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# Intellectual Property: Patents



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# Patents

“a property right granted by the Government of the United States of America to an inventor ‘to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States’ for a limited time in exchange for public disclosure of the invention when the patent is granted.”

USPTO web site

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## What is a Patent?

- A contract between an inventor and society
- In exchange for teaching how to do something new, an inventor gets a limited-term monopoly on the concept
- Promotes progress in several different ways

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## Trade Secrets

- An industrial process, etc., that is kept secret, e.g., the formula for Coca Cola
- No time limit to force disclosure
- If you reverse-engineer one or otherwise (legitimately) learn it, you may practice it
- The precise opposite of a patent

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## Progress from Patents

- Obvious: market incentive to invent things
- Somewhat obvious: people learn from the description
- Somewhat obvious: people can invent and build follow-on items
- Not as obvious: a good patent attorney will try to get the inventor to generalize the invention and think of other, related variants
- Not as obvious: people will try to “invent around” a patent, to avoid paying royalties

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## What is Patentable?

- Must be “new, useful, and non-obvious”
- Must be a “process, machine, manufacture, or composition of matter”
- Cannot be “laws of nature, physical phenomena, and abstract ideas”
- Cannot be “a mere idea or suggestion”
- Cannot be useful for nuclear weapons only. . . (42 USC §2181)

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# Novelty

- If someone else invented it earlier, it's not novel
- If someone else published a description, it's not novel
- If it's a straight-forward variant or combination of older items, it's not patentable
- 👉 But: it must be obvious why someone would want to combine the older items

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# Obviousness

- Reference standard for obviousness: “person of ordinary skill in the art”
- Inventors are generally presumed to have more than ordinary skill in the art
- Crucial issue in many software patents

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## Abstract Ideas

- It has to be some actual way of doing things
- You can't patent, say, a faster-than-light spaceship without giving at least one way to actually build one
- You also can't patent things you just observe, e.g., the law of conservation of energy
- Is software a concrete way of doing things or an abstract idea?

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## Rights in Patents

- A patent gives you the right to block someone else from practicing your invention
- It does not give you the right to practice it—someone else may have a patent that interferes
- If you have a patent on the pencil and someone else has a patent on erasers, who can manufacture pencils with erasers? Neither of you.

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## Time Limits

- Generally, patents last for 20 years from filing date
- Priority is given based on when the patent application is filed
- (The US used to use a “first to invent” scheme; some say that that’s better for small inventors.)
- In the U.S., must file within one year of first publication; elsewhere, must file before any publication
- International patents have the same priority date, under the Patent Cooperation Treaty, but you must file separately in each country where you want protection; unlike copyrights, patents are not automatically in force in other countries

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## Structure of Patents

- Apart from formal boilerplate, two primary sections: a description of the invention and the *claims*
- The description is effectively a technical paper, with some stylized language, e.g., “taught by” to refer to a citation
- It must give a clear-enough description of what has been invented that one of ordinary skill in the art could replicate the work; material omissions here can invalidate the patent
- The claims delineate what the invention consists of; they’re often quite incomprehensible
- Writing good claims is the heart of a patent attorney’s job

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# Claims

- “Staking out territory” via very stylized language
- You want to claim as much territory as possible—it doesn’t matter if some is wasteland, if by claiming it you get more productive territory
- Independent and dependent claims; dependent claims describe more specific variants
- (Prevent someone else from patenting that variant)
- A patent is infringed by anything that has all of the elements of any single claim

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## Extra Elements

- Suppose you've invented the car, and your claim describes “a chassis with four wheels”. Does a six-wheel car infringe?
- Yes—it has all of the claimed elements, *plus* something else
- However, a three-wheeled car would not infringe

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## The Problem with Broad Claims

- A patent claim is *anticipated* if some existing device or publication has all elements of the claim
- The previous device may not resemble what you really invented—but maybe you claimed too much
- Example: does a bicycle with training wheels anticipate your claim for inventing the car? If your claim was for a “chassis or framework with four wheels”, it’s probably anticipated by bicycles

