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AI and Inventorship: The U.S. Patent Context

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1   Introduction

The increasingly widespread use of artificial intelligence, or AI, based on large language models (LLMs) and packaged as generative pretrained transformers (GPTs), opens up the tantalizing prospect of rapid advances in many technical fields. It also poses special problems of inventorship in the patent space. This article focuses on the use of AI and its treatment by the USPTO, in particular as regards inventorship.

2   Legal Background: *Thaler* and the Federal Circuit

At present, there is only one clear data point on the issue of AI and inventorship in the U.S.: *Thaler v. Vidal*, 43 F.4th 1207 (Fed. Cir. 2022). In this case, the Court of Appeals for the Federal Circuit made it clear that a machine cannot be an inventor; only a human being (a "natural person") can be an inventor.

Interestingly, the USPTO denied Thaler's two applications on procedural grounds: Thaler listed his system, DABUS, as sole inventor, with no surname; the USPTO concluded that both applications lacked a valid inventor and were incomplete, and sent Thaler a "Notice to File Missing Parts of Nonprovisional Application" for each application. After two rounds of petitions and judicial review in the District Court, the case moved to the Federal Circuit, with the results noted above. The Supreme Court declined to get involved.

3   USPTO Guidance

In early 2024, in response to developments in the field of AI and to *Thaler* -- and under prompting from the Oval Office -- the USPTO developed and published two sets of guidelines (or "guidance") in the Federal Register:

"Inventorship Guidance for AI-Assisted Inventions", 89 FR 10043 (February 13, 2024) https://www.federalregister.gov/documents/2024/02/13/2024-02623/inventorship-guidance-for-ai-assisted-inventions (the "February 13, 2024 guidance") and "Guidance on Use of Artificial Intelligence-Based Tools in Practice before the USPTO", 89 FR 25609 (April 11, 2024) https://www.federalregister.gov/documents/2024/04/11/2024-07629/guidance-on-use-of-artificial-intelligence-based-tools-in-practice-before-the-united-states-patent.

Taken together, and particularly the first document, these guidelines articulate two key principles: First, that Inventors must be human beings, and, second, where AI is used to assist with invention, the human contribution must be significant. Note that the focus is on the human contribution, not the machine's.

The first principle, that inventors and joint inventors named on U.S. patents and patent applications must be natural persons, has as its corollary that patent applications that name a machine on an application data sheet (37 CFR 1.76), an inventor's oath or declaration (37 CFR 1.63), or a substitute statement (37 CFR 1.64) as either an inventor or joint inventor will be considered by the USPTO to have improper inventorship. Practitioners would do well to bear this admonition in mind.

The second principle -- that where AI is used to assist with invention the human contribution must be significant -- is, in the inimitable wording of the USPTO, rephrased as "AI-assisted inventions are not categorically unpatentable for improper inventorship." The double negative is worth noting, for its suggests that much in this space is provisional and dependent on further developments, legal as well as technical.

The February 13, 2024 guidance goes on to state that "the use of an AI system by a natural person(s) does not preclude a natural person(s) from qualifying as an inventor (or joint inventors) if the natural person(s) significantly contributed to the claimed invention — i.e., the "*Pannu* factors."

4   The *Pannu* Factors and Five Guidelines

In *Pannu v. Iolab Corp.*, 155 F.3d 1344, 1351 (Fed. Cir. 1998), the CAFC held that each inventor must contribute in some significant manner to the invention, meaning:

1. Contribute in some significant manner to the conception or reduction to practice of the invention
2. Make a contribution to the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention
3. Do more than merely explain to the real inventors well-known concepts and/or the current state of the art

Finally, the February 13, 2024 guidance offers five guidelines to aid in the use of AI in invention:

1. A natural person's use of an AI system in creating an AI-assisted invention does not negate the person's contributions as an inventor.
2. Merely recognizing a problem or having a general goal or research plan to pursue does not rise to the level of conception.
3. Reducing an invention to practice alone is not a significant contribution that rises to the level of inventorship.
4. A natural person who develops an essential building block from which the claimed invention is derived may be considered to have provided a significant contribution to the conception of the claimed invention even though the person was not present for or a participant in each activity that led to conception. This means that a person who designs, builds, or trains an AI system in view of a specific problem to elicit a particular solution could be an inventor.
5. Maintaining "intellectual domination" over an AI system does not, on its own, make a person an inventor of any inventions created through the use of the AI system.   This means that simply owning or overseeing an

AI system does not make that person an inventor.

It will be noted that these guidelines focus on the human action and contribution, not the AI system.

Perhaps recognizing that the guidelines are at a rather high level of generality, the USPTO has separately offered hypothetical examples, discussed below.

5   Two Examples

As part of its training materials for practitioners and examiners alike, the USPTO has offered two examples of the use of AI in invention (https://www.uspto.gov/initiatives/artificial-intelligence/artificial-intelligence-resources). Since their issuance, both examples have since been labeled "Under Review" – suggesting that developments in the field continue to move faster than the USPTO can respond.

The first example, a hypothetical in the mechanical field, is titled "Transaxle for Remote Control Car" and envisions use of a free, publicly available generative AI system to prepare a patent application.   The hypothetical considers five different scenarios, ranging from employing a general prompt with no alterations to AI system output to significant human alterations of output versus minor AI-generated suggestions. Only in those scenarios in which the human engineers prompt the AI for alternative designs and make significant modifications thereto do the human engineers qualify as bona fide inventors.

Note that this scenario raise the question: What is a significant alteration, and what is a minor, conventional alteration? In some cases, the answer might not be obvious. Perhaps unwittingly, the Patent Office may have provided inventors and their AI assistants with a significant opening —one wide enough through which to drive a truck.

The second example, drawn from the pharmaceutical field and considerably more complex than the first, involves the use of special-purpose and custom-built generative AI systems. Inputted prompts are at a high level of specificity. Essentially, however, it boils down to an illustration of two points:

First, the greater the extent and sophistication of the human interaction with the generative AI system and the reworking of the system's product, the more likely the human contribution to the invention is likely to be considered significant; and

Second, a person who designs, builds, or trains an AI system in view of a specific problem to elicit a particular solution could be an inventor (the fourth of the five guidelines mentioned above).

6   Conclusion: A Five-Point Test

As noted at the beginning of this article, much is unknown about the exact lines between human inventorship and AI assistance.   Between what little case law we now have (i.e., *Thaler* and *Pannu*), the February 13, 2024 Guidance, and the USPTO's examples, what can we say about how to recognize the difference between proper AI-assisted inventions, on the one hand, and AI-generated interventions on the other?

With the knowledge that the best way forward must by nature be preliminary, awaiting future developments, for now we can offer inventors and practitioners the following five-part test for determining proper inventorship:

1.   Quality and sophistication of the AI system

    Is the AI in use an off-the-shelf, general-purpose AI/LLM? (think Chat GPT), or is it custom-built, large-scale, and/or refined through multiple iterations?

2.   Specificity and sophistication of the inputted information (the prompt)

    Are the inputs (prompts) general in nature, abstract, and/or lacking in detail, or are they highly specific, detailed, and/or refined through multiple iterations? Note that a good prompt might well offset the disadvantage of using a general-purpose AI system -- suggesting that a good prompt engineer might save the day.

3.   Nature and extent of the transformation of the AI system-generated output

    Is there significant reworking of the product outputted by the AI system, through one or multiple iterations, or is the output used largely as is, without much modification? The latter leans toward proper inventorship.

4.   Relation between the putative human inventors and the AI system

    Somewhat similar to point 1., have the human beings built, trained or customized the AI system, or are they mere owners or operators? Recall the fifth guideline noted above: A mere owner cannot be an inventor of an AI-generated invention.

5.   Significance of human inventors' contribution(s) to the overall invention

    As with the *Pannu* second factor, this question asks: Taking the overall invention, is the human contribution significant in relation to the invention as a whole?

A better, more refined test will have to await future developments. Given the fast pace of advances in the field of AI -- technical more than legal -- we might not have to wait long.

(October 2025)

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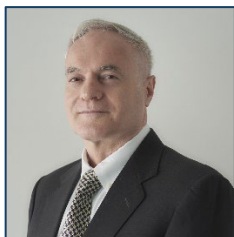
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