26 RM Reardon Metals Pat. No. 12234536
REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Patenting A New High Speed Steel Alloy Invention at the USPTO

(12) **United States Patent**
Reardon

(10) **Patent No.: US 12,234,536 B2**
(45) **Date of Patent: Feb. 25, 2025**

(54) **HIGH SPEED STEEL COMPOSITION**

(71) Applicant: **Arthur Craig Reardon**, Webster, NY (US)

(72) Inventor: **Arthur Craig Reardon**, Webster, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/715,318**

(22) PCT Filed: **Nov. 28, 2023**

(86) PCT No.: **PCT/US2023/081465**
§ 371 (c)(1),
(2) Date: **May 31, 2024**

(87) PCT Pub. No.: **WO2024/118682**
PCT Pub. Date: **Jun. 6, 2024**

(65) **Prior Publication Data**

US 2024/0417833 A1 Dec. 19, 2024

Related U.S. Application Data

(63) Continuation of application No. 18/074,470, filed on Dec. 3, 2022.

(51) **Int. Cl.**
C22C 38/30 (2006.01)
B33Y 70/00 (2020.01)
(Continued)

(52) **U.S. Cl.**
CPC ***C22C 38/30*** (2013.01); ***B33Y 70/00*** (2014.12); ***C22C 33/02*** (2013.01); ***C22C 38/001*** (2013.01);
(Continued)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,627,514 A 12/1971 Steven
3,809,541 A 5/1974 Steven
(Continued)

FOREIGN PATENT DOCUMENTS

BR PI0614983 3/2011
CA 2371320 10/2002
(Continued)

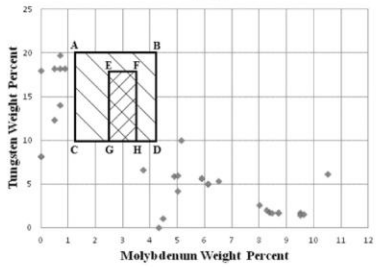
Primary Examiner — Anthony M Liang
(74) *Attorney, Agent, or Firm* — Patent Technologies, LLC; Robert D. Gunderman

(57) **ABSTRACT**

A high speed steel composition and article are disclosed consisting, in weight percent, essentially of about 0.75% to 1.69% carbon, 0.15% to 0.80% manganese, 0.20% maximum phosphorous, 0.25% maximum sulfur, 0.20% to 0.65% silicon, 3.75% to 4.50% chromium, greater than 10.00% to 20.00% tungsten, greater than 1.25% to 4.21% molybdenum, 4.00% maximum vanadium, 4.00% maximum columbium, 12.00% maximum cobalt, 0.010% to 0.090% nitrogen, 0.75% maximum copper, 0.75% maximum nickel, 0.25% maximum aluminum and balance iron with residual elements and trace impurities in normal amounts, the composition and article being characterized by very high hardness capability and wear resistance. The high speed steel article is preferably manufactured via powder metallurgy by dispersion of a liquid metal stream of the alloy with nitrogen gas to form metal powder. This metal powder may be utilized in metal additive manufacturing applications and is suitable for applications involving chip cutting machining, or advanced machine elements.

19 Claims, 3 Drawing Sheets

Tungsten vs. Molybdenum Content in High Speed Steels



The presenter is?

Dr. Arthur C. Reardon PE, founder of Reardon Metals LLC.

You can contact me directly by phone at 585-455-0121, or by email at arthur@reardonmetals.com.

You can also download this presentation from the publications page on the Reardon Metals website at https://reardonmetals.com.

The USPTO Patenting Process

In this presentation I will describe the process of obtaining a United States utility patent from the perspective of the inventor. Relevant aspects of this process may be unfamiliar to new inventors, and will be covered in detail for that reason.

Utility patent 12,234,536 B2 was issued on February 25th, 2025 for a new family of high speed steel alloys. Sections of this patent will be used throughout the following discussion for reference purposes.

I am not a patent agent or a patent attorney, and will not be dispensing any legal advice during this presentation.

What is a US patent, and what kind of protection does it provide?

