

United States Court of Appeals for the Federal Circuit

2006-1633

SINORGCHEM CO., SHANDONG,

Appellant,

v.

INTERNATIONAL TRADE COMMISSION,

Appellee,

and

FLEXSYS AMERICA L.P.,

Intervenor.

Carter G. Phillips, Sidley Austin LLP, of Washington, DC, argued for appellant. With him on the brief were Stephen B. Kinnaird, Stanton T. Lawrence, III, and Paul J. Zegger. Of counsel was Ruthanne Mary Deutsch. Of counsel on the brief were Manni Li, Perkins Coie LLP, of Santa Monica, California, and Joan Ellis, Venable LLP, of Washington, DC.

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Appealed from: United States International Trade Commission

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DECIDED: December 21, 2007

Before NEWMAN and DYK, Circuit Judges, and YEAKEL, District Judge.^{*}

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

DYK, Circuit Judge.

Appellant Sinorgchem Co., Shandong (“Sinorgchem”) appeals from a limited exclusion order of the International Trade Commission (“ITC”) based on a finding that Sinorgchem infringed four method claims of U.S. Patents 5,117,063 (“the ’063 patent”) and 5,608,111 (“the ’111 patent”) owned by intervenor Flexsys America L.P. (“Flexsys”).

^{*} Honorable Lee Yeakel, District Judge, United States District Court for the Western District of Texas, sitting by designation.

In re Certain Rubber Antidegradants, Components Thereof, and Products Containing Same, No. 337-TA-533 (I.T.C. July 13, 2006) (commission opinion). Because the ITC's determination of infringement was based on an erroneous construction of the term "controlled amount" in the claims at issue, and under the correct construction Sinorgchem does not literally infringe, we vacate and remand.

BACKGROUND

Sinorgchem produces in China and sells for importation to the United States a compound known as 6PPD, a rubber antidegradant that counters the deteriorative effect of various environmental factors on tires. 6PPD is made from an intermediate compound, 4-aminodiphenylamine, or 4-ADPA, which Sinorgchem also makes in China. In turn, Sinorgchem makes the intermediates of 4-ADPA using a process that reacts aniline and nitrobenzene. In that reaction, aniline is a solvent, tetramethylammonium hydroxide ("TMAH") is a base, and water is a protic material. The term "protic material" refers to proton donors. The amount of water used in the condensation reaction of nitrobenzene with aniline is at least 10 to 15% water throughout the reaction.

The issue is whether Sinorgchem's method for producing 6PPD and 4-ADPA infringes the asserted method claims of the '063 and '111 patents, owned by Flexsys. The '111 patent issued from a continuation-in-part application to the application that led to the '063 patent and is subject to a terminal disclaimer based on the earlier filed '063 patent. The specification of the '111 patent includes additional Examples 13 through 21 but is otherwise substantially identical to the '063 patent specification. The parties

agree that the term “controlled amount” in both patents should receive the same construction.

At issue are independent claims 30 and 61 of the ‘063 patent and claims 7 and 11 of the ‘111 patent. These claims describe methods for producing 4-ADPA and 6PPD. Claim 61 of the ‘063 patent is representative:

61. A method of producing alkylated p-phenylenediamines [6PPD] comprising the steps of:
- a) bringing aniline and nitrobenzene into reactive contact in a suitable solvent system;
 - b) reacting the aniline and nitrobenzene in a confined zone at a suitable temperature, and in the presence of a suitable base and controlled amount of protic material to produce one or more 4-ADPA intermediates;
 - c) reducing the 4-ADPA intermediates to produce 4-ADPA; and
 - d) reductively alkylating the 4-ADPA of Step c) [which produces 6PPD].

‘063 patent col.15 ll.34-46. The central question is whether Sinorgchem’s method of producing 4-ADPA intermediates satisfies the claim limitations of step (b). There is no dispute that Sinorgchem utilizes steps (a), (c), and (d). The ITC and the private parties particularly focus on a portion of the specification that states: “A ‘controlled amount’ of protic material is an amount up to that which inhibits the reaction of aniline with nitrobenzene, e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent.” Id. at col.4 ll.48-52.

On February 23, 2005, Flexsys filed a complaint with the ITC alleging, among other things, that Sinorgchem was infringing claims 30 or 61 of the ‘063 patent or claims 7 or 11 of the ‘111 patent, and had violated subsection (a)(1)(B) of section 337 of the Tariff Act of 1930, which makes unlawful the importation of articles that either infringe a valid U.S. patent or are produced by a process covered by the claims of a valid U.S.

patent. 19 U.S.C. § 1337(a)(1)(B) (2000). The administrative law judge (“ALJ”) issued a final initial determination (“final ID”) on February 17, 2006, holding that Sinorgchem had infringed the claims and violated section 337. In re Certain Rubber Antidegradants, No. 337-TA-533 (I.T.C. Feb. 17, 2006) (final initial and recommended determinations).

Central to the dispute before the ALJ was the claim construction of the term “controlled amount of protic material” found in each of the asserted independent claims. Sinorgchem urged the ALJ to adopt a construction of “controlled amount of protic material” as “up to about 4% water in the reaction mixture when aniline is the solvent.” J.A. at 108-09. Under this construction, Sinorgchem does not infringe because its process uses more than 4% water.

