Gamification Code:
IMPROVE

Claiming beyond

Means plus functional claims

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Smart & Biggar

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- Aoki researched computer science and artificial intelligence at Mathematical Engineering and Information Physics, The University of Tokyo. After graduation in 1988, he started to research AI and neural networks at Fujitsu Laboratories Ltd. In 1991-1993, he was involved in the 5th generation computer project and developed a parallel database machine ("the second AI boom") in Manchester, United Kingdom. Since he left Fujitsu Laboratories Ltd in 1999, he has prosecuted many patent applications on business method, IT, image compression and cryptography, more recently on deep learning ("the third AI boom") at PRIMEWORKS IP Attorneys. He earned LL.M. in Business Law at Hitotsubashi University in 2011.
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- Sterling Fillmore is a US patent attorney and shareholder of the boutique IP firm of Workman Nydegger in Salt Lake City, UT.
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- She advises international companies, research institutions, and start-ups on German and European patent law, including patent drafting and prosecution, portfolio development, freedom-to-operate analyses, and IP strategy at German and European level.
- A part of her practice involves opposition and appeal proceedings before the German and European Patent Office, as well as nullity and infringement proceedings before the German Patent and District Courts. Dr. Hermann helps to develop strategies to protect and enforce valuable intellectual property rights.

Outline

- 1. Presentation of a mechanical drafting problem
  - Analysis from a US perspective
  - Analysis from a European perspective
  - Analysis from a Japanese perspective

- 2. presentation of an electrical/software drafting problem
  - Analysis from a US perspective
  - Analysis from a European perspective
  - Analysis from a Japanese perspective

Mechanical Sample: Automatic Smartphone Car Mount

- **Background:** Traditional car mounts require the user to manually press side buttons to release or clamp the phone.
- **The Invention:** An automated mount that detects the presence of a smartphone and automatically clamps it.
- **Core Embodiment in Description:** A motorized mechanism where an infrared (IR) sensor detects the phone, triggering an electric motor that drives a gear train to close the clamping arms.
- **The Target Concept to Protect (Claiming Beyond):** The inventor wants to protect *any* mechanism that automatically secures a phone upon detection, preventing competitors from bypassing the patent by using non-motorized structures (e.g., gravity-fed mechanical linkages, magnetic suction, or pneumatic clamps).
- **Key Discussion Point:** How to draft the "clamping/securing mechanism" and "detection mechanism" using functional language without triggering US 112(f) automatic narrowing, while satisfying EP Clarity and preventing JP courts from restricting the scope to the "electric motor and gears" embodiment.

Electrical/Software Sample: AI-Driven Energy Saving HVAC System

- **Background:** standard HVAC (heating/cooling) systems operate on fixed schedules or simple temperature thresholds, leading to energy waste.
- **The Invention:** A smart controller that predicts room occupancy using historical data and environment sensors, adjusting power levels dynamically.
- **Core Embodiment in Description:** A specific Neural Network (AI model) running on a local microcontroller that inputs temperature/humidity/time and outputs an optimal power frequency.
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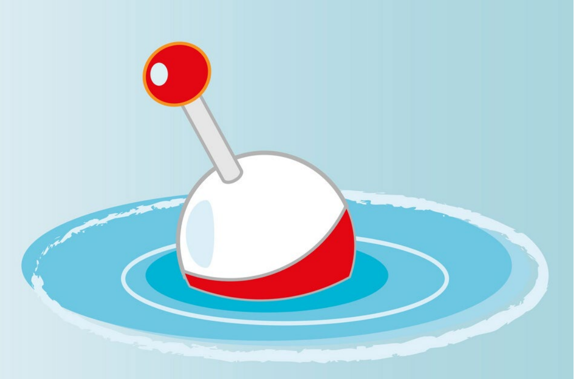
Functional Limitations – A US Perspective Roadmap

- Intro
- Quick jurisprudence background
- Means-plus-function vs. Non-means-plus-function
- Samples
- Best practices

Functional Limitations – A US Perspective

Functional Limitations – A US Perspective



"Bobber"

"In English, we often call things by what they do."

