

# United States Court of Appeals for the Federal Circuit

03-1078

AFG INDUSTRIES, INC.  
and ASAHI GLASS COMPANY, LTD.,

Plaintiffs-Appellants,

v.

CARDINAL IG COMPANY, INC.,

Defendant-Appellee,

and

ANDERSEN WINDOWS, INC.,

Defendant.

Richard D. Kelly, Oblon, Spivak, McClelland, Maier & Neustadt, P.C., of Alexandria, Virginia, argued for plaintiffs-appellants. With him on the brief were Stephen G. Baxter, William T. Enos and Andrew M. Ollis.

V. Bryan Medlock, Jr., Sidley Austin Brown & Wood LLP, of Dallas, Texas, argued for defendant-appellee. With him on the brief was Nathanael G. Barnes.

Appealed from: United States District Court for the Eastern District of Tennessee

Judge Thomas Gray Hull

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DECIDED: July 13, 2004

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Before NEWMAN, MICHEL, and RADER, Circuit Judges.

Opinion for the court filed by Circuit Judge RADER. Dissenting opinion filed by Circuit Judge NEWMAN.

RADER, Circuit Judge.

On summary judgment, the United States District Court for the Eastern District of Tennessee ruled that Cardinal IG Co. (Cardinal) did not infringe U.S. Patent No. 4,858,532. AFG Indus., Inc. v. Cardinal IG Co., No. 2:96-CV-244 (E.D. Tenn. Oct. 1, 2002). Because the district court erred in granting summary judgment of noninfringement, this court vacates and remands.

## I.

This litigation began in 1996, when AFG Industries, Inc. and Asahi Glass Co. (collectively, AFG) sued Cardinal and Andersen Windows, Inc.<sup>[1]</sup> for infringing the '532 patent. The '532 patent claims a glass

window with a coating to reflect infrared light and, thus, to reduce heat transfer through the glass. The patent's sole claim recites:

A transparent laminated product comprising  
a transparent substrate and  
a 5-layered transparent coating composed of  
a first ZnO layer formed on the substrate,  
a second Ag layer formed on the first layer,  
a third ZnO layer formed on the second layer,  
a fourth Ag layer formed on the third layer and  
a fifth ZnO layer formed on the fourth layer,  
and having a visible ray transmission of at least 60%,  
wherein the thickness of each Ag layer is from 60 to 250 Å.

'532 patent, col. 10, ll. 59-67 (paragraphing added).

Cardinal markets low-emissivity glass that are known as LoE<sup>2</sup> products. To produce its LoE<sup>2</sup> products, Cardinal uses magnetron sputter deposition. This sputter deposition method moves a glass sheet through coat zones. In each coat zone, the method deposits a thickness of material on the glass. The deposited material may be, for example, silver (Ag) in one zone and zinc (Zn) in another. Furthermore, this deposition method also permits the manufacturer to control the atmosphere in each zone to provide nonoxidized or oxidized deposition. Zinc deposited in an oxygenated atmosphere, for instance, produces a layer of zinc oxide (ZnO). Although discussing the method of depositing layers of zinc oxide, this court recognizes that the '532 claim is a product claim that covers this inventive glass structure however it is made or however it is used. See Vanguard Prods. Co. v. Parker Hannifin Corp., 234 F.3d 1370, 1372 (Fed. Cir. 2000) (explaining that “[t]he method of manufacture . . . does not of itself convert product claims into claims limited to a particular process”).

In depositing material, the manufacturer may also deposit the same material consecutively, which would increase the thickness of deposited material, such as zinc oxide. This appeal asks, in part, whether sequential applications of a single material produce a single layer or multiple layers. Cardinal's accused LoE<sup>2</sup> products contain a center thickness of zinc oxide produced by at least three separate depositions. This appeal also asks, in part, whether certain depositions of titanium dioxide (TiO<sub>2</sub>) have a thickness sufficient to qualify as a layer. Only some of Cardinal's accused LoE<sup>2</sup> products contain

titanium dioxide of disputed thickness.

Roughly a year after AFG filed suit, Cardinal moved for summary judgment of, *inter alia*, noninfringement. AFG opposed and cross-moved for summary judgment of literal infringement. After holding a *Markman* hearing, the district court granted summary judgment of noninfringement and dismissed. AFG appealed to this court, which vacated the grant of summary judgment and remanded. *AFG Indus., Inc. v. Cardinal IG Co.*, 178 F.3d 1312, 1999 U.S. App. LEXIS 653, (Fed. Cir. Jan. 5, 1999) (nonprecedential). This court's opinion particularly recommended that the district court precisely determine the meaning of various disputed terms in the claim, including "layer." On remand, the district court construed the claim terms as necessary and granted summary judgment in favor of Cardinal. AFG again appealed, arguing, *inter alia*, that the district court erred in construing various terms, including "layer."

This court examined the claim and interpreted "layer" to mean "a thickness of material of substantially uniform chemical composition, but excluding interlayers having a thickness not to substantially affect the optical properties of the coating." *AFG Indus., Inc. v. Cardinal IG Co.*, 239 F.3d 1239, 1250 (Fed. Cir. 2001). While basing its opinion primarily on the claim language and the written description, this court also considered the effect of a prior art patent, U.S. Patent No. 4,943,484 to Goodman (the Goodman patent) on its reading of the claim. *Id.* at 1249-50. In fact, this court rejected Cardinal's original argument that "layer" means "a thickness of a material of uniform chemical composition bounded by a material of a different chemical composition":

Cardinal appears to have advocated applying this further limitation so that a prior art patent, U.S. Patent No. 4,943,484 to Goodman (that appears to disclose sequential deposits of zinc oxide/silver/zinc oxide/zinc oxide/silver/zinc oxide), would constitute a five layer coating and thus anticipate the asserted claim. However, the specification of the '532 patent nowhere limits the term "layer" to a deposit bounded by a material of a different chemical composition. We thus decline to include such a limitation in our construction of the term "layer."

*Id.* at 1250. After construing "layer," this court remarked that it made "no determination as to whether a chemical compound that has been deposited in multiple separate, sequential applications, without intervening layers or interlayers, constitutes a single 'layer.'" *Id.* Instead, that was "a matter for the trial court to resolve in a manner consistent with our claim construction." *Id.*

On remand, the district court reevaluated the claim construction in light of this court's opinion and again held on summary judgment that Cardinal did not infringe the '532 patent. In particular, the district court determined, as it understood this court to have instructed, that a "layer" was defined further by its method of formation. Because the accused products contain multiple, sequentially deposited layers of zinc oxide, the trial court determined that Cardinal could not infringe. The district court separately determined that some accused products contain a layer of titanium dioxide, which would also preclude infringement. Although not appealed, the district court also held the Goodman patent did not anticipate the '532 patent.

## II.

This court reviews a grant of summary judgment without deference to the decision of the district court. Williams v. Mehra, 186 F.3d 685, 689 (6th Cir. 1999); Johns Hopkins Univ. v. CellPro, Inc., 152 F.3d 1342, 1353 (Fed. Cir. 1998). Summary judgment is appropriate only where "there is no genuine issue as to any material fact and . . . the moving party is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(c); see also Celotex Corp. v. Catrett, 477 U.S. 317, 322 (1986). "On summary judgment, the evidence must be viewed in the light most favorable to the party opposing the motion, with doubts resolved in favor of the nonmovant." Crown Operations Int'l, Ltd. v. Solutia Inc., 289 F.3d 1367, 1375 (Fed. Cir. 2002) (citations omitted).

Determining infringement is a two-step process. First, the court determines the scope and meaning of the asserted claim. Then, the court compares the properly construed claims with the accused device or product to reach a finding regarding infringement. Johnson Worldwide Assocs., Inc. v. Zebco Corp., 175 F.3d 985, 988 (Fed. Cir. 1999). This court reviews the first determination without deference. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456 (Fed. Cir. 1998). In the context of summary judgment, this court reviews the second determination for genuine disputes of material facts that would preclude a grant of summary judgment. Hilgraeve Corp. v. McAfee Assocs., Inc., 224 F.3d 1349, 1352-54 (Fed. Cir. 2000). In particular, a trial court cannot reach a conclusive finding of noninfringement if the record shows some evidence supporting a finding of noninfringement and some

evidence to the contrary.

On appeal, AFG argues two main points. AFG asserts that the district court erred by finding that the multiple adjacent depositions of zinc oxide in Cardinal's LoE<sup>2</sup> products precluded infringement. AFG also asserts that the district court erred by finding that the deposition of titanium dioxide in some of Cardinal's LoE<sup>2</sup> products precluded infringement.

#### A. *Zinc Oxide*

The sole claim of the '532 patent recites, among other limitations, a 5-layered transparent coating composed of alternating layers of zinc oxide and silver. This court has already construed the term "layer" in the '532 patent to mean "a thickness of material of substantially uniform chemical composition, but excluding interlayers having a thickness not to substantially affect the optical properties of the coating." AFG Indus., 239 F.3d at 1250. Moreover, the '532 claim does not recite a limitation on the thickness of the zinc oxide layers, unlike the silver layers, which must have a thickness ranging from 60 to 250 Å.

That construction is the law of the case, which "generally bars retrial of issues that were previously resolved." Intergraph Corp. v. Intel Corp., 253 F.3d 695, 697 (Fed. Cir. 2001); see also Central Soya Co. v. Geo. A. Hormel & Co., 723 F.2d 1573, 1580 (Fed. Cir. 1983). None of the recognized exceptions to the law of the case doctrine – "the discovery of new and different material evidence that was not presented in the prior action, or an intervening change of controlling legal authority, or when the prior decision is clearly incorrect and its preservation would work a manifest injustice" – apply in this case. Intergraph, 253 F.3d at 698. Therefore, this court is not free to second-guess its prior decision (and even if this court were to reexamine the claim construction, it would reach a conclusion identical to the prior conclusion). This court has established the meaning of "layer." AFG Indus., 239 F.3d at 1250.[2]

With the meaning of "layer" established by this court's earlier ruling, this court's remand left

open only the second step of the infringement analysis, namely the application of the claim to the accused device. In other words, this court remanded for the trial court to determine as a matter of fact “whether a chemical compound that has been deposited in multiple separate, sequential applications, without intervening layers or interlayers, constitutes a single ‘layer.’” *Id.* This court’s remand did not invite further refinements in the meaning of the term “layer,” as Cardinal argues. Rather, this court requested the trial court to apply the established claim construction to the accused products. That inquiry requires, of course, comparison of the ’532 claim to Cardinal’s LoE<sup>2</sup> products. *See, e.g., Johnson Worldwide*, 175 F.3d at 988.

In forming the accused LoE<sup>2</sup> products, Cardinal successively deposits 200 Å of zinc oxide until achieving a thickness ranging from 600 to 890 Å. Cardinal asserts that these successive depositions result in 3 to 4.5 layers of zinc oxide, which brings the accused products outside the scope of the ’532 patent’s claim. In essence, Cardinal asks this court to adopt a new construction of the claim that would impermissibly import a process limitation into a pure product claim. *See 3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1371-74 (Fed. Cir. 2003) (holding that “multiple embossed patterns” did not import a process limitation into a structural claim). Much like “multiple embossed patterns” in *3M*, the term “layer” in the ’532 patent does not require any particular method of manufacture. *Cf. Hazani v. United States Int’l Trade Comm’n*, 126 F.3d 1473, 1479 (Fed. Cir. 1997) (holding that “chemically engraved” is a process limitation meaning “asperities of the sort produced by oxidation”); *In re Garnero*, 412 F.2d 276, 279 (CCPA 1969) (holding that “interbonded one to another by interfusion” is a process limitation similar to “intermixed,” “ground in place,” “press fitted,” “etched,” and “welded”). In other words, Cardinal’s process of successive depositions does not provide conclusive information about whether its products contain a single layer of zinc oxide. Multiple depositions of the same material, for instance, would form a single layer if those additional depositions have no optical effect different than that of a single deposition of the same thickness. On the other hand, if multiple depositions do not create a unitary structure having the same optical properties of a single deposition of the same thickness, the product will not have a single layer – not because of the method of application but because of the structure and optical properties resulting from the application.

Thus, multiple depositions are only relevant if they affect the structure and optical properties.

In sum, the determination of whether a particular structure is a “layer” within the meaning of the claim is not affected by the method of creation of that structure. A structure that falls within the meaning of “layer” due to its structure and optical properties remains a single layer whether it was deposited in a single sputtering operation or multiple operations. By the same token, that unitary structure of the same material that constitutes a “layer” does not become multiple layers because the manufacturer decided to deposit it in multiple passes rather than in a single pass. The method of making is not determinative of the structure and properties of a “layer.” Because the trial court considered the method of creating the layer dispositive of its structure and character in the accused LoE<sup>2</sup> products, this court vacates the grant of summary judgment.

The present record before this court discloses, at the very least, genuine issues of material fact on the question of infringement. Indeed, a document internal to Cardinal refers to its products as containing five layers, which would support a factual inference that the successive depositions of zinc oxide form a single layer rather than multiple layers. See AFG Indus., 239 F.3d at 1246. Even though that document predates this court’s construction of “layer” and is not conclusive as to the structure of the accused products, this court notes that a fact-finder may consider it relevant in determining whether Cardinal’s LoE<sup>2</sup> products meet the limitations of the ’532 claim.

Moreover, the record contains analytical evidence that the accused products contain a single middle layer of zinc oxide. Using secondary ion mass spectroscopy, AFG proffered evidence showing no interface between the successive depositions of zinc oxide in the accused products. Without an interface, AFG asserts that the successive depositions result in a thickness of material of substantially uniform chemical composition. Cardinal correctly notes that this court’s claim construction does not require the absence of an interface between successive depositions of the same material to meet the definition of “layer.” Nevertheless, the analytical evidence lends credence to the position that successive depositions create a single layer. At the very least, this evidence creates a genuine issue of material fact about Cardinal’s LoE<sup>2</sup> products’ infringement, particularly when considered in



combination with Cardinal's internal documents stating that the accused products contain a single layer of zinc oxide. See Hilgraeve, 224 F.3d at 1352-54.

## **B. *Titanium Dioxide***

The five-layered transparent coating recited in the sole claim of the '532 patent does not contain any layers of titanium dioxide sandwiched between the alternating layers of zinc oxide and silver. See AFG Indus., 239 F.3d at 1245 (holding that "composed of 'excludes ingredients that would materially affect the basic and novel characteristics of the claimed composition'" (quoting Atlas Powder Co. v. E.I. du Pont De Nemours & Co., 750 F.2d 1569, 1574 (Fed. Cir. 1984) (internal quotations omitted))). AFG argues that the district court erred in holding that Cardinal's LoE<sup>2</sup> products have a layer of titanium dioxide that would place the accused products outside the scope of the claim. In particular, AFG argues – and Cardinal does not contest – that not all of the accused LoE<sup>2</sup> products contain a thickness of titanium dioxide. Accordingly, this court vacates the district court's judgment of noninfringement on the alternative grounds of the titanium dioxide layer. On remand, the trial court will have an opportunity, at a minimum, to examine separate and distinct LoE<sup>2</sup> products separately and distinctly, particularly treating those products containing various thicknesses of titanium dioxide differently from those products without titanium dioxide. Indeed, the trial court may choose to evaluate each category of Cardinal's LoE<sup>2</sup> products individually.

AFG also argues that the district court erred in finding noninfringement of those products that do contain a thickness of titanium dioxide between layers of zinc oxide and silver. AFG's expert testified that a thickness of 35 Å or more of titanium dioxide affects the optical properties of the coating. Because such a thickness would be a "layer" and not an "interlayer" within the meaning of the '532 patent's claim, any of Cardinal's accused products that contain thicknesses of 35 Å or more of titanium dioxide would not infringe the claim. In making some (again, not all) of the LoE<sup>2</sup> products, Cardinal typically deposits a thickness of 20 Å of titanium, then exposes that thickness to oxygen to form titanium dioxide. During the oxidation, the thickness of 20 Å can grow to a thickness of up to 40 Å.

The quantum of growth, however, does not appear to be certain. Moreover, the record does not show incontrovertible evidence regarding the basic inquiry, that is, whether the thicknesses titanium dioxide – regardless of whether it is 20 or 40 Å – in Cardinal’s LoE<sup>2</sup> products affect the optical properties of the coatings. Accordingly, this court perceives genuine issues of material fact that preclude summary judgment on this point as well. See Hilgraeve Corp., 224 F.3d at 1352-54.

### III.

Because genuine issues of material fact preclude summary judgment of noninfringement of the '532 patent, this court vacates and remands.

### COSTS

Each party shall bear its own costs.

VACATED AND REMANDED.

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NEWMAN, Circuit Judge, dissenting.

I respectfully dissent from the panel's decision to remand this case for the third time on the issue of claim construction with respect to the claim term "layer." Claim construction is a matter of law, and as such it receives de novo review. The purpose is objective correctness; the record is complete, the question is ripe. It is time for decision, not for remand.

There have been three Markman hearings and now three appeals, all directed to the meaning of the term "layer." For the first two hearings the definition was applied to the titanium dioxide deposits, and in the second appeal this court held that a layer is a material of optically significant uniform chemical composition. In the third Markman hearing the district court held that Cardinal's multiple deposits of its center zinc oxide component produced multiple layers. This court now appears to hold that its definition in the previous appeal, wherein "layer" was defined in the context of the "interlayers" of titanium dioxide, bars the district court from considering the additional aspect of whether multiple sputtering deposits can produce multiple "layers," unless they affect the structure and optical properties. However, when the later claim construction is made in a different technical context from that which was earlier considered, in the interest of correctness the court must consider the new context.

This case was filed in 1996. Before the district court the parties produced extensive evidence, in the form of expert and other witness testimony, and physical exhibits and demonstrations. The district court has three times held, on summary judgment upon deciding the legal question of claim construction, that there is no infringement. It is a relatively simple technical question, for which the

record is fully developed. After eight years this question of law requires finality, not a fourth cycle of Markman hearing and appeal. From my colleagues' remand for this purpose, I respectfully dissent.

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[1] Under a joint stipulation, the district court severed Andersen Windows and stayed the action against it pending the outcome of this litigation between AFG and Cardinal.

[2] This court does not suggest that a district court should in all circumstances avoid refining an ambiguous claim construction. See, e.g., Utah Med. Prods., Inc. v. Graphic Controls Corp., 350 F.3d 1376, 1381-83 (Fed. Cir. 2003) (affirming the district court's claim construction, which was amended to clarify the meaning). In the precise circumstances of this case, however, this court perceives no ambiguity or necessity to amend its earlier claim construction.