Flexsys argued that “controlled amount” meant “that the amount of protic material should be controlled between an upper limit and a lower limit,” where the upper limit was “that amount beyond which the reaction between nitrobenzene and aniline is inhibited,” and the lower limit was “that amount below which the desired selectivity for 4-ADPA intermediates is not maintained.” J.A. at 108. Under Flexsys’s claim construction, the Sinorgchem process would infringe.

The ALJ rejected Sinorgchem’s construction and adopted Flexsys’s construction of the term “controlled amount.” Based on this construction, the ALJ concluded that (1) Sinorgchem’s processes for making 4-ADPA and 6PPD literally infringed the asserted claims, (2) the claims as construed were not invalid as indefinite, and (3) the claims were not invalid as obvious in view of the prior art.

On appeal, the ITC rejected the construction of “controlled amount” urged by Flexsys and adopted by the ALJ. It found that the patentee in the specification had

acted as his own lexicographer and expressly defined the meaning of “controlled amount” of protic material as “an amount up to that which inhibits the reaction of aniline with nitrobenzene.” J.A. at 227. However, it excluded from that construction the second clause of the sentence, which stated “e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent.” The ITC read the 4% water limit as inconsistent with other general language found in the same paragraph (quoted below), which the ITC interpreted as teaching that the amount of protic material can change based on other reaction conditions, even where aniline is used as the solvent. Similarly, the ITC read the 4% limit as inconsistent with the reaction in Example 10, where a calculated 10% water level was utilized.

The ITC construed “controlled amount” as specifying an upper limit determined by when protic material “inhibits the reaction of aniline with nitrobenzene.” J.A. at 227. The ITC found that “inhibits” meant inhibits “to the extent where the reaction is no longer significant,” J.A. at 232, and that “significant” in turn meant that the “minimum acceptable conversion rate would be more than 12% but less than 63%,” J.A. at 233-34. In determining what was “significant,” the ITC looked to Example 8 for the conversion rate of nitrobenzene at which a reaction would be considered significant. It found that when DMSO was the solvent, the conversion rate of nitrobenzene drops from 63 to 12% when the amount of water increases from 6 to 9.75%. Sinorgchem’s process, the ITC determined, yields a conversion rate of around 85%. Under this new construction of the disputed term “controlled amount,” the ITC likewise found infringement.

The ITC next concluded that the claims as construed were not invalid as indefinite. Although the ITC rejected the 4% water limit, it found that “controlled amount” was not indefinite since an upper limit – where the amount of protic material yields an acceptable conversion rate between 12 and 63% – could be found in the specification. Given this definition of “controlled amount,” the ITC rejected Sinorgchem’s argument that the claims were indefinite.

As to obviousness, the ITC held that while the asserted prior art – a 1903 German article published by Wohl (the “Wohl” reference) – disclosed the reaction of aniline with nitrobenzene, the formation of a small amount of intermediate, and the presence of water as a protic material, it failed to disclose or teach “whether or how water or any other protic material affects the conversion of nitrobenzene.” J.A. at 245.

Sinorgchem timely appealed the ITC’s decision to our court. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(6).

DISCUSSION

I

The main issue on appeal is the meaning of the claim term “controlled amount.” The parties here agree that “controlled amount” does not have any well-accepted meaning in the field of chemistry. Sinorgchem contends that the ITC misconstrued the term “controlled amount” and on that basis erred in finding infringement. Claim construction is a question of law which we review de novo. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc).

Our opinions have repeatedly encouraged claim drafters who choose to act as their own lexicographers to clearly define terms used in the claims in the specification.

See, e.g., CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed. Cir. 2002) (“[A] claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in . . . the specification”); Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996) (“The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication.”).

The approach of those cases was endorsed in Phillips v. AWH Corp., 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc). In Phillips, we described the specification as “the single best guide to the meaning of a disputed term.” Id. at 1315 (citing Vitronics, 90 F.3d at 1582). We confirmed that “our cases recognize that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs.” Id. at 1316.

Here, the drafters have done just that. The specification states:

A “controlled amount” of protic material is an amount up to that which inhibits the reaction of aniline with nitrobenzene, e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent.

‘063 patent col.4 ll.48-52. The term “controlled amount” is set off by quotation marks—often a strong indication that what follows is a definition. See, e.g., Cultor Corp. v. A.E. Staley Mfg. Co., 224 F.3d 1328, 1331 (Fed. Cir. 2000) (finding that the claim term “water-soluble polydextrose” was expressly defined in the specification). Moreover, the word “is,” again a term used here in the specification, may “signify that a patentee is serving as its own lexicographer.” Abbott Labs. v. Andrx Pharms., Inc., 473 F.3d 1196, 1210 (Fed. Cir. 2007). As such, the patentee must be bound by the express definition.

See Durel Corp. v. Osram Sylvania Inc., 256 F.3d 1298, 1303-04 (Fed. Cir. 2001). Here the drafter clearly, deliberately, and precisely defined the term “controlled amount” of protic material as “an amount up to that which inhibits the reaction of aniline with nitrobenzene, e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent.”¹ Elsewhere in the same paragraph, the specification again refers to the 4% limit.²

¹ Flexsys cites Conoco, Inc., v. Energy & Environmental International, L.C., 460 F.3d 1349, 1358 (Fed. Cir. 2006), Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1249 (Fed. Cir. 1998), and Modine Manufacturing Co. v. International Trade Commission, 75 F.3d 1545, 1551 (Fed. Cir. 1996) for the proposition that a claim construction should not import numerical limits into a claim that does not contain such limits. But cases like these have no application here, where the numerical limit is included within an express definition set forth in the specification.

