

# United States Court of Appeals for the Federal Circuit

06-1088

DYSTAR TEXTILFARBEN GMBH & CO DEUTSCHLAND KG,

Plaintiff-Appellee,

v.

C.H. PATRICK CO., and BANN QUIMICA LTDA,

Defendants-Appellants.

William T. Enos, Oblon, Spivak, McClelland, Maier & Neustadt, P.C., of Alexandria, Virginia, argued for plaintiff-appellee. With him on the brief were Richard D. Kelly and Andrew K. Beverina.

Neil C. Jones, Nelson Mullins Riley & Scarborough, L.L.P., of Greenville, South Carolina, argued for defendants-appellants.

Appealed from: United States District Court for the District of South Carolina

Magistrate Judge William M. Catoe, Jr.

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DECIDED: October 3, 2006

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Before MICHEL, Chief Judge, RADER and SCHALL, Circuit Judges. Opinion for the court filed by Chief Judge MICHEL. Concurring opinion filed by Circuit Judge SCHALL.

MICHEL, Chief Judge.

DyStar Textilfarben GmbH & Co. Deutschland KG ("DyStar") sued defendants C.H. Patrick Co. and Bann Quimica Ltda. (collectively, "Bann") in the United States District Court for the District of South Carolina, alleging direct, contributory, and induced infringement of U.S. Patent No. 5,586,992 ("the '992 patent"),<sup>1</sup> which discloses a process for dyeing textile materials with catalytically hydrogenated leuco indigo. DyStar and Bann Quimica Ltda. are large chemical manufacturers that, *inter alia*, sell prerduced indigo for use in dyeing processes; C.H. Patrick Co. purchased prerduced

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<sup>1</sup> BASF was the assignee of the '992 patent. BASF divested its dyestuff business, including the '992 patent, to DyStar in 2000.

indigo solution from Bann Quimica Ltda. in 2002 and used it to dye yarn in a process alleged to infringe.

The parties agreed to a jury trial before a magistrate judge. Prior to charging the jury and in open court, the magistrate judge granted DyStar's motion for judgment as a matter of law ("JMOL") that it had not engaged in inequitable conduct before the United States Patent and Trademark Office ("PTO"). The jury rendered a verdict that "Bann Quimica and/or C.H. Patrick" had infringed each of claims 1-4, assessed damages at \$90,000, and declined to hold the '992 patent claims invalid for lack of enablement, anticipation or obviousness. DyStar Textilfarben GmbH & Co Deutschland KG v. C.H. Patrick Co., Civ. No. 6:02-2946-WMC (D.S.C. Sept. 16, 2005).

Following briefing, the magistrate judge denied Bann's motions for JMOL or, alternatively, a new trial on the question of invalidity of the '992 patent for anticipation, obviousness, and lack of enablement. DyStar Textilfarben GmbH & Co Deutschland KG v. C.H. Patrick Co., Civ. No. 6:02-2946-WMC (D.S.C. Nov. 1, 2005). The magistrate judge did not issue an opinion. His order stated:

The jury diligently considered the evidence presented and found for the plaintiff. This court concludes that the jury's verdict was reasonable and was supported by evidence in the record. Therefore, as this court has great respect for trial by jury and the right of the parties to request a jury trial, this court will not substitute its findings for those of the jury as the jury's decision was clearly supported by the trial record and was reasonable.

Id.

Bann appeals from the denials of its motions on anticipation and obviousness, and the grant of JMOL to DyStar regarding inequitable conduct.

For the reasons explained below, we reverse the district court's denial of Bann's motion for JMOL of invalidity of claims 1-4 for obviousness.

I

Indigo has been used in dyeing textile materials for thousands of years. Because indigo pigment is insoluble in water, it must be de-oxidized, or "reduced," to a water-soluble white form known as "leuco indigo" before it can be used in dyeing. Leuco indigo is unstable; it oxidizes and returns to its blue pigment form when exposed to oxygen. Thus, leuco indigo solution needs to be kept in an oxygen-free environment, or otherwise stabilized, if it is not being used immediately for dyeing.

