United States Court of Appeals for the Federal Circuit

BASF CORPORATION,
Plaintiff-Appellant

v.

JOHNSON MATTHEY INC.,
Defendant-Appellee

2016-1770

Appeal from the United States District Court for the District of Delaware in No. 1:14-cv-01204-SLR-SRF, Judge Sue L. Robinson.

Decided: November 20, 2017

DEANNE MAYNARD, Morrison & Foerster LLP, Washington, DC, argued for plaintiff-appellant. Also represented by MARC A. HEARRON, SETH W. LLOYD, DANIEL P. MUINO.

DOUGLAS E. MCCANN, Fish & Richardson, P.C., Wilmington, DE, argued for defendant-appellee. Also represented by PATRICK D. COONEY, MARTINA TYREUS HUFNAL, ROBERT M. OAKES.

Before LOURIE, O'MALLEY, and TARANTO, *Circuit Judges*.

TARANTO, *Circuit Judge.*

BASF Corporation owns U.S. Patent No. 8,524,185, which describes and claims systems for performing catalytic conversion of nitrogen oxides (NO_x) in an exhaust gas stream. As relevant here, the patent claims a partly-dual-layer arrangement of coatings on a substrate over which exhaust gas passes—a coat along the full length of the substrate containing "a material composition B effective to catalyze selective catalytic reduction (SCR) of NOx"; and beneath part of that coat, on the outlet end of the gas passage, a partial-substrate undercoat containing "a material composition A effective for catalyzing NH3 oxidation" (ammonia oxidation, or AMOx). '185 patent, col. 19, lines 40–55 (claim 1); *see also id.*, col. 20, lines 3–5 (dependent claim 5, similar); *id.*, col. 20, lines 42–62 (independent claim 17, similar, but adding restrictions concerning precious metals). In 2014, BASF sued its competitor, Johnson Matthey Inc., for infringement of the '185 patent. The district court held that the "effective for catalyzing"/"effective to catalyze" language is indefinite and entered judgment of invalidity of all claims on that basis.

BASF appeals. We have jurisdiction under 28 U.S.C. § 1295(a)(1). We reverse the judgment of invalidity for indefiniteness. We remand for further proceedings in accordance with this opinion.

I

A

The '185 patent claims a partly-dual-layer arrangement of catalytic coatings on a substrate over which exhaust gas passes, *e.g.*, the walls of a flow-through chamber having a honeycomb structure, whose function is to remove NO_x from a stream of exhaust gas while minimizing the amount of ammonia that ends up being released from the system. Claim 1 is representative:

> A catalyst system for treating an exhaust gas stream containing NOx, the system comprising:
>
> at least one monolithic catalyst substrate having an inlet end and an outlet end; an undercoat washcoat layer coated on one the outlet end of the monolithic substrate and which covers less than 100% of the total length of the monolithic substrate, and containing a material composition A effective for catalyzing NH3 oxidation;
>
> an overcoat washcoat layer coated over a total length of the monolithic substrate from the inlet end to the outlet end sufficient to overlay the undercoat washcoat layer, and containing a material composition B effective to catalyze selective catalytic reduction (SCR) of NOx; and
>
> wherein material composition A and material composition B are maintained as physically separate catalytic compositions.

'185 patent, col. 19, lines 40–55. Relevantly similar language about effective catalysis appears in claims 5 and 17, as already noted. The parties have not suggested any distinction among the claims or their language that is material to the point at issue. We focus on the language, "composition . . . effective to catalyze," but our analysis applies equally to "composition . . . effective for catalyzing."

The specification describes the generally contemplated two-phase operation of a partly-dual-layer, two-zone coating system, which involves a full-length coating that is the sole coat for part of the substrate (the first zone) and that lies atop another layer on part of the substrate, toward the outlet of the gas stream (the second zone). The gas stream travels along the substrate from the inlet to the outlet and is exposed, along the full length of the substrate, to "material composition B," which removes

NO_x by catalyzing an SCR reaction between NO_x and ammonia. *Id.*, col. 11, lines 40–47. The ammonia for the reaction may be injected into the gas upstream of the catalysts. *Id.*, col. 3, lines 28–29. That SCR process, however, can leave unreacted ammonia, which, if untreated, might escape through the outlet of the system along with the treated gas stream. *Id.*, col. 1, lines 41–48. The '185 patent's system addresses that problem (so-called "ammonia slip," *id.*, col. 1, line 41) by use of an undercoat layer, beneath a part of the full-length layer of SCR catalyst, toward the outlet end of the substrate. At that dual-layer end of the substrate, the ammonia is exposed to the undercoat, which contains a "material composition A" effective to catalyze an AMOx reaction, reducing the residual ammonia, *see id.*, col. 11, lines 47–52; and the overcoat continues to minimize NO_x via SCR, *id.*, col. 12, lines 37–45.