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## **“Method of exercising a cat” (US 5443036)**

1. A method of inducing aerobic exercise in an unrestrained cat comprising the steps of:
  - (a) directing an intense coherent beam of invisible light produced by a hand-held laser apparatus to produce a bright highly-focused pattern of light at the intersection of the beam and an opaque surface, said pattern being of visual interest to a cat; and
  - (b) selectively redirecting said beam out of the cat’s immediate reach to induce said cat to run and chase said beam and pattern of light around an exercise area.

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## Other Claims

2. The method of claim 1 wherein said bright pattern of light is small in area relative to a paw of the cat.
3. The method of claim 1 wherein said beam remains invisible between said laser and said opaque surface until impinging on said opaque surface.
4. The method of claim 1 wherein step (b) includes sweeping said beam at an angular speed to cause said pattern to move along said opaque surface at a speed in the range of five to twenty-five feet per second.

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## Definitions

- In claim 1, what does “coherent” mean?
- Rule: first see if the patent specification defines it, then go to technical sources, then rely on ordinary meaning
- Definitions are often crucial in patent lawsuits (settled during a “Markman hearing”)

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## The Process of Patents

- (Optional) File a provisional patent, to protect your priority
- Create and file a patent application; it's published after 18 months
- When the authorizing letter appears, file international applications as desired
- Iterate a few times with with interim rejections and amendments
- Pay periodic maintenance fees to keep your patent alive (the cat versus laser pointer patent expired after 12 years for failure to pay the fee)
- Get your patent!
- (Attempt to) collect money from infringers
- Fight off attempts to invalidate the patent

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# The Trouble with Software Patents

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# Issues with the Patent System

- The patentability of software
- Patent quality
- Patents as a drag on innovation

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# Software Patents

- Should software be patentable?
- Is a program a “process, machine, manufacture, or composition of matter”?
- Does ordinary programming require far more day-to-day creativity than most other fields, and in turn affecting what one of “ordinary skill in the art” can do?
- Is there an adequate documentary record of prior art?
- Is 20 years far too long a period for such a dynamic field?
- Does the patent office have enough qualified people to evaluate software patents?
- But—why shouldn’t there be protection for something as unusual as, say, RSA?

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## Let's Invent the First Thermostat, Circa 1950

- Find a physical phenomenon that changes with temperature: mercury expanding in a tube, a bimetallic strip bending because of different expansion rates, gallium and its alloys melting at a low temperature, conductivity changes with temperature, etc.
- Find a way to use this to control a furnace
- Patent it!

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## Let's Invent the First Thermostat, Circa 2016

- Buy a solid state temperature sensor
- Add a microprocessor and a power control interface; program the microprocessor to monitor the temperature and control the furnace appropriately:

```
while true do
    if (temp() < setting)
        turn_on_furnace();
    else turn_off_furnace();
```

- Patent it!

