

NOTE: This disposition is nonprecedential.

**United States Court of Appeals  
for the Federal Circuit**

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**IN RE: ASPEN AEROGELS, INC.,**  
*Appellant*

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2019-2176

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Appeal from the United States Patent and Trademark  
Office, Patent Trial and Appeal Board in No. 14/446,663.

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Decided: November 24, 2020

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POONGUNRAN MUTHUKUMARAN, Aspen Aerogels, Inc.,  
Northborough, MA, for appellant. Also represented by  
CHRISTOPHER JAMES STOW.

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Before DYK, SCHALL, and HUGHES, *Circuit Judges*.

HUGHES, *Circuit Judge*.

Aspen Aerogels, Inc. applied for a patent on a layered  
reinforced aerogel product. The examiner issued a final

rejection finding the pending claims obvious under 35 U.S.C. § 103, and the Patent Trial and Appeal Board affirmed. On appeal to this court, Aspen argues that the prior art does not teach layers as required by the claims, and that the pending claims are therefore nonobvious. Because we conclude that the Board's factual findings were supported by substantial evidence and because we agree with the Board's conclusion of obviousness, we affirm.

## I

Aspen filed Patent Application No. 14/446,663 (the '663 application) regarding layered reinforced aerogel.

Aerogels are effective insulating materials, but they are fragile on their own, so many applications require adding reinforcing structures. One way to create reinforced aerogel is to pour a liquid form of aerogel into a fibrous material and then dry the aerogel. The fibers inside then strengthen the otherwise fragile structure.

The '663 application claims a layered structure, where one layer is fiber-reinforced aerogel and a second layer is another fiber-containing material that may or may not be fiber-reinforced aerogel. In this structure, the fibers of the first layer are interlaced with the fibers of the second layer. Claim 1 is representative:

A composite comprising at least one first ply of fiber-reinforced aerogel material adjacent to at least one second ply of fiber-containing material, wherein fibers from the at least one first ply of fiber-reinforced aerogel material are interlaced with fibers from the at least one second ply of fiber-containing material.

The examiner rejected pending claims 1–19 of the '663 application as obvious under 35 U.S.C. § 103, and the Board affirmed.

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## II

The examiner found two pieces of prior art that render the claims in Aspen's application obvious: U.S. Patent App. No. 2002/0094426 (Stepanian) and the English translation of the Abstract of Japanese Patent No. 2000-080549 (Sano). The examiner found that Stepanian, which is owned by Aspen, teaches aerogel composites with multiple layers of fiber-containing material. Stepanian teaches placing layers of fibrous material adjacent to each other and then filling those layers with aerogel, thereby creating an aerogel structure that contains multiple layers of fibrous materials. While the examiner found that Stepanian does not teach interlacing the layers of fiber, the examiner determined that Sano teaches connecting fibrous materials by interlacing fibers through a technique known as needle punching. The examiner determined that it would have been obvious to one of ordinary skill in the art to modify Stepanian's composite by needle punching the fiber reinforced layer of the composite in view of Sano's teaching, thereby creating a composite where layers of reinforced aerogel have interlaced fibers.

## III

“Whether a claimed invention would have been obvious is a question of law, based on factual determinations regarding the scope and content of the prior art, differences between the prior art and the claims at issue, the level of ordinary skill in the pertinent art, [and] the motivations to modify or combine prior art[.]” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015). We review the Board's legal decisions de novo and its factual determinations for substantial evidence. *Id.* Substantial evidence “means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.” *Consol. Edison Co. v. N.L.R.B.*, 305 U.S. 197, 229 (1938).

## A

The key inquiry here is whether Stepanian teaches aerogel composites with multiple layers of fiber-containing material as determined by the examiner and the Board. Aspen argues that this issue is a legal question of claim construction that we should review de novo. Aspen contends that the dispute is whether the meaning of the terms “layer” and “ply” includes the structure in Stepanian: multiple sheets of fibrous material within a monolithic piece of aerogel. We do not find Aspen’s characterization of the issue persuasive. There is no formal construction of the term “layers” that Aspen disputes. Aspen merely asserts that the Board must have misunderstood the meaning of the term layers if the Board thought that the prior art included layers. Instead, we determine the issue to be a factual question of whether the prior art teaches an *undifferentiated* mass of aerogel or teaches *layers* of fiber-reinforced aerogel as the Board determined. We review this issue for substantial evidence. *Belden Inc.*, 805 F.3d at 1073.

## B

There is substantial evidence that the prior art teaches a reinforced composite material with the same layered properties as the patent, and we find Aspen’s arguments to the contrary unpersuasive. Based on these findings, we agree with the Board that the pending claims are obvious.

Aspen argues that the prior art does not teach a layered composite. In the appellant’s view, Stepanian does not include meaningful layers because the aerogel is poured over the fibrous material at once, rather than separately over each layer. But there is little reason to think that the different order of steps in Stepanian results in a different product than the application at issue. As the examiner stated:

Even though Stepanian refers to the resulting structure as monolithic since the structure began

with a laminate comprising a first ply and a second ply of fiber reinforced material, the final product would also have a first ply and a second ply except for now, as a result of the process, the plies each contain fiber reinforced material aerogel material.

*Ex Parte* Bullock, No. 2017-009313, 2019 WL 2318893, at \*3 (P.T.A.B. May 22, 2019).

Whether layers of fibrous material are filled with aerogel and then stacked or stacked and then filled with aerogel makes no difference if the result is the same as the claimed composite here.

Aspen also contends the prior art does not teach the key insight of the invention here. In the appellant's view, one of the key innovations is the ability to attach a layer of fiber-reinforced aerogel material to a separate layer of different fiber-containing material. However, this innovation is not captured in the claim language. Claim 1 broadly lists a composite material where one layer is "fiber-reinforced aerogel material" and a second layer is any "fiber-containing material." Nothing in claim 1 or subsequent claims prevents the second layer from also being fiber-reinforced aerogel. Indeed, claim 5 is directed to a composite "wherein the second ply of fiber-containing material comprises a fiber-reinforced aerogel." J.A. 40. Moreover, the claim is not a product by process claim, so the allegedly inventive method employed to reach the claimed product is of little importance if the product itself would have been obvious to an artisan.

### C

It is undisputed that claim 1 is representative of most of the claims, but Aspen separately argues that claims 13 and 19 narrow the patent by requiring that the "first layer" and "second layer" have "surfaces" that are "adjacent" to each other. In Aspen's view, Stepanian does not teach adjacent surfaces because the composite in Stepanian is one

monolithic whole. However, this argument is little more than a restatement of Aspen's earlier contention that Stepanian does not teach layers. Once it is understood that the prior art teaches stacked layers of fiber-reinforced aerogel, it is also clear that these layers have surfaces that are adjacent to each other. Further, if we were to accept Aspen's argument that layers in a well-integrated product cannot have surfaces, we likely would also have to declare that the layers in the claims at issue do not have surfaces because they are "interlaced," which would make claims 13 and 19 incoherent. Thus, claims 13 and 19 are obvious for the same reasons claim 1 is obvious.

#### IV

The Board found persuasive evidence that the claimed composite would have been obvious to a person skilled in the art in light of Stepanian and Sano. The prior art teaches a layered fiber-containing aerogel structure, and there is a substantial evidence that an artisan would have known to interlace the layers of fibers. We therefore agree with the Board's legal conclusion that claims 1–19 are invalid under 35 U.S.C. § 103.

**AFFIRMED**