² The specification states:

Control of the amount of protic material present in the reaction is important. Generally, when the reaction is conducted in aniline, water present in the reaction in an amount greater than about 4% H₂O, (based on volume of the reaction mixture) inhibits the reaction of the aniline with the nitrobenzene to an extent where the reaction is no longer significant. Reducing the amount of water to below the 4% level causes the reaction to proceed in an acceptable manner. When tetramethylammonium hydroxide is utilized as a base with aniline as the solvent, as the amount of water is reduced further, e.g., down to about 0.5% based on the volume of the reaction mixture, the total amount of 4-nitrodiphenylamine and 4-nitrosodiphenylamine increases with some loss in selectivity so that more 2-nitrodiphenylamine is produced but still in minor amounts. Thus, the present reaction could be conducted under anhydrous conditions. A "controlled amount" of protic material is an amount up to that which inhibits the reaction of aniline with nitrobenzene, e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent. The upper limit for the amount of protic material present in the reaction varies with the solvent. For example, when DMSO is utilized as the solvent and tetramethylammonium hydroxide [TMAH] is utilized as the base, the upper limit on the amount of protic material present in the reaction is about 8% H₂O based on the volume of the reaction mixture. When aniline is utilized as a solvent with the same base [TMAH], the upper limit is 4% H₂O based on the volume of the reaction mixture. In

The ITC agreed that the patentee had expressly defined the term “controlled amount” in the specification but held that the language “e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent” should not be considered part of that definition for two reasons. Neither of these reasons is persuasive. First, the ITC dismissed the 4% limit as merely an example that did not apply to all situations in which aniline was used as the solvent. The ITC relied particularly on the emphasized language in the following passage:

When aniline is utilized as a solvent with the same base [TMAH], the upper limit is 4% H₂O based on the volume of the reaction mixture. In addition, the amount of protic material tolerated will vary with type of base, amount of base, and base cation, used in the various solvent systems. However, it is within the skill of one in the art, utilizing the teachings of the present invention, to determine the specific upper limit of the amount of protic material for a specific solvent, type and amount of base, base cation and the like.

‘063 patent col.4 ll.58-68 (emphasis added). The ITC found that this language made clear that the “e.g., up to about 4% H₂O” language was used in the specification as an example and not a definition of the amount of water permitted when aniline is the solvent.³

addition, the amount of protic material tolerated will vary with type of base, amount of base, and base cation, used in the various solvent systems. However, it is within the skill of one in the art, utilizing the teachings of the present invention, to determine the specific upper limit of the amount of protic material for a specific solvent, type and amount of base, base cation and the like. The minimum amount of protic material necessary to maintain selectivity of the desired products will also depend on the solvent, type and amount of base, base cation and the like, that is utilized and can also be determined by one skilled in the art.

‘063 patent col.4 l.31 – col.5 l.4 (emphases added).

³ On appeal, the ITC relies on expert testimony that “a person of skill in the art would recognize the example of 4% water to be limited to the conditions of room

We disagree. This vague language cannot override the express definitional language. We have frequently found that a definition set forth in the specification governs the meaning of the claims. See, e.g., Cultor Corp., 224 F.3d at 1330. “When the specification explains and defines a term used in the claims, without ambiguity or incompleteness, there is no need to search further for the meaning of the term.” Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1478 (Fed. Cir. 1998). When aniline is used as the solvent, the express definition is neither ambiguous nor incomplete – the “controlled amount” is “up to about 4% H₂O based on the volume of the reaction mixture” – and we need look no further for its meaning. Nor is the specification passage relied on by the ITC inconsistent with the express definition of “controlled amount,” since the passage refers generally to at least six different solvents while the definition refers specifically to reactions in which aniline is the solvent. Moreover, the specification sets forth a different limit of “about 8% water” for the “controlled amount” of protic material when DMSO is the solvent. Quite tellingly, aniline and DMSO were the only two solvents of the six solvents mentioned in the specification for which an express numerical limit was given for the “controlled amount.” The quoted “will vary” language appears to refer to the four other solvents for which a specific percentage was not provided.

temperature and ambient pressure.” Br. of Appellee at 22. We attribute no weight to that testimony because the experts did not identify any evidence that those skilled in the art would recognize that “controlled amount,” or any term used in the specification, has an accepted meaning in the field of chemistry. Under such circumstances, testimony as to how one skilled in the art would interpret the language in the specification is entitled to little or no weight.