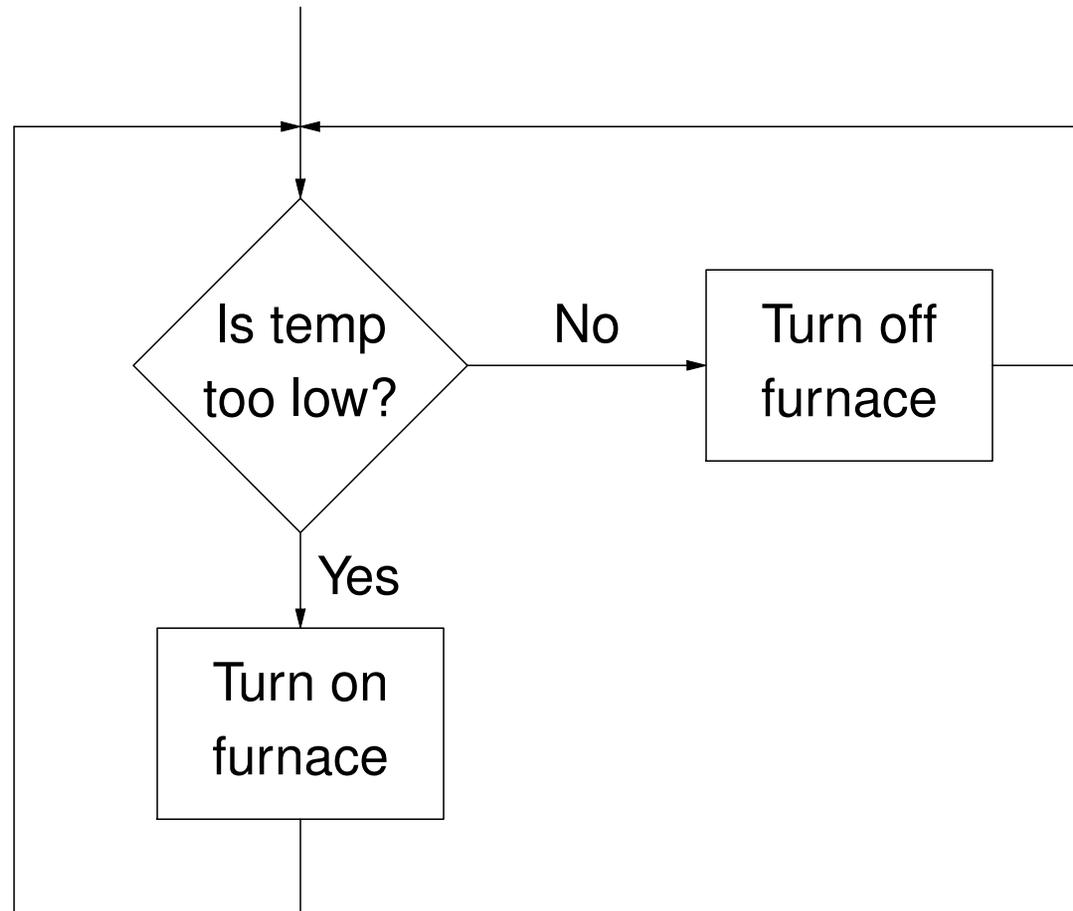
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## What is the Relationship Between These Patents?

- Is the second idea patentable if the first one already exists?
- (Let's ignore the patent law issue of how the claims are written.)
- At the block diagram level, they're the same
- Is “do it with software” somehow different?

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## This Describes Both Designs



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## Computers Are Cheaper Today

