



Birch  
Stewart  
Kolasch  
Birch LLP

Protecting  
*the* Product  
*of your* Mind.®

# Guidance for AI-Assisted Inventions

## AI: Please include me as an inventor . . .



By: Maki Hatsumi  
Date: May 8, 2024

## Overview

- AI-Assisted Inventions defined
- Background for AI-Assisted Inventions
  - Can an AI system be named as an inventor?
  - Executive Order
- Inventorship Guidance for AI-Assisted Inventions
  - The guidance
  - The *Pannu* factors
  - Guiding Principles (Gp)
- Patent Practice
- Inventorship Examples
- Takeaways

## AI-assisted Invention defined (by MS Copilot)

- AI-assisted inventions refer to innovations created with the help of artificial intelligence (AI) systems. These inventions involve a collaboration between human inventors and AI technology.

.....

In summary, AI-assisted inventions involve collaboration between humans and AI systems, and the focus remains on human contributions when determining inventorship.

## Can an AI system be named as an inventor?

- In *Thaler v. Vidal* (43 F.4th 1207 (Fed.Cir.2022)), court Upheld the USPTO decision to deny petitions to name an AI system as an inventor. (note: in 2018, a judge in Australia ruled inventions created by an AI can qualify for a patent. South Africa has also granted a patent in the name of DABUS.)
- 35 U.S.C. 100(f) defines the term “inventor” to mean “the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention.”
- Court concluded that “an inventor” must be a natural person.
- Court also explained that it was not confronted with “the question of whether inventions made by human beings with the assistance of AI are eligible for patent protection.”

## Executive Order (EO)

- **Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial (EO 14110) was issued on October 30, 2023.**
- (c) To promote innovation and clarify issues related to AI and inventorship of patentable subject matter, the Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office (USPTO Director) shall:
  - (i) within 120 days of the date of this order, publish guidance to USPTO patent examiners and applicants addressing inventorship and the use of AI, including generative AI, in the inventive process, including illustrative examples in which AI systems play different roles in inventive processes and how, in each example, inventorship issues ought to be analyzed;
  - (ii) subsequently, within 270 days of the date of this order, issue additional guidance to USPTO patent examiners and applicants to address other considerations at the intersection of AI and IP, which could include, as the USPTO Director deems necessary, updated guidance on patent eligibility to address innovation in AI and critical and emerging technologies.

# Inventorship Guidance for AI Assisted Inventions

- In response to the EO, USPTO issued inventorship guidance for AI-assisted inventions on Feb. 13, 2024 (89 FR 10043)
- **Key takeaways** (from USPTO slides)
  - AI-assisted inventions are not categorically unpatentable for improper inventorship
  - Focus of inventorship analysis on human contributions, specifically *-significant* contribution (*Pannu* factors)
  - Five guiding principles to inform application of *Pannu* factors
  - Guidance applies to utility, plant, and design patents & applications
  - Potential impact to other areas of patent practice

## AI-assisted inventions are not categorically unpatentable for improper inventorship

- Patent applications for AI-assisted inventions must name the natural person(s) who significantly contributed to the invention as the inventor or joint inventors.
- Note, however, the use of an AI system by a natural persons does not preclude that natural person(s) from qualifying as the inventor (or joint inventor(s)) if the natural person(s) has significantly contributed to the claimed invention.
- Use Pannu factors analysis for determining *significant contribution*.

## The *Pannu* Factors

- To analyze the natural person(s) contributions, all three (3) factors of *Pannu* factors analysis must be satisfied by each inventor.
- First *Pannu* factor:
  - Each named inventor must have significantly contributed to the “definite and permanent idea of the complete and operative invention as it is thereafter applied in practice.”
  - Reduction to practice of an invention conceived by another is not enough to constitute inventorship.



## The *Pannu* Factors (Cont.)

- The second *Pannu* factor – Each named inventor must 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
  - Simply providing routine or expected inputs to an AI system could be an exercise of normal skill expected of one skilled in the art that is considered insignificant in quality.
- The third *Pannu* factor – An inventor must do more than merely explain to the real inventors well-known concepts and/or the current state of the art.

## Miscellaneous

- Application of *Pannu* factors to determine whether a natural person significantly contributed to an AI-assisted invention is made on a claim-by-claim and case-by-case basis
- When a single person uses an AI system to create an invention, that single person must make a significant contribution to every claim
- No requirement for a named joint inventor to contribute to every claim - a contribution to a single claim is sufficient; *but* each claim must have at least one natural person inventor
- Each inventor must make a significant contribution to the conception of the invention, and at least one inventor must have recognition and appreciation.