Second, the ITC found that the 4% language was inconsistent with Example 10 (which appears identically in both the '063 and the '111 patents), a “preferred embodiment,” which uses more than 10% water in a reaction where aniline is the solvent. Despite the high level of water used in Example 10, the reaction yields a high percentage (92.8%) of 4-ADPA intermediates. On appeal, both the ITC and Flexsys support the ITC’s decision by relying on statements in our case law that we do “not normally interpret a claim term to exclude a preferred embodiment,” Primos, Inc., v. Hunter’s Specialties, Inc., 451 F.3d 841, 848 (Fed. Cir. 2006), as would be the case if the 4% limit were applied to the claims. This rule has particular force where the claims as construed do not encompass any disclosed embodiments. See Johns Hopkins Univ. v. CellPro, Inc., 152 F.3d 1342, 1355 (Fed. Cir. 1998) (“A patent claim should be construed to encompass at least one disclosed embodiment in the written description portion of the patent specification.”) (emphasis added). This is not the case here. Example 10 is merely one of twenty-one distinct examples set out in the two specifications, all of which are described as “preferred embodiment[s].” ‘111 patent col.8 ll.5-8.

Where, as here, multiple embodiments are disclosed, we have previously interpreted claims to exclude embodiments where those embodiments are inconsistent with unambiguous language in the patent’s specification or prosecution history. Telemac Cellular Corp. v. Topp Telecom, Inc., 247 F.3d 1316, 1326 (Fed. Cir. 2001); see also N. Am. Container, Inc. v. Plastipak Packaging, Inc., 415 F.3d 1335 (Fed. Cir. 2005). In Telemac, the district court looked to the specification to determine the meaning of the claim term “communication means,” since that term was written in the claim in “means-

plus-function” form. 247 F.3d at 1324. Telemac challenged the district court’s construction on the basis that it left certain embodiments inoperable. Id. at 1326. We held that the description of those embodiments did not call for a different construction. Id. Instead, we held that those embodiments “could not provide the structure or equivalent structure for performing the claimed function” and were therefore outside of the scope of the claims. Id. See also Rheox, Inc. v. Entact, Inc., 276 F.3d 1319, 1327 (Fed. Cir. 2002) (“where the prosecution history requires a claim construction that excludes some but not all of the preferred embodiments, such a construction is permissible”) (emphasis added).

It is moreover significant that Example 10 does not specifically disclose the amount of water used in the reaction. Instead, the amount of water used in that reaction can only be determined by a complex calculation.⁴ In stark contrast, the patentees in Tables 2 and 6, accompanying Examples 3 and 8 respectively, specifically disclose the amount of water used in those reactions. ‘063 patent col.9 ll.32-48, col.11 ll.25-33. In Example 3, for example, the amount of water added to the reaction where aniline is the solvent ranges from 2.2 to 4.7%, and illustrates the effect of water on the yield of 4-NDPA and p-NDPA. Table 2 shows that the yield dropped from 0.18 mmole to 0.05 mmole, an unacceptably low level, as the amount of water added was increased from

⁴ Flexsys’s supplemental filing in response to a question raised at oral argument described how the calculation is conducted. Letter from Mark G. Davis, Sept. 14, 2007. First, one determines the total volume of the reaction mixture from the known volumes of aniline, nitrobenzene, water added, and base. Next, one determines the total mass of water in the base and converts that number to volume of water. By summing the volume of the water added to the volume of water in the base, one can determine the total volume of water in the reaction. Water volume percentage is thus determined by dividing the total amount of water in the reaction by the total volume of the reaction mixture.

3.45 to 4.7%. Similarly, Example 8 illustrates the effect of the amount of water added to a reaction where DMSO is the solvent. Water added there ranged from 2.3 to 14.7%, and again shows that the yield dropped to an unacceptably low level when more than 8% water is added. Significantly, Example 10 is not even directed toward illustrating the control of the amount of protic material to be used in the reaction. Rather, its stated purpose is to illustrate “the reaction of aniline, nitrobenzene and tetramethylammonium hydroxide dihydrate under anaerobic conditions at 50° C.” ‘063 patent col.11 ll.61-63. Examples 3 and 8, on the other hand, are explicitly directed toward the control of the amount of protic material:

“[Example 3] illustrates that control of the amount of protic material present in the reaction is important.”

...

“[Example 8] illustrates the effect that the amount of protic material present in or added to the reaction has on the extent of conversion and yields of 4-NDPA and p-NDPA.”

Id. at col.9 ll.20-21, col.11 ll.10-13. Under these circumstances, the fact that the calculated amount of water in Example 10 exceeds 4% where aniline is used as the solvent is entitled to little weight, and cannot override the clear definitional language set forth in the specification.⁵

Flexsys further argues that the doctrine of claim differentiation supports the ITC’s refusal to read into the claims the 4% water limit. We have characterized the doctrine of

⁵ All parties agreed before the ITC that the disputed term “controlled amount” must be construed to mean the same thing in the claims of the ‘111 patent as in the ‘063 patent. Additional examples included in the specification of the continuation-in-part application that led to the ‘111 patent cannot alter the meaning of the term as it appears in the ‘063 patent.

claim differentiation generally as the “presumption that each claim in a patent has a different scope.” Curtiss-Wright Flow Control Corp. v. Velan, Inc., 438 F.3d 1374, 1380 (Fed. Cir. 2006) (internal citation omitted). Flexsys points out that independent claim 30 of the ‘063 patent does not specify a numerical limit for “controlled amount of protic material,” while dependent claim 41 recites “up to about 4 v/v % water.”⁶ Claim 30 states:

30. A method of producing 4-aminodiphenylamine (4-ADPA) comprising the steps of:
- a) bringing aniline and nitrobenzene into reactive contact in a suitable solvent system;
 - b) reacting the aniline and nitrobenzene in a confined zone at a suitable temperature, and in the presence of a suitable base and controlled amount of protic material to produce one or more 4-ADPA intermediates; and
 - c) reducing the 4-ADPA intermediates under conditions which produce 4-ADPA.