A US patent confers upon the title owner the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States. It also prevents others from *importing* the invention into the US.

A patent, among other things, arms the inventor (or the assignee) with the right to sue for infringement.

What are the basic criteria for a patent?

In order for a patent to be allowed, your invention must meet these four criteria as a minimum:

- It must be new, or “novel” (something not done before)

- It must be reduced to practice (the invention is required to function and cannot just be a theory)

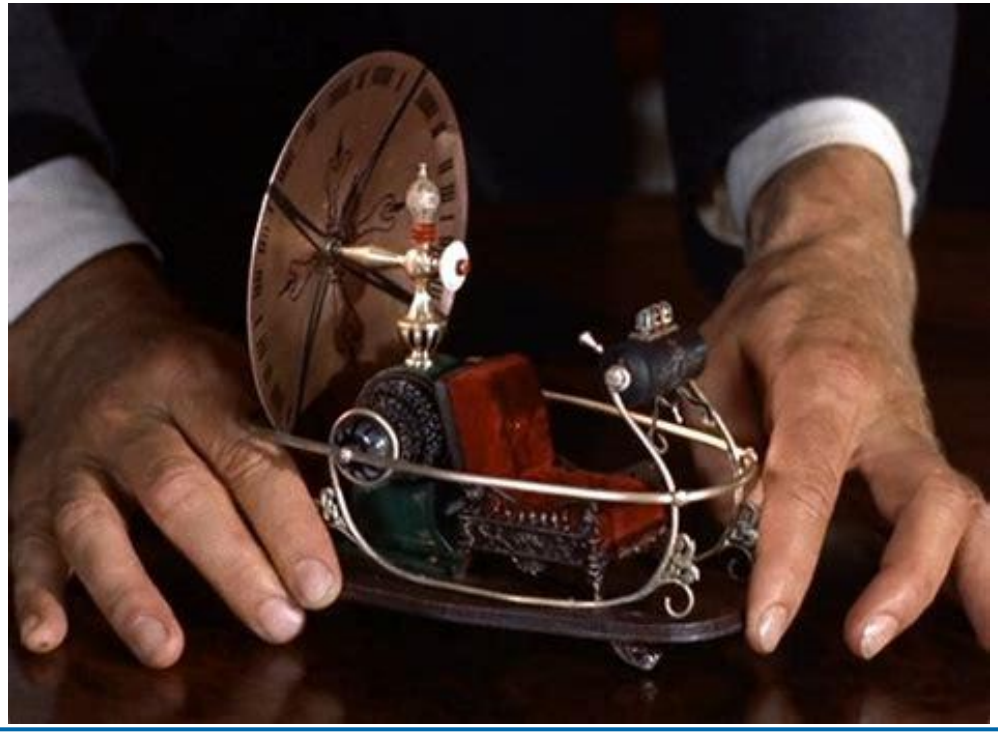
- A clear, detailed description must be provided of how to make and use the invention

- It must not be obvious to someone skilled in the art. Failure to meet this requirement is a commonly cited reason for rejecting a patent application.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Do you need to submit a working example of the invention?

No, not any longer. Application number US20090234788A1 by Mitchell Kwok did not include a working example of his invention (for obvious reasons): "**Practical Time Machine Using Dynamic Efficient Virtual And Real Robots**" – It claims to allow an object or even a group of objects to travel into the future or the past.



Source: pinterest.com

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Do you need to submit a working example of the invention?

Patents are *never* issued for time machines. They are also never issued for perpetual motion machines.

Can you guess why?

Source: Reddit.com

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

What are the various types of US patents?

There are several different types of patents. They are:

- Utility Patent
- Design Patent
- Plant Patent

What are the most common types of US patents?

They are:

- Utility Patents
- Design Patents

In general terms, a “utility patent” protects the way an article is used and works (35 U.S.C. 101), while a "design patent" protects the way an article looks (35 U.S.C. 171).

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Design Patent

The design patent is the second most common type issued:

- less than 10% of issued patents are design patents.

- They are issued for a new, original, and ornamental design embodied in or applied to an article of manufacture.

- The time from submission of the non-provisional application to issuance of the patent is typically less than 24 months (but there are exceptions).