(from USPTO Slides)

# Guiding Principles (Gp)

(from USPTO Slides)

- **Gp1:** 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.
- **Gp2:** Merely recognizing a problem or having a general goal or research plan to pursue does not rise to the level of conception.
  - A natural person who only presents a problem to an AI system may not be a proper inventor or joint inventor of an invention identified from the output of the AI system.
  - However, a significant contribution could be shown in how the person constructs the prompt in view of a specific problem to elicit a particular solution from the AI system.
- **Gp3:** Reducing an invention to practice alone is not a significant contribution that rises to the level of inventorship.
  - A natural person who merely recognizes and appreciates the output of an AI system as an invention, particularly when the properties and utility of the output are apparent to those of ordinary skill, is not necessarily an inventor.
  - However, a person who takes the output of an AI system and makes a significant contribution to the output to create an invention may be a proper inventor.

# Guiding Principles (Gp) (Cont.)

(from USPTO Slides)

- **Gp4:** 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 the conception of the claimed invention.
  - In some situations, the natural person(s) who designs, builds, or trains an AI system in view of a specific problem to elicit a particular solution could be an inventor, where the designing, building, or training of the AI system is a significant contribution to the invention created with the AI system.
- **Gp5:** Maintaining “intellectual domination” over an AI system (by owning or overseeing the system) does not, on its own, make a person an inventor of any inventions created through the use of the AI system.

- Guidance applies to utility, design, and plant patent applications and patents.
- Naming the inventor:
  - Only natural persons can be listed as an inventor or joint inventor.
- Inventor's Oath/declaration:
  - No oath, declaration, or substitute statement should be filed on behalf of an AI system, even if the AI system made contributions to one or more claims in a patent application.
- Duties owed to USPTO:
  - Duty of disclosure remains basically the same.
  - Duty of reasonable inquiry may include questions about whether and how AI is being used in the invention creation process.

## Patent Practice (Cont.)

- Correction of inventorship:
  - When inventorship of a claim cannot be corrected (i.e., no natural person significantly contributed to the claimed invention), the claims must be canceled or amended.
- Priority Claims:
  - For a U.S. application claiming priority to a foreign application or entering the national stage that names both a natural person(s) and non-natural person as a joint inventor, application data sheet (ADS) accompanying the U.S. application must list as the inventor:
    - Only the natural person(s) who significantly contributed to the invention; and
    - One of those natural persons must be in common with the foreign application.
    - See page 4 of this slide for countries that recognize AI as an inventor.
- Applicants/ownership/assignments
  - Assignments from AI systems should not be recorded with the USPTO. An AI system cannot be a named inventor, it has no rights to assign.

# Inventorship Examples

- The USPTO issued examples to provide assistance on the application of the guidance.
  - One example is directed to a transaxle for remote control car
  - Another example is directed to developing a therapeutic compound for treating cancer (*which I will not go into*)



# Transaxle for remote control car

## Scenario 1

### Facts

- Ruth and Morgan, engineers at the XYZ Toy Company prompt an AI system (Puerto5) to elicit a preliminary design for the transaxle for an RC car.
- The prompt states: “Create an original design for a transaxle for a model car, including a schematic and description of the transaxle.”
- The output from Puerto5, which Ruth and Morgan reviewed, includes a preliminary design for a transaxle that is comprised of a casing, a transmission that is removably mounted within the casing and secured by fasteners, and axle shafts that extend from the casing. The casing of the preliminary design consists of two elements that are separable along a vertical plane.
- Ruth and Morgan reviewed the output and agreed that the design should work in their RC car.



## Transaxle for remote control car (Cont.)

### Claim 1

A transaxle comprising:

- a casing;

- a transmission;

- said transmission separate from said casing and removably mounted within said casing;

- axle shafts extending from said casing;

- said casing being defined by two separable casing elements of said transaxle; and

- a fastener on said transmission that removably mounts the transmission to one of said separable casing elements.

## Transaxle for remote control car (Cont.)

- Are Ruth and Morgan proper joint inventors of the claimed invention?