Functional Limitations – A US Perspective

- Often very advantageous to define a feature by what is does rather than what is (e.g., structural, software, composition, chemical, biotech)

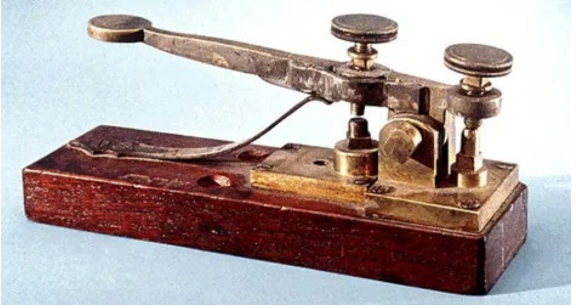
- "There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP 2173.05(g) (citations omitted)

- The dichotomy: two types of functional limitations:
    1) "means-plus-function" limitations under 35 U.S.C. 112(f)
    2) "regular" (i.e. non-means-plus-function) functional limitations (far more common now in US)

- "means-plus-function" limitations are generally <u>narrower</u> than non-"means-plus-function" limitations

Functional Limitations – A US Perspective
A Quick History

Functional limitations and descriptions have commonly been used since the US patent system began (e.g., Samuel Morse, the Telegraph Patent Case)



Morse Claim 8: “I do not propose to limit myself to the specific machinery or parts of machinery described in the foregoing specification and claims; the essence of my invention being the use of . . . electro-magnetism, however developed, for making or printing intelligible characters, signs or letters at any distances.”

US Supreme Court: Too broad. “[O]ne may lawfully accomplish the same end without infringing the patent, if he uses means substantially different from those described.” (*O’Reilly v. Morse*, 56 U.S. 62, 119 (1854)).

Functional Limitations – A US Perspective - A Quick History

- *Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1 (1946)

  Established rule prohibiting "functional language at the exact point of novelty"—not adequately disclosed

- US Patent Act of 1952 included a direct, statutory response to *Halliburton*

  "An element in a claim … may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts <u>described in the specification and equivalents</u> thereof." (35 U.S.C. 112(¶ 6))

Functional Limitations – A US Perspective - A Quick History

- On an element-by-element basis, USPTO and courts first determine whether to apply means-plus-function interpretation under 35 U.S.C. 112(f)

  1) Look for “means” or “step” or generic “nonce” term with no specific structure (e.g., “means” or unit, device, mechanism, module)
  2) Look for functional language, often in present participle (“-ing” form), and often linked by “for”
  3) Not modified by sufficient structure for performing the recited function

- If means-plus-function interpretation under 35 U.S.C. 112(f) is determined to apply, that element is limited to the specific structure, materials, acts and their equivalents described in the specification.

- If means-plus-function interpretation is <u>not</u> applied, the functional limitation is given the usual “broadest reasonable interpretation”, using the "plain and ordinary meaning" to those of ordinary skill in the art at the time of the invention in view of the specification (which is often broader).

Functional Limitations – A US Perspective - A Quick History

- With the US Patent Act of 1952, means-plus-function limitations became widespread and popular in US practice

- In late 1990s (1996), means-plus-function claiming became less dependable
  - "Means" means "means", and no "means" means no "means"
    (*Greenberg v. Ethicon Endo-Surgery, Inc.*, Fed. Cir. 1996)
  - "Means" without function doesn't mean "means"
    (*York Products, Inc. v. Central Tractor Farm & Family Center*, Fed. Cir. 1996)
  - "Means" plus function (with some structure) doesn't necessarily mean "means"
    (*Cole v. Kimberly-Clark Corp.*, Fed. Cir. 1996)

Functional Limitations – A US Perspective
To "means" or not to "means"

Since late 1990s, means-plus-function claiming has generally fallen out of favor in US practice

Cons

- Less predictable
- Often more limiting (limited to specific structure, material, or acts—and examiners often overlook "and equivalents thereof") than non-means-plus-function functional limitations
- Unintentional triggering
- Indefiniteness risk (means-plus-function interpretation but not sufficient description of "structure, material, or acts" in specification)
- Examiners are less comfortable and less familiar (recent training memo in 2024)

Pros

- Can be an efficient, shorthand way to require in the claims all structure disclosed in the specification and equivalents
- Hedging for future legal interpretational shifts
- Can be some advantages in biotech/pharmaceutical due to the statutory phrase "and equivalents thereof", e.g., antibodies

Functional Limitations – A US Perspective
To "means" or not to "means"