When referring to compositions A and B, the specification uses the language of "composition . . . effective to catalyze" (or comparable "effective" terminology), *e.g.*, *id.*, col. 2, lines 5, 9, 22, 24; col. 3, lines 9, 14, 33, 38–39; col. 5, lines 40, 48, 55–58, and, in ways that are interchangeable for present purposes, the names "SCR catalyst" and "ammonia oxidation [or AMOx] catalyst," *e.g.*, *id.*, col. 1, lines 30–58; col. 5, lines 38–49; col. 6, lines 48–55; col. 8, lines 4–14, 37–41; col. 10, lines 56–61; col. 11, lines 9–20; col. 11, line 65 through col. 12, line 3; col. 12, lines 13–26. (It also uses certain other terms, such as "SCR composition" and "NH_3 oxidation composition." *E.g.*, *id.*, col. 7, line 58; col. 8, line 48.) The specification sets out the specific stoichiometric chemical reactions for the catalysts. *Id.*, col. 5, lines 33–49. It identifies a variety of materials that can be used for "material composition A" (*e.g.*, "refractory metal oxide[s] containing alumina, silica, zirconia, titania, ceria") and "material composition B" (*e.g.*, an "aluminosilicate molecular sieve [with] one of the crystal framework types FAU, MFI, MOR, BEA"). *Id.*, col.

2, lines 29–58. And it includes various examples of how catalyst layers are prepared and how they perform under practical engine conditions in comparison to the prior art. *Id.*, col. 13, line 54 through col. 19, line 14.

B

In its opening brief on claim construction in this case, BASF urged that the "composition . . . effective to catalyze" phrases have a plain and ordinary meaning, so it proposed simply using those phrases followed by the qualification, "as understood in the art of exhaust systems." J.A. 105. BASF also argued that the phrases are not indefinite, contrary to the contention Johnson had stated in advance of claim construction.

Johnson responded that the phrases are indefinite, because the "effective to catalyze" language used to identify the claim compositions is functional, and there are no "objective boundaries on (1) what amount of effectiveness is required, or (2) how to measure the effectiveness." J.A. 380; *see id.* at 379–93. Johnson's expert, Dr. William S. Epling, filed a declaration in support. He stated that there are effectively a "limitless number" of materials that can catalyze ammonia oxidation or SCR reactions. J.A. 953, 955. Regarding SCR catalysts, he stated that the materials listed in the '185 patent specification were known in the art to be effective catalysts for SCR of NO_x. Regarding AMOx catalysts, Dr. Epling listed various materials he considered to be known in the art as effective catalysts. He also stated that "objective standards," such as "percent conversion," exist in the field of catalysis to test and quantify catalytic function. J.A. 957. Nevertheless, he concluded that the claims here are indefinite because the materials given in the specification are not an "exhaustive list" and the patent "does not define the level of function required to be considered 'effective'" or the "particular conditions" under which a material would have to be effective. J.A. 954, 956; *see* J.A. 954–58. For

those reasons, Dr. Epling opined, a person of ordinary skill in the art "would not be able to determine with reasonable certainty the boundary of which materials are included within" the claims. J.A. 955; *see* J.A. 953–56.

In reply, BASF argued that the claims are not indefinite. It rejected Johnson's core contentions that the patent had to specify a "level" of effectiveness and the "conditions" under which that level would be achieved. Rather, BASF argued, based on ordinary meaning and the considerable information in the specification about examples and testing conditions, "the disputed 'material composition' limitations" (those at issue here) "should be construed to encompass all compositions known to those of skill in the art that perform the recited SCR or AMOx functions," J.A. 1165, to whatever degree and under whatever conditions would be viewed by a relevant skilled artisan as making the material an SCR or AMOx catalyst, J.A. 1162–68.