- Expect to pay anywhere from $3,000 to $15,000 from start to issuance.

- They are valid for 15 years from the date of grant.

- There are no USPTO maintenance fees.

26
RM
Reardon Metals
Pat. No. 12234536
REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Design Patent

The classic example of a design patent is the shape of the Coca-Cola bottle.

Source: campaignlive.co.uk

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Utility Patent

The utility patent is by far the most common type issued:

- Over 90% of issued patents are utility patents.

- They are for the invention of a new and useful process, machine, manufacture, or composition of matter, or for a new and useful improvement thereof.

- The time from submission of the application to issuance of the patent is typically less than 29 months (but your mileage may vary).

- Expect to pay anywhere from $5,000 to $35,000 from start to issuance.

- Utility patents are valid for 20 years from the filing date of the non-provisional application.

- Unlike a design patent, USPTO maintenance fees *must* be paid.

26
RM
Reardon Metals
Pat. No. 12234536
REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Assessment of Learning

What are the four different criteria that a patent must satisfy?

What is the most common type of patent, and for how many years can it be enforced?

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Assessment of Learning

What are the four different criteria that a patent must satisfy?

Answer – It must be new or novel, non-obvious, reduced to practice, and a clear, detailed description of the invention must be provided.

What is the most common type of patent, and for how many years can it be enforced?

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Assessment of Learning

What are the four different criteria that a patent must satisfy?

Answer – It must be new or novel, non-obvious, reduced to practice, and a clear, detailed description of the invention must be provided.

What is the most common type of patent, and for how many years can it be enforced?

Answer – A utility patent is the most common type issued. Provided all of the maintenance fees are paid on time, it can be enforced for 20 years.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Utility Patent

Utility patents can be very simple in concept. From the utility patent US 6,637,447 B2:

“The present invention provides a small umbrella (“Beerbrella”) which may be removably attached to a beverage container in order to shade the beverage container from the direct rays of the sun.”