Be intentional—use terms of art (i.e., magical words) carefully

Spectrum of likely interpretation

Very likely means-plus-function interpretation (narrower)	**Less predictable hybrids (case by case analysis)**		**Very likely <u>not</u> given means-plus-function interpretation (broader)**
means for fastening	fastening means	fastening device, fastening mechanism, fastener for	a fastener that, fastener configured to

Analogous to open-ended or closed-ended claims

Closed-ended interpretation	**Less predictable hybrids (case by case analysis)**		**Open-ended interpretation**
consisting of	consisting essentially of	having, composed of	comprising, including

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Functional Limitations – A US Perspective - Examples

Mechanical Sample: Automatic Smartphone Car Mount

Spectrum of likely interpretation

Very likely means-plus-function interpretation (narrower)	Less predictable hybrids (case by case analysis)		Very likely not given means-plus-function interpretation (broader)
means for holding a phone, means for clamping a phone	a holding mechanism for, holding means for, clamping means	a phone holding system, phone clamping device	a holder that secures a mobile device, phone holder configured to, phone securer that, phone clamp (recite alternatives in dependent claims)
means for detecting	detecting mechanism for, detecting unit that	a phone detection system	a detector that detects, detector configured to detect

Electrical/Software Sample: AI-Driven Energy Saving HVAC System

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Functional Limitations – A US Perspective - Examples

Electrical/Software Sample: AI-Driven Energy Saving HVAC System

Spectrum of likely interpretation

Very likely means-plus-function interpretation (narrower)	**Less predictable hybrids (case by case analysis)**		**Very likely not given means-plus-function interpretation (broader)**
means for processing data to predict occupancy	a processing system for predicting	a processing system configured to predict	one or more processors configured to predict an occupancy (recite alternatives in dependent claims)

Functional Limitations – A US Perspective - Best practices for US

- Provide sufficient disclosure and many examples and possibilities, the more the better.
- Be intentional in whether you wish to trigger the (often narrower) means-plus-function interpretation or not.
- It is typically better to avoid means-plus-function interpretation to get a broader claim.
- Avoid less-predictable, hybrid functional limitations.
- Do not use means-plus-function language for a limitation if there is not sufficient description to support it.
- Know the strengths and weaknesses of your granted patent—avoid over aggressive patent assertion.

Functional Limitations – A European Perspective

Functional language is allowed — but claim form changes the risk

Common framework → two equal field sections → layered claim strategy

01

Common EPO framework

Strengths, weaknesses, qualitative grant prospects, Article 69 scope and post-grant validity gates

02

Part I • Mechanical

Suitability, causal structure, three claim forms, hybrid claim, scorecard and validity risks

03

Part II • Software

Adapted means, technical effect, three claim forms, hybrid claim, scorecard and validity risks

EPO GL 2026 F-IV 4.13.2, 4.10 and 6.2–6.4; EPC Articles 69, 100 and 138.

Functional breadth buys coverage — and creates validity exposure

The EPO has no automatic US-style restriction to disclosed structure and equivalents

01

Strengths

Captures alternative implementations; expresses the invariant contribution; reduces simple design-arounds; keeps claims concise

02

Weaknesses

Wider prior-art exposure; support and sufficiency across the breadth; uncertain boundaries; difficult amendment positions

03

Best use

Claim a verifiable causal chain, then add hybrid and embodiment fallbacks that were clearly disclosed at filing

Three separate questions:

1 - Grant

2 - Scope

3 - Survival

Directional—not statistical

GRANT
Claim-form fit under Articles 84/83—plus novelty and inventive step

SCOPE
Claims govern, description and drawings interpret them under Article 69

SURVIVAL
Opposition/revocation: patentability, sufficiency and added matter

EPC Articles 69, 100 and 138 • Protocol on Article 69

Mechanical means are read by technical suitability

Physical capability can be enough

Functional feature: no automatic lock-in to IR, motor or gears.
Any prior-art means suitable for the stated function may anticipate.
Intended use or design purpose is not required.

EPO GUIDELINE EXAMPLE

“means for opening a door”

anticipated by

a door key + **a crowbar**

Mechanical specificity: broader function means a broader prior-art attack surface

EPO Guidelines 2026, F-IV 4.13.2 and F-IV 4.2.

