

Patent Law Fundamentals

From Application to Prosecution to Litigation



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Patent Law Fundamentals

- Patentable Subject Matter
- Patent Application Requirements
- Drafting Patent Applications
- Prosecuting Patent Applications
- Litigation and Dispute Resolution
- Q&A



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Constitutional Right to Intellectual Property

United States Constitution (Art. I, §8, ¶ 8)

“Congress shall have the power...to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries..”



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Types of Intellectual Property

- Trademarks
- Copyrights
- Trade Secrets
- Patents



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What Is a Trademark?

- Any word, name, symbol, or device, or any combination thereof, used by a business to distinguish its goods or services from those offered by others.
- Used for source identification, quality assurance, or symbol of goodwill.
- Trademark rights may be used to prevent others from using a confusingly similar mark, but not to prevent others from making the same goods or from selling the same goods or services under a clearly different mark.
- Trademarks have a perpetual duration if used properly.



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Why Register A Trademark?

- Prevent others from using your registered trademark
- Being entitled to use the ® symbol
- Provides constructive notice nationwide
- Award of damages, court costs and attorney fees
- Evidence of ownership of the trademark.
- Basis for registration in other countries.
- Registration may be filed with the Customs Service to prevent importation of infringing foreign goods.



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What Is A Copyright?

- A form of IP protection for original works of authorship fixed in a tangible medium of expression.
- Includes both published and unpublished works.



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What Does A Copyright Protect?

- Literary, dramatic, musical, and artistic works, such as poetry, novels, movies, songs, computer software, and architecture.



What Does A Copyright Not Protect?

- Copyright does not protect facts, ideas, systems, or methods of operation, although it may protect the way these things are expressed.



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What is a Trade Secret?

“Information” that derives independent economic value, actual or potential, from not being generally well known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use and which is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.



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Accorded Trade Secret Protection

- Manufacturing processes
- Operating parameters and procedures
- Inventory projections, unit costs, profit margins and pricing methods
- Computer programs and software systems
- Details of R&D, projected capital spending, marketing plans
- Secret recipes
- Customer lists



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How Do You Maintain a Trade Secret?

- Automatic provided that “reasonable efforts” are taken to keep it secret.
- Use agreements (*i.e.*, Confidentiality, Security) and other means (*i.e.*, limited access, need-to-know, exit interview) to maintain the trade secret status.
- Lasts indefinitely, as long as it remains secret. Requires constant vigilance.



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Types of Intellectual Property

Patents

Trade Secret

Trademark

Copyright

	Patents	Trade Secret	Trademark	Copyright
Subject	<ul style="list-style-type: none"> • Process • Method • Manufacture • Composition • Improvement 	<ul style="list-style-type: none"> • Anything advantageous in business but not known in the trade. 	<ul style="list-style-type: none"> • Names or Symbols used for source identification 	<ul style="list-style-type: none"> • Original works of authorship (literary, musical, etc.)
Duration	<ul style="list-style-type: none"> • 20 years from filing date 	<ul style="list-style-type: none"> • Uncertain – based on disclosure of secret 	<ul style="list-style-type: none"> • 10 years but may be renewed indefinitely 	<ul style="list-style-type: none"> • Life + 70 years
Examples	<ul style="list-style-type: none"> • Chemical compounds • Process for making... 	<ul style="list-style-type: none"> • Coca-Cola's formula 	<ul style="list-style-type: none"> • Company names • Company slogan • Company logo 	<ul style="list-style-type: none"> • SOP • Marketing materials • Website
Protection Provided	<ul style="list-style-type: none"> • Right to exclude others from making, using, selling or importing 	<ul style="list-style-type: none"> • Right to protect against theft or improper disclosure 	<ul style="list-style-type: none"> • Right to prevent others from using confusingly similar marks 	<ul style="list-style-type: none"> • Right to copy, distribute, display, perform, create derivatives



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What is a Patent?

- A **limited monopoly** granted to a patentee by the U.S. federal government.
- The term of the **exclusionary right** is generally **20 years** from the earliest effective filing date.
- Patents filed since December 12, 1980 require the payment of **maintenance fees** to remain effective for their full terms.



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What Rights Do Patents Protect?

- **Right to Exclude**
 - Prevent unauthorized making, using, selling, offering for sale in the U.S. and importation into the U.S. of the invention claimed in the patent.
 - Rights are specific to the country where the patent is granted.
- **NOT a Right to Practice**
 - The right to exclude does not grant the right to practice the invention (i.e., government regulation may interfere; another patent may interfere)



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What Is An Invention?

- The discovery or creation of something new and useful that is recognized as being patentable.
- Conception + Reduction to Practice



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What Are the Types of Patents?

- **Utility**

- “Whoever invents or discovers any **new** and **useful** process, machine, manufacture, or composition of matter, or any new and useful **improvement** thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.” 35 U.S.C. § 101.

- **Design**

- “Whoever invents any **new, original** and **ornamental** design for an **article of manufacture** may obtain a patent therefor, subject to the conditions and requirements of this title.” 35 U.S.C. § 171.

- **Plant**

- “Whoever **invents or discovers** and **asexually reproduces** any **distinct** and **new** variety of plant, including cultivated sports, mutants, hybrids, and newly found seedlings, other than a tuber propagated plant or a plant found in an uncultivated state, may obtain a patent therefor, subject to the conditions and requirements of this title.” 35 U.S.C. § 161.



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What is Patentable Subject Matter?

- “Anything under the sun that is made by man.” *Diamond v. Chakrabarty*, 447 U.S. 303, 308-09 (1980)
- Any new and useful:
 - Process
 - Machine
 - Manufacture
 - Composition of matter
 - Improvement thereof

35 U.S.C. § 101 (Utility Patent)



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What Is Not Patentable?

- Laws of Nature
 - law of gravity
- Physical Phenomenon
 - a new plant found in the wild
- Abstract Ideas
 - $E = mc^2$



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But ... What Is Patentable Is ...

- A practical application or use of a:
 - Law of Nature
 - Physical Phenomenon
 - Abstract Idea



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- Everything that can be invented has been invented.
 - U.S. Patent Office Director, urging President McKinley to abolish the Office (1899).
- Man won't fly for a thousand years.
 - Wilbur Wright to Orville after a disappointing experiment in 1901.
- I think there is a world market for about five computers
 - Thomas J. Watson, IBM President (1958)



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What Is Conception?

