Patents: Fundamental Considerations and Current Topics

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Patents

FUNDAMENTAL CONSIDERATIONS

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Patents – What?

"Congress shall have 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."

U.S. Constitution, Art. I, § 8, Clause 8

- Types: Utility, Design, Plant

Patents – What?

(12) **United States Patent**
Di Vincenzo et al.

(10) **Patent No.: US 9,728,256 B2**
(45) **Date of Patent: Aug. 8, 2017**

(54) **METHODS AND APPARATUSES HAVING A VOLTAGE GENERATOR WITH AN ADJUSTABLE VOLTAGE DROP FOR REPRESENTING A VOLTAGE DROP OF A MEMORY CELL AND/OR A CURRENT MIRROR CIRCUIT AND REPLICA CIRCUIT**

(71) Applicant: **Micron Technology, Inc.**, Boise, ID (US)

(72) Inventors: **Umberto Di Vincenzo**, Capriate San Gervasio (IT); **Simone Lombardo**, Folsom, CA (US)

(73) Assignee: **MICRON TECHNOLOGY, INC.**, Boise, ID (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.: **15/054,984**

(22) Filed: **Feb. 26, 2016**

(65) **Prior Publication Data**

US 2016/0180933 A1 Jun. 23, 2016

Related U.S. Application Data

(63) Continuation of application No. 13/800,622, filed on Mar. 13, 2013, now Pat. No. 9,281,061.

(60) Provisional application No. 61/703,168, filed on Sep. 19, 2012.

(51) **Int. Cl.**
G11C 13/00 (2006.01)
G11C 11/56 (2006.01)

(52) **U.S. Cl.**
CPC ***G11C 13/0069*** (2013.01); ***G11C 11/5678*** (2013.01); ***G11C 13/0004*** (2013.01); ***G11C 13/0023*** (2013.01); ***G11C 13/0038*** (2013.01); *G11C 2211/5645* (2013.01); *G11C 2213/72* (2013.01)

(58) **Field of Classification Search**
CPC G11C 13/0004; G11C 13/0069
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,085,154 B2 8/2006 Cho et al.
7,180,767 B2 2/2007 Chen et al.
7,423,898 B2 9/2008 Tanizaki et al.
7,492,637 B2 2/2009 Kim et al.
7,920,407 B2 * 4/2011 Chen G11C 13/0007 365/148
7,974,122 B2 * 7/2011 Lin G11C 13/0004 365/148
8,077,506 B2 12/2011 Lee et al.
8,243,520 B2 8/2012 Chan et al.
(Continued)

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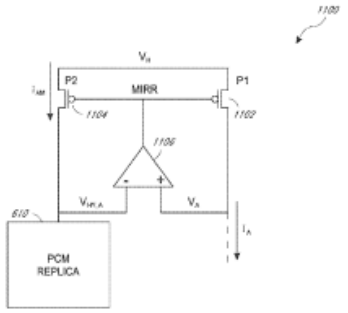
(57) **ABSTRACT**

Apparatus and methods utilize a replica circuit to generate a voltage for programming of a memory cell, such as a memory cell of a phase-change memory (PCM). Current passing through a circuit including the memory cell to be programmed is mirrored in a scaled or unscaled manner, and provided as an input to the replica circuit. The replica circuit represents voltage drops that should be encountered when programming the memory cell. An input voltage is also provided to the replica circuit, which affects the voltage drop within the replica circuit that represents the voltage drop of the cell. The voltage drop across the replica circuit can then be mirrored and provided to bias the circuit including the memory cell.

14 Claims, 18 Drawing Sheets



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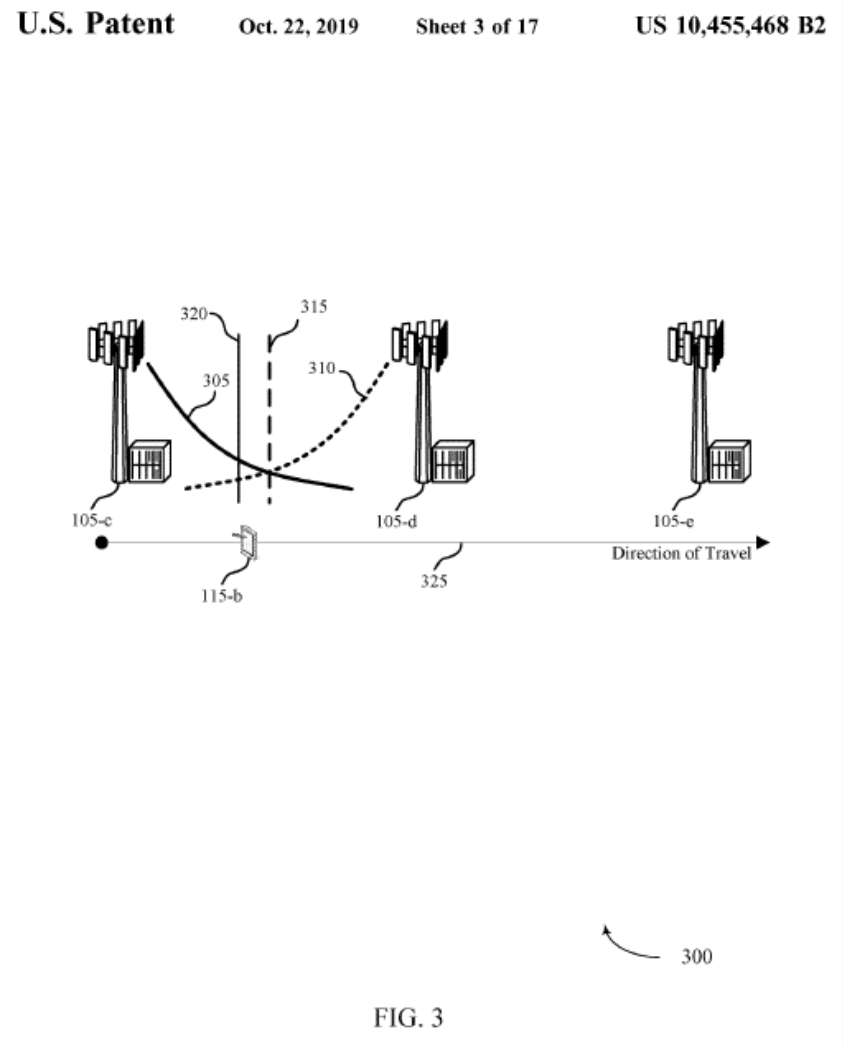
Patents – What?