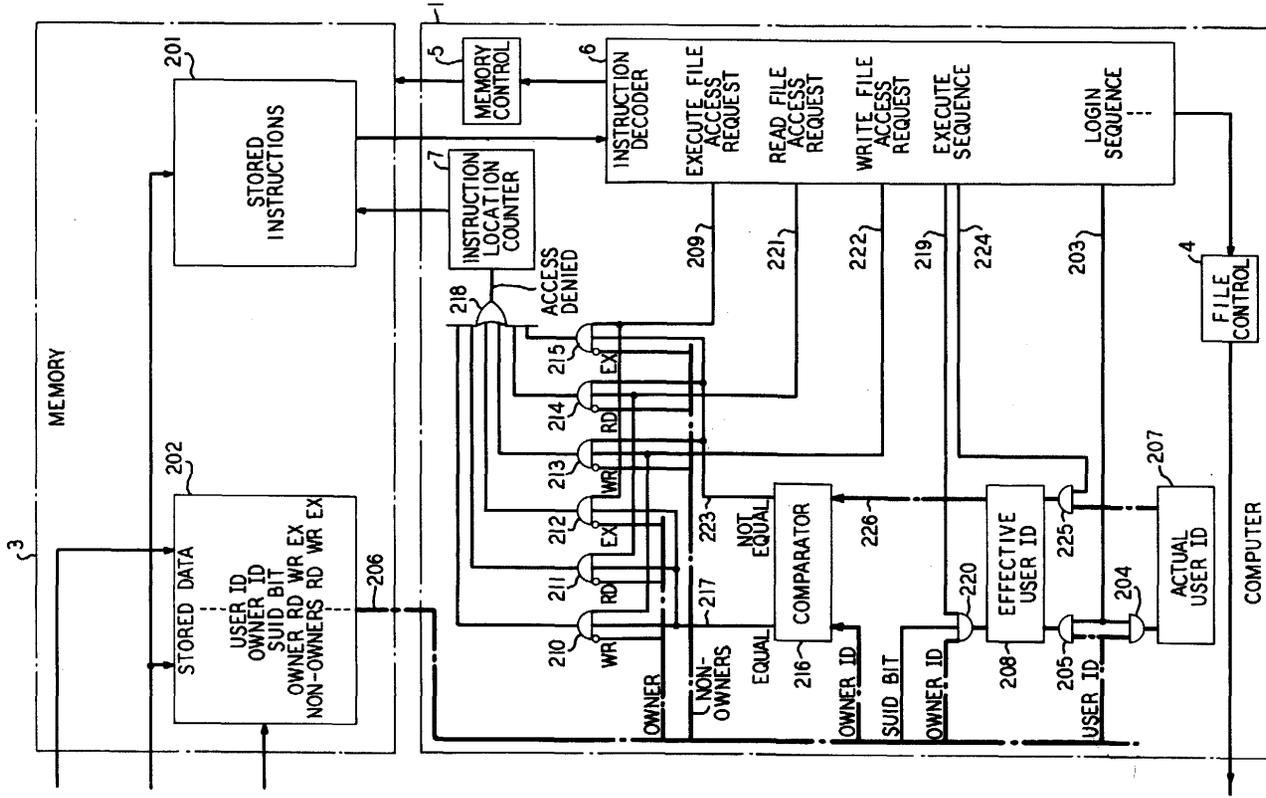
- Many things that were once done with circuitry are now done with microprocessors
- Example: integrators used to be built with op amps, but today you can write some code instead
- It's often much cheaper—but does the code somehow make it different?

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# Alice Corp. v. CLS Bank International (134 S. Ct. 2347)

- Alice Corp's patents covered executing contracts through a computer, with the computer system acting as the escrow agent
- The Supreme Court: "Stating an abstract idea while adding the words 'apply it with a computer'" doesn't make something patentable
- That would seem to rule out our second thermostat patent
- But—most commenators found the Court's reasoning to be rather confused
- Does the Court understand technology well enough to actually rule on patents? Does Congress?

FIG. 1B



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## Does the Patent Office Understand Programming?

- They grant patents on things that any programmer can and would do
- They may not understand what stopped people from doing something earlier
- The result: bad patents