Ruth and Morgan's Contribution	Analysis of the contribution
Recognized a problem (needing a transaxle)	Gp2 - Recognition of a problem did not rise to the level of conception
Prompted the AI system to solve the problem	Prompt is only a statement of the problem, no inventive contribution in how the prompt is constructed
Reviewing the AI output	Gp3 – Recognition and appreciation of an invention without a contribution is not sufficient.

- **Gp2:** Merely recognizing a problem or having a general goal or research plan to pursue does not rise to the level of conception.
- **Gp3:** Reducing an invention to practice alone is not a significant contribution that rises to the level of inventorship.

## Transaxle for remote control car (Cont.)

### Pannu Factor Analysis

- First *Pannu* factor – None of Ruth and Morgan’s contributions are considered a significant contribution to the conception of the claimed invention under the first Pannu factor.
- The inventorship analysis fails the first *Pannu* factor, and thus Ruth and Morgan are not the proper joint inventors of claim 1.
- First *Pannu* factor:
  - Each named inventor must have significantly contributed to the “definite and permanent idea of the complete and operative invention as it is thereafter applied in practice.”
  - Reduction to practice of an invention conceived by another is not enough to constitute inventorship.

# Transaxle for remote control car (Cont.)

## Scenario 2

### Facts

- Morgan, using the schematic created by Puerto5, builds the transaxle of claim 1 by:
  - Following the schematic exactly and not altering the design.
  - Selecting steel, a common material used in the RC car industry, to build transaxles.

### Claim 2

The transaxle of claim 1, wherein the casing is constructed from steel.

- Are Ruth and Morgan proper joint inventors of the claimed invention?

## Transaxle for remote control car (Cont.)

Ruth and Morgan's contribution	Morgan's contribution	Analysis of the contribution
Recognized a problem; Prompted the AI system to solve the problem; Reviewing the AI output		As in scenario 1, Ruth and Morgan's contributions to identifying a problem and prompting Puerto5 to solve that problem are not significant
	Reduced the transaxle to practice	Gp3 – Reducing an invention to practice alone is not a significant contribution that rises to inventorship
	Selected steel for the building the design	Selecting of a well-known material is insignificant in quality when compared to the full scope of the claimed invention (Second <i>Pannu</i> factor)

**Gp3:** Reducing an invention to practice alone is not a significant contribution that rises to the level of inventorship.

**The second *Pannu* factor** – Each named inventor must 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.

## Transaxle for remote control car (Cont.)

### ***Pannu* Factor Analysis**

- First *Pannu* factor – None of the Ruth and Morgan’s contributions are considered a significant contribution to the conception of the claimed invention under the first *Pannu* factor.
- Second *Pannu* factor – Selection of a well-known material is an insignificant contribution, when compared to the invention as a whole.

The second *Pannu* factor – Each named inventor must 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

- Simply providing routine or expected inputs to an AI system could be an exercise of normal skill expected of one skilled in the art that is considered insignificant in quality.
- The inventorship analysis fails the first and second *Pannu* factors, and thus, *Ruth and Morgan are not the joint inventors of claim 2*.

## Scenario 3

### Facts

- Ruth and Morgan prompt Puerto5 to provide alternative transaxle designs
- Puerto5 outputs an alternative design with a casing separable along a horizontal (as opposed to vertical) plane
- Ruth and Morgan experiment with this alternative design and create a new different design
- Morgan further designs a clip fastener for the new design.

## Transaxle for remote control car (Cont.)

### Claim 3

A transaxle comprising:

an elongated casing;

a transmission;

said transmission being separate from said casing and removably mounted within the lower two thirds of said casing;

axle shafts extending from the lower two thirds of said casing;

said casing being defined by two separable casing elements wherein the separation of said casing elements is along a horizontal plane that is parallel to the axle shafts;

wherein said casing elements are separable at a location within the upper third of said casing; and

a clip fastener on said transmission that removably mounts the transmission to one of said separable casing elements.

- Are Ruth and Morgan proper joint inventors of claim 3?



## Transaxle for remote control car (Cont.)

Ruth and Morgan's Contribution	Analysis of Contribution
Created the new design based upon a suggestion from the AI system including: <ul style="list-style-type: none"> <li>• Elongated case</li> <li>• Specific placement of elements in cases</li> <li>• Specific location of separation in casing</li> </ul>	Gp1 – a natural person's use of an AI system in creating an AI-assisted invention does not negate the person's contribution as an inventor
	Original design by a natural person and a significant element of the claimed invention

### Pannu factor Analysis

- First *Pannu* Factor - The new design and the clip fastener are significant contributions to the claimed invention
- Second *Pannu* Factor - Ruth and Morgan's experimentation on the general idea resulted in a specific arrangement and design of the clip fastener. These are integral elements of the claimed invention.
- Third *Pannu* Factor - Contributions are not the result of explaining the current state of the art or well-known concepts.
- Since the contributions of Ruth and Morgan satisfied all three *Pannu* factors, Ruth and Morgan are inventors of claim 3.