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Patents – What?

speed. Thus, if the UE **115**-*b* is moving relatively slowly, measurements may continue to be made according to the first interval. As the UE **115**-*b* continues along direction of travel **325** between base station **105**-*d* and base station **105**-*e*, the process may be repeated.

In some examples, a serving cell signal strength (e.g., RSRP) threshold may be identified, based on which the UE **115**-*b* may change the way it performs measurements. In some examples, the change in the measurement interval may be achieved indirectly through an adjustment of the length of the DRX cycle of UE **115**-*b*. In further examples, one or more RLM parameters may be adjusted. If a measured signal strength (e.g., RSRP) is above the threshold, the UE **115**-*b* can use the first interval or configured DRX cycle. If the signal strength (e.g., RSRP) goes below the threshold the UE **115**-*b* starts to perform measurement more frequently or may switch to a shorter DRX cycle, which would increase the measurement frequency and also provide more opportunities to communicate with the network (e.g., receive a HO command). The UE **115**-*b*, as mentioned above, may also change one or more RLM parameters (e.g., to shorten the serving cell evaluation period) based on such signaling to speed up connection re-establishment.

The parameter threshold may be established based on the particular deployment of wireless network **300**. For example, it may be known that a high speed rail line is associated with base stations **105**-*c*, **105**-*d*, and **105**-*e*, and it may also be determined that switching time intervals for measurements at a particular threshold may enhance likelihood of HO without a dropped connection. Thus, in some examples, the threshold may be configured for particular deployment conditions. In some examples, UE **115**-*b* may be configured to switch DRX cycles, and may inform serving base station **105**-*c* that is has switched DRX cycles, which may allow base station **105**-*c* to transmit downlink signals according to the new DRX cycle. In some examples, UE **115**-*b* may autonomously trigger more frequent measurements or change RLM parameters based on some RSRP thresholds or differences seen between consecutive measurements (e.g., if the difference is very high it may be determined that the UE **115**-*b* is moving relatively fast, so it triggers more frequent measurements). Base station **105**-*c* may also signal to the UE **115**-*b* that it is in a high speed deployment or the UE **115**-*b* could determine high speed through other techniques (e.g., a number of cells visited in a certain amount of time, or speed estimation from position measurements, etc.).

FIG. **4** illustrates an example of a process flow **400** for mobility enhancements for high speed deployments in accordance with various aspects of the present disclosure. Process flow **400** may include a UE **115**-*c* and base station **105**-*f*, which may be examples of a UE **115** and base station **105** described with reference to FIGS. **1-3**.

The base station **105**-*f* may identify measurement time intervals or DRX periodicity, as indicated at block **405**. At block **410**, the base station **105**-*f* may set a mobility parameter threshold. As discussed above, the mobility parameter threshold may be set to provide more frequent measurements after the threshold is reached in order to enhance the likelihood of a successful HO. In some examples, the mobility parameter threshold may be an RSRP value. The base station **105**-*f* may signal mobility parameter threshold **415** to UE **115**-*c*. In the event that the UE **115**-*c* determined the mobility parameter threshold is met, the UE **115**-*c* may transmit a threshold met signal **420**. In examples where a DRX periodicity is changed upon meeting the threshold, the base station **105**-*f* may set a second DRX periodicity. Based on measurements made at the second time intervals, base station **105**-*f* may initiate a HO procedure, as indicated at block **430**.

FIG. **5** illustrates an example of a process flow **500** for mobility enhancements for high speed deployments in accordance with various aspects of the present disclosure. Process flow **500** may include a UE **115**-*d* and base station **105**-*g*, which may be examples of a UE **115** and base station **105** described with reference to FIGS. **1-4**.

The base station **105**-*g* may signal mobility parameter threshold **505** to UE **115**-*d*. At block **510**, the UE **115**-*d* may identify time intervals for measuring parameters. The time intervals may include first time interval and a second time interval that may be shorter than the first time interval. At block **515**, the UE **115**-*d* may determine that the mobility parameter is exceeded (e.g., a measured RSRP is less than the signaled threshold value). In some examples, the determination that the mobility parameter is exceeded may also include a determination that the UE **115**-*d* is in a high speed environment (e.g., via signaling from base station **105**-*g*, positioning information, numbers of cells visited in a time period, differences seen between consecutive parameter measurements, etc.). At block **520**, the UE **115**-*d* may change the time interval for measuring parameters, in order to measure parameters more frequently. The UE **115**-*d* may signal an indication of a changed interval **525** to base station **105**-*g*. The UE **115**-*d* may signal one or more measured parameters to the base station **105**-*g*, which may initiate a HO based on the measured parameters. In some examples, the UE **115**-*d* may adjust one or more RLM parameters based on the mobility parameter threshold being exceeded.

FIG. **6** shows a block diagram of a wireless device **600** configured for mobility enhancements for high speed deployments in accordance with various aspects of the present disclosure. Wireless device **600** may be an example of aspects of a UE **115** described with reference to FIGS. **1-5**. Wireless device **600** may include a receiver **605**, a wireless communication management module **610**, or a transmitter **615**. Wireless device **600** may also include a processor. Each of these components may be in communication with each other.

The receiver **605** may receive information such as packets, user data, or control information associated with various information channels (e.g., control channels, data channels, and information related to mobility enhancements for high speed deployments, etc.). Information may be passed on to the wireless communication management module **610**, and to other components of wireless device **600**.

The wireless communication management module **610** may identify a first time interval for performing one or more signal characteristic measurements, determine that a mobility parameter is outside of a mobility parameter threshold, and change, responsive to the determining, to a second time interval for performing the one or more signal characteristic measurements, wherein the second time interval is shorter than the first time interval.

The transmitter **615** may transmit signals received from other components of wireless device **600**. In some examples, the transmitter **615** may be collocated with the receiver **605** in a transceiver module. The transmitter **615** may include a single antenna, or it may include a plurality of antennas.

FIG. **7** shows a block diagram of a wireless device **700** for mobility enhancements for high speed deployments in accordance with various aspects of the present disclosure. Wireless device **700** may be an example of aspects of a wireless device **600** or a UE **115** described with reference to FIGS. **1-6**. Wireless device **700** may include a receiver

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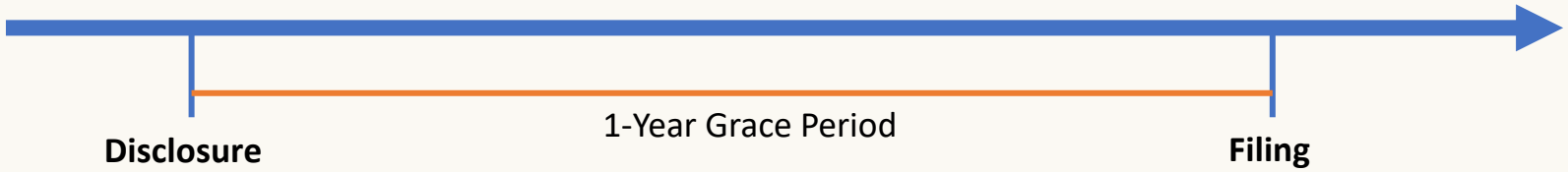
Patents – What?

1. An apparatus, comprising:
a feedback loop configured to receive an input clock signal and output a delayed clock signal, the feedback loop comprising;
a first delay component configured to introduce, into a forward path of the feedback loop, a first delay that is inversely proportional to a supply voltage; and
a second delay component configured to introduce, into the forward path of the feedback loop, a second delay that is proportional to the supply voltage.

Generally: shorter claims = better/broader

Patents – How?



- Phase 1 – Prepare and file application
  - First to file wins – actual "reduction to practice" not required
  - Once idea is publicly disclosed, 12mo window to file in the US
    - Toast in most foreign jurisdictions
  - Pre-disclosure, NDAs are your friend
  - Might file a provisional application (placeholder, 12mo to convert)
  - Pre-filing search?

Patents – How?

- Phase 2 – Prosecution (Examination)
  - USPTO tries to reject you
    - You can amend the claims
    - But nothing else
  - often 2-4 rounds of rejection
  - often 2-4 years until allowance

Patents – What?

- A patent provides a ***negative*** right:
  - Right to prevent anyone else from making, using, or selling the claimed invention.
  - Someone else might be able to block you, even if you have a patent
- There is no "Patent Police"
  - **You** have to enforce (can be very expensive)

Patents – Why?

- Protect core technology against knockoffs
- Deter/defend attacks
- Attract investment – e.g., demonstrate legitimacy and ownership
- Marketing
- Leverage
- Licensing Revenue
  - Cross-Licensing Opportunities (especially for larger companies)
- Provide value for sale, merger, acquisition, and joint venture opportunities
- Create prior art (prevent others from getting patents that might block you)

Patents v. Trade Secrets

- Definition:
  - Information that derives economic value *because* it is secret; and
  - You take reasonable efforts to keep it secret

- Pros:
  - Potentially unlimited duration
  - No public disclosure of details
  - "Free"

- Cons:
  - Protects only against misappropriation
    - e.g., not against independent discovery, reverse engineering
  - Risk of accidental disclosure
  - Can be very difficult to enforce

Best Practices for In-House Counsel

- Educate teams about public disclosure risks
- Initiate early discussions with patent attorneys
  - Do not wait for product to be ready; protect early
- Implement internal procedures for preserving trade secrets

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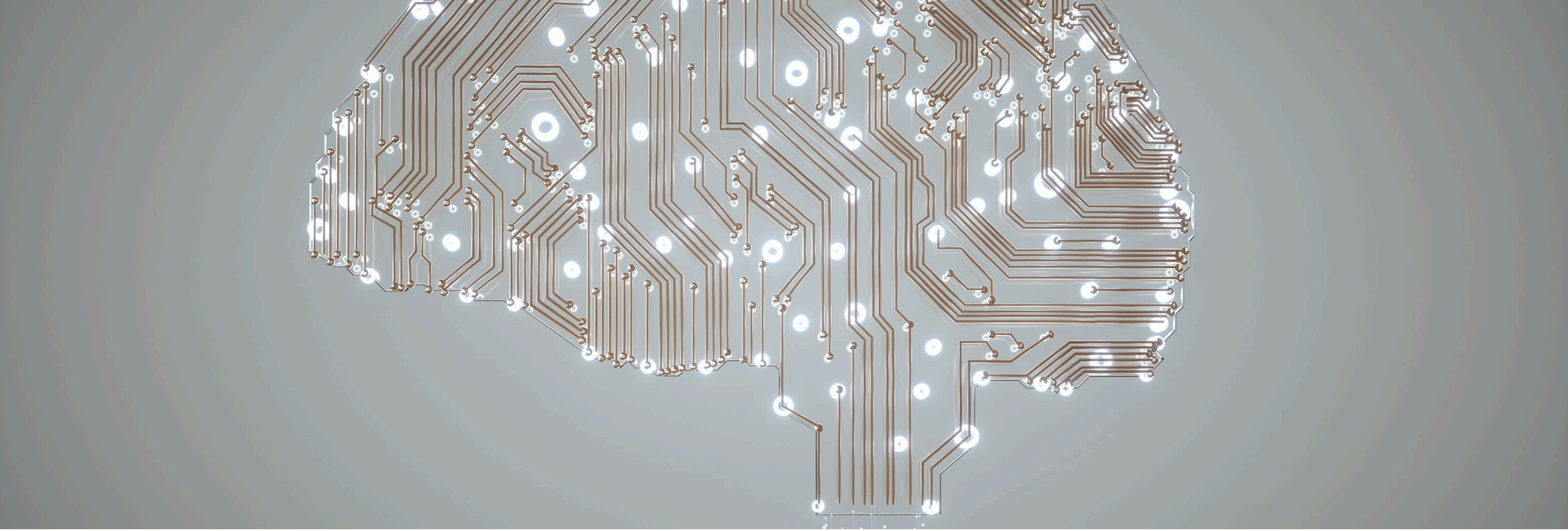

Patents

CURRENT TOPICS

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Patent Eligibility Restoration Act

- 35 U.S.C. § 101:
  "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."

- Judicially Created Exceptions:
  - natural phenomena
  - laws of nature
  - abstract ideas
    - mathematical processes, mental processes, methods of organizing human activity

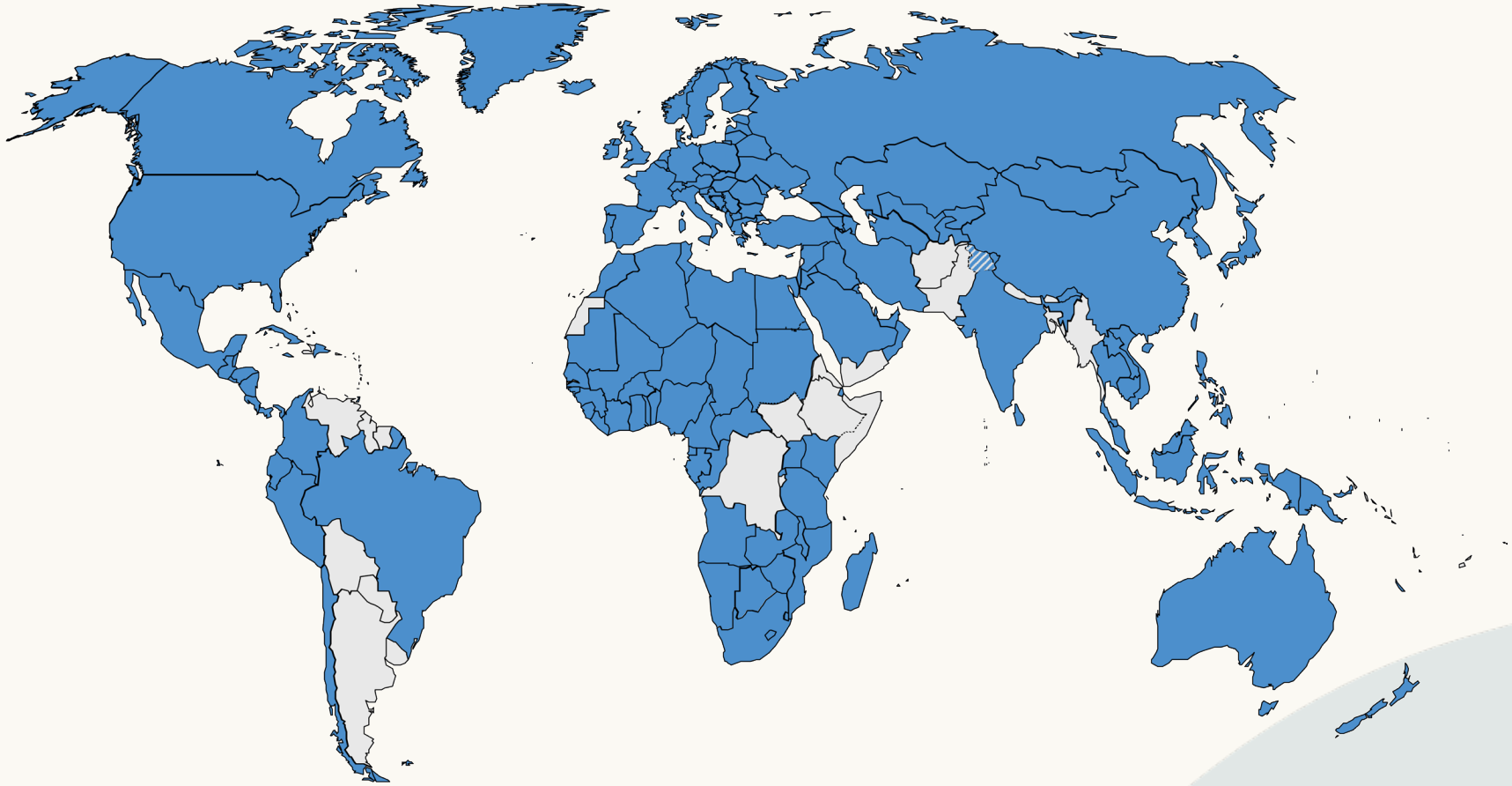
- The judicial exceptions are often broadly and inconsistently applied
  - Especially "abstract idea"—often used to reject software

Patent Eligibility Restoration Act

- **PERA**
  - Introduced by Senators Thom Tillis (R-NC) and Chris Coon (D-DE) in June 2023
  - Would eliminate ***judicial*** exceptions, replacing with only the following ***statutory*** exceptions:
    - mathematical formula that is not part of an invention
    - process that is substantially economic, financial, business, social, cultural, or artistic
    - process that (i) is a mental process performed solely in the human mind or (ii) occurs in nature wholly independent of, and prior to, any human activity
    - unmodified human gene, as that gene exists in the human body
    - unmodified natural material, as that material exists in the nature
- Intended/expected to greatly increase scope of patent-eligible subject matter

Unitary Patent System

Background: Patent Cooperation Treaty (PCT) countries



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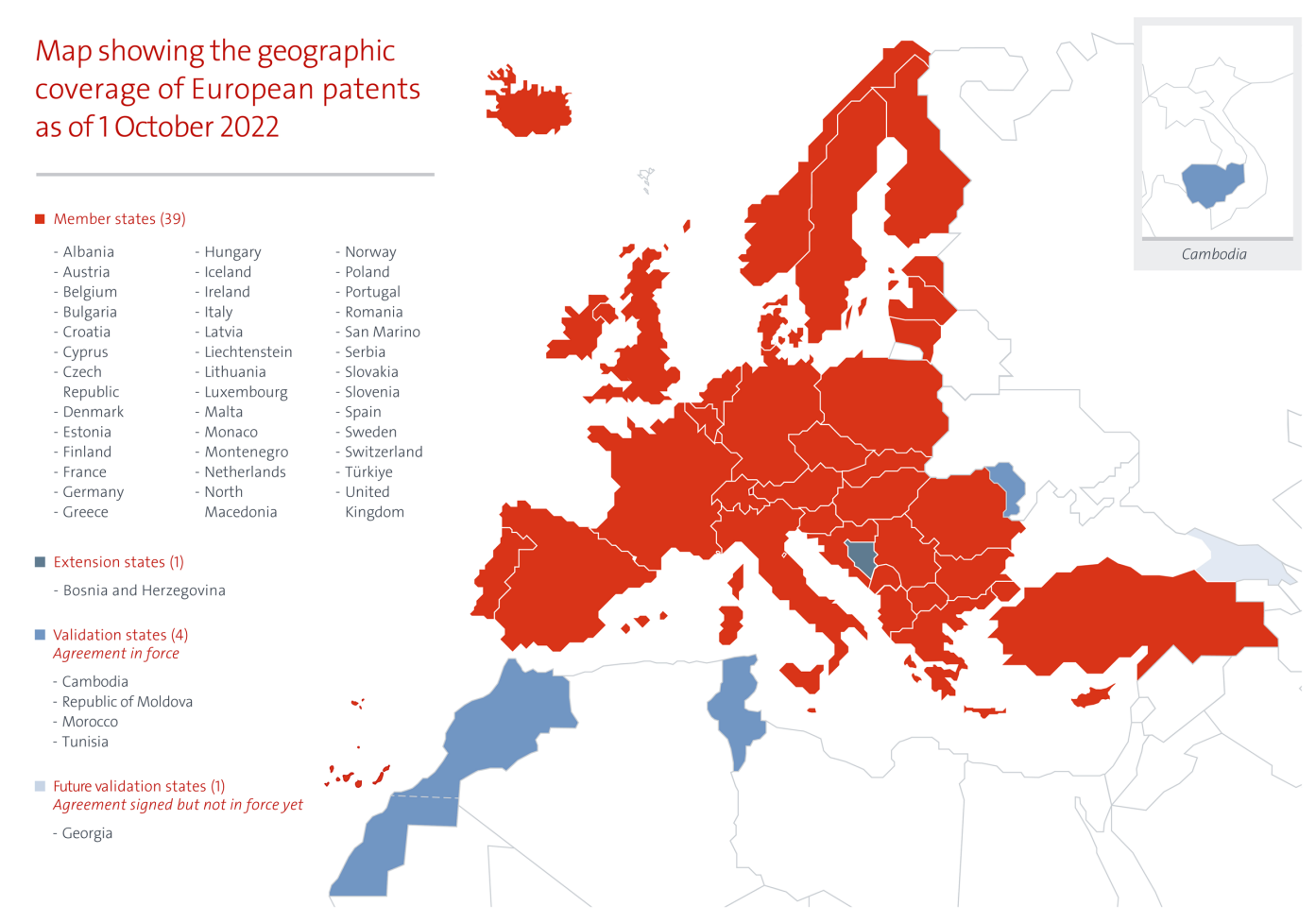
Unitary Patent System

Background: European Patent Office (EPO) States



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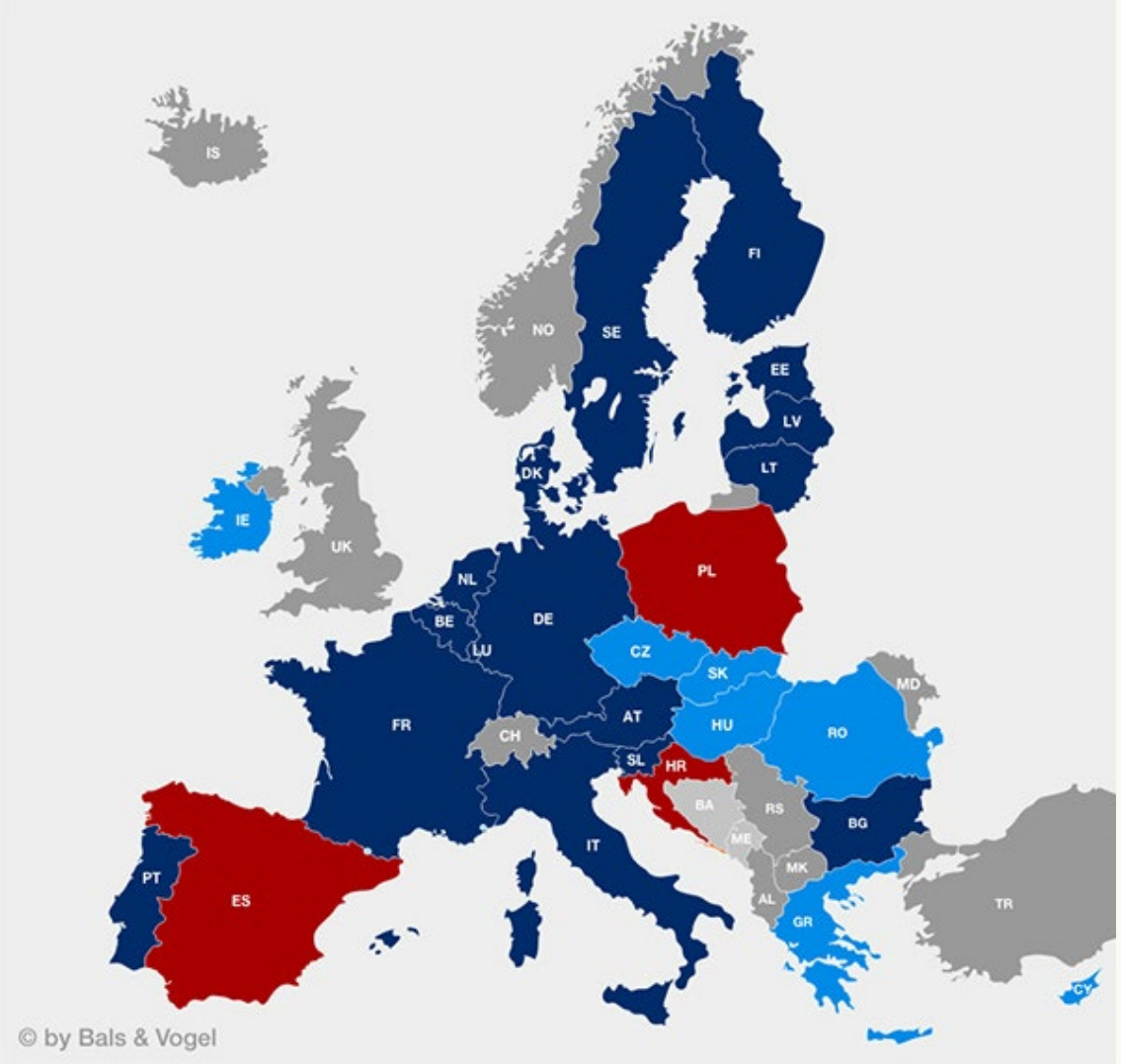
Unitary Patent System



Launched June 1, 2023

Ratified:
Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovenia, Sweden

Expected to Ratify:
Cyprus, Czech Republic, Greece, Hungary, Ireland, Romania, Slovakia

EU Members Not Participating :
Spain, Poland, Croatia

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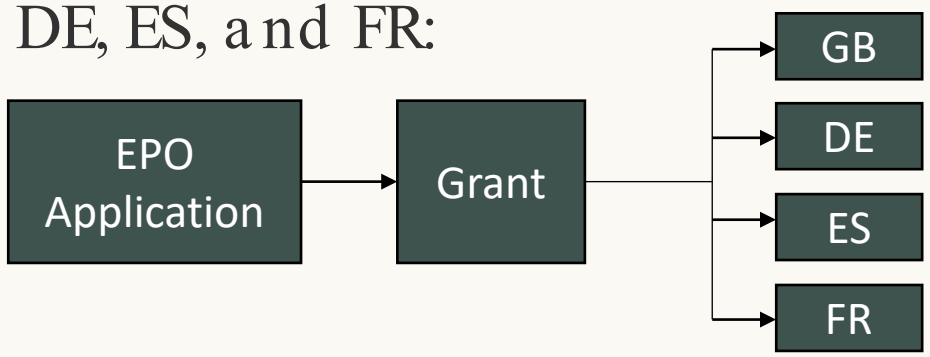
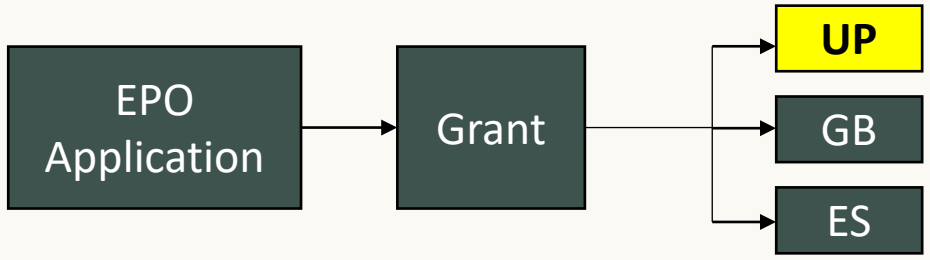
Coverage

Before, to obtain Protection in GB, DE, ES, and FR:



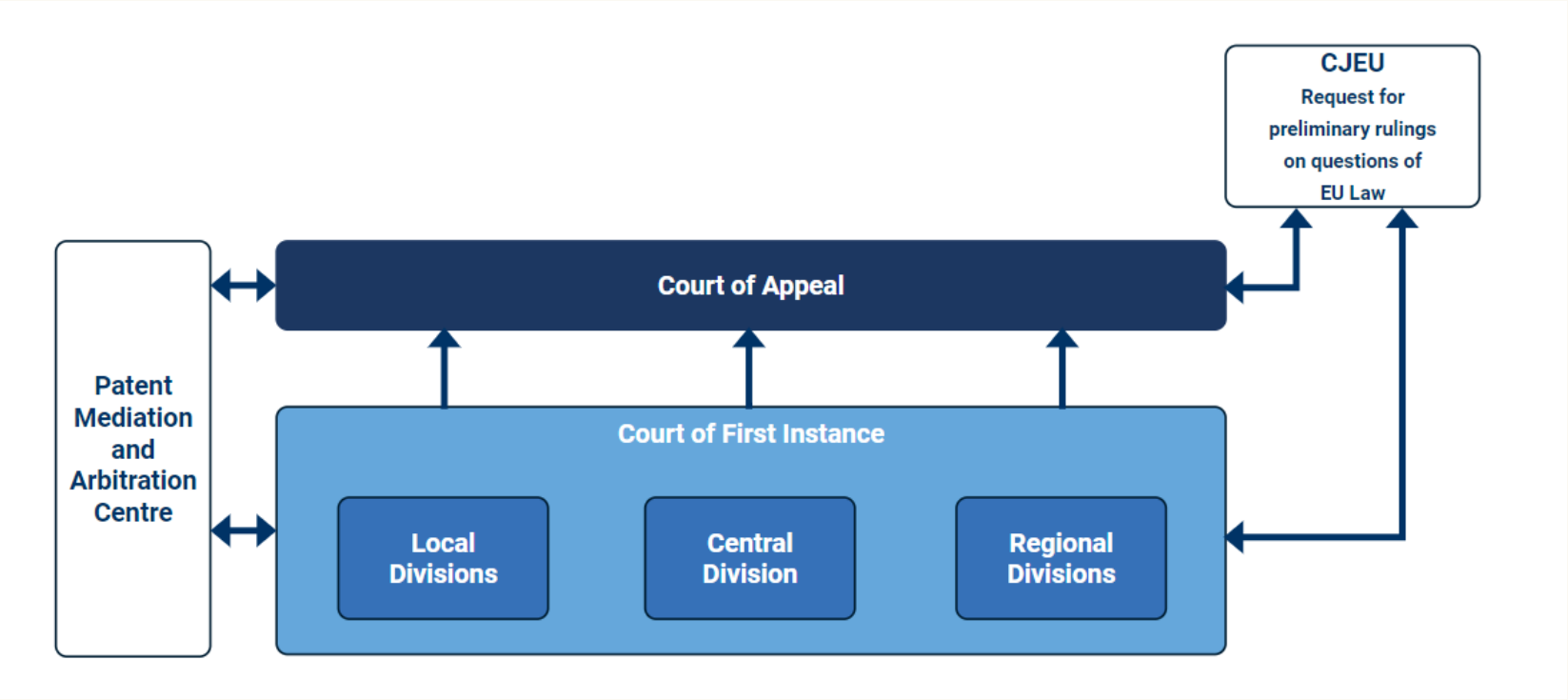
Now, to obtain the same protection:



Choose from the following upon grant:

1. File National Validations;
2. Elect a UP designation covering all UP states; or
3. A combination of 1 and 2

Unified Patent Court



- Local/Regional for infringement
- Central for nullity (invalidation)

- Sizzling Hot Topic: Opt-out?

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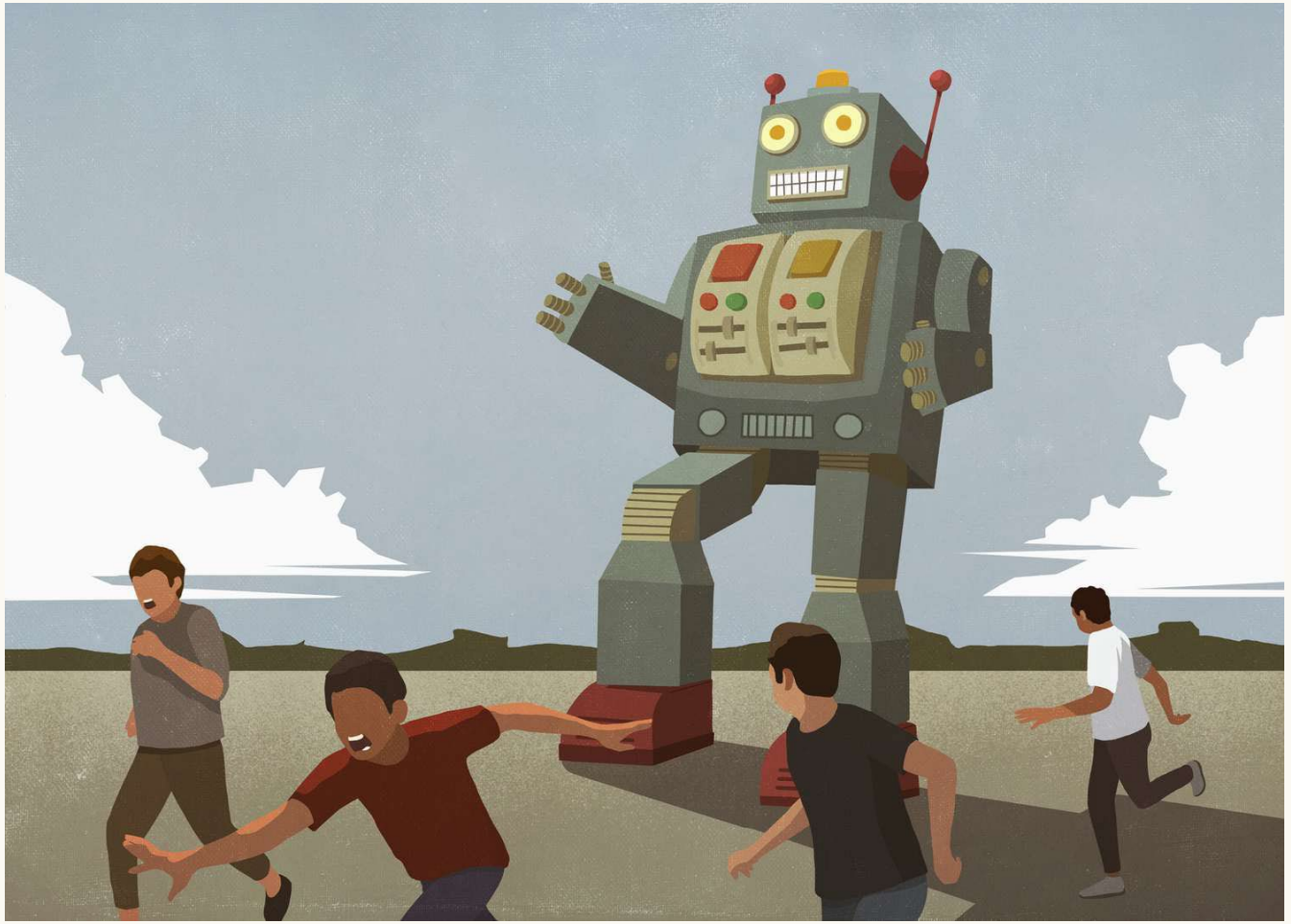
AI – The Robots are Coming



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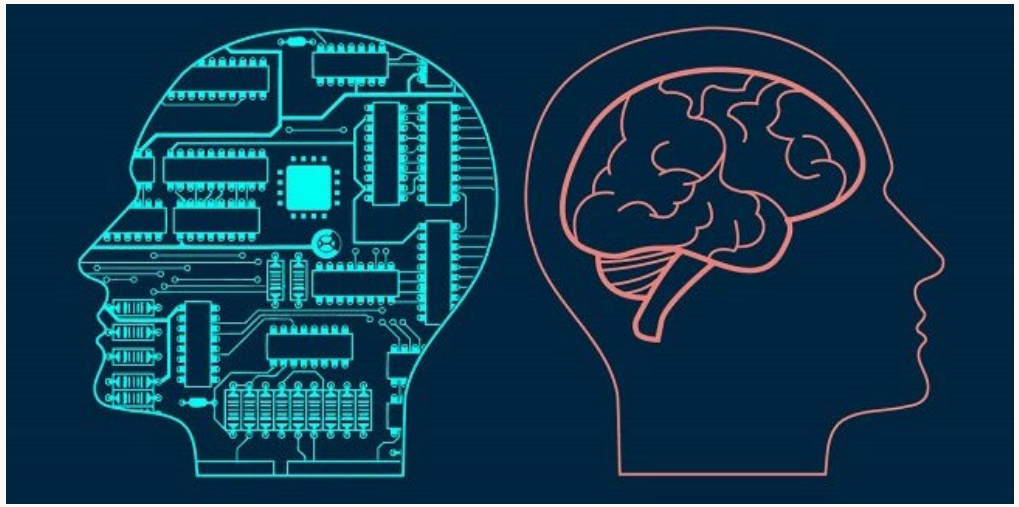
Patent Issues (Inventorship)



- **Inventorship**:
  - Determined based on the claims.
  - Defined as an individual that contributes to the conception of at least one claim.
    - Someone who helps build/implement the invention may not qualify

Patent Issues (Inventorship)

- April 2020: USPTO issued decision denying petition to name an AI system as an inventor
  - Inventorship is limited to a natural person(s).
  - Upheld in a decision by U.S. District Court (*Thaler v. Hirshfeld*, 558 F.Supp.3d 238 (E.D. Va. 2021)) and again by the Federal Circuit (*Thaler v. Vidal*, 43 F.4th 1207, 1210 (Fed. Cir. 2022))
    - Based on Supreme Court precedent, an "individual" ordinarily means a human being unless Congress provided some indication that a different meaning was intended in the Patent Act

Patent Issues (Inventorship)

- Can AI invent (i.e., be a named inventor), or merely help humans invent?

- April 2020: USPTO denies petition to name an AI system as an inventor
  - Inventorship is limited to a natural person(s).
  - Upheld in a decision by U.S. District Court (*Thaler v. Hirshfeld*, 558 F.Supp.3d 238 (E.D. Va. 2021)) and again by the Federal Circuit (*Thaler v. Vidal*, 43 F.4th 1207, 1210 (Fed. Cir. 2022))
    - Based on Supreme Court precedent, an "individual" ordinarily means a human being unless Congress provided some indication that a different meaning was intended in the Patent Act

Patent Issues (Inventorship)

- **Related Example from Copyright Office:**
  - Reviewed a registration for a work containing human-authored elements combined with AI-generated images.
  - The Office concluded that a graphic novel comprised of human-authored text combined with images generated by an AI service constituted a copyrightable work, but that the individual images themselves could not be protected by copyright

- **AI models are, however, now being prevalently used as part of R&D efforts**
  - e.g., drug discovery, chip design
  - Is there a gap in legal/IP coverage for such advancements?

Questions?

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