Claim the physical causal chain

1

Placement trigger

The phone enters the receiving region: an observable physical event

2

Automatic transition

The trigger causes movement or another state change — without separate clamping

3

Verifiable retention

Retention opposes removal; define force, orientation or vibration if degree matters

MECHANICAL FEATURES TO TEST

trigger	state change	force path	release

A result-defined feature is strongest when the physical boundary is objectively testable.

Mechanical claim forms trade breadth for robustness

Three legitimate choices — the hybrid normally offers the best balance

01

Functional only

“retaining means configured to secure the phone automatically” — widest reach; weakest boundary; widest prior-art exposure

02

Hybrid • recommended

Support + movable retaining member + detector + actuation linkage; function defines the causal operation

03

Structural embodiment

IR sensor + electric motor + gear train + clamping arms; clear and supportable, but easy to design around

Example of a recommended hybrid mechanical claim

1. A mounting device for a smartphone, comprising:
a support defining a receiving region for the smartphone;
at least one retaining member movable relative to the support between:
(i) a release position permitting placement and removal of the smartphone, and
(ii) a retaining position in which the retaining member opposes removal from the receiving region;
a detection arrangement responsive to placement of the smartphone in the receiving region; and
an actuation linkage coupling the detection arrangement to the retaining member and configured to cause the retaining member to move to the retaining position automatically, without a separate user clamping operation.

Medium–high claim-form grant prospect—if supported

Medium–broad scope; stronger physical boundary

Mechanical scorecard: breadth versus resilience

Formulation	Grant prospect*	Scope	Post-grant resilience
Result-only means	Low–Medium	Very broad	Low
Causal functional	Medium	Broad	Medium
Hybrid movable member	Medium–High	Medium–broad	Medium–High
IR + motor + gears	High	Narrow	High—if inventive

*Claim-form assessment only; novelty and inventive step may change the outcome.

Mechanical survival depends on prior art and enabled variants

Clarity alone is not the post-grant battleground

01

Article 100(a) / 138(a)

Any suitable earlier physical structure may attack novelty; the broad function also enlarges the obviousness enquiry

02

Article 100(b) / 138(b)

A single motor example may not enable gravity, pressure, suction and magnetic variants across the whole claimed range

03

Article 100(c) / 138(c)

Deleting IR, motor or gears later needs direct filing-day basis for the remaining generalised combination

Best defence: hybrid main claim + principle-specific dependants + objective retention test.

Computer means are read as adapted or programmed

In CII claims, the function requires specific adaptation — not mere capability

01

Equivalent CII wording

‘Means for’, ‘adapted to’ and ‘configured to’ normally mean specifically adapted for the claimed steps

02

Programmed—or hard-wired

Specific adaptation usually means programmed; a hard-wired implementation may also satisfy the wording

03

Novelty consequence

An unprogrammed general-purpose computer does not anticipate merely because it could be programmed later

Bryn Aarflot (2024); EPO GL 2026 F-IV 4.13.2, F-IV 3.9 and F-IV 6.5

Claim the data-to-plant causal chain

1

Technical inputs

Environmental sensor data plus historical occupancy information

2

Prediction + decision

Predict occupancy; determine an HVAC operating power level

3

HVAC operation

Output a control signal causing the HVAC installation to operate at that level

SOFTWARE FEATURES TO TEST

- **input meaning**
- **prediction horizon**
- **control rule**
- **plant effect**

The computation must serve a specific technical purpose — not merely "analyze" or "optimize"

Software breadth requires implementable alternatives

Algorithm-neutral breadth needs operative teaching — not a generic disclaimer

01

Result-only controller

'Analyse data and optimise HVAC power' leaves the processing chain and technical effect under-defined

02

Causal hybrid • recommended

Interfaces + adapted processor + complete data-to-plant chain; broad, but with a defined technical boundary

03

Algorithm-neutral

Support with several working approaches—or alternatives implementable without inventive effort

Example of a recommended hybrid HVAC controller claim

1. A control system for an HVAC installation, comprising:
a sensor interface configured to receive environmental sensor data for a space;
a plant-control interface configured to output a control signal to the HVAC installation;
one or more processors and a memory storing instructions which, when executed, cause the processors to:
receive historical occupancy data for the space;
determine, from the sensor data and historical occupancy data, a predicted occupancy state for a future interval;
determine an operating power level using the predicted occupancy state and a target environmental condition; and
output, through the plant-control interface, a control signal causing the HVAC installation to operate at the determined power level.

