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Crafting Composition Claims: Federal Circuit Reverses ITC on Polycrystalline Diamond Compact Patent Eligibility

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The U.S. Court of Appeals for the Federal Circuit recently reversed an International Trade Commission decision that found certain composition claims for a polycrystalline diamond compact patent ineligible

This ruling provides valuable insights for companies drafting composition of matter claims in materials science, particularly when the claims involve measurable properties that reflect material structure

Companies drafting composition of matter claims should define a specific, non-natural material with measurable parameters, provide detailed specification support for enablement, and link measurable properties to structural features

In a significant decision for the materials science and patent law communities, the U.S. Court of Appeals for the Federal Circuit has overturned a ruling by the International Trade Commission (ITC) that found certain claims of a polycrystalline diamond compact (PDC) patent ineligible under U.S. patent laws. The case, *US Synthetic Corp. v. International Trade Commission*, decided on Feb. 13, 2025, offers important guidance on the patentability of composition of matter claims involving measurements of natural properties.

US Synthetic Corp. (USS) filed a complaint with the ITC alleging violations of customs laws known as Section 337 based on the importation and sale of products infringing its U.S. Patent No. 10,508,502 ('502 patent), titled “Polycrystalline Diamond Compact.”

A PDC includes a polycrystalline diamond table bonded to a substrate, typically made from a cemented hard metal composite like cobalt-cemented tungsten carbide. PDCs are manufactured using high-pressure, high-temperature (HPHT) conditions. The process involves placing a substrate into a container with diamond particles positioned adjacent to it. Under HPHT conditions and in the

presence of a catalyst (often a metal-solvent catalyst like cobalt), the diamond particles bond together to form a matrix of bonded diamond grains, creating the diamond table that bonds to the substrate.

The '502 patent describes several key properties of the PDC. It exhibits a high degree of diamond-to-diamond bonding and a reduced amount of metal catalyst without requiring leaching. The PDC's magnetic properties reflect its composition, including coercivity, specific magnetic saturation, and permeability.

The patent discloses that USS developed a manufacturing method using heightened sintering pressure (at least about 7.8 GPa) and temperature (about 1400°C) to achieve these properties without resorting to leaching, which can be time-consuming and may decrease the mechanical strength of the diamond table.

ITC's Initial Determination

The ITC initially found the asserted claims infringed and not invalid under Sections 102, 103, or 112 of U.S. patent laws. However, it determined they were patent ineligible under Section 101, preventing a finding of a Section 337 violation. Specifically, the ITC concluded the asserted claims were directed to the "abstract idea of PDCs that achieve . . . desired magnetic . . . results, which the specifications posit may be derived from enhanced diamond-to-diamond bonding," and that the magnetic properties are merely side effects of the unclaimed manufacturing process.

Federal Circuit's Analysis

The Federal Circuit focused its analysis on claim 1 and 2 of the '502 patent. Claim 1 recited, "a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including: a plurality of diamond grains bonded together via diamond-to-diamond bonding … a catalyst including cobalt … wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to about 250 Oe; wherein the unleached portion of the polycrystalline diamond table exhibits a specific permeability less than about 0.10 G?cm3/g?Oe." Claim 2, depending from claim 1, further recited, "wherein the unleached portion of the polycrystalline diamond table exhibits a specific magnetic saturation of about 15 G?cm3/g or less."

The court emphasized that the claims were directed to a composition of matter, not a method of manufacture. It noted that USS had developed a way to produce PDCs with high diamond-to-diamond bonding and reduced metal catalyst content without leaching, addressing known issues in the field.

The Federal Circuit delved deeper into the relationship between the claimed magnetic properties and the structure of the PDC. The court recognized that coercivity, specific magnetic saturation, and specific permeability provide information about the quantity of metal catalyst present and the extent of diamond-to-diamond bonding, which were key features of the inventive PDC. As the court summarized, "Each of these magnetic properties provides information about the quantity of metal catalyst present in the diamond table and/or the extent of diamond-to-diamond bonding."

The court also highlighted the importance of the specification's disclosure, which included comparative data between the claimed PDCs and conventional PDCs. This data demonstrated that the claimed PDCs exhibited significantly less cobalt content and a lower mean free path between diamond grains than prior art examples. The court recognized that the prior art examples "exhibit a lower coercivity indicative of a greater mean free path between diamond grains and thus may indicate

relatively less diamond-to-diamond bonding between the diamond grains."

The Federal Circuit engaged in the two-step analysis established by *Alice Corp. v. CLS Bank International*. Applying *Alice* step No. 1, the court determined that the claims were directed to a specific composition of matter having particular characteristics, rather than being directed to an abstract idea and did not reach *Alice* step No. 2. The court found that, in view of the recitation of "a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table," a "plurality of diamond grains," a "catalyst including cobalt," and the limitations of magnetic properties, dimensional parameters, and the interface topography between the polycrystalline diamond table and substrate, the claims are plainly directed to matter.

In so holding, the court found the ITC erred when it concluded that the asserted claims are directed to the "abstract idea of PDCs that achieve . . . desired magnetic . . . results, which the specifications posit may be derived from enhanced diamond-to-diamond bonding." The court also disagreed with the commission's apparent expectations for precision between the claimed properties and structural details of the claimed composition. As the court noted, a perfect proxy is not required between the recited material properties and the PDC structure.

The court also affirmed the ITC's finding that the claims were enabled under Section 112, indicating that the specification provided sufficient information for a person of ordinary skill to make and use the invention without undue experimentation. This determination was based on the detailed manufacturing methods and examples provided in the patent specification.

Takeaways

This decision provides valuable guidance for patent practitioners in the materials science field and reinforces the importance of carefully crafting claims and specifications to withstand Section 101 challenges. Composition of matter claims can remain patent-eligible under Section 101 even when they involve measuring natural properties, as long as they claim a non-naturally occurring composition.

When drafting claims for materials science inventions, practitioners should consider including specific, measurable parameters that distinguish the invention from naturally occurring substances or prior art.

The decision also highlights the importance of providing detailed descriptions in the specifications of how to measure claimed properties and how they relate to the composition's structure or function.

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