The mental formulation of the discovery in sufficient detail that someone familiar with the subject matter could make and use the discovery.

That person would only need his/her skills in the relevant subject matter and would not need to do any further inventing.



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What Is Reduction to Practice?

Two Forms: Actual and Constructive

Actual

- Making or constructing the discovery and testing it to demonstrate its usefulness for its conceived purpose.

Constructive

- Filing a patent application describing the discovery.



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How Do You Protect An Invention?

- Publish
 - right to practice the disclosed invention
- Trade Secret
 - right to protect against theft or improper disclosure
- Patent
 - right to exclude others from making, using, selling or importing



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How Do You Evaluate An Invention?

- 1) Is it patentable?
- 2) Is it already patented?
- 3) Is it worth patenting?



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Is It Already Patented?

Prior Art Search and Legal Opinion:

- Patentability
- Freedom to Operate
- Infringement
- Validity



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What Is “Prior Art”?

- The total body of knowledge which teaches or otherwise relates directly to an invention.
- Prior art references include documentary sources such as **patents and publications** from anywhere in the world, and non-documentary sources such as things known or used publicly.



Is It Worth Patenting?

- Will the invention be practiced by the owner?
- Will the patent prevent others from competing?
- Will the invention be licensed to others?
- Will the invention be better protected as a trade secret?
 - Factors favoring trade secret protection include:
 - The invention is hard to reverse engineer
 - The invention will have a short lifetime in the marketplace



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Why Seek Patent Protection?

- Protect the market
 - Prevent competitor from copying
 - Maintain product differentiation
 - Erect barriers for entry into a market
 - Develop reputation as innovator/prestige
- Revenue through licensing/assignment
- Helps with credibility/advertising



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Requirements of a Utility Patent

- Utility
- Novelty
- Non-obviousness



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What Does “Utility” Mean?

- The invention must be “useful”:
 - Hypothetical person of ordinary skill in the art (“POSA”) can make and use the claimed invention in a manner which provides some immediate benefit to the public.
 - An invention that is inoperative is not a useful invention.
 - Generally, the easiest requirement to meet.
 - Mostly used to deny patents that lack credibility.



What Does “Novelty” Mean?

- The claimed invention must be new.
- The invention must meet all of the following:
 - Not known, published, or used publicly anywhere by others before discovery made
 - Not patented or described by anyone in a printed publication anywhere, or on sale in the U.S., more than 1 year prior to the U.S. filing date of the patent application
 - Not abandoned, suppressed, or concealed
 - Not first patented in a foreign country, prior to the date of the patent application, based on an application filed more than 1 year before the filing of the U.S. application
 - Not described in a patent granted to another where the other application was filed in the U.S. before the discovery
 - Not made in the U.S. by another, before the discovery



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What Does “Novelty” Mean?

- Not previously known or used by others in the U.S.
- Not previously patented or described in a printed publication anywhere
 - One year grace period to file a patent application if publicly disclosed by the inventor
- Not the prior invention of another
- “All Elements” Rule – a single prior art reference must not teach or suggest all of the claim limitations.



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What Does “Non-obviousness” Mean?

- Invention must not be an obvious modification to the prior art:
 - Examine the differences between the “prior art” and the **claimed** invention in view of what would be readily understood by a POSA at the time of the “invention”.
 - “Prior Art,” alone or in combination, discloses an invention that is so similar to the alleged invention that it would have been obvious to a POSA.



Can You Overcome Obviousness?

- Objective evidence of non-obviousness (“secondary considerations”):
 - Commercial success
 - Long felt but unsatisfied need
 - Copying by competitors
 - Acclaim by the industry
 - Licensing
 - Etc.



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THE WALL STREET JOURNAL. ONLINE

May 1, 2007, 8:07 am

KSR v. Teleflex: The Supreme Court's Big Patent Ruling

Posted by Peter Lattman



Yesterday, in a decision many are calling its furthest-reaching patent ruling in decades, the Supreme Court sided with critics who argued that the Federal Circuit — the federal appeals court specializing in patent law — was potentially stifling innovation by giving patent holders more power than Congress intended. The ruling in *KSR v. Teleflex* will make it harder to get new patents and to defend existing ones. The decision involves an arcane but vital area of patent law dealing with how to determine whether an invention is "obvious" and hence not patentable. Click [here](#) for the opinion; here are stories from the [Legal Times](#), [NYT](#), [WSJ](#) and the [WaPo](#).



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Patent Applications



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Patent Filing Strategies?

- Ongoing documentation of invention
 - U.S. is a “first-to-invent” country
 - Establishing date of invention is critical
 - Preferably in bound notebook
 - Periodically reviewed, signed and dated by a non-inventor
 - Date of witness signature is the effective date proven
 - Invention: Conception + Reduction to Practice
 - Diligence in reducing the invention to practice and/or promptly filing a patent application can be relevant.



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Invention Disclosure Forms

- Means for disclosing invention to company
- Further documents date of invention
- Prompts inventors for information necessary to evaluate the commercial and patent potential of the invention
- Means for company to disclose invention to patent attorney/agent



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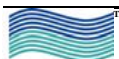
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Invention Disclosure Forms



Integra LifeSciences Corporation

MEMO TO:
CC:
FROM:
DATE:
SUBJECT:

RECORD OF INVENTION AND DISCLOSURE FORM

1. Descriptive title of subject of invention or discovery (about four to eight words).
2.
 - a. Briefly summarize the invention here (250 words or less). Include novel features and advantages.
 - b. Attach a detailed description of the invention, which includes its purpose or utility, the advantage provided by the invention, and the commercial significance of that advantage.
3. Date of first conception of the invention :
4.
 - a. Date of first successful test of invention :
 - b. By whom the first successful test was made:
 - c. Location of record of that test:
 - d. Who witnessed that test:
 - e. Who witnessed the record of that test:
 - f. Results of that test:
 - g. Date of first successful test in the United States, if different from 4.a.
5. First written record of the invention (notebook, letter, proposal, drawing, etc.).
 - a. Date:
 - b. Location of that first description or drawing:
6. First disclosure to another within Integra LifeSciences.
 - a. Date:
 - b. To whom disclosure was made:
 - c. Location or record of first disclosure:
7. Has your invention been described orally or in writing to another person other than an Integra LifeSciences employee or co-inventor? Yes ___ No ___
 - a. Date _____
 - b. To whom disclosure was made _____
 - c. Location or record of first disclosure _____