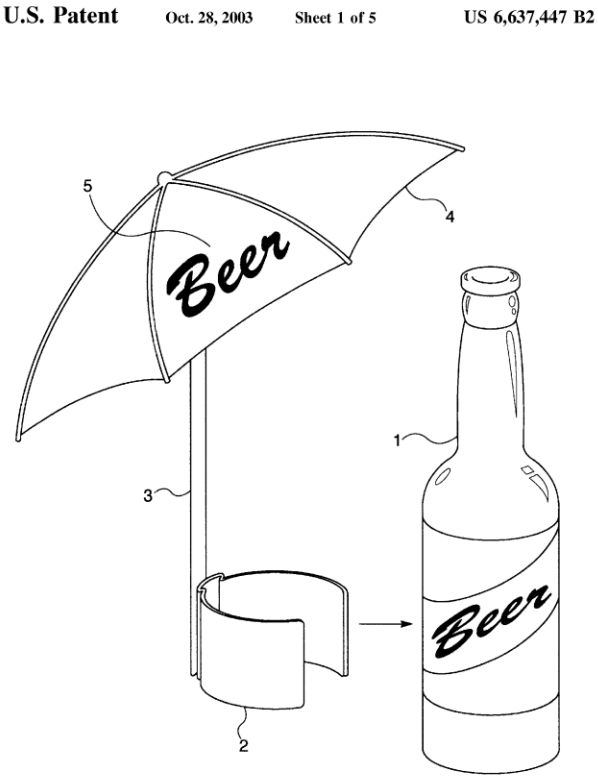


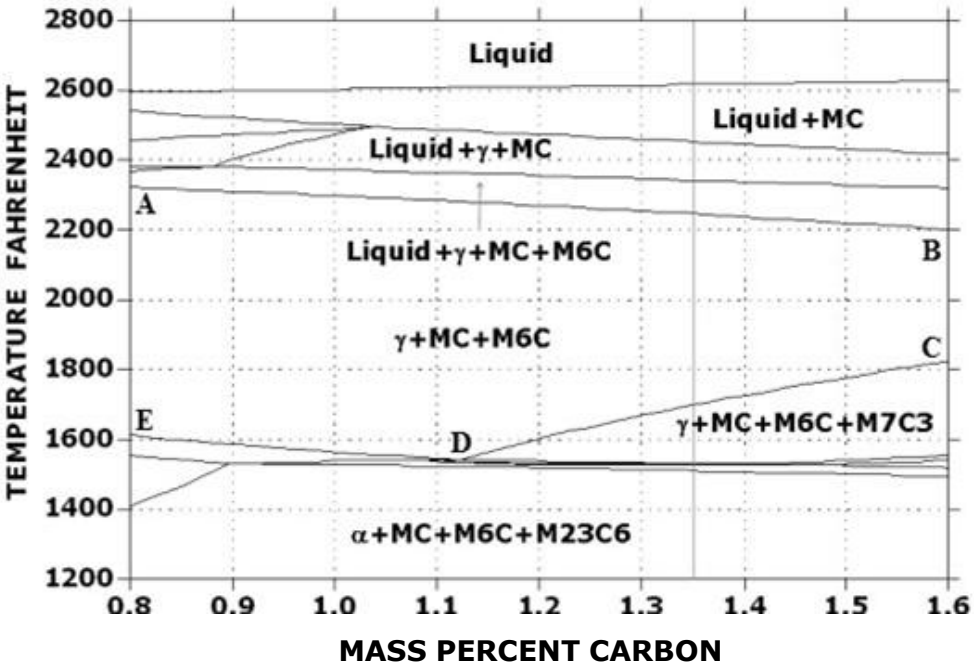
Figure 1

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Utility Patent

Utility patents can also be quite complex. From US 12,234,536 B2:

The present invention relates primarily to tool steels and high speed steels, and more particularly to an improved high speed steel composition, preferably manufactured using powder metallurgy (PM) processing.



Where should you start the patent application process?

The best place to begin is by visiting the USPTO website and reading about the basics of the process:

https://www.uspto.gov/patents/basics

The USPTO is the single best resource for information on the steps that need to be followed and the paperwork that must be submitted in order to successfully apply for a US patent.

Should I File a Provisional or a Non-Provisional Application?

A provisional patent application only lasts for one year, and gives the inventor an opportunity to conduct more research and more time to complete the invention before filing a non-provisional patent application.

Think of it as a time-stamped placeholder for your non-provisional patent application.

I recommend filing the non-provisional application from the start.

Should I hire a patent attorney or a patent agent?

You are not obligated to hire anyone, but pursuing a patent on your own is a daunting task with a steep learning curve. It is critical for you to find the right patent agent or patent attorney to represent you before the US patent office.

I recommend patent agent Robert Gunderman PE who works at:

Patent Technologies LLC
20 Office Park Way, Suite 122
Pittsford, NY 14534
585-624-3714

The patent process is a complex set of regulations, policies, laws, and procedures. I do *not* recommend attempting to navigate it all by yourself.

Background Art Search

A background or prior art search should be performed to determine if the proposed invention already exists, or if a patent was previously issued for a similar invention. These searches can be performed online at:

- The USPTO website (but it can be hard to navigate)
- Google patents website (a good resource, but incomplete)
- Justia patents website (also a good resource, same problem)
- WIPO Patentscope website (a GREAT resource)
- An online college or university library database

Or you could hire a search firm to perform the search for you. Expect to pay at least $1,000 (or much more) for this service.

The Parts of a Non-Provisional Utility Patent Application

A utility patent application will normally contain the following sections:

- A cover page listing the title of the invention, the inventor's name, the docket number, and other relevant information
- A statement of the technical field of the invention
- A discussion of the background art (the introduction)
- An introductory disclosure of the invention
- A brief description of the drawings (if there are any)
- The best mode for carrying out the invention (the body of the spec)
- The claims **– This is the most important part of the entire patent**
- The abstract of the disclosure

The Claims of a Non-Provisional Utility Patent Application

From a legal perspective, the claims are by far the most critical part of the patent application. Craft them with great care.

There are two types of claims:

- Independent claims – these stand on their own
- Dependent claims – these reference the independent claims

In the United States you are allowed up to 3 independent claims, and a total of 20 claims per patent application. You can add additional claims, but you will pay extra for them.

