

Nanotechnology Patents: What Can Be Learned?

Donald J. Featherstone
Michael D. Specht

Nano Science and Technology Institute
Nanotech 2005
Anaheim, California
May 11, 2005



Strategists and Advisors
specializing in the protection,
transfer and enforcement of
Intellectual Property Rights.

Top Ten Nanotech Patents

“Ten Patents that Could Dramatically
Impact the Development of
Nanotechnology”

1.2 Nanotechnology Law & Business 225 (2004)

protect
ideas
increase
value

Top Ten Nanotech Patents

protect
ideas
increase
value

Pat No.	Title	Issue Date
RE 38,233	Field Emission Cathode Having an Electrically Conducting Material Shaped of Narrow Rod or Knife Edge	08/19/03
5,286,571	Molecular Modification Reagent and Method to Functionalize Oxide Surfaces	10/21/03
5,424,054	Carbon Fibers and Method for their Production	6/13/95
5,505,928	Preparation of III-IV Semiconductor Nanocrystals	3/9/96
5,883,705	Atomic Force Microscope for High Speed Imaging Including Integral Actuator and Sensor	3/16/99

Top Ten Nanotech Patents

protect
ideas
increase
value

Pat No.	Title	Issue Date
5,897,945	Metal Oxide Nanorods	04/27/99
6,268,041	Narrow Size Distribution Silicon and Germanium Nanocrystals	07/31/01
6,322,901	Highly Luminescent Color-Selective Nano-Crystalline Materials	11/27/01
6,346,189	Carbon Nanotube Structures Made Using Catalyst Islands	02/12/02
6,593,731	Displacement Transducer Utilizing Miniatured Magnet and Hall Junction	07/15/03

Issues Impacting Nanotechnology Patents

- ✓ Size Considerations
- ✓ Nomenclature
- ✓ Rigorous Examination
- ✓ Speed of Examination

protect
ideas
increase
value

Size Considerations

- ✓ *In 6 patent applications, size considerations became fundamentally important to the examination.*

Examples:

- (1) 5,424,054 – prior art teaches hollow carbon tubes of about 2 nm and a wall several carbon atoms thick.

SOLUTION: “consisting essentially of” to limit claim to single layer of atoms

- (2) 6,593,731 – Applicants needed to overcome reference by showing critical nature of dimensions.

SOLUTION: amendment that stated “a gap which is small enough to allow direct magnetic flux linkage between the magnet and Hall Junction.”

protect
ideas
increase
value

Nomenclature

Example Lexicography

1. A device comprising: a composite material comprising aligned nanowires (Patentable features omitted.)
2. The device of claim 1, wherein the nanowires are selected from carbon, silicon, and germanium.
3. The device of claim 2, wherein the nanowires are carbon nanotubes

(USPN 6,741,019)

protect
ideas
increase
value

Definitions Confusing at Best

Definition of Claim Terms from Specification?

- "**Carbon nanotubes** feature a high aspect ratio (>1,000) and a small tip radii of curvature (.about.5-50 nm). These geometric characteristics, coupled with the high mechanical strength and chemical stability of the tubules, make carbon nanotubes attractive as electron field emitters." (Citations omitted.)
- "Other types of **nano-scale wires** with small diameters also exist. Semiconductor or metallic nanowires of silicon or germanium, for example, are capable of being fabricated by a number of different methods including laser processing, vapor-liquid approach or CVD deposition." (Citations omitted.)
- "The first step is to provide **nanowires such as carbon nanotubes or semiconductor nanowires** by any of the known synthesis techniques...."

protect
ideas
increase
value

Nomenclature: Possible Solutions

protect
ideas
increase
value

1. A field-effect transistor, comprising
a source region;
a drain region;
a gate region between said source region and said drain region;
said gate region containing conductive material having at least one through hole formed therein;
at least one nanoelement disposed in said through hole and electrically coupled to said source region and said drain region;
and
said nanoelement being arranged and configured such that a conductivity thereof is controlled via said gate region, and said nanoelement forms a channel region.
2. The field-effect transistor according to claim 1, **wherein said nanoelement comprises at least one of a nanotube and a nanowire.**

(USPN 6,740,910)

Nomenclature

Class 977 – Nanotechnology

The Nanotechnology art collection provides for disclosures related to:

- (1) Nanostructure and chemical compositions of nanostructure;
- (2) Devices that include at least one nanostructure;
- (3) Mathematical algorithms, e.g., computer software, etc., specifically adapted for modeling configurations or properties of nanostructures;
- (4) Methods or apparatus for making, detecting, analyzing, or treating nanostructures; and
- (5) Specified particular uses of nanostructures.

protect
ideas
increase
value

Nomenclature

Class 977 – Nanotechnology

The term “nanostructure” is defined to mean an atomic, molecular or macromolecular structure that:

- (a) Has at least one physical dimension of approximately 1-100 nanometers; and
- (b) Possesses a special property, provides a special function, or produces a special effect that is uniquely attributable to the structure’s nanoscale size.

protect
ideas
increase
value

Nomenclature

Class 977 – Nanotechnology

Nanotube: A fullerene molecule having a cylindrical or toroidal shape.