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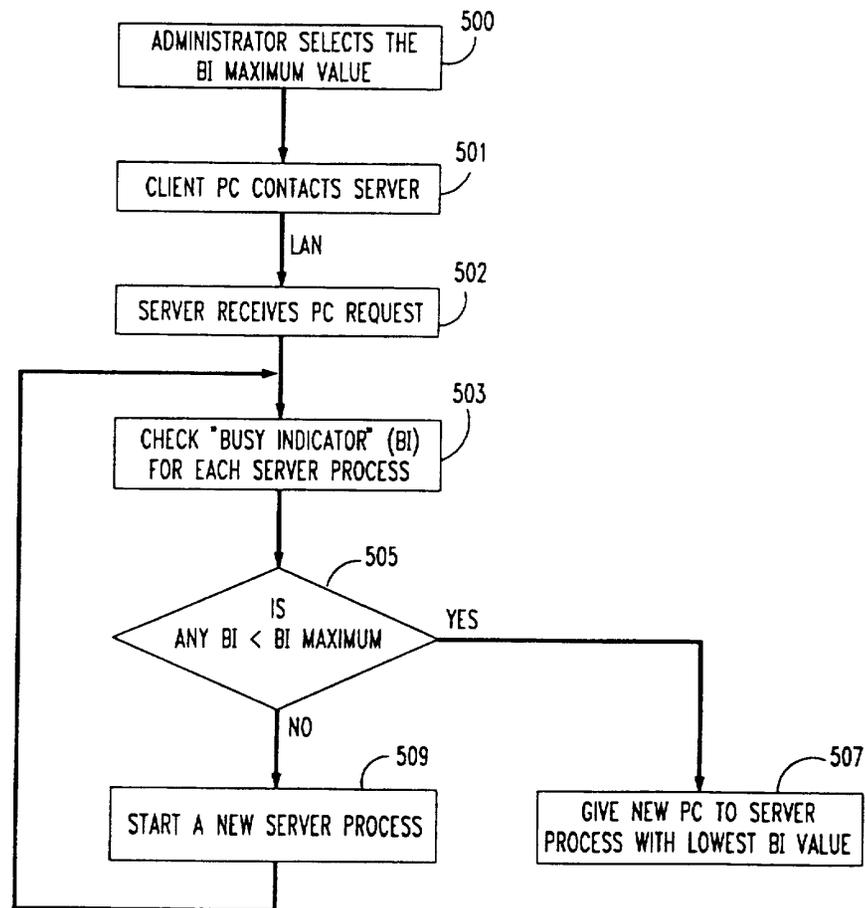
## **Method of and apparatus for operating a client/server computer network: US 5,249,290**

A server apparatus for accessing one or more common resources using a plurality of server processes to which client service requests are assigned, said server apparatus comprising

means for receiving an unassigned client service request requesting access to one of said common resources and

means, responsive to a workload indication from each server process, each workload indication being less than a maximum workload for that server process, for assigning said unassigned received client service request to a server process having a workload indication which is less than the workload indication of all other server processes.

# How It Works



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## Prior Art

- A single line at the bank, for the first available teller
- “Do it with a computer” doesn’t make it patentable!

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## Why This Happens

- Not enough understanding of software by some examiners
- Not enough time spent on each patent
- Too little published prior art—most programmers don't bother filing patent applications on clever little tricks
- Also: the US patent office looks primarily at previous patents, and for many years software patents weren't even allowed—there's not enough history

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## But—There are Good Software Patents

- RSA algorithm—the basis for much Internet encryption
- Non-obvious: it took Rivest, Shamir, and Adelman two years to devise their scheme, and Diffie and Hellman had tried and failed
- Easily showed as much creativity as most traditional patents
- Why shouldn't it be patentable?
- Note: the patent seriously interfered with use of crypto in Internet standards: the IETF didn't like patents

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## Patent “Trolls”

- Patent “trolls”—people who make money buying patents and suing corporations for infringement
- More formally known as “non-practicing entities” or “patent assertion entities”
- Issue: does the patent office do a good-enough job finding prior art or weeding out obvious ideas?
- Issue: effective priority date?
- Issue: should folks who have no interest in the invention per se be allowed to profit?

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## The Secondary Market

- Economists will tell you that the secondary market is important
- Are patent “trolls” any different than folks who buy stocks after the IPO?
- But—the constitutional purpose of patents is “[t]o promote the progress of science”. Do most inventors plan to sell the patent rights, as opposed to practicing the invention?
- That is, is the existence of the secondary market part of the actual incentive of the inventors?

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## Other Issues

- The problem is exacerbated by the number of bad software patents
- Patent “trolls” sometimes buy patents from bankrupt companies that had originally intended other uses for the patents (remember the issue of overly broad claims)
- There are some inventors and companies who develop ideas precisely to profit from licensing and/or lawsuits

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## Patent Trials

- Do judges understand the technology well enough to play their role?
- (Defining terms in the claims is a crucial part in patent lawsuits; the judge rules on that.)
- What about jurors' understanding?

