANT
[FR] CONVERSION DU D-XYLOSE EN ETHANOL PAR FERMENTATION DIRECTE PAR UN MUTANT D'UNE LEVURE FERMENTANT LE XYLOSE

Abstract
[EN]
A process for obtaining ethanol directly from D-xylose through fermentation of D-xylose by xylose-fermenting yeast mutants. The process provides for obtaining ethanol from hemicellulose hydrolyzates through yeast fermentation of D-xylose to ethanol. In addition, a process for producing yeast mutants capable of utilizing D-xylose to ethanol in high yields is described. Furthermore, the process also provides for obtaining ethanol from a mixture of cellulose and hemicellulose hydrolyzates through yeast fermentation of D-glucose and D-xylose directly and simultaneously to ethanol.
[FR]
Procede permettant d'obtenir directement de l'ethanol a partir du D-xylose par fermentation du D-xylose a l'aide de mutants de levures fermentant le xylose. Le procede permet d'obtenir de l'ethanol a partir d'hydrolysats d'hemicellulose par fermentation avec des levures du D-xylose en ethanol. De plus, on decrit un procede de production de mutants de levures capables de convertir le xylose en ethanol avec des rendements eleves. Le procede permet egalement d'obtenir de l'ethanol a partir d'un melange d'hydrolysats de cellulose et d'hemicellulose par fermentation avec des levures de D-glucose et de D-xylose directement et simultanement en ethanol.

Also published as
AU1982085859

It is possible to filter the results based on the Countries, Applicants, inventors, and the results can be presented in the form of charts as histograms, per charts, etc.

The search can be targeted using the IPC or CPC code identified from the opened document

Tabs can be used to read specific sections of the document

1. ████1982004068 – DIRECT FERMENTATION OF D-XYLOSE TO ETHANOL BY A XYLOSE-FERMENTING YEAST MUTANT

PCT Biblio. Data   Description   Claims   Drawings   National Phase   Notices   Documents

PermaLink   Machine translation ▼

Note: Text based on automatic Optical Character Recognition processes. Please use the PDF version for legal matters
WHAT IS CLAIMED IS;

1. A process for the direct fermentation of D-xylose to ethanol which comprises inoculating .a medium comprising growth nutrients and D-xylose with a yeast mutant having an ability to ferment D-xylose to ethanol with a bioconversion yield of at least 50%, permitting the inoculated medium to ferment for a period of time sufficient to achieve a conversion of D-xylose to ethanol of at least 50% and recovering the ethanol so produced as product.

2. The process of claim 1 wherein the conversion of D-xylose to ethanol is at least 80%.

3. A process according to claim 1 wherein said yeast mutant is obtained from a parent strain which has the ability to ferment D-xylose to ethanol.

4. A process according to claim 1 wherein said mutant is obtained from a parent yeast strain selected from the group consisting of Candida diddensii, Candida utilis, Candida tropicalis, Candida subtropicalis, Candida parapsilosis, Pachysolen tannophilus, Saccharomyces diastaticus, Saccharo-mycopsis fibuligera, Saccharomyces cerevisiae,
Saccharomyces uvarium, Schizosaccharomyces pombe ,
Kluyveromyces fragilis and Torula Candida.

5. A process according to claim 3 wherein the parent yeast strain is Candida sp.

6. A process according to claim 2 wherein the yeast mutant is Candida sp. XF 217.

997 results   Offices all   Languages en   Stemming true   Single Family Member false

ANALYSIS

Filters   Charts

Countries		Applicants		Inventors	
United States of America	198	E. I. DU PONT DE NEMOURS AND COMPANY	33	Zhang Min	15
China	187	DSM IP ASSETS B.V.	31	Viitanen Paul V.	12
PCT	140	FORSKARPATENT I SYD AB	25	ZHANG, MIN	12
European Patent Office	93	TOYOTA JIDOSHA KABUSHIKI KAISHA	23	ZHANG, Min	12
Canada	75	DSM IP Assets B.V.	17	ZHANG MIN	11