8. Have any specific embodiments of your invention (e.g. peptide, protein, cells, antibodies, DNA preparations, etc.) been distributed to persons other than Integra LifeSciences employees or co-inventors? Yes ___ No ___

Has a seminar or poster session been scheduled for future presentation? Yes ___ No ___

9. List the funding source(s) for the project under which this invention was made. If applicable, identify by contract, or grant number and name the Principal Investigator/Supervisor of each.
10. If any proprietary material (e.g. cell line, antibody, plasmid, software or chemical compound) obtained from outside your laboratory was used to develop this invention under a restrictive written or oral transfer agreement (other than a normal purchasing agreement), please attach a copy or a summary of that agreement.
11. Signatures, names and addresses of inventors.

a. Signature: _____ Date: _____

Print name: _____

Address: _____

City/State/Zip: _____

Telephone: _____

Note: If there are more inventors, or if an inventor is not an Integra LifeSciences' employee, please provide information on an additional sheet of paper.
12. For any "inventor" named (Item 12) who is not employed full time by Integra NeuroSciences, please identify other employers, the percent of salary time funded by such other employer, and the nature of the other employment (e.g. position, title).

Employer	Percent Salary	Position/Title
_____	_____	_____
_____	_____	_____
_____	_____	_____

13. Who is preparing this disclosure?

Signature: _____ Date: _____

Print name: _____



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Provisional vs. Non-Provisional

- Utility Patent Applications file either as a provisional application or non-provisional application
- Provisional application is a time reservation device
 - Establishes an early filing date
 - Cannot issue as a patent
 - Invention is “patent pending” for one year
 - Sales, offers for sale, and the like during that year do not risk loss of patent rights
 - **SIGNIFICANT BENEFIT:** year of patent pendency does not diminish the term of a patent that issues on a nonprovisional application claiming benefit of provisional filing date » 20 years from non-provisional filing date



Provisional vs. Non-Provisional

- The patent laws do not require a provisional application to be as comprehensive as a non-provisional application
 - But ... the benefit of the filing date extends only to the subject matter disclosed in the provisional application
- Provisional applications may be the only choice where there is very short notice of a filing deadline.





U.S. Patent Applications – Process



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What Is “Patent Prosecution”?

- “Prosecution” is the term given to the patent application process, including communications between the USPTO patent examiner and the patent applicant or his/her representative.



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Typical Patent Prosecution Process

- Application is filed
- Application is assigned to a patent examiner by the USPTO based on a classification system
- Examiner reviews application and performs a prior art search
- Examiner issues an Office Action listing perceived defects in the application
- Applicant responds to the Office Action by amending the application, submitting arguments and/or submitting evidence
 - Amendments are limited to the scope of the original disclosure. No new matter may be added.



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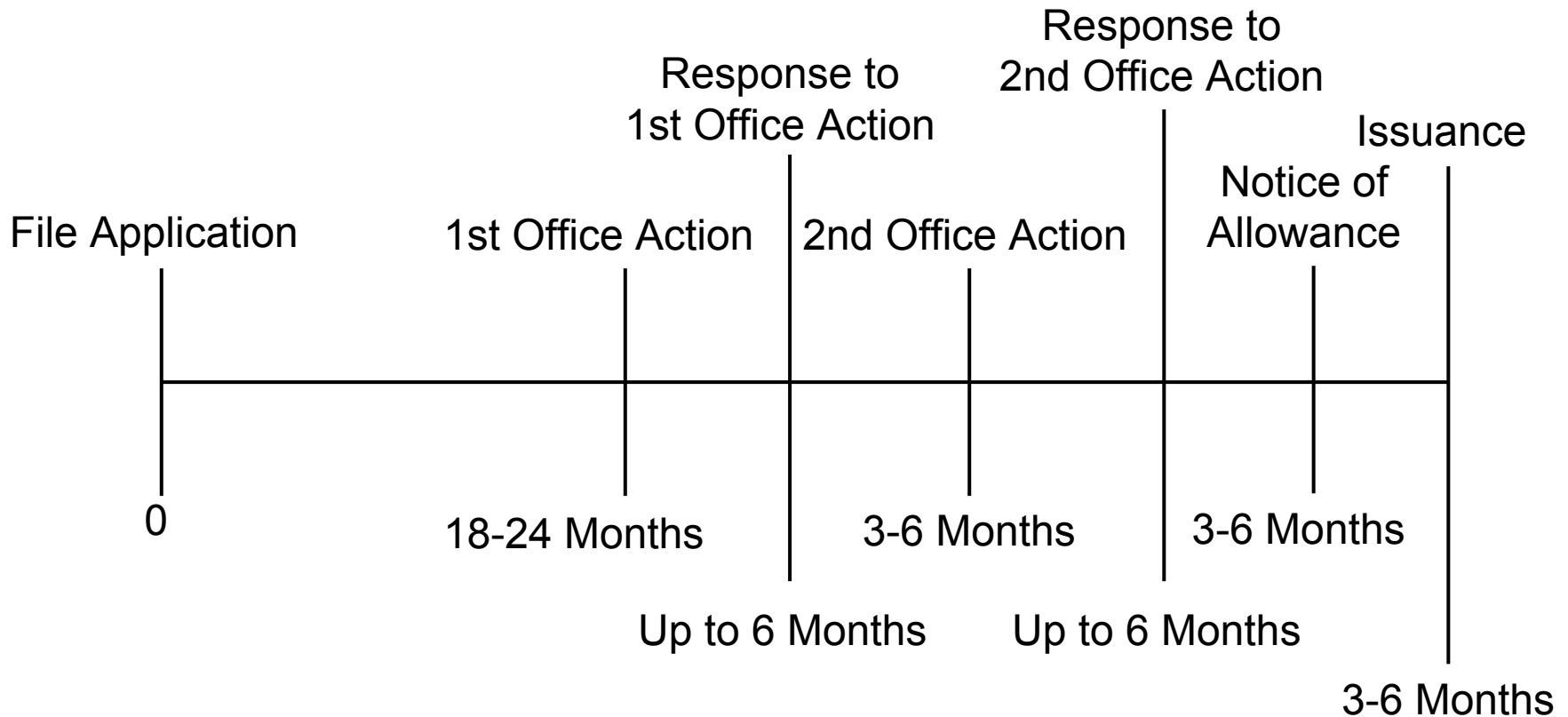
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Typical Patent Prosecution Process

- The Office Action/Response cycle can be repeated ...
- However, second or third Office Action is typically a Final Rejection
 - New amendments and evidence are limited after final
 - Options for response include filing: Request for Reconsideration; Appeal; Request for Continued Examination (RCE):
 - Appeal is to a Board of three administrative patent judges
 - RCE costs about the same as filing an application, and provides additional opportunities to submit new arguments, evidence and amendments



Typical Patent Application Process Timeline



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How can I protect my invention in several countries?