The Claims of a Non-Provisional Utility Patent Application

Here is the first independent claim from US 12,234,536 B2:

1. A high speed steel composition consisting essentially of, in weight percent, 0.75% to 1.69% carbon, 0.15% to 0.80% manganese, 0.00% to 0.20% phosphorous, 0.00% to 0.25% sulfur, 0.20% to 0.65% silicon, 3.75% to 4.50% chromium, 0.00% to 4.00% vanadium, greater than 10.00% to 20.00% tungsten, greater than 1.25% to 4.21% molybdenum, 0.00% to 12.00% cobalt, 0.010% to 0.090% nitrogen, 0.00% to 4.00% niobium (columbium), 0.00% to 0.75% copper, 0.00% to 0.75% nickel, 0.00% to 0.25% aluminum; wherein the combination of nickel plus copper in weight percent is greater than or equal to 0.00% and less than or equal to 1.00%; and wherein the combination of vanadium plus niobium (columbium) in weight percent is greater than or equal to 0.00% and less than or equal to 4.00%; with the remainder essentially iron and residual elements.

The Claims of a Non-Provisional Utility Patent Application

And here is a dependent claim from US 12,234,536 B2:

19. The high speed steel composition of claim 1, wherein sulfur is replaced in all or in part with one or more elements selected from the group consisting of selenium, lead, and tellurium.

Assessment of Learning

How do utility patents and design patents differ from each other?

What are the two types of claims in a utility patent application?

Assessment of Learning

How do utility patents and design patents differ from each other?

Answer – a utility patent protects the way an article is used and works while a design patent protects the way an article looks.

What are the two types of claims in a utility patent application?

Assessment of Learning

How do utility patents and design patents differ from each other?

Answer – a utility patent protects the way an article is used and works while a design patent protects the way an article looks.

What are the two types of claims in a utility patent application?

Answer – Independent claims and dependent claims.

After Submitting the Application

Be prepared to wait…and wait….and wait even longer.

It is not unusual for it to take18 months or more to hear *anything* back from the USPTO.

And when you do hear back, the news is usually not great. If the application is not rejected outright, the first response is typically an office action.

Source: Tenor.com

What is an office action?

An office action is an official response from the patent examiner that details the potential issues with your application. It may list conflicts with prior or existing art, improper terminology used in the claims, procedural issues, etc.

But fear not – you usually have an opportunity to fix any potential problems that were identified. The downside is that office actions can be quite expensive to respond to. It is not unusual for them to cost between $2,000 and $6,000.

You basically get two bites at the apple. Don’t waste them.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

What happens after the office action?

If you properly address the issues the examiner brought up, and they have no further objections, then you will get an allowance. This means that your patent application will be permitted to move forward to issuance.

Issuance

After an allowance is granted, you have 3 months in which to pay the issuance fees. They can run from about $250 for a micro-entity to about $1,300 for a large business entity (note this does *not* include the fees charged by your agent or attorney).

If you choose to pay it, then in about 6 to 8 weeks you will be issued a patent!

And you can choose to either pay the issuance fee immediately or to slow roll the payment process and file for a continuation.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

What is a Continuation?

A continuation is a new patent application that is based upon the original specification that was submitted. The continuation uses the same spec, but includes a different set of claims. So you could end up with two patents instead of just one.

The continuation *must* be filed with the USPTO before the allowed application is issued. Otherwise, you are out of luck in filing for it. So this is a time sensitive issue.

Congratulations you have a patent!

Your patent is a full legal instrument after it is officially issued by the USPTO.

Be certain to pay your maintenance fees on time. If you don't, then your patent will be considered abandoned.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

I have a patent. Now what?

You can manufacture your invention, market it, and sell it.

Or you can license your patent to others so they can manufacture your invention and sell it. And you get to sit back and collect the royalties.

Typical negotiated royalty rates fall somewhere between about 2% and 10%, depending upon the invention and the market for it.

Assessment of Learning

What is the typical elapsed length of time before an office action is issued by the USPTO for a utility patent application?

What is the typical range of negotiated royalty rates for a utility patent?

Assessment of Learning

What is the typical elapsed length of time before an office action is issued by the USPTO for a utility patent application?

Answer – Approximately 18 months or more from the date of submission.

What is the typical range of negotiated royalty rates for a utility patent?

Assessment of Learning

What is the typical elapsed length of time before an office action is issued by the USPTO for a utility patent application?

Answer – Approximately 18 months or more from the date of submission.

What is the typical range of negotiated royalty rates for a utility patent?

Answer – Approximately 2% to 10%, depending upon the invention and the market for it.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Does my newly issued US patent protect me in other countries?

No, it only has jurisdiction within the boundaries and territories of the United States.

Can I file for patents in other countries?

Yes, you can. And there are a number of ways to go about it.

Be aware that once your patent application has been submitted to the USPTO you have a time limit of 30 months (with some wiggle room) to file for a patent on the same invention outside of the United States.

And the Patent Cooperation Treaty (PCT) is often used for this purpose.

What is the PCT?

The Patent Cooperation Treaty (PCT) is an international law treaty from 1970 consisting of more than 150 Contracting States (countries).

The PCT makes it possible to seek patent protection for an invention simultaneously in a large number of countries by filing a single application instead of filing several separate national or regional patent applications.

A PCT application by itself does not result in the grant of a patent, since there really isn’t any such thing as an "international patent".

The granting of patents under the PCT remains under the control of the national or regional patent offices in what is called the “national phase”.

Although it can save you money overall, the PCT is expensive to pursue.

What are the phases of the PCT?

A PCT application goes through two basic phases.

The first phase is the international phase in which patent protection is pending under a single patent application filed with the patent office of a contracting state of the PCT (usually your own country of residence).

The second phase is the national and regional phase which follows the international phase in which rights are continued by filing necessary documents with the patent offices of separate contracting states of the PCT (that is, countries where you want the patent to be granted).

What happens during the PCT examination?

A PCT application goes through a rigorous review process.

An extensive authorized international search is performed to identify the most relevant background or prior art regarding the claimed subject matter. It is *very* thorough.

Are you sure that you found everything of relevance in your own background search?

PCT examination and written opinion

Each individual PCT claim is evaluated using three separate criteria:

- Novelty (is the invention new or “novel”?)
- Inventive Step (is the invention non-obvious to one skilled in the art?)
- Industrial Applicability (can the invention be made or used in industry?)

The best possible outcome is that every single claim gets the green light based on each of these three criteria (which is quite rare).

The patent examiner issues their written opinion summarizing the outcome, and the result is published shortly thereafter.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

National phase entry

After the PCT written opinion is issued, a patent application may be submitted for national phase entry.

Then you wait…and wait…and wait some more. Remember this guy?

Source: Tenor.com

A word of advice

If the PCT report is clean, then it would be wise to fast track your application for national phase entry by utilizing what in the United States is called the Patent Prosecution Highway (PPH).

This will cost an additional fee, but guarantees examination of your application within 12 months.

It is like handing your patent application to the examiner on a silver platter. Someone else already did the hard work by performing the background search, and if the result was clean all the examiner has to do is review the results and provide their opinion.

It greatly reduces their work burden, and allows them to get your patent application off of their desk quickly.

I’ve done this. It works.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Assessment of Learning

Does a US patent protect your invention in other countries?

What are the 3 criteria used to evaluate the claims in the PCT application?

Assessment of Learning

Does a US patent protect your invention in other countries?

Answer – No, it doesn't.

What are the 3 criteria used to evaluate the claims in the PCT application?

Assessment of Learning

Does a US patent protect your invention in other countries?

Answer – No, it doesn't.

What are the 3 criteria used to evaluate the claims in the PCT application?

Answer – Novelty, inventive step, and industrial applicability.

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

Questions?

Contact


26
RM
Reardon Metals
Pat. No. 12234536
REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121

REARDON METALS LLC
Dr. Arthur C. Reardon, P.E.
Metallurgical & Materials Consulting
arthur@reardonmetals.com
1-585-455-0121