‘063 patent col.14 ll.16-26 (emphases added). Claim 41 states:

Method of claim 30 wherein said solvent system includes aniline and up to about 4 v/v % water based on the total volume of the reaction mixture.

Id. at col.14 ll.50-52 (emphasis added).

Thus, according to Flexsys, interpreting “controlled amount” in claim 30 to have an upper limit of “e.g., up to about 4% H₂O . . . when aniline is utilized as the

⁶ Flexsys also points to the same relationship between non-asserted independent claims 1 and 61 and dependent claims 12 and 72 of the ‘063 patent. For the reasons described in the text, the existence of these dependent claims is also not persuasive.

Flexsys, but not the ITC, relies in passing on claim 29 of the ‘111 patent, which, in addition to specifying that the process involves “reacting” in the presence of a “controlled amount” of protic material, states that “the amount of protic material present at the beginning of the reaction is up to about 13.8 volume % water based on the total volume of the reaction mixture.” Flexsys has not explained how the presence of 13.8%

solvent” would render the scope of the independent claim and the dependent claim identical. Flexsys’s argument might have some merit if claim 30 referred only to aniline solvents. But it does not. Claim 30 refers generally to “a suitable solvent system,” which, as the specification indicates, can include “dimethylformamide, aniline, pyridine, nitrobenzene, nonpolar hydrocarbon solvents such as toluene and hexane, ethyleneglycol dimethyl ether, diisopropyl ethylamine, and the like, as well as mixtures thereof.” ‘111 patent col.4 ll.24-27. Because claim 41 refers merely to a subset of the solvent systems described in claim 30, and is significantly narrower in scope, the claims are not rendered identical and present no claim differentiation problem. Therefore, Flexsys’s claim differentiation argument is without merit.

For these reasons, we hold that the correct claim construction of the term “controlled amount” is that defined expressly in the specification, namely: “an amount up to that which inhibits the reaction of aniline with nitrobenzene, e.g., up to about 4% H₂O based on the volume of the reaction mixture when aniline is utilized as the solvent.”

II

In light of the correct claim construction of “controlled amount” it is clear that there is no literal infringement. Based on the specification’s express definition of “controlled amount,” each asserted claim can only encompass processes that utilize at most 4% water when aniline is the solvent. There is no dispute that Sinorgchem always uses more than 4% water when it reacts aniline with nitrobenzene, and thus there can be no literal infringement of any of the asserted claims. Because the ITC found that

water at the beginning of the reaction is necessarily inconsistent with a “controlled

Sinorgchem literally infringed Flexsys's patents, it did not reach the question whether Sinorgchem's process would infringe under the doctrine of equivalents. Although Flexsys argued below that under Sinorgchem's construction of "controlled amount," the Sinorgchem process would infringe under the doctrine of equivalents, J.A. at 236, neither Flexsys nor the ITC contends here that Sinorgchem infringes under the doctrine of equivalents when the claims are construed to limit the controlled amount to 4% water when aniline is used as the solvent. On remand, the ITC should address the claim of doctrine of equivalents infringement in light of our holding that there was no literal infringement. See Exxon Chem. Patents, Inc. v. Lubrizol Corp., 137 F.3d 1475, 1479 (Fed. Cir. 1998).

III

Sinorgchem also argues that the asserted claims are invalid as indefinite and obvious. Under Cardinal Chemical, in an appeal from a district court action, once we have addressed infringement we generally must nonetheless address counterclaims of invalidity. See Cardinal Chem. Co. v. Morton Int'l, Inc., 508 U.S. 83 (1993). Since the invalidity issues before the ITC were raised only as affirmative defenses, decisions on these issues would be necessary only if on remand there was a determination of doctrine of equivalents infringement. See MEMC Elec. Materials, Inc. v. Mitsubishi Materials Silicon Corp., No. 2006-1305, -1326, slip op. at 11, 2007 WL 2728376, at *5 (Fed. Cir. Sept. 20, 2007). Under these circumstances, we do not address the invalidity issues in this appeal.

amount" of 4% during the operative part of the reaction.

CONCLUSION

For the foregoing reasons, the decision below is VACATED and REMANDED.

No costs.

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NEWMAN, Circuit Judge, dissenting.

I do not join the panel majority in its reversal of the Commission's finding of literal infringement. No error of fact or law has been shown in the Commission's determination; indeed the Commission's findings are scarcely mentioned. Instead, my colleagues have made findings contrary to the detailed and unchallenged text of the patent specifications, and have construed the claims so that they exclude a major part of the invention described in the patents. I must, respectfully, dissent.

The basic principle of determining the scope of patent claims is that the claims provide the legal definition of the invention that is patented, based on the descriptive text and controlled by the prosecution history, with cognizance of the prior art. A patentee can reduce or disclaim claim scope to cover less than what is described in the specification.

Here, however, there was no disclaimer of the scope set forth in the patent specifications and claims; there is no prior art to limit the claims in the way selected by the panel majority; and there is no reason to insert an absolute numerical limit of "about 4%" protic material into the claims that do not contain a numerical limit, when the specifications of both patents demonstrate significantly higher percentages. There was no evidence contradicting the evidence of the experts concerning the range of protic material set forth in the specifications' text and illustrated in the specific examples.

The Commission correctly construed the "controlled amount of protic material" to match the content of the specifications and claims. The Commission's findings concerning the amount of protic material shown in the specifications are supported by substantial evidence, the statutory standard for review of the agency's findings, 19 U.S.C. §1337(c), and its claim construction is in accordance with law. The panel majority has seriously erred in discarding the Commission's findings and conclusions, for they are not only supportable on the required standard of review, but they also are correct.

The products at issue are N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine (6-PPD) and 4-aminodiphenylamine (4-ADPA), from which 6-PPD is derived. The complaint charged that the 4-ADPA and 6-PPD are produced using a process that is covered by claims 30 and 61 of Patent No. 5,117,063 and claims 7 and 11 of Patent No. 5,608,111. The '111 patent issued from a continuation of an application that led to Patent No. 5,453,541 (not in suit here), which was a continuation-in-part to the application that led to the '063 patent. The patents describe and claim conducting the process by the direct reaction of aniline and nitrobenzene in the presence of a solvent, a base and a "controlled

amount" of protic material as set forth in step (b) of the overall process. Claim 61 of the '063 patent is representative:

61. A method of producing alkylated p-phenylenediamines comprising the steps of:
- a) bringing aniline and nitrobenzene into reactive contact in a suitable solvent system;
 - b) reacting the aniline and nitrobenzene in a confined zone at a suitable temperature, and in the presence of a suitable base and controlled amount of protic material to produce one or more 4-ADPA intermediates;
 - c) reducing the 4-ADPA intermediates under conditions which produce 4-ADPA; and
 - d) reductively alkylating the 4-ADPA of Step c).

The patents explain that the presence of a controlled amount of protic material produces the environmental advantage of avoiding halide waste products, and reduces manufacturing and material costs because it permits the direct reaction of aniline and nitrobenzene, instead of requiring the preparation of intermediate compounds as in the prior art.

The claims in suit do not include numerical limits for the "controlled amount" of protic material, and the specifications define the amount as varying with the solvent, base, base cation, and the like. The '063 patent states (with emphases added):

A "controlled amount" of protic material is an amount up to that which inhibits the reaction of aniline with nitrobenzene, e.g., up to **about 4% H₂O** based on the volume of the reaction mixture when aniline is utilized as the solvent. The upper limit for the amount of protic material present in the reaction **varies with the solvent**. For example, when DMSO is utilized as the solvent and tetramethylammonium hydroxide is utilized as the base, the upper limit on the amount of protic material present in the reaction is **about 8% H₂O** based on the volume of the reaction mixture. When aniline is utilized as a solvent with the same base, the upper limit is **4% H₂O** based on the volume of the reaction mixture. In addition, the amount of protic material tolerated **will vary with type of base, amount of base, and base cation, used in the various solvent systems**. However, it is within the skill of one in the art, **utilizing the teachings of the present invention, to determine the specific upper**

limit of the amount of protic material for a specific solvent, type and amount of base, base cation and the like.

Id., col. 4, lines 48-68. The "teachings of the present invention" are extensive and detailed.

The Commission defined "controlled amount" as "an amount up to that which inhibits the reaction of aniline and nitrobenzene." This definition is in accord with the patent specifications, but it is rejected by the panel majority, who limit "controlled amount" to the part of the patentee's statement about using up to 4% water where there is excess aniline and no other solvent, and exclude all of the other variables that affect the amount of water, as demonstrated in the specifications' text and specific examples. The panel majority promotes the number that is described for one condition, to a limit under all conditions, contrary to the specifications. It is not the judicial role to change the invention. Although the panel majority acknowledges that limits above 4% "could be found in the specification" and were so found by the Commission, the panel majority discards this undisputed fact.

The patents describe the conditions in which 4-ADPA intermediates are produced by the direct reaction of aniline and nitrobenzene. The '063 patent specification includes twelve specific examples, varying the amount and nature of the base, the solvent, the cation, the protic material, and the reaction conditions. Additional examples are in the continuing '111 patent, illustrating further variation in the protic material. In the '063 patent, Example 1 was conducted at room temperature, using tetramethylammonium hydroxide (TMAH) dihydrate¹ as the base. Example 2 shows the effect of varying the temperature. Example 3 shows varying the amount of water from 2.2 to 4.7%, and also uses methanol

¹ TMAH dihydrate contains two molecules of water per molecule of tetramethylammonium hydroxide. The specific Examples in the patents variously add water in liquid form, or as the dihydrate, or both together.

as the protic material. In Example 3, water in amounts of 0, 10, 50 and 100 μL is added to the reaction. The percentage of water in the reaction includes both this added water and the water introduced by the TMAH dihydrate. See '063 patent, col. 9, tbl.2 note. The other Examples show that the amount of water present in the dihydrate is part of the protic material that is present and is calculated as such. See id. col. 11, lines 14-18 & tbl.6.

Example 4 shows the use of various solvents; Example 5 is directed to various bases; Example 6 is a comparison with a prior art method; Example 7 varies the ratios of the reactants; Example 8 shows varying the total amount of water in steps of 2.3%, 3.5%, 6%, 9.75%, and 14.7%; Example 9 shows varying the amount of the TMAH dihydrate base while maintaining the amount of added protic material constant at 4.7%. Example 10 shows anaerobic conditions at 50°C and contains 10% water² from the dihydrate; the

2 My colleagues call it a "complex calculation" to calculate the percentage of water in the total volume of reactants, maj. op. n.7, and decline to consider this evidence; the ALJ, the Commission, and everyone else in the record and briefs treat this calculation as routine. In response to a question from the bench during oral argument, counsel submitted the following explanation:

Specifically, the question was asked of how one skilled in the art would be able to calculate the percentage of water in the reaction disclosed in Example 10 of the patents-in-suit.

Example 10 discloses "the reaction of aniline, nitrobenzene and tetramethylammonium hydroxide dihydrate ("TMAH dihydrate") under anaerobic conditions at 50°C." JA 000269. Col. 11, line 64-Col. 12, line 1. The term "dihydrate" means that there are two water molecules for each molecule of TMAH. JA 000561, lines 13-22. Example 10 discloses that 0.42 moles of TMAH dihydrate are present in the reaction. Because there are two moles of water (dihydrate) for one mole of TMAH, there are .84 moles of water in the reaction. JA 000567, lines 4-20. Because the amount of water and of aniline and nitrobenzene and TMAH are disclosed in Example 10, the percentage of water in the reaction can be calculated using the method described at JA 000568, line 6 through JA 000569, line 21. The method of calculating the amount of water in a reaction where the amount of TMAH

Commission describes this example as a preferred embodiment. Example 11 demonstrates the production of the tetramethylammonium ion salt of 4-NDPA and p-NDPA; Example 12 illustrates the conversion of 4-ADPA to produce 6-PPD.

In the '111 patent, additional examples, particularly Examples 13 and 15, again show the presence of significantly more than 4% water. The panel majority declines to consider the additional examples, which show 10.8% water for Example 13 and 13.8% water for Example 15. The Commission had no need to rely on the additional examples because it found the '063 examples sufficient. Nor is the issue one of "new matter," in using the continuation-in-part to construe claims of an ancestor patent, for the charge is infringement of both or either patent.

The specifications explain the effect of each variable, and state that "the amount of protic material tolerated will vary with type of base, amount of base, and base cation, used in the various solvent systems." '063 patent, col. 4 lines 61-63. The specifications further explain that "[T]he reactions can be successfully performed by conventional modifications known to those skilled in the art, e.g., by appropriate adjustments in temperature, pressure and the like, by changing to alternative conventional reagents such as other solvents or other bases, by routine modification of reaction conditions, and the like, or other reactions

dihydrate, aniline and nitrobenzene are known is also found in the prosecution history of the '111 patent, as is discussed in the Final Initial and Recommended Determination at JA 000137-138. Sinorgchem's experts agreed that Example 10 has 9 to 10 percent water, and that it could be calculated. JA 000151.

Letter from counsel Mark G. Davis dated September 14, 2007. The experts were in agreement that Example 10 shows the presence of 9-10% water. It is undisputed that a person of ordinary skill in the field of the invention can readily calculate the amount of water.

disclosed herein or otherwise conventional, will be applicable to the method of this invention." Id. col. 6, lines 35-43.

The panel majority, in discussing some of the examples, ignores the dihydrate that is present throughout the examples, and finds that only Example 10 of the '063 patent can be viewed as having more than 4% water. The majority's complaint that Example 10 "is not even directed toward illustrating the control of the amount of protic material to be used in the reaction," maj. op. at 13, is inapt, for Example 10 shows 92.8% yield of the desired 4-ADPA intermediates in conditions that include 9-10% of protic material. '063 patent, col. 12, lines 11-13. Thus my colleagues find "clear definitional language [of a 4% limit] set forth in the specification" although that number is in a sentence with the signal "for example," and ignore the text and examples showing a higher range. These erroneous appellate findings of scientific fact directly contradict the findings of the Commission, made upon extensive and detailed evidence and argument on the content of the specifications, including the variables discussed and exemplified in the '063 and '111 patents. Instead, the panel majority selects the parts of the specifications that show water in the 4% range, and ignores the description and examples that show other amounts of water. The majority's de novo ruling is contrary to the testimony of experts for both sides, contrary to Commission expertise, and contrary to the rules of claim construction. The Commission's finding warrants appropriate deference. See, e.g., Federal Power Comm'n v. Fla. Power & Light Co., 404 U.S. 453, 466 (1972) ("The court may not . . . ignore the conclusions of the experts and the Commission and put itself in the absurd position of substituting its judgment for theirs on controverted matters of hydraulic engineering." (quoting United States ex rel.

Chapman v. Fed. Power Comm'n, 191 F.2d 796, 808 (4th Cir. 1951), aff'd, 345 U.S. 153 (1953))).

Claims are construed as they would be understood by persons in the field of the invention, for those are the persons by and for whom patents are written. Such persons are charged with the specification, the prosecution history, and general knowledge in the field of the invention. Phillips v. AWH Corp., 415 F.3d 1303, 1316-17 (Fed. Cir. 2005) (*en banc*). It is beyond debate that the entire specification must be consulted in construing the claims. Pfizer, Inc. v. Teva Pharms. USA, Inc., 429 F.3d 1364, 1373 (Fed. Cir. 2005) ("It is necessary to consider the specification as a whole, and to read all portions of the written description, if possible, in a manner that renders the patent internally consistent."); Slimfold Mfg. Co. v. Kinkead Industries, Inc., 810 F.2d 1113, 1116 (Fed. Cir. 1987) ("Claims are not interpreted in a vacuum, but are part of and are read in light of the specification.").

When the entire specification including the specific examples is consulted, rather than selected snippets, the correct claim scope is apparent from the specifications. Abbott Labs. v. Andrx Pharms., Inc., 473 F.3d 1196, 1210-11 (Fed. Cir. 2007) (declining to limit claim term to description following the word "is" in the specification where to do so would exclude disclosed examples); Verizon Servs. Corp. v. Vonage Holdings Corp., 503 F.3d 1295, 1305 (Fed. Cir. 2007) ("We normally do not interpret claim terms in a way that excludes disclosed examples in the specification."); Invitrogen Corp. v. Biocrest Mfg., L.P., 327 F.3d 1364, 1369 (Fed. Cir. 2003) (district court's claim construction erroneously excluded an embodiment described in an example in the specification); Budde v. Harley-Davidson, Inc., 250 F.3d 1369, 1379-80 (Fed. Cir. 2001) (the specification should be

considered as a whole and read "if possible, in a manner that renders the patent internally consistent").

The labored justification by the majority of its ruling that "about 4%" is the maximum amount of protic material permitted by the specifications does not suggest how the Commission erred, or explain a claim construction that excludes much of the content of the specifications and is contrary to the expert testimony. For example, expert witness David Crich testified, without dispute, that a person of ordinary skill would recognize that the description of 4% water is directed to reactions with aniline as the solvent at conditions of ambient temperature and pressure. The panel majority inexplicably attributes "no weight" to this expert testimony by arguing that since "controlled amount" has no universal meaning in chemistry, the court can ignore how persons skilled in this field of chemistry would understand the term as applied in this field. As resolved in Phillips, 415 F.3d at 1313, "[t]he inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation. That starting point is based on the well-settled understanding that inventors are typically persons skilled in the field of the invention and that patents are addressed to and intended to be read by others of skill in the pertinent art." (Citations omitted.)

The cases on which the majority relies do not support, and indeed contravene the majority's approach to claim construction. In Durel Corp. v. Osram Sylvania, Inc., 256 F.3d 1298, 1303-04 (Fed. Cir. 2001) the court held that the entirety of the specification, including the specific examples, must be considered in determining the scope of the term "oxide coating," and not a single broader statement. In Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1478 (Fed. Cir. 1998) the court stated that the patentee's lexicography

could not be enlarged by resort to extrinsic dictionary definitions, when the intended scope was clearly set forth in the entirety of the specification "without ambiguity or incompleteness," a sound rule that emphasizes the controlling role of the specification. These cases support the Commission's holding, not that of the panel majority. Equally inapplicable is the majority's citation of Rheox, Inc. v. Entact, Inc., 276 F.3d 1319, 1327 (Fed Cir. 2002), for unlike Rheox, here the prosecution history does not require exclusion of preferred embodiments.

The majority also relies on Telemac Cellular Corp. v. Topp Telecom, Inc., 247 F.3d 1316 (Fed. Cir. 2001) and North American Container, Inc. v. Plastipak Packaging, Inc., 415 F.3d 1335 (Fed. Cir. 2005) as supporting its claim construction. These are cases where the construction of claims is narrower than the breadth of the specification, on specific facts where such narrowing was required, such as by "means-plus-function" construction, or by an express disclaimer during prosecution as in North American Container, 415 F.3d at 1345-46, 1348. In contrast, in the present case the words "controlled amount" do not have an unambiguous meaning that dictates the exclusion of disclosed embodiments, nor is there any suggestion of disclaimer. These decisions do not support the majority's arbitrary appellate limitation of claim scope, contrary to the content of the specifications. See, e.g., Conoco, Inc. v. Energy & Env'tl. Int'l, L.C., 460 F.3d 1349, 1358 (Fed. Cir. 2006) (it is generally improper for courts to import a numerical limitation into a patent claim that contains no numerical limit); Modine Mfg. Co. v. U.S. Int'l Trade Comm'n, 75 F.3d 1545, 1551 (Fed. Cir. 1996) ("Ordinarily a claim element that is claimed in general descriptive words, when a numerical range appears in the specification and in other claims, is not limited to the numbers in the specification or the other claims.") The patents' teachings that

the amount of protic material can vary with the reaction conditions, teachings heavily reinforced by actual experimental examples, were readily understood by the Commission to show, as the patentee stated, that the invention can be practiced over a range of conditions. The extensive data in the patent specifications were not challenged. No error has been shown in the Commission's conclusion that "controlled amount" is not limited to 4%.

Our appellate obligation is to impart consistency, predictability, and guidance to patent claiming, whereby the patent-user community can rely on a technologically correct and legally consistent interpretation of patent claims. The health of innovative technology requires confidence in objective rules of claim construction, and in uniform judicial application of the rules. The panel majority adds inconsistency and unpredictability by arbitrarily limiting the scope of the claimed invention in a way that conflicts with the teachings of the specifications and the knowledge in the field of the inventions. I respectfully dissent.