- (a) file separate patent applications at the same time in the countries in which you want patent protection;
- (b) file a patent application in a Paris Convention country and then file separate patent applications in other Paris Convention countries within 12 months from the filing date of that first patent application;
- (c) file a patent application under the Patent Cooperation Treaty (a “PCT” application).



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Patent Applications – Drafting



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Preferred Contents of a Utility Patent

- Title of the Invention
- Abstract
- Background of the Invention
- Summary of the Invention
- Detailed Description of the Invention
- Brief Description of Several Views of the Drawings (if any)
- Claims



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Cover Page of a Utility Patent



US007022235B2

(12) **United States Patent**
Hassett

(10) **Patent No.:** **US 7,022,235 B2**
(45) **Date of Patent:** **Apr. 4, 2006**

Inventor(s)

Assignee

Term
Extension

Filing
Date

Priority
Date

Prior Art

(54) **WASTEWATER BIOLOGICAL TREATMENT SYSTEM AND METHOD THEREFOR**
(75) Inventor: **Alan F. Hassett**, Berwyn, PA (US)
(73) Assignee: **The White Oak Partnership, L.P.**, Berwyn, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 95 days.

(21) Appl. No.: **10/663,211**

(22) Filed: **Sep. 16, 2003**

(65) **Prior Publication Data**
US 2004/0112809 A1 Jun. 17, 2004

Related U.S. Application Data
(60) Provisional application No. 60/427,507, filed on Nov. 18, 2002, provisional application No. 60/411,773, filed on Sep. 17, 2002.

(51) **Int. Cl.**
C02F 3/00 (2006.01)
(52) **U.S. Cl.** 210/620; 210/747; 210/150;
210/170; 210/532.2; 405/43; 405/50; 134/21;
134/22.11
(58) **Field of Classification Search** 210/617,
210/618, 620, 747, 150, 151, 170, 532.2;
134/21, 22.11, 22.12; 405/43, 44, 45, 50
See application file for complete search history.

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Primary Examiner—Christopher Upton
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(57) **ABSTRACT**
A biological treatment system, including a wastewater system drain field and at least one perforated distribution pipe located within the drain field and adapted to receive effluent. At least one perforated outer pipe surrounds the at least one distribution pipe to receive effluent from the at least one distribution pipe and to dispense the effluent to the drain field after it has been biologically treated in the at least one outer pipe. The system also includes a method of biological treatment comprising the steps of supplying effluent to at least one vessel positioned within a wastewater drain field; delivering gas to the at least one vessel to interact with the effluent such that the effluent experiences aerobic biological treatment; and passing biologically treated effluent from the at least one vessel to the wastewater drain field.

28 Claims, 6 Drawing Sheets

Patent No.

Issue Date

Prior Art
Publications

Patent
Examiner
and Law
Firm

Abstract



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Specification

“The specification shall contain a **written description** of the invention, and the manner and process of making and using it, in such full, clear, concise, and exact terms as to **enable** any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the **best mode** contemplated by the inventor of carrying out his invention.”
35 U.S.C. § 112 (¶1).



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Background of the Invention

- Describe field of the invention
- Provide context to the invention
- Summarize problems in art addressed by the invention
- Summarize attempts of others to solve the same problems
- “Miranda Warning” for patents
 - Anything you say in the Background can and will be used against you in a court of law (or the Patent Office)



Parts of a Patent continued...

- Summary of the Invention
 - Typically corresponds to a description of one or more of the claims;
 - Often includes a summary of the objectives of the invention



Parts of a Patent continued...

- Detailed Description of the Invention
 - Must enable a POSA to practice the claimed invention without undue experimentation
 - Working Examples are not required
 - Misrepresenting that examples were performed can be fraud on the PTO, rendering a patent invalid
 - Drawings may be required depending on the claimed subject matter



Parts of a Patent continued...

- **Claims**

- Appear at end of patent (“We claim ...”)
- Define scope of patent protection:
 - Patents typically include many claims of different scope and form (e.g., product claims, process claims)
- Each claim must be a single sentence.
- Independent claims do not depend from any other claim
- Dependent claims depend from other claim(s) and incorporate all elements/limitations from earlier claim(s)
- Extra claim fees
 - More than 20 claims
 - More than 3 independent claims
 - New Rule Changes?!



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WASTEWATER BIOLOGICAL TREATMENT SYSTEM AND METHOD THEREFOR

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application No. 60/411,773, filed Sep. 17, 2002 and U.S. Provisional Patent Application No. 60/427,507, filed Nov. 18, 2002 which are hereby incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

Traditionally, conventional onsite wastewater treatment systems (OWTSs) have consisted primarily of a septic tank and a soil absorption field, also known as a subsurface wastewater infiltration system (SWIS). Conventional systems work well if they are installed in areas with appropriate soils and hydraulic capacities; designed to treat the incoming waste load to meet public health, ground water, and surface water performance standards; installed properly; and maintained to ensure long-term performance. These criteria, however, are often not met.

Over the past century developing countries have witnessed an explosion in sewage treatment technology and widespread adoption of centralized wastewater collection and treatment services. Scientists, engineers, and manufacturers in the onsite wastewater treatment industry have also developed a wide range of alternative technologies designed to address the shortcomings of traditional conventional systems as well as increased hydraulic loads and water contamination. These "alternative" onsite treatment technologies are more complex than conventional systems and incorporate pumps, recirculation piping, aeration, and other features. As such, alternative technologies are applied to the treatment train beyond the septic tank and often provide environments (e.g., recirculating sand filters, peat-based systems, package aeration units) that promote additional biological treatment.

Accurate characterization of raw wastewater, including daily volumes, rates of flow, and associated pollutant load, is critical for effective alternative treatment system design. Determining treatment system performance requirements, selecting appropriate treatment processes, designing the alternative treatment system, and operating the system depends on an accurate assessment of the wastewater to be treated and the effluent quality desired.