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## How Companies Use Patents

- Directly, to exclude competitors from their market
- Bulk cross-licensing between two (typically large) companies
- Defensively: “we won’t assert our patents against you unless you sue us for patent infringement”
- Profit from licensing—or lawsuits

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## Settlements

- Patent lawsuits are extremely expensive, on both sides
- It may be cheaper to settle than to fight
- Defendants really win if they can prove “non-infringement” or “invalidity”
- 👉 Actually, proving invalidity may be bad—your competitors benefit, too. . .
- They can also win in practice if the damages or licenses are very cheap

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## Invalidity versus Non-Infringement

- Invalidity: the patent is thrown out entirely, and cannot be used to sue others
- Non-infringement: the particular system that is accused does not violate the patent—but some later system might
- Defendants typically try to prove both

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## Standards-Essential Patents

- Often, industry standards rely on patented technology
- Example: https required use of RSA; until September 2000, it was patented
- Different standards organizations have different requirements:
  - IEEE: “reasonable and non-discriminatory” (RAND) licensing
  - W3C: “W3C will not approve a Recommendation if it is aware that Essential Claims exist which are not available on Royalty-Free terms.”
  - IETF: participants must disclose patents’ existence

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## The Trouble with RAND

- What is “reasonable”?
- Is the royalty rate calculated on the covered feature, or on the overall price of the device? (Think about cellular-related patents used by smartphones.)
- What if a company reneges on its RAND commitment? This is generally actionable—but it can take a while

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## Non-Participants

- Standards bodies' policies only bind participants
- Non-participants don't have to share their patents, declare them openly, practice RAND, etc.
- Sometimes, the patent owner isn't even aware of the standards proceeding at first

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## Do (Software) Patents Hurt Innovation?

- CS is very fast-moving—few ideas have that long a lifespan
- There are *many* patents; they're often dubious
- Are developers withdrawing from the market?
- Is it becoming impossible to innovate without risking a lawsuit?  
Remember that even winning a patent lawsuit is expensive.

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## How Do High-Tech Companies Profit?

- Did Apple make money on iPhones because of the patents?
- Or was it a lot of hard work on engineering, programming, and manufacturing?
- Would they still have made iPhones with no patents?
- Do other people's patents discourage innovators?

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## Twitter's Innovator's Patent Agreement

- An agreement between Twitter and its employees
- As is conventional, employees agree to assign their patents to Twitter
- Twitter promises not to use these patents offensively
- The employee retains the right to license the patent without Twitter's consent if Twitter (or some later owner of the patent) violates that clause
- Example: if Twitter sues company X offensively, the inventor can give X a license, thereby ending the suit

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## Avoiding Patent Infringement

- It's hard to know what is patented
- ☞ Searches aren't easy
- ☞ Interpreting claims is very hard
- ☞ Knowing what portion of your idea or implementation may infringe some patent is almost impossible
- If you know of a patent and go ahead anyway, it may be “willful infringement”, and you may be liable for treble damages
- ☞ But you're not required to search, so some companies bar their technical people from even looking

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## Why is Software Different?

- “Opportunistic licensors flourish when there is a large gap between the cost of getting a patent and the value that can be captured with an infringement action.” (Magliocca)
- Software is easy to create
- Patents aren’t that expensive, either
- The potential for profit is high

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# Open Source Software

- Who should pay royalties?
- The original programmer? Not possible.
- Anyone who downloads it?
- How is this enforced?

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# The Free Software Foundation

- Started by Richard Stallman, originator of the GNU project
- To Stallman, free software is a moral imperative
- To him, software patents are evil—that's probably the proper word—because they interfere with freedom to program and to use code
- GNU software is protected by the GPL (General Public License—more on that next class) to guarantee continued free availability of the code
- (Note: there are many different types of free and open source software licenses. The differences are quite ideological.)