ANALYSIS   Close

Filters   Charts

Countries   Applicants   Inventors   IPC code   Publication Dates
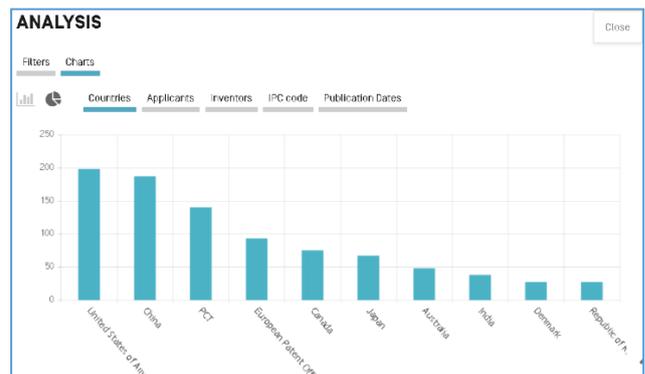
Advanced Search: Key word search can be done in all patent offices or in specific country patent offices

The search can be done in specific country patent offices as illustrated in the screen shot

The results of the advance search using the key words may be viewed as in the SIMPLE SEARCH as shown in the screen shot

1. WO1982004068 – DIRECT FERMENTATION OF D-XYLOSE TO ETHANOL BY A XYLOSE-FERMENTING YEAST MUTANT

ADVACNED SEARCHES can be conducted by combining the key words with various fields including the IPC.

The Boolean Operators can be used to combine the search terms.
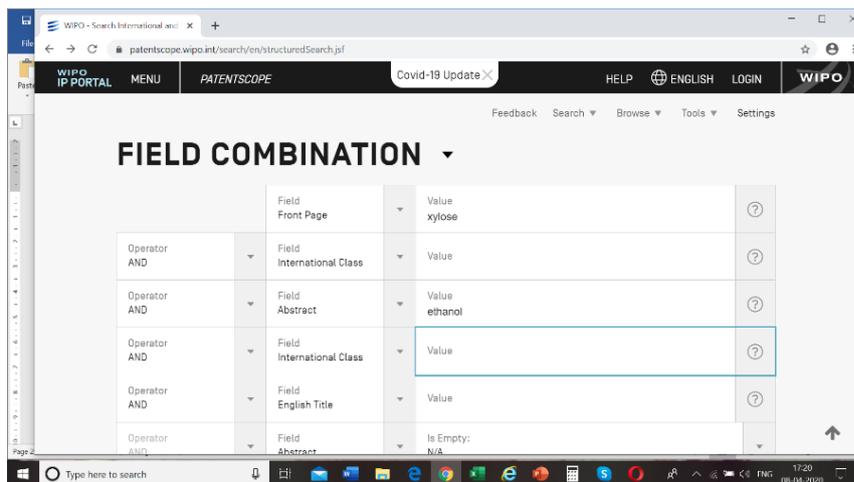
Combining Xylose in Front page and Ethanol in abstract results in 972 hits
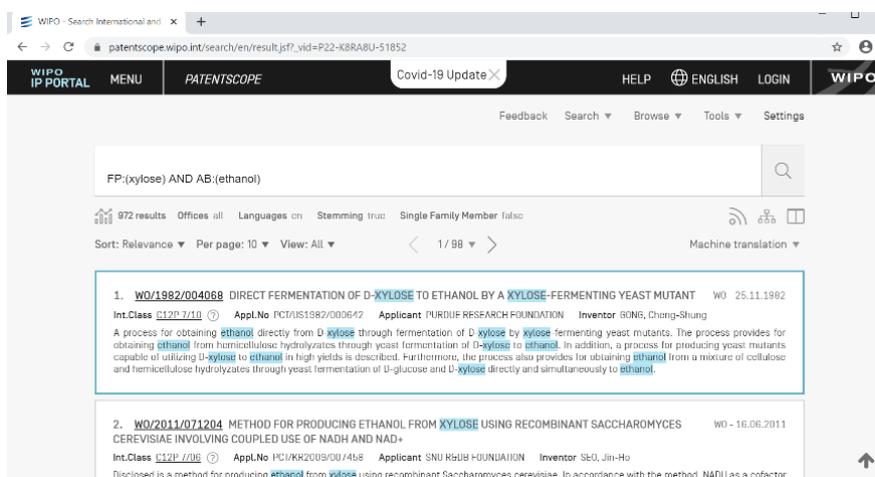
Combining Xylose in Front page, Ethanol in abstract and the IPC Code for Fermentation C12P7/00 results in 697 hits