There are basically two types of onsite wastewater systems—residential and nonresidential. The required hydraulic capacity for an OWTS can be determined initially from an estimated wastewater flow. For example, the average daily wastewater flow from typical residential dwellings can be estimated from indoor water use in the home. However, maximum and minimum flows, as well as instantaneous peak flow variations, are necessary factors in properly sizing and designing system components. Alternative onsite treatment system designs vary considerably and are based largely on the type of establishment under consideration. Therefore, reliable data on existing and projected flows must be used if onsite systems are to be designed properly and cost-effectively. Accurate wastewater characterization data and appropriate factors of safety to minimize the possibility of system failure are required elements of a successful alternative wastewater system design. All OWTSs should be designed to accept and process hydraulic flows from residential or

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nonresidential wastewaters while providing necessary pollutant removal efficiency to achieve performance goals.

The three primary components of a conventional OWTS are: the soil beneath the SWIS; the SWIS (also called a leach field, drain field or infiltration trench); and, the septic tank. The SWIS is the interface between the engineered system components and the receiving ground water environment. SWISs provide both dispersal and treatment of the applied wastewater. Typically, wastewater is transported from the infiltration system through several different soil zones, which can act as fixed-film biozones, where oxygen in the soil may or may not satisfy the oxygen demand generated by the microorganisms degrading the treated wastewater. If sufficient oxygen is not present, the aerobic metabolic processes of the microorganisms (biomass) can be reduced or halted and both treatment and infiltration of the wastewater can be adversely affected.

The method and pattern of wastewater distribution in a SWIS are important design considerations. Uniform distribution aids in maintaining unsaturated flow below the infiltration surface which results in wastewater retention times in the soil that are sufficiently long to effect treatment and promote subsol re-aeration. As a result, uniform distribution design can provide more complete utilization of the infiltration surface.

While many different SWIS designs and configurations are used, all incorporate soil infiltrative surfaces that are located in buried excavations. Typically, a SWIS utilizes perforated pipe to distribute the wastewater over the infiltration surface. A porous medium of aggregate, such as gravel or crushed rock, is often placed in the excavation below and around the perforated distribution pipe to support the pipe and spread the localized flow from the distribution pipe across the excavation cavity. However, the porous aggregate may be substituted by gravelness or "aggregate-free" system components.

Gravelless systems are prominent in the United States today taking on many designs, including open-bottomed chambers, fabric-wrapped pipe, and synthetic materials such as expanded polystyrene foam chips. Many gravelness systems use large-diameter corrugated plastic tubing covered with permeable nylon filter fabric not surrounded by gravel or rock. Other gravelness systems use leaching chambers that consist of trenches or beds and one or more distribution pipes or open-bottomed plastic chambers.

Several different biological treatment processes exist for reducing biochemical oxygen demand (BOD) and total suspended solids (TSS) from septic tank effluent to meet higher effluent standards. The activated sludge process is an aerobic suspended-growth process that maintains a relatively high population of biomass by recycling concentrated biomass back to the treatment process. The biomass converts soluble and colloidal biodegradable organic matter and some inorganic compounds into cell mass and metabolic end products. The biomass is separated from the wastewater by settling in a clarifier and recycled or removed to a sludge handling process. Preliminary treatment to remove settleable solids and floatable materials is usually provided by a septic tank or other primary treatment devices.

Alternatively, fixed-film systems are biological treatment processes that employ a medium of natural or synthetic solid material that will support biomass on its surface and within its porous structure. At least two types of fixed-film systems have been employed—those in which the medium is held in place and stationary relative to fluid flow (trickling filter) and those in which the medium is in motion relative to the wastewater (e.g., rotating biological disk). A third system,



which is the focus of the present invention, includes dual-process systems that encompass both fixed and suspended biomass together or in series.

The state of the art with respect to the present invention is presented in U.S. E.P.A. Office of Water, Office of Research and Development, "Onsite Wastewater Treatment Systems Manual" (February 2002) which is hereby incorporated by reference in its entirety and restated, in part, above. Importantly, improvements can be made to suspended-growth processes, including adding surfaces where biomass can attach and grow, such that the system can be categorized as a dual-process or fixed-film/suspended growth system. The present invention provides an improved fixed-film/suspended, nominally zero-net growth onsite wastewater treatment technology that is incorporated with gravel or graviness SWISs. The coupled contact aeration or controlled biomass system of the present invention is, preferably, preceded by a septic tank and followed by an aggregate or aggregate-free infiltration surface such that a fixed film of biomass can attach and grow on a medium to augment a suspended microbial population thereby providing more biomass to feed on wastewater constituents. Advantages of the well-controlled system of the present invention include increased active microbial mass per unit volume, enhanced potential for nitrification, reduced sludge production, and resilience under variable influent conditions without the need for biomass recycle. Such a controlled biomass system, as the present invention provides, can also be a low-cost means of upgrading existing overloaded OWTs that do not currently meet BOD or nitrification goals.

BRIEF SUMMARY OF THE INVENTION

Briefly stated, the present invention is directed to a biological treatment system, including a wastewater system drain field and at least one perforated distribution pipe located within the drain field and adapted to receive effluent. At least one perforated outer pipe surrounds the at least one distribution pipe to receive effluent from the at least one distribution pipe and to dispense the effluent to the drain field after it has been biologically treated in the at least one outer pipe.

In another aspect, the present invention is directed to a method of biological treatment comprising the steps of supplying effluent to at least one perforated distribution pipe; discharging the effluent through the at least one perforated distribution pipe; receiving the effluent in at least one perforated outer pipe surrounding the at least one distribution pipe such that the effluent experiences biological treatment; and passing the biologically treated effluent from the at least one perforated outer pipe to a wastewater drain field within which the at least one outer pipe is located.

In another aspect, the present invention is directed to a method of flushing a biological treatment system, comprising the steps of positioning at least one perforated flushing pipe adapted to receive liquid within at least one outer pipe; connecting a vacuum system to an end of the at least one outer pipe; starting the vacuum system; and supplying the liquid to the at least one flushing pipe such that the liquid is distributed within the at least flushing pipe and received by the outer pipe before being removed by the vacuum system.