BASF attached a declaration from an expert, Dr. Mark Crocker, that responded to Dr. Epling. He stated that a person of ordinary skill in the art would understand "composition . . . effective to catalyze" in the context of the '185 patent to mean a "composition capable of catalyzing" the reaction in question "in a catalyst system for treating engine exhaust gas." J.A. 1318. And he stated that such a "person would be reasonably certain about the scope of the claims from reviewing the '185 patent claims and the specification (including the exemplary compositions, exemplary measurements of catalytic performance, and exemplary evaluation conditions)." *Id.* "[I]t was well-known to persons of ordinary skill in the art that the catalytic performance would vary based on environmental considerations, such as temperature," he said, and "known variance in catalytic performance would not have created confusion among ones of ordinary skill in the art as to whether a material composition was an 'effective' SCR catalyst or an 'effective' AMOx catalyst,

i.e., a material composition that could achieve or perform catalysis." J.A. 1319. He concluded: "The exemplary evaluation conditions identified in the specification are fairly standard and well-known. From these disclosures, one of ordinary skill in the art would be reasonably certain as to what falls within the scope of the material compositions in the disputed terms." J.A. 1322.

When Johnson filed a sur-reply brief, it attached a short additional declaration from Dr. Epling. He asserted that a person of ordinary skill in the art would not interpret the claims of the '185 patent to include "any material that possessed any degree of effectiveness" to catalyze AMOx or SCR of NO_x and that "scientists and engineers in this field do not consider materials that display only a minimal level of SCR or ammonia oxidation function to be a material effective to reduce NOx or to oxidize ammonia." J.A. 1410.

C

The district court agreed with Johnson. The court reasoned as follows:

> Each claim fails to limit the "material composition A" or the "material composition B" to any specific materials. Rather than explicitly defining the material compositions, the claims utilize functional language, specifically "effective," to purportedly define them. In other words, the claims recite a performance property the composition must display, rather than its actual composition. Moreover, none of the claims recite a minimum level of function needed to meet this "effective" limitation nor a particular measurement method to determine whether a composition is "effective" enough to fall within the claims. Without such information, a person of ordinary skill in the art could not determine which materials are within the

> "material composition A" or "material composition B" limitation, and which are not.

J.A. 5. In a footnote, the court, quoting Dr. Epling, added that "'a practically limitless number of materials' exist that would 'catalyze SCR of NOx, even within the normal operating conditions of an exhaust aftertreatment system,' indicating that the claims, as written, fail to sufficiently identify the material compositions." *Id.* at 5 n.10 (quoting J.A. 955).

II

The Supreme Court in *Nautilus, Inc. v. Biosig Instruments, Inc.* held that a patent claim is indefinite if, when "read in light of the specification delineating the patent, and the prosecution history, [the claim] fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." 134 S. Ct. 2120, 2124 (2014). "Reasonable certainty" does not require "absolute or mathematical precision." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1381 (Fed. Cir. 2015) (internal quotation marks omitted). Johnson had the burden of proving indefiniteness by clear and convincing evidence. *Id.* at 1377.

We review a determination of indefiniteness de novo. *Id.* Determinations about governing legal standards and about intrinsic evidence are reviewed de novo, and any factual findings about extrinsic evidence relevant to the question, such as evidence about knowledge of those skilled in the art, are reviewed for clear error. *Id.* at 1377–78, 1382; *see Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841–42 (2015); *UltimatePointer, L.L.C. v. Nintendo Co., Ltd.*, 816 F.3d 816, 826 (Fed. Cir. 2016); *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1342 (Fed. Cir. 2015).

A

Under *Nautilus*, the question presented here is this: would the "composition . . . effective to catalyze" language, understood in light of the rest of the patent and the knowledge of the ordinary skilled artisan, have given a person of ordinary skill in the art a reasonably certain understanding of what compositions are covered? The district court's reasoning supplies no basis to answer that question in Johnson's favor.

The court first described the functional character of the claim language. But the *Nautilus* standard of "reasonable certainty" does not exclude claim language that identifies a product by what it does. Nothing inherent in the standard of "reasonable certainty" precludes a relevant skilled artisan from understanding with reasonable certainty what compositions perform a particular function. Not surprisingly, we have long held that nothing in the law precludes, for indefiniteness, "defining a particular claim term by its function." *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1374–75 (Fed. Cir. 2014); *see Cox Commc'ns, Inc. v. Sprint Commc'n Co. LP*, 838 F.3d 1224, 1232 (Fed. Cir. 2016) (explaining that claims "are not per se indefinite merely because they contain functional language"), *cert. denied*, 137 S. Ct. 2267 (2017); *Microprocessor Enhancement Corp. v. Tex. Instruments Inc.*, 520 F.3d 1367, 1375 (Fed. Cir. 2008) (explaining that "apparatus claims are not necessarily indefinite for using functional language"); *In re Swinehart*, 439 F.2d 210, 212 (CCPA 1971) (ruling that "there is nothing intrinsically wrong with the use of such a technique in drafting patent claims"). What is needed is a context-specific inquiry into whether particular functional language actually provides the required reasonable certainty.

The district court next stated that the claims do not "recite a minimum level of function needed to meet this 'effective' limitation nor a particular measurement meth-

od to determine whether a composition is 'effective' enough to fall within the claims." J.A. 5. By itself, that observation merely describes two things not expressly stated in the claims. But "an inventor need not explain every detail because a patent is read by those of skill in the art." *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1367 (Fed. Cir. 2011). The mere observation of information not "recited" does not answer the question whether a person of ordinary skill in the art would *need* to be given the level and measurement information to understand, with reasonable certainty, whether a composition is "effective to catalyze" the SCR (of NO_x) or AMOx reactions.

Indeed, the district court did not treat the mere observation about information not "recited" as itself answering the question. The court immediately went on to declare that "[w]ithout such information, a person of ordinary skill in the art could not determine which materials are within the 'material composition A' or 'material composition B' limitation, and which are not." J.A. 5. That sentence is the crucial sentence in the district court's analysis.

The problem with that sentence, however, is that it is entirely unsupported, whether by reference to the specification or other intrinsic evidence or by reference to extrinsic evidence. Such support was central to our determination that indefiniteness of certain physical-property claims was proved in cases such as *Dow Chemical Co. v. Nova Chemicals Corp. (Canada)*, 803 F.3d 620, 633–35 (Fed. Cir.), *rehr'g denied*, 809 F.3d 1223 (Fed. Cir. 2015); *Teva*, 789 F.3d at 1342–45; *Halliburton Energy Services, Inc. v. M-I LLC*, 514 F.3d 1244, 1252–54 (Fed. Cir. 2008); and *Honeywell International, Inc. v. International Trade Commission*, 341 F.3d 1332, 1340–42 (Fed. Cir. 2003). The district court's analysis in the present case lacks such support for its conclusion about what a

relevant skilled artisan could determine without more information than the patent here provides.

The district court's analysis does not consider that the specification makes clear that it is the arrangement of the SCR and AMOx catalysts, rather than the selection of particular catalysts, that purportedly renders the inventions claimed in the '185 patent a patentable advance over the prior art. As a result, the claims and specification let the public know that any known SCR and AMOx catalysts can be used as long as they play their claimed role in the claimed architecture. The district court's analysis also does not address the significance of the facts that both the claims and specification provide exemplary material compositions that are "effective" to catalyze the SCR of NO_x and the oxidation of ammonia, disclose the chemical reactions that define the "SCR function" and "NH_3 oxidation function," '185 patent, col. 5, lines 33–49, and illustrate through figures, tables, and accompanying descriptions how the purportedly novel arrangement of the catalysts results in improved percent conversion of ammonia and improved nitrogen selectivity, *see id.*, cols. 13–19.

The district court's footnote adds nothing helpful to Johnson. It credits Dr. Epling's assertion that "a practically limitless number of materials" could catalyze SCR of NO_x, and it treats that scope as "indicating that the claims, as written, fail to sufficiently identify the material compositions." J.A. 5 n.5. But the inference of indefiniteness simply from the scope finding is legally incorrect: "breadth is not indefiniteness." *SmithKline Beecham Corp. v. Apotex Corp.*, 403 F.3d 1331, 1341 (Fed. Cir. 2005) (internal brackets omitted).

B

In this court, Johnson has supplemented the district court's reasoning. But we do not find persuasive support for the necessary conclusion that a relevant skilled arti-

san would lack reasonable certainty as to what compositions are "effective to catalyze" the reactions at issue—or, equivalently, what compositions are SCR catalysts or AMOx catalysts—in the context of this patent.

Johnson suggests that certain intrinsic evidence shows that this particular patent departs from a relevant skilled artisan's general understanding of what constitutes an SCR or AMOx catalyst and, instead, requires some minimal level of catalysis but fails to identify that level. In particular, Johnson points to language describing a certain catalyst (Q) that the patent calls an "SCR-only" catalyst, which under some conditions had a low "NH_3 percent conversion" and under other conditions had a conversion percent higher than another catalyst (P) that the patent calls an "SCR+AMOx catalyst." '185 patent, col. 18, lines 3–9 & tbl. 2; *id.* figure 10. From that material in the specification, and another passage referring to "AMOx-only parts," *id.,* col. 18, line 1, Johnson infers that this patent requires, but fails to specify, a distinctive, patent-specific set of criteria for what constitutes an SCR catalyst or an AMOx catalyst.

Johnson has read too much into the specification. Contrary to Johnson's essential contention in this specification-based argument, it strongly appears that the language on which Johnson relies—"SCR-only," "AMOx-only," and "SCR+AMOx"—does not refer to whether a composition can produce only one or the other or both of the catalytic reactions. Instead, the language refers to the catalysts being located in different "zones" on the substrate. For example, the specification describes the "upstream zone compris[ing] an SCR catalyst washcoat layer disposed on the carrier and the downstream zone compris[ing] an undercoat layer containing an NH_3 oxidation component disposed on the carrier and an SCR catalyst washcoat layer disposed on at least a portion of the undercoat layer." *Id.*, col. 11, lines 15–20. The specification goes on to describe the upstream portion as the

"SCR zone" and the downstream portion as the "AMOx zone." *Id.*, col. 11, lines 29–30, 49–50. The labels, as merely structure-describing shorthands, do not carry the implications that Johnson urges. Johnson has given us no persuasive reason to conclude that a relevant skilled artisan, reading the claims in light of the specification, would conclude that this patent departs from such an artisan's general understanding and instead adopts a special, patent-specific standard without identifying what it is.

The intrinsic evidence in this case makes clear that the asserted advance over the prior art is in the partly-dual-layer arrangement to create a two-phase operation for performing the identified conversion processes, not in the choices of materials to perform each of the required catalytic processes. It is in this context that the question of the certainty or uncertainty experienced by a relevant skilled artisan in understanding the claims, read in light of the specification, is presented. And it is in this context that the relevant skilled artisan would be informed by the specification's numerous examples of qualifying compositions A and B, disclosure of the stoichiometric reactions, and equating of the "composition . . . effective to catalyze" phrases with familiar terms such as "SCR catalyst" and "AMOx catalyst."

The extrinsic evidence does not show that a person of ordinary skill in the art would lack reasonable certainty as to what compositions would qualify as an SCR or AMOx catalyst in this context. To the contrary, the record here could not support a finding of lack of such reasonable certainty.

Both parties' experts agreed that materials capable of performing the claimed reactions were known in the art at the time of the invention. The experts also agreed that objective tests to determine the effectiveness of the catalysts in question, *e.g.*, percent conversion, were available

and well known at the time. BASF's expert declared, with explanation, that "one of ordinary skill in the art would be reasonably certain as to what falls within the scope of the material compositions in the disputed terms." J.A. 1322. And Johnson's expert, Dr. Epling, did not provide substantial evidence to the contrary.

Dr. Epling's declaration describes his own work with "SCR catalysts," speaks of "ammonia oxidation catalysts," gives examples of materials that can catalyze under which conditions, and identifies materials that would "to some measurable extent[] catalyze the oxidation of ammonia if used to treat diesel engine emissions." J.A. 951, 953. In those ways, Dr. Epling's declaration implicitly confirms that the terms at issue are ones whose scope is understood with reasonable certainty by relevant skilled artisans. Dr. Epling's declaration also states: "In my experience, scientists and engineers in th[e] field do not consider materials that display only a minimal level of SCR or ammonia oxidation function to be a material effective to reduce NOx or to oxidize ammonia." J.A. 1410. That assertion does not contradict the position of BASF and its expert, which was that relevant skilled artisans would reasonably understand what level (under what conditions) qualify a composition as a claimed catalyst. In fact, Dr. Epling's assertion tends to confirm the existence of just that understanding.

This record, we conclude, does not contain intrinsic or extrinsic evidence that would support a judgment of indefiniteness.

III

For the foregoing reasons we reverse the district court's judgment that the claims of the '185 patent are indefinite. We remand for further proceedings.

REVERSED AND REMANDED