Fullerene: Any of various cage-like, hollow molecules composed of hexagonal and pentagonal groups of atoms, and especially those formed from carbon, that constitute the third form of carbon after diamond and graphite. Alternatively, a class of cage-like carbon compounds composed of fused, pentagonal, or hexagonal sp^2 carbon rings.

Graphene: Two-dimensional sheet form of fullerene.

Single Walled Nanotube (SWNT): Formed from one layer of graphene wrapped in cylindrical form.

Multi-Walled Nanotube (MWNT): Formed of multiple layers of graphene wrapped in cylindrical form.

protect
ideas
increase
value

Rigorous Examination

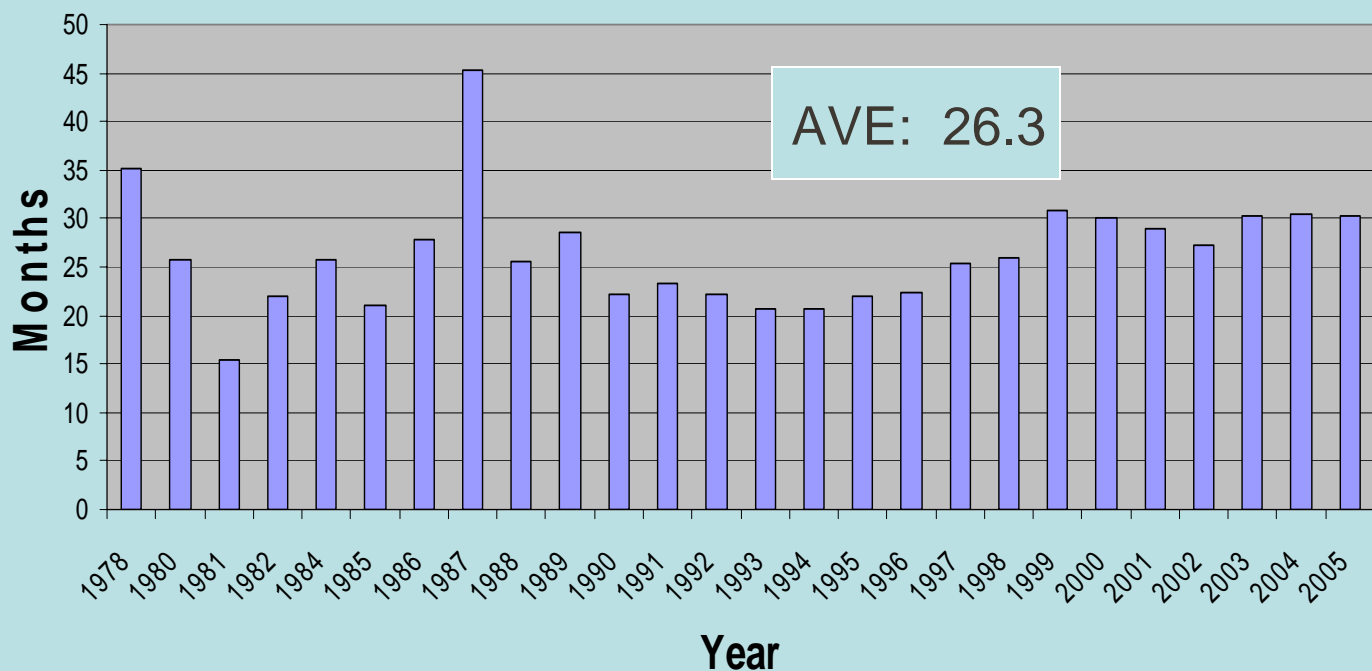
- ✓ Rejections generally well thought out.
- ✓ In nine of ten applications, applicants made narrowing amendments.
- ✓ In at least half of the applications, applicants cancelled claims.
- ✓ Examiners requiring showing of criticality of dimensions.
- ✓ Misleading conclusions – perhaps – more on this later.

protect
ideas
increase
value

Speed of Examination

protect
ideas
increase
value

**Class 977 Patent Average Pendency
(Filing Date to Issue Date)**



Source: *United States Patent and Trademark Office*

Disclaimers & Contact Information

These materials are not intended and should not be used as legal advice. If you need legal advice or an opinion on a specific issue or factual situation, please consult an attorney. Answering questions or the use of this material does not form or constitute an attorney-client relationship. These material are for information purposes only and should not be relied upon as a substitute for legal advice

The presentation reflects only the current considerations and views of the authors, which should not be attributed to Sterne, Kessler, Goldstein & Fox P.L.L.C. or any of its current or former clients.

For More Information, please contact

Donald J. Featherstone
202-772-8629 or donf@skgf.com

Michael D. Specht
202-772-8756 or mspecht@skgf.com

protect
ideas
increase
value