In yet another aspect, the present invention is directed to a method of biological treatment comprising the steps of supplying effluent to at least one vessel positioned within a wastewater drain field; delivering gas to the at least one vessel to interact with the effluent such that the effluent

experiences aerobic biological treatment; and passing biologically treated effluent from the at least one vessel to the wastewater drain field.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of preferred embodiments of the invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings embodiments which are presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown. In the drawings:

FIG. 1 is a schematic view, partially in cross-section, of an biological treatment system for use with an onsite wastewater system in accordance with a first preferred embodiment of the invention;

FIG. 2 is an enlarged cross-sectional view of a section of the biological treatment system of FIG. 1 taken along line 2—2 of FIG. 1;

FIG. 3 is an enlarged cross-sectional view of the distribution pipe, the flushing pipe, the gas delivery pipe, and the outer pipe shown in FIG. 2, taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged cross-sectional view of a portion of an biological treatment system in accordance with a second preferred embodiment of the invention;

FIG. 5 is an enlarged cross-sectional view of the distribution pipe, the flushing pipe, the gas delivery pipe, and the outer pipe in accordance with a third preferred embodiment of the invention; and,

FIG. 6 is an enlarged cross-sectional view of the distribution pipe, the flushing pipe, the gas delivery pipe and the outer pipe in accordance with a fourth preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Certain terminology is used in the following description for convenience only and is not limiting. The words "right," "left," "lower," and "upper" designate directions in the drawings to which reference is made. The terminology includes the words above specifically mentioned, derivatives thereof and words of similar import.

The biological treatment system, generally designated 8, comprises an OWTs with a conventional gravel or alternative graviness SWIS positioned over a soil infiltration system, as described in more detail below. The biological treatment system 8 is placed on a terrain and/or in a subterranean volume or drain field and is integral to an OWTs such that the system 8 promotes biological treatment to meet high effluent standards. As used herein the term drain field is defined to include at least the SWIS and the soil infiltration system below the SWIS as well as aggregate or aggregate-free components. It will be recognized by those skilled in the art from the present disclosure that the present system 8 can also be used to reduce the required size for a drain field. Although not part of the present invention, the biological treatment system 8 preferably includes a septic tank which receives wastewater and sewage from a source such as a house or commercial building and provides for the separation by gravity of gross solids and also the decomposition of bacteria and/or digestion of raw sewage.



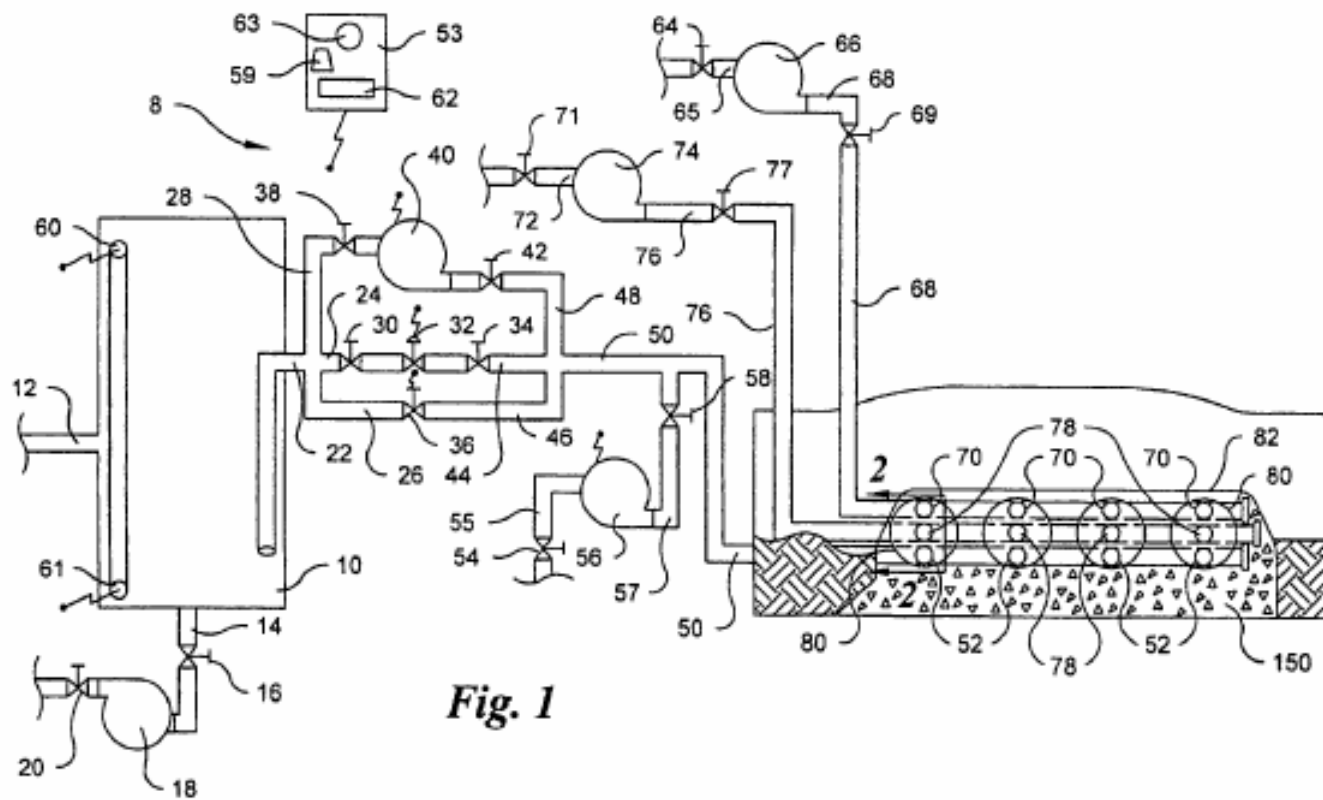
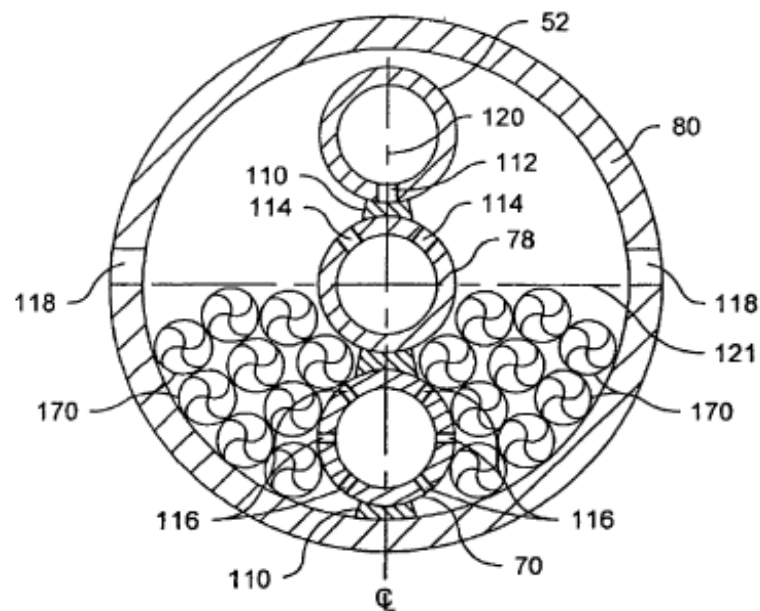