Medium–high claim-form grant prospect—if enabled

Algorithm-neutral; structurally tied to the plant

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Software scorecard: technical causality wins

Formulation	Grant prospect*	Scope	Post-grant resilience
Analyze + optimize	Low	Nominally very broad	Low
Causal configured controller	Medium–High	Broad	Medium
Interface + processor hybrid	Medium–High	Medium–broad	Medium–High
NN on local MCU	Medium	Narrow	Medium–High—if technical

*Claim-form assessment only; generic hardware or an AI label may add no inventive step

Software survival depends on technical effect and enabled breadth

"Configured to" limits the apparatus, but does not cure COMVIK, sufficiency or added matter

01

Article 100(a) / 138(a)

Prior art must disclose the adapted processing chain; inventive step still depends on the claimed technical contribution

02

Article 100(b) / 138(b)

One neural-network embodiment plus a generic disclaimer may not enable algorithm, cloud and data breadth

03

Article 100(c) / 138(c)

Removing the neural network or local MCU needs filing-day basis for the broader causal combination

Best defence: technical-effect evidence + representative alternatives + explicit fallback combinations.

Layer claims: breadth with survivable fallbacks

1

Functional genus

Claim the invariant, verifiable causal chain — only to the breadth enabled at filing

2

Hybrid architecture

Add physical members/linkage or processor/interfaces without locking into the full embodiment

3

Specific fallbacks

IR/motor/gears; NN/local MCU; parameters, tests and implementation-specific dependants

WHY THE LAYERS MATTER

novelty fallback | **Art. 83 support** | **Art. 123(2) basis** | **enforcement proof**

The strongest portfolio is rarely one claim: preserve scope and credible amendment positions

MEANS-PLUS-FUNCTION AT THE EPO

Conclusion for the EPO:

Functional claims are granted
-
layered claims survive better

Preferred balance

MECHANICAL FIELD
Hybrid physical architecture + functional causality

ELECTRICAL / SOFTWARE FIELD
Interfaces + specifically adapted processor + plant effect

BOTH
Broad causal genus + working alternatives + filing-day fallbacks.

Functional Limitations – A Japanese Perspective

Claiming Beyond: Means Plus Functional Claims — A Japanese Perspective

1. Mechanical sample – Non-infringement risk
2. Electrical/Software sample – Invalidity risk
3. Best Practice – 'Three Tiers' Defense Strategy

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Misunderstanding of Japanese Functional Claim

- Foreign Practitioner: "Japan Patent Act has no 35 U.S.C. 112(f) equivalent, so functional claims give broad protection in Japan"
- Japanese court reality – Broad functional wording creates two critical dangers:
  - *Non-infringement risk* – Courts limit functional terms to disclosed embodiments
  - *Invalidity risk* – Courts strike down claims under strict support requirements

Framework of Japan Patent Act

- Article 70(1) [Literal scope]: Technical scope of a patented invention is determined based upon *claim language*
- Article 70(2) [Claim Interpretation]: *Description and drawings* shall be used to interpret terms in the claims

- Article 36(6)(i) [*Support Requirement*]: The claimed invention must be supported by the detailed description

Mechanical Sample: Automatic Smartphone Mount

- The Invention: Automated mount that detects a smartphone and clamps it automatically
- Disclosed Embodiment: IR sensor + electric motor + gear train
- Goal: Protect *any* mechanism securing a phone upon detection
- Competitor Workarounds: Gravity-fed mechanical linkages (no motor), magnetic suction, pneumatic arms

Non-Infringement Risk under Article 70

- Mechanism of Judicial Narrowing:
    - Under Article 70(1), generic functional terms ('clamping section') appear broad
    - Under Article 70(2), courts strictly reference the description to define the term
    - Disclosing *only one* physical embodiment causes courts to restrict the functional term strictly to that structure
- Legal Outcome: Competitor's alternative variants fall outside technical scope (Non-Infringement)

Ball Bearing Automatic Assembly Machine Case (1978)

- Claim: Means for automatically selecting and assembling inner/outer parts
- Specification: A specific mechanical lever and chute mechanism
- Accused product: Used a different mechanism controlled by electrical/air-cylinder systems
- Court ruling: Non-infringement. The scope must be limited to the technical concept derived from the disclosed embodiments

Why Did the Court Narrow the Scope?