For many years, dyehouses commonly reduced indigo in-house through a process known as hydrosulfite reduction. Dyers created a "stock vat," in which indigo is reduced in water with sodium hydrosulfite and solubilized with an alkali, e.g., sodium hydroxide. The resulting leuco indigo solution is then transferred into a feed tank and fed into the dyebath. After the dyebath is prepared, the textile material is dyed through a process known as "dipping" and "skying." In "dipping," the textile material is contacted with leuco indigo in the dyebath; in "skying," the dyed textile material is introduced to the air, causing the indigo to convert back to its blue pigment form.

A second common method of indigo reduction, catalytic hydrogenation, was patented by Andre Brochet in 1917. See U.S. Patent No. 1,247,927 ("Brochet"). The superficial difference between hydrosulfite reduction and catalytic hydrogenation is that the latter uses gaseous hydrogen, rather than sodium hydrosulfite, as a reducing agent. Catalytic hydrogenation allowed "economical production of concentrated solutions of leuco derivatives free from impurities and mineral salts"; when left to settle, the solution

naturally separates from nickel or another catalytic metal and can be "drawn off and is ready for use". Brochet, II.88-90, 109-110. Most important to the dyehouses, however, was the fact that Brochet's leuco indigo solution could be stabilized in solid form, usually powder or paste, and coated with molasses or glue to protect the reduced indigo from air and prevent premature oxidation. This allowed the indigo reduction process to shift out of the dyehouses and into chemical manufacturers, which began to produce and sell prerduced indigo to dyehouses in the early 1900s. Rather than create a stock vat, dyers needed only to dissolve the prerduced indigo into a preparation tank, add caustic soda (i.e., sodium hydroxide) and sodium hydrosulfite to remove oxygen from the water, and transfer the resulting solution from the preparation tank to the dyebath. This significantly reduced the time necessary to prepare a dyebath, the dyehouses' expenditures on sodium hydrosulfite and caustic soda, and the level of pollution in dyehouse waste water and on dyehouse floors.

The process of dyeing textile materials with catalytically hydrogenated leuco indigo traditionally has involved six steps: (1) reducing indigo to its leuco form in solution; (2) stabilizing the leuco indigo solution, usually in paste or powder form; (3) creating a preparation tank in which the dried leuco indigo is re-converted to solution form; (4) adding the solution to the dyebath; (5) dipping; and (6) skying.

Claim 1 of the '992 patent, the only independent claim at issue, recites:

A process for dyeing cellulose-containing textile material with indigo which comprises

- a) introducing into a dyebath an aqueous solution of leuco indigo solution prepared by catalytic hydrogenation;
- b) contacting the textile material with the dyebath; and, after the leuco indigo has gone onto the textile material,
- c) converting said leuco indigo back into the pigment form in a conventional manner by air oxidation.

'992 patent, col.6, l.66–col.7, l.6. The '992 patent thus improved upon the prior art by eliminating steps two and three of the traditional process: stabilizing the leuco indigo solution into a paste or powder form, and then reconstituting the solution in a preparation tank. Instead, it allowed a dyer to pour prereduced indigo solution directly into a dyebath and commence dyeing immediately.

## II

Bann appeals from the denials of its motions on anticipation of claim 1 and obviousness of claims 1-4, and the grant of DyStar's JMOL of no inequitable conduct. We review decisions on motions for JMOL and motions for a new trial under the law of the regional circuit. MicroStrategy, Inc. v. Bus. Objects, S.A., 429 F.3d 1344, 1348 (Fed. Cir. 2005) (JMOL); EMI Group N. Am., Inc. v. Cypress Semiconductor Corp., 268 F.3d 1342, 1348 (Fed. Cir. 2001) (new trial). In the Fourth Circuit, the grant or denial of JMOL is reviewed de novo, which requires us to step into the shoes of the trial judge and reapply the JMOL standard. Johnson v. MBNA Am. Bank, NA, 357 F.3d 426, 431 (4th Cir. 2004). "The question is whether a jury, viewing the evidence in the light most favorable to [DyStar], could have properly reached the conclusion reached by this jury. We must reverse if a reasonable jury could only rule in favor of [Bann]; if reasonable minds could differ, we must affirm." Id. (internal citation and quotation marks omitted). The denial of a motion for a new trial is reviewed in the Fourth Circuit for abuse of discretion. United States v. Perry, 335 F.3d 316, 320 (4th Cir. 2003).