Fig. 1



**Fig. 6**

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ensuring aerobic activity. The third preferred embodiment also allows biomass to attach completely around the outside circumference of the gas delivery pipe 70 and, as previously disclosed, around a majority of the outside circumference of the flushing pipe 78 since a majority of the flushing pipe 78 is located below the flow line 121 and therefore in contact with the effluent. Also, in the third preferred embodiment, the gas delivery pipes 70, in addition to or in lieu of the slotted PVC Well Screen previously described, can comprise a diffuser-type design such as the Tubeflex® Fine Bubble Air Diffuser Model TFX-26 Type II available from the Red Valve Company, Inc., located in Pittsburgh, Pa. It will be recognized by those skilled in the art that the introduction of gas, e.g., air, by a diffuser submerged in the effluent produces a large quantity of small bubbles as compared to the larger bubbles produced by a slotted Well Screen pipe. As such, it will also be recognized by those skilled in the art that the use of a diffuser provides more bubble surface area for oxygen transfer in the effluent thereby improving oxygen transfer in the effluent in comparison to a similarly submerged slotted pipe.

Referring now to FIG. 6, in a fourth preferred embodiment, the aerobic treatment system 8 of the present invention provides effluent to the distribution pipes 52 and the outer pipes 80 in the same manner described in the third preferred embodiment of the present invention. However, in the fourth preferred embodiment packing material 170 is placed inside at least a portion of the outer pipe 80 below the flow line 121 in all or a portion of the length of the outer pipe 80 and in available space not otherwise occupied by the gas delivery pipe 70 and the flushing pipe 78. It will be recognized by those of ordinary skill in the art from the disclosure of this embodiment that sections of the outer pipe 80 can repeatedly be filled with the packing material 170 followed by sections that do not contain the packing material along the length of the outer pipe 80 without departing from the spirit and scope of the invention.

It will also be recognized by those of ordinary skill in the art from the disclosure of this embodiment that, if desired, the packing material 170 can be placed inside at least a portion of the outer pipe 80 below the flow line 121 in available space not otherwise occupied by the distribution pipe 52 and the flushing pipe 78 as these pipes 52, 78 are described in the first and second preferred embodiments and shown, for example, in FIG. 3, without departing from the spirit and scope of the invention. The packing material 170 is inserted to provide additional surface area for fixed-film growth of biomass resulting in increased aerobic activity. Preferably, the packing material only occupies a portion of the available space below the flow line 121 which can be ensured, if necessary by using a screen (not shown) that can be attached by conventional means to the inside circumference of the outer pipe 80. The use of the screen is not considered critical to the invention, however, if a screen is not used the size of the packing material should be larger than the outer pipe holes 118 so that the packing material is not capable of escaping from inside in the outer pipe 80.

The packing material 170 is a generally rigid open-spherical material such as 1-inch polypropylene Jaeger Tri-Packs® available from Jaeger Products®, Inc., located in Houston, Tex. Various types of media, such as a media comparable to the AccuWeb® active fabric media available from Brenwood Industries, Inc., located in Reading, Pa., could be used with or in lieu of packing material in order to provide additional surface area for fixed-film growth of biomass. It will be recognized by those skilled in the art from this disclosure that other types and sizes of packing material

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and/or media could be used, if desired, without departing from the spirit and scope of the invention. It will also be recognized by those skilled in the art from this disclosure that the size (diameter) of the outer pipe 80, the distribution pipe 52, the gas delivery pipe 70 and the flushing pipe 78 can be changed to accommodate a desired amount, type or size of packing material 170 without departing from the spirit and scope of the invention.

It will be recognized by those skilled in the art from the present disclosure that in order for the system 8 to operate effectively only one more distribution pipe is provided to the drain field to allow aerobic activity to be maintained. Therefore, it will be recognized from the present disclosure that the system 8 need not be aerobic or anaerobic; it can be aerobic, anaerobic, or a combination thereof. Such systems are well known in the art and are not described in detail here.

Further, it will be recognized from the present disclosure that the gas delivery pipes 80 can be connected to the effluent by a network of pipes that are a part of the systems described in the present invention. It will be recognized from the present disclosure that the gas delivery pipes 80 can be connected to the effluent by a network of pipes that are a part of the systems described in the present invention.

Finally, it will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad invention concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but is intended to cover modifications within the spirit and scope of the present invention.

I claim:

1. A biological treatment system comprising:
 - a wastewater system drain field;
 - at least one perforated distribution pipe located within the drain field and adapted to receive effluent; and
 - at least one perforated outer pipe surrounding the at least one distribution pipe to receive and retain effluent from the at least one distribution pipe for a period of time and to dispense the effluent to the drain field after it has been biologically treated in the at least one outer pipe.
2. The biological treatment system of claim 1, wherein the at least one distribution pipe is located adjacent an inside bottom surface of the at least one outer pipe.

I claim:

1. A biological treatment system comprising:
 - a wastewater system drain field;
 - at least one perforated distribution pipe located within the drain field and adapted to receive effluent; and
 - at least one perforated outer pipe surrounding the at least one distribution pipe to receive and retain effluent from the at least one distribution pipe for a period of time and to dispense the effluent to the drain field after it has been biologically treated in the at least one outer pipe.
2. The biological treatment system of claim 1, wherein the at least one distribution pipe is located adjacent an inside bottom surface of the at least one outer pipe.

td.



3. The biological treatment system of claim 1, wherein the perforations of the at least one distribution pipe are spaced along a bottom portion of a length of the at least one distribution pipe.

4. The biological treatment system of claim 1, wherein the perforations of the at least one outer pipe are spaced along opposite sides of the outer pipe.