# Takeaways

- Watch out for patent applications claiming priority based on a patent application(s) from Australia and South Africa.
- Ask your client if AI was involved as an inventor(s).
- Determine whether there were significant contributions by humans (using the *Pannu* factors)
  - First *Pannu* factor: Determine whether each named inventor has significantly contributed to the definite and permanent idea of the complete and operative invention as it is thereafter applied in practice.
  - Second *Pannu* factor: Determine whether each named inventor made contribution to the claimed invention that is not insignificant in quality.
  - Third *Pannu* factor: Determine whether the inventor did more than merely explain to the real inventors well-known concepts and/or the current state of art.

# Takeaways

- There are no requirements to disclose the AI involvement. If patentability of a claim is in issue, the Examiner *may* require disclosure of the AI involvement.
  - If the invention is determined to be made by AI, the claim(s) may be subject to the rejections under 35 U.S.C. § 101 and/or § 115.
  - However, it is not likely that the Examiner determines during prosecution that an AI has made the invention.

(discussed during the Q&A session in the video)

AI: I worked so hard . . .



## Resources

- Executive Order (EO 14110 of October 30, 2023)
- Federal Register (A Notice by the Patent and Trademark Office on 02/13/2024)
- Inventorship guidance for AI-assisted inventions
  - <https://www.uspto.gov/sites/default/files/documents/inventorship-guidance-for-ai-assisted-inventions.pdf>
  - <https://rev-vbrick.uspto.gov/#/videos/7acc291a-7235-40cd-a533-d552969f7d8e>

# How good is AI in inventing things?

- **Task for MS Copilot:**
  - Invent a fuel injection control that improve fuel efficiency while driving on an uphill road. When driving uphill, fuel efficiency remains a crucial concern. Here are some techniques to manage fuel injection while ascending slopes without compromising consumption:
- **Answer:**
  - **Adaptive Gradient-Aware Fuel Injection (AGAFI)**
  - **Concept Overview**
  - The AGAFI system dynamically adjusts fuel injection parameters based on the road gradient (slope) to optimize fuel economy during uphill travel. By intelligently modulating the fuel delivery process, it ensures efficient combustion while maintaining drivability.
- **Key Components and Functionality**
  1. Gradient Detection Module:
    - Utilizes vehicle sensors (such as inclinometers) to detect uphill or downhill road segments.
    - Measures the slope angle and communicates it to the AGAFI control unit.

# How good is AI in inventing things? (Cont.)

2. AGAFI Control Unit:
  - Receives gradient information from the detection module.
  - Calculates the optimal fuel injection pulse width based on the slope angle and engine RPM.
  - Adapts the fuel injector's behavior to achieve the desired torque output.
  
3. Fuel Injector Pulse Width Modulation (PWM):
  - During uphill driving:
    - Gradual inclines trigger a slight increase in fuel injection pulse width.
    - AGAFI ensures sufficient torque delivery without excessive fuel consumption.
  - During downhill driving:
    - The system reduces the pulse width to prevent unnecessary fuel enrichment.
    - Gravity assists in maintaining vehicle speed, minimizing engine load.
  
4. Real-Time Feedback Loop:
  - Monitors engine performance, exhaust emissions, and fuel consumption.
  - Adjusts AGAFI parameters dynamically based on driving conditions.

. . . . .

Good research but did not invent anything

# How good is AI in drafting claims

- **Task:**
  - Draft a patent claim on how to control fuel injection during acceleration.
- **Copilot:**
  1. A method for optimizing fuel injection during engine acceleration, comprising the steps of:
    - monitoring engine speed and load parameters;
    - determining the desired air-fuel ratio based on the monitored parameters;
    - adjusting fuel injection timing and duration to achieve the desired air-fuel mixture;
    - modulating fuel pressure to optimize combustion efficiency during acceleration.

Not bad. . .

Thank you.  
Questions?

[mh@bskb.com](mailto:mh@bskb.com)