- Principle of equity: Unfair to grant a monopoly over structures undisclosed or unpredictable to a skilled person at the time of filing
- Single embodiment trap: Without structural variants in the text, broad functional terms collapse down to the single disclosed structure during litigation

Applying Court Lesson to Smartphone Mount

- **Scenario:**
  - Claim: A clamping mechanism configured to secure a phone...
  - Specification: Discloses *only* electric motor + gear train
- **Japanese Court Outcome:**
  - Competitor uses a gravity-fed mechanical linkage (no motor)
  - Court may apply 'Ball Bearing' case logic: 'Clamping mechanism' = 'electric motor + gear'
  - Judgment: Non-infringement

Electrical/Software Sample: AI-Driven HVAC System

- The Invention: Smart HVAC controller predicting room occupancy to dynamically adjust power
- Disclosed Embodiment: Specific neural network model running on a local microcontroller
- Goal: Cover *any* processor predicting occupancy (linear regression, decision trees, cloud AI)
- Key Challenge: Overcoming support requirement objection in examination and litigation

Invalidity Risk under Article 36(6)(i)

- Defendants rarely rely solely on non-infringement
- Another Weapon: Defense of Patent Invalidity
    - Defendant asserts broad functional claim lacks support under Patent Act Article 36(6)(i)
    - Demonstrating success with only one specific AI model renders *generic claims* covering all algorithms *entirely invalid*

IP High Court 'Polarizing Film Case' (2005)

- Issue: Whether a broad claim defined by a formula/parameter is valid when supported by limited working examples
- General Rule: Claimed invention must fall within the scope of what a person skilled can recognize as capable of solving the problem based on the specification and/or the state of the art at the time of filing
- Outcome: If a broad claim covers a generic implementation, but the specification proves success with only one model, the claim fails the support requirement

Paradigm Shift in Patent Litigation

- Past: Court has narrowed broad functional claims down to disclosed embodiments to rule non-infringement
- Current: Defendant directly attacks the patent's validity using support requirement to secure patent invalidity
- Broad functional drafting requires comprehensive multi-example backing in the specification; otherwise, enforcing a broad claim may lead directly to patent invalidation

Applying Court Lesson to AI HVAC Controller

- **Scenario:**
  - Claim: A generic processor configured to predict occupancy...
  - Specification: Discloses only a local Neural Network model
- **Japanese Court Outcome:**
  - Competitor uses a rule-based algorithm
  - Court applies "Polarizing Film' case logic: a broad claim covering a generic algorithm fails support requirement
  - Judgment: Patent invalidation

Best Practice: 'Three Tiers' Defense Strategy

1. Claim:
   Multi-layer claiming
2. Linking claim to specification:
   Explicit definition
3. Specification:
   Alternative embodiments

1. Claim: Multi-layer Claiming

- ***Top Layer: Broadest functional scope***
  Use a generic noun (like 'sensor' or 'filter') + functional qualifier in place of a means-plus-function ('means for')
- ***Middle Layer: Semi-structural scope***
  Intermediate structural concept that bridges the gap between a broad function and a specific example that realizes that function to *prevent the court from narrowing claim interpretation* to the narrowest embodiment
- ***Bottom Layer: Specific structural scope***
  Specific structure for products of patentee and competitors

2. Linking claim to specification: Explicit definition

- Insert explicit definitions in the specification:

  As used herein, the term "clamping mechanism" is not limited to the disclosed electric motor, but encompasses gravity-fed linkages, magnetic structures, pneumatic arms, and equivalents thereof.

- Direct evidence under Article 70(2) to *block judicial narrow claim interpretation* in courtrooms

3. Specification: Alternative embodiments

- Disclose at least 2 or 3 algorithmically or structurally different paths for core functions
- Examples:
  - Mechanical case: Motorized + Gravity Linkage + Magnetic Clamp
  - Software case: Neural Network + Linear Regression/ Decision Trees + Cloud AI
- *Fully satisfies support requirement to counter patent invalidation challenges*

Conclusion: *Claiming beyond*

To claim beyond successfully across jurisdictions,

1. disclose variations of structural examples in the specification behind functional claim language;
2. build structural layers (broad to narrow) in claims; and
3. anchor the claims with a matrix of structural alternatives in the description


Gamification Code:
IMPROVE
FICPI
STRENGTHENING THE PRACTICE OF THE INDEPENDENT IP ATTORNEY