5. The biological treatment system of claim 1 further comprising at least one perforated gas delivery pipe positioned within the at least one outer pipe and being adapted to receive gas containing oxygen such that the gas is distributed within the at least one outer pipe to interact with the effluent.

6. The biological treatment system of claim 5, wherein the at least one gas delivery pipe is located above the at least one distribution pipe.

7. The biological treatment system of claim 5, wherein the at least one perforated gas delivery pipe is in fluid communication with a gas delivery header pipe.

8. The biological treatment system of claim 5, wherein the at least one gas delivery pipe is located below the at least one distribution pipe.

9. The biological treatment system of claim 5, wherein the at least one gas delivery pipe is at least one diffuser.

10. The biological treatment system of claim 5, further comprising at least one perforated flushing pipe which is located between the at least one distribution pipe and the at least one gas delivery pipe.

11. The biological treatment system of claim 1, further comprising a barrier located above the at least one outer pipe which isolates and insulates the at least one outer pipe from a surrounding environment.

12. The biological treatment system of claim 11, wherein the barrier is at least one of a geofabric, a geomembrane and includes both a geofabric and geomembrane.

13. The biological treatment system of claim 1, further comprising at least one perforated flushing pipe positioned within the at least one outer pipe and adapted to receive liquid and discharge the liquid to the at least one outer pipe.

14. The biological treatment system of claim 13, wherein the perforations of the at least one flushing pipe are spaced along one end of the at least one flushing pipe.

15. The biological treatment system of claim 14, wherein the at least one flushing pipe is in fluid communication with a flushing header pipe.

16. The biological treatment system of claim 1, further comprising a tank in fluid communication with the at least one distribution pipe for allowing effluent to pass from the tank to the at least one distribution pipe.

17. The biological treatment system of claim 16, further comprising a return pump in fluid communication with the tank to pump effluent from the tank.

18. The biological treatment system of claim 17, further comprising a sensor positioned within the tank for controlling a periodic delivery or dosing of the effluent from the tank to the at least one distribution pipe.

19. The biological treatment system of claim 18 further comprising a discharge pump in fluid communication with the tank to deliver the effluent from the tank to the at least one distribution pipe.

20. The biological treatment system of claim 1, further comprising at least one of a packing material and a media

such that the packing material and the media are located within the at least one outer pipe.

21. The biological treatment system of claim 1, wherein the drain field is a gravelless drain field assembly within which the at least one outer pipe is located.

22. A method of biological treatment comprising the steps of:

- (a) supplying effluent to at least one perforated distribution pipe;
- (b) discharging the effluent through the at least one perforated distribution pipe;
- (c) receiving the effluent in at least one perforated outer pipe

22. A method of biological treatment comprising the steps of:

(a) supplying effluent to at least one perforated distribution pipe;

(b) discharging the effluent through the at least one perforated distribution pipe;

(c) receiving the effluent in at least one perforated outer pipe surrounding the at least one distribution pipe and retaining the effluent therein for a period of time such that the effluent experiences biological treatment; and

(d) passing the biologically treated effluent from the at least one perforated outer pipe to a wastewater drain field within which the at least one outer pipe is located.

23. The method of claim 22 further comprising the step of delivering gas to the at least one outer pipe to interact with the effluent.

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28. The method of claim 27, further comprising the step of controlling at least one of: the effluent to the at least one distribution pipe; the gas to the at least one outer pipe; and temperature of the effluent within the outer pipe.



Claim Interpretation

- First step in evaluating patentability, validity and infringement
- Claims in U.S. patents are typically written in three-part form:
 - Preamble or introductory portion
 - Transitional phrase
 - Body



Claim Interpretation Example

1. A bandage comprising:

preamble transitional phrase

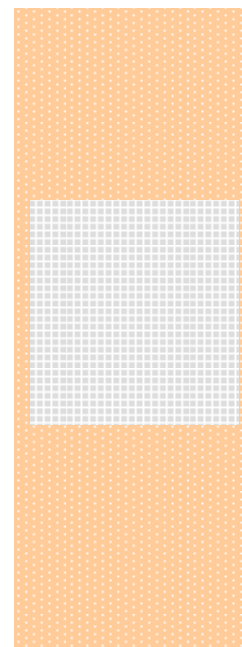
a flexible substrate;

an adhesive coated on a face
of the flexible substrate; and

an absorptive material adhered
to a portion of the face of the
flexible substrate.

body

Claimed Invention



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Claim Interpretation Guidelines

- Claims are given their broadest reasonable interpretation consistent with the specification
 - However, do not read limitations from the specification into the claims
- The words of the claim must be given their plain meaning as understood by a POSA unless patentee provided a clear definition in the specification.
- Claims should be interpreted in view of the specification and the prosecution history (“intrinsic evidence”).
 - Extrinsic evidence, such as a dictionary definition of a claim term and expert opinion, may also be relevant.



Patent Dispute Resolution

- Arbitration
- Mediation
- Litigation
- International Trade Commission



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Litigation

- Claims brought by Patent Holder (Plaintiff)
 - Infringement (direct, contributory, induced)
- Claims brought by Defendants
 - Invalidity
 - Unenforceability



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Claim Construction

□ Meaning of the Claims

- Presumption – “claim term carries its ordinary and customary meaning”
- Intrinsic Evidence
 - Claims; Specification; Prosecution History
- Extrinsic Evidence
 - When claim term is unclear after reviewing intrinsic evidence.
 - Expert opinions
 - Inventor testimony
 - Articles/ Publication/ Treatises
 - Discoveries



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Infringement

- Making, selling, using, offering for sale, or importing the **claimed** invention without approval of the patent owner.
- If a claim “reads on” the accused device or process, infringement exists.
- Burden of Proof: Preponderance of the Evidence
- Two types of infringement:
 - Literal
 - Infringement under Doctrine of Equivalents



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Invalidity

- A patent is valid only if the following requirements for patentability are satisfied:
 - Useful
 - Novel
 - Non-obvious
 - Definiteness
 - Written description
 - Enablement
 - Best mode
- A patent is presumed valid.
- Burden of Proof: Clear and Convincing Evidence



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Unenforceability

- A patent is not enforceable when there is:
 - Inequitable conduct
 - Patentee intentionally made a misrepresentation or withheld information about the patentability of the invention during the application process.
 - Patent misuse
 - Patent is used as leverage to obtain more market power than Congress intended to convey through granting the patent.



QUESTIONS

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