Bann asserts that claim 1 of the '992 patent is invalid because it is anticipated by Brochet. Bann further argues that claims 1-4 are invalid as obvious in light of Brochet and certain other prior art, including two pre-1917 BASF patents—United States Patent

Nos. 820,900 ("Wimmer") and 885,978 ("Chaumat"), a post-World War II report of the British Intelligence Objectives Sub-Committee ("BIOS report"), and the 1936 Manual for the Dyeing of Cotton and Other Vegetable Fibres ("Manual"), published by General Dyestuff Corporation. We address the broader argument, relating to obviousness, first.

## A

A determination that a claimed invention would have been obvious, and thus the patent issued thereon invalid, is a legal conclusion that we review de novo. Richardson-Vicks, Inc. v. The Upjohn Co., 122 F.3d 1476, 1479 (Fed. Cir. 1997). We must determine "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a). We thus consider whether a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and whether there would have been a reasonable expectation of success in doing so. Brown & Williamson Tobacco Corp. v. Philip Morris, Inc., 229 F.3d 1120, 1124 (Fed. Cir. 2000).

Underpinning this legal inquiry are four groups of factual findings, which, in a jury trial, we review for substantial evidence. Richardson-Vicks, 122 F.3d at 1479. Following the 1952 enactment of § 103, the Supreme Court explained that obviousness depends on (1) the scope and content of the prior art; (2) the differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) any relevant secondary considerations, including commercial success, long felt but unsolved needs, and failure of others. Graham v. John Deere Co., 383 U.S. 1, 17 (1966).

This court has articulated a subsidiary requirement for the first Graham factor, the scope and content of the prior art. SIBIA Neurosciences, Inc. v. Cadus Pharma. Corp., 225 F.3d 1349, 1356 (Fed. Cir. 2000). Where, as here, all claim limitations are found in a number of prior art references, the factfinder must determine "[w]hat the prior art teaches, whether it teaches away from the claimed invention, and whether it motivates a combination of teachings from different references". In re Fulton, 391 F.3d 1195, 1199-1200 (Fed. Cir. 2004). It is important in this inquiry to distinguish between the references sought to be combined and "the prior art", as the latter category is much broader. For example, textbooks or treatises may include basic principles unlikely to be restated in cited references.

As we recently explained in Alza Corp. v. Mylan Labs., Inc., No. 06-1019, 2006 U.S. App. LEXIS 22616 (Fed. Cir. Sept. 6, 2006), the suggestion test—as our motivation-to-combine inquiry has come to be known—"prevent[s] statutorily proscribed hindsight reasoning when determining the obviousness of an invention." Id. at \*7. This test "informs the Graham analysis", id. at \*8 (quoting In re Kahn, 441 F.3d 977, 987 (Fed. Cir. 2006)), by implementing the Supreme Court's recognition of "the importance of guarding against hindsight, as is evident in its discussion of the role of secondary considerations as 'serv[ing] to guard against slipping into use of hindsight and to resist the temptation to read into the prior art the teachings of the invention in issue.'" Id. at \*6 (quoting Graham, 383 U.S. at 36).

In contrast to the characterization of some commentators, the suggestion test is not a rigid categorical rule. The motivation need not be found in the references sought to be combined, but may be found in any number of sources, including common

knowledge, the prior art as a whole, or the nature of the problem itself. In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999). As we explained in Motorola, Inc. v. Interdigital Tech. Corp., 121 F.3d 1461, 1472 (Fed. Cir. 1997), "there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention. Rather, the suggestion to combine may come from the prior art, as filtered through the knowledge of one skilled in the art."