28
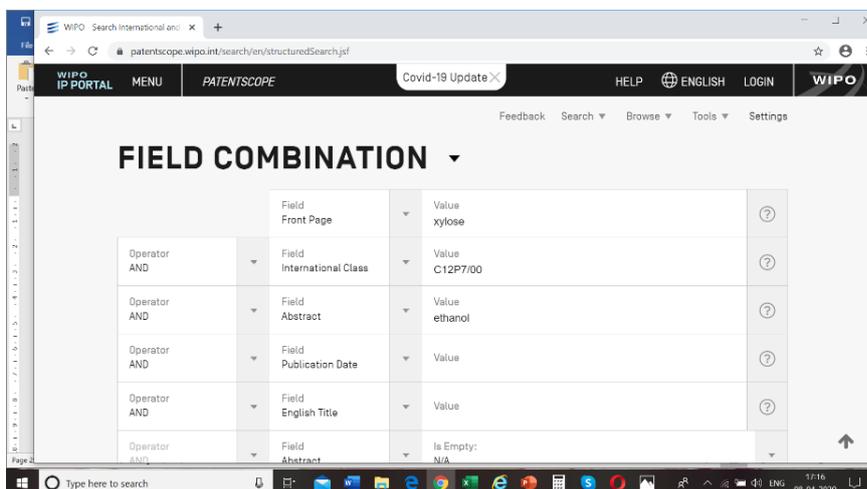
Note the output of 697

Xylose in Front page, Ethanol in abstract, IPC for fermentation C12P7/00 and IPC Code C12R1/85 for Saccharomyces are now combined

The result of the above search results in 96 hits

By clicking on each publication number, the complete document can be downloaded and read.

The systematic reduction in the number of hits and tis relevance has to be assessed in the context of the problem to be solved. Narrowing the search with too much of specificity, one may lose out on some relevant patents. Search strategies have to be prepared and searches are to be carried out after defining the focal point and the contours of the problem to be researched.

The users' guide may be used to understand further details of how to use all the features of the PATENTSCOPE.

URL for users' guide: https://patentscope.wipo.int/search/help/en/users_guide.pdf

Further regular webinars are conducted by the World Intellectual Property Organisation (WIPO). The details can be accessed at the URL: https://www.wipo.int/patentscope/en/webinar/

WIPO also publishes PATENTLANDSCAPES on various technologies from time to time that can be freely accessed at the URL https://www.wipo.int/patentscope/en/programs/patent_landscapes/

A formal WIPO ppt presentation on PATENTSCOPE titled: " Discover all the features and functionalities PATENTSCOPE has to offer", can be downloaded from https://www.wipo.int/meetings/en/doc_details.jsp?doc_id=431712

The Indian Patent Office Database (inPASS)

https://ipindia.nic.in
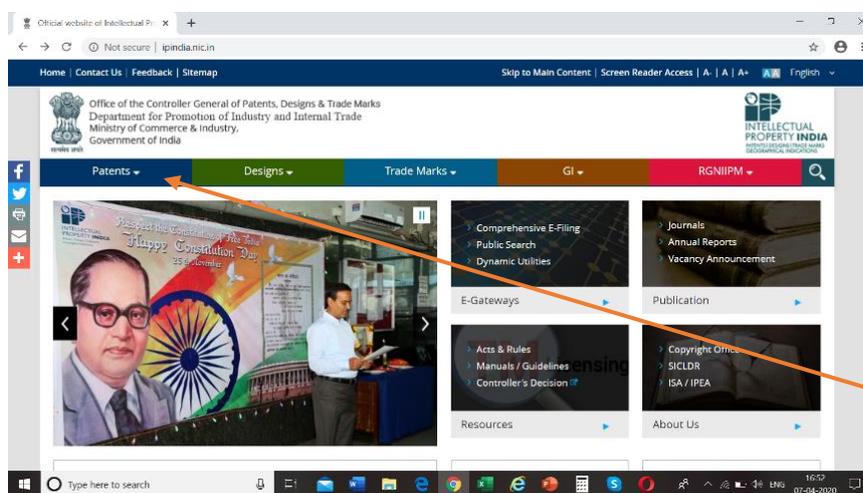
This is the home page of the Office of the Controller General of Patents, Designs, Trademarks. It also covers Geographical Indications.

Note Patents

When you click on Patents, the next screen opens as shown
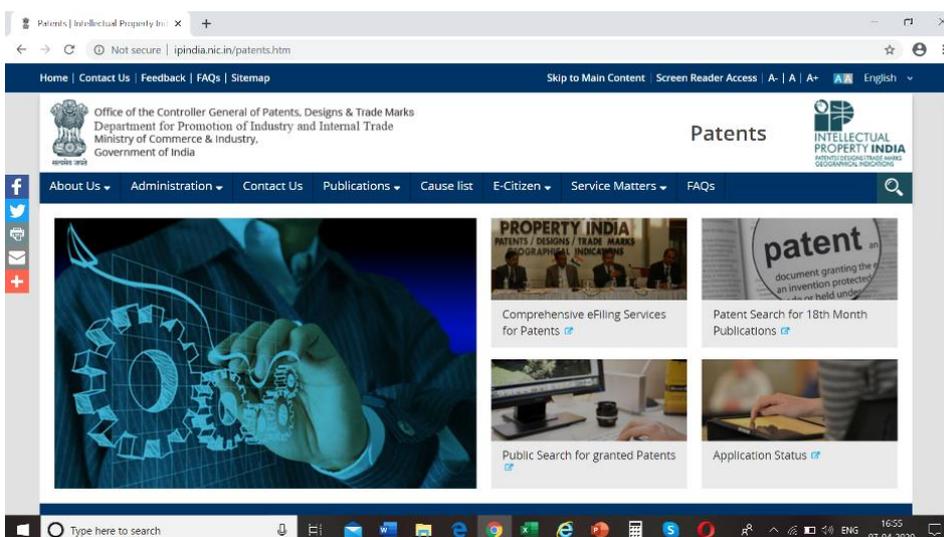
The screenshot shows options for search of Patent Applications Published, Patents granted, Application Status and comprehensive e-services for patents.

This website covers patents filed and granted only in India.

By clicking on the options for patent applications, or patents granted or application status, the screenshot shows the various options

Searches can be conducted using key words in combination with various fields using the Boolean Operators.

We now proceed to search patents for the production of Ethanol from Xylose

Key words Xylose and Ethanol in Abstract and fermentation in complete specification….Search in published patent applications gives 544 hits; Clicking on the application number will open the document

Key words Xylose and Ethanol in Abstract and Saccharomyces in complete specification fields ….Search in published patent applications gives 235 hits

Key words Xylose and Ethanol in Abstract ….Search in granted patents gives 133 hits

Clicking on the patent application number, the document opens, Further, clicking on the e-register gives the details entered in the e-register

Application Number	Title	Application Date	Status		
201817037964	METHODS AND APPARATUS FOR SEPARATING ETHANOL FROM FERMENTED BIOMASS	06/10/2018	Granted	E-Register	Application Status
201647021509	METHOD FOR DEHYDRATING A MIXTURE CONTAINING ETHANOL AND ISOPROPANOL	23/06/2016	Granted	E-Register	Application Status
201617020930	METHOD FOR USE IN PRODUCTION OF ETHANOL AND COPRODUCTION OF METHANOL	18/06/2016	Granted	E-Register	Application Status
201617008267	METHODS FOR FERMENTING CARBOHYDRATE RICH CROPS	09/03/2016	Granted	E-Register	Application Status
10063/DELNP/2014	METHODS AND COMPOSITIONS FOR BIOMETHANE PRODUCTION.	27/11/2014	Granted	E-Register	Application Status
2589/MUM/2014	A PROCESS FOR CONVERSION OF BIOMATERIAL	11/10/2014	Granted	E-Register	Application Status
1679/MUMNP/2014	PREPARATION OF LEVULINIC ACID	20/08/2014	Granted	E-Register	Application Status
1642/KOLNP/2014	PENTOSE FERMENTING MICROORGANISMS	06/08/2014	Granted	E-Register	Application Status
2324/MUM/2014	PROCESS FOR HYDROLYSIS OF STARCH BASED FEEDSTOCKS	17/07/2014	Granted	E-Register	Application Status
735/CHENP/2014	METHOD FOR PRODUCING ETHANOL USING CELLULOSIC BIOMASS AS STARTING	29/01/2014	Granted	E-Register	Application Status

Key words Xylose and Ethanol in Abstract and Saccharomyces in complete specification ….Search in granted patents gives 53 hits

| Application Number	Title	Application Date	Status		
201617008267	METHODS FOR FERMENTING CARBOHYDRATE RICH CROPS	09/03/2016	Granted	E-Register	Application Status
1642/KOLNP/2014	PENTOSE FERMENTING MICROORGANISMS	06/08/2014	Granted	E-Register	Application Status
7785/CHENP/2013	METHOD FOR PRODUCING ETHANOL AND SOLVENTS FROM LIGNOCELLULOSIC BIOMASS INCLUDING THE RECIRCULATION OF AN ETHYLIC WINE MADE FROM PENTOSE FERMENTATION	25/09/2013	Granted	E-Register	Application Status
4447/DELNP/2013	METHOD FOR PREPARING AN INDUSTRIAL YEAST INDUSTRIAL YEAST AND USE IN THE PRODUCTION OF ETHANOL FROM AT LEAST ONE PENTOSE	17/05/2013	Granted	E-Register	Application Status
3651/DELNP/2013	NEW SACCHAROMYCES CEREVISIAE STRAINS	25/04/2013	Granted	E-Register	Application Status
937/CHENP/2013	IMPROVED METHOD FOR PRODUCING CELLULOLYTIC AND/OR HEMICELLULOLYTIC ENZYMES	05/02/2013	Granted	E-Register	Application Status
8786/DELNP/2012	"INDUSTRIAL YEAST CAPABLE OF PRODUCING ETHANOL FROM AT LEAST ONE PENTOSE"	09/10/2012	Granted	E-Register	Application Status
1528/MUMNP/2012	DISPERSING FEEDSTOCKS AND PROCESSING MATERIALS	19/06/2012	Granted	E-Register	Application Status
2270/DELNP/2012	"STABILIZED CHLORINE DIOXIDE TO PRESERVE CARBOHYDRATE FEEDSTOCKS"	15/03/2012	Granted	E-Register	Application Status

Keywords Xylose and Ethanol in Abstract and C12P in IPC fields ….Search in published patent applications gives 9 hits

Application Number	Title	Application Date	Status	
21/MUM/2015	PREPARATION OF ETHANOL BY CONTINUOUS FERMENTATION PROCESS	05/01/2015	Published	Application Status
670/CHE/2014	PRODUCTION OF MONOGLYCERIDES FROM MANGO SEED KERNEL BUTTER BY ENZYMATIC TRANSESTERIFICATION	13/02/2014	Published	Application Status
2262/CHE/2012	EXTRACTION OF PHYTOCHEMICALS FROM PLANT MATTER	06/06/2012	Published	Application Status
1005/DEL/2010	A PROCESS FOR THE CONVERSION OF XYLOSE TO XYLITOL USING CANDIDA TROPICALIS	27/04/2010	Published	Application Status
389/CHE/2010	A PROCESS FOR ALCOHOL PRODUCTION FROM PANICUM SUMATRENSE (LITTLE MILLET) GRAINS	15/02/2010	Published	Application Status
387/CHE/2010	A TECHNOLOGY FOR ETHANOL FROM BANANA PSEUDOSTEM WASTE	15/02/2010	Published	Application Status
8517/DELNP/2009	CONTINUOUS COUNTER-CURRENT ORGANOSOLV PROCESSING OF LIGNOCELLULOSIC FEEDSTOCKS	28/12/2009	Published	Application Status
231/CHE/2009	AN ENZYMATIC PROCESS TO ENHANCE TOTAL REDUCING SUGARS (FERMENTABLE & UN-FERMENTABLE SUGARS) IN MOLASSES, POST PRODUCTION DURING TRANSPORT AND STORAGE	02/02/2009	Published	Application Status
230/CHE/2009	A PROCESS TO ENHANCE ETHANOL YIELD FROM MOLASSES FERMENTATION, BY ADDITION OF ENZYMES WHICH CONVERT UNFERMENTABLE SUGARS INTO FERMENTABLE SUGARS	02/02/2009	Published	Application Status

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Concluding remarks:

From this exercise, one will have to study the patent documents obtained from the searches yielding the least number of hits such as 5 and 9, to access the relevance of those documents in the context of the problem at hand.

After doing this assessment, one will then get to the results with higher number of hits and select the most relevant documents based on a reading of the abstracts and the independent claims to assess their relevance before reading the corresponding complete specifications.

Such an exercise will minimise the possibilities of missing out the most relevant documents in the context of the problem at hand.

Based on the searches made in various databases, and accounting for the common documents found in various countries, one can prepare a report on the prior art from the available patent literature.

These results will have to be merged with the results of the general literature search in books, journals and other academic and commercial literature to construct the technology landscape for the creation of a "research strategy" in the context of the problem at hand.

This process will have to be repeated from time to time and midcourse corrections in the research strategy will have to be done based on the prior art at that point in time.