For one to conclude that the invention of the '992 patent would have been obvious, then, the prior art, common knowledge, or the nature of the problem, viewed through the eyes of an ordinary artisan, must have suggested the following steps: (1) creating leuco indigo solution through catalytic hydrogenation; (2) stabilizing the leuco indigo in solution form; (3) adding the leuco indigo solution directly into a dyebath; (4) dipping; and (5) skying. Because the jury did not make explicit factual findings in the form of answers to written interrogatories or special verdicts, we must discern the jury's implied factual findings by interpreting the evidence consistently with the verdict and drawing all reasonable inferences in DyStar's favor. Konkel v. Bob Evans Farms Inc., 165 F.3d 275, 279 (4th Cir. 1999).

## B

Bann's obviousness argument rests primarily on three U.S. patents: Brochet, Wimmer, and Chaumat. Brochet is directed to "the Manufacture of Leuco Derivatives of Vat Dyestuffs" generally, of which indigo is one. Brochet, II.6-7. By its plain language, Brochet discloses the process of preparing an aqueous solution of leuco indigo by catalytic hydrogenation. There can be no serious dispute that the ultimate use of a "dyestuff" is dyeing textile materials; indeed, the '992 patent inventor, Georg Schnitzer,

testified that leuco indigo solutions were known to be used in 1917 for dyeing, and Dr. Richard Blackburn, one of DyStar's technical experts, testified that BASF began reducing indigo with catalytic hydrogenation, and selling the reduced indigo to dyehouses, in 1926. Moreover, both parties agree that dipping and skying were well known in the art. As explained supra, when indigo is reduced in-house in a stock vat, the resulting leuco indigo solution is introduced directly into the dyebath without first being stabilized through drying. Thus, the critical issue in our obviousness analysis is whether stabilizing catalytically reduced leuco indigo in solution form, rather than in powder form coated with molasses, for example, renders the claimed process nonobvious to one of ordinary skill in the art.

### **1. Level of Ordinary Skill in the Art**

Because the parties disagree over the relevance of the cited prior art, which, fundamentally, is a disagreement over the level of ordinary skill in the art, we address this third Graham factor first. DyStar asserts that we must disregard Brochet, Wimmer, and Chaumat, because a person of ordinary skill in the art would not be aware of these references. In short, DyStar argues that no knowledge of chemistry is required in the relevant technical field.

DyStar points to testimony from Dr. Blackburn that "[a] person of ordinary skill in the art is a dyer", someone with "a high school degree" who is "able to read and write", but whose knowledge is limited to "flipping the switches" on the machine. Dr. Blackburn also testified, however, that a person of ordinary skill in the art was "running the dye processes", which required, *inter alia*, "doing the calculations". When confronted with the inconsistency between his testimony regarding the applicable level of skill during

cross-examination, Dr. Blackburn stated that "it's difficult to say" which of the two skill levels should be applied to the obviousness inquiry. Dr. Blackburn explained that "those people may do both jobs", but concluded by stating, "I think the former [i.e., the person 'flipping the switches']" is the ordinary artisan. Thus, the jury had evidence before it of two potential levels of ordinary skill: (1) that of a dyer and (2) that of a person creating the dye processes, who we will refer to as a dyeing process designer.

DyStar presented evidence that The Application of Vat Dyes, a book by the American Association of Textile Chemists and Colorists, teaches people how to dye and is a text that a dyer would have had at the time of the '992 patent invention. Dr. Nolan Etters, Bann's expert witness, agreed that "a person of ordinary skill in the art" would be a member of the American Association of Textile Chemists and Colorists and conceded that none of the prior art cited by Bann is referenced in The Application of Vat Dyes.

We agree with DyStar that we are required to assume the jury accepted its argument that a person of ordinary skill in the art is a dyer with no knowledge of chemistry. Because the jury heard testimony that the prior art cited by Bann was directed toward chemists, not dyers, the jury must have found the prior art cited by Bann neither in the relevant art nor analogous arts and then, consistent with the limited evidence of prior art deemed relevant, concluded that the process claimed in the '992 patent would not have been obvious.

However, substantial evidence does not support the jury's finding that a person of ordinary skill is a dyer with no knowledge of chemistry. Indeed, that factual finding is inconsistent with the '992 patent's very purpose. The technical problem that the process of the '992 patent and the prior art cited by Bann sought to solve is precisely

the same: an improved process for dyeing textile materials with indigo. This process includes several discrete subcomponents—e.g., indigo reduction and dyebath preparation—and an ordinary artisan would be concerned with all of them. To beneficially practice the dyeing process claimed in the '992 patent, the ordinary artisan must have a higher-level perspective, as he must first decide whether it is more efficient to reduce indigo in-house or purchase prereduced indigo and, if prereduced, must then decide whether solid or solution form is preferable.

Designing an optimal dyeing process requires knowledge of chemistry and systems engineering, for example, and by no means can be undertaken by a person of only high school education whose skill set is limited to "flipping the switches". This is especially true when one considers that only in the last century have improvements in indigo reduction chemistry enabled outsourcing of the indigo reduction step from dyehouses to chemical manufacturers; prior to that simplification, there would have been no question that a dyer would also require knowledge of indigo reduction. Because, for this patent, the only finding supported by substantial evidence is that an ordinary artisan is not a dyer but a person designing an optimal dyeing process, the jury's implicit finding of a mere dyer cannot withstand scrutiny on JMOL. Accordingly, the jury's apparent decision to disregard Brochet, Wimmer, and Chaumat, and perhaps other prior art references, as neither in the dye process art nor even in analogous arts is unsupported by substantial evidence.

## **2. Scope and Content of Prior Art**

Where, as here, claim limitations are found in a combination of prior art references, the factfinder must determine "[w]hat the prior art teaches, whether it

teaches away from the claimed invention, and whether it motivates a combination of teachings from different references". Fulton, 391 F.3d at 1199-1200 (Fed. Cir. 2004).

To support its argument that an ordinary artisan—i.e., a dyeing process designer—would have known to attempt to stabilize the Brochet solution in oxygen-excluding conditions for addition directly into a dyebath, Bann points to two pre-Brochet BASF patents. Wimmer, issued in 1906, discloses a leuco indigo solution that "can be filtered and the filtrate (which contains a high percentage of indigo white) can be placed on the market without any further treatment", in contrast to reduction using zinc, which required the solution "to be separated before the solution can be used for dyeing." Wimmer, II.34-40. Chaumat, issued in 1908, discloses a leuco indigo solution that "may be drawn off protected from the air and preserved indefinitely in receptacles which are either soldered or closed in any other hermetic manner." Chaumat, II.84-87. Although Wimmer and Chaumat disclose different reducing methods than Brochet—Wimmer suggests the use of iron, rather than zinc, as a reducing agent, and Chaumat discloses an electrolytic process for indigo reduction—Bann argues that once the indigo has been converted to its leuco form, the distinction is irrelevant for dyeing purposes. Accordingly, Bann argues that this prior art would teach an ordinary artisan in the field of indigo dyeing process design to attempt to stabilize any leuco indigo solution, however reduced, for addition directly into the dyebath.

**a. *What does the prior art teach?***

DyStar argues that because Wimmer and Chaumat involve different methods of reducing indigo, they are nonanalogous art and properly disregarded by the jury. In support of this assertion, Mr. Schnitzer testified that, up until the time of the invention,

BASF's "people from production" believed that leuco indigo created from catalytic hydrogenation was too unstable to be added directly to the dyebath, and might "stain the yarn with indigo pigment" or "block[ ] pipes". DyStar offered evidence that, prior to the '992 patent, BASF had limited its sales of catalytically hydrogenated leuco indigo to that stabilized in paste or solid form. Thus, argues DyStar, the language in Wimmer and Chaumat suggesting that the solution could be stabilized and sold in solution form does not apply to catalytically hydrogenated leuco indigo solution.

We disagree. As explained supra, the proper focus is on the indigo dyeing process as a whole, which requires the ordinary artisan to consider (and choose between) the various indigo reduction methods. The '992 patent is directed toward a process of dyeing with indigo and, although a specific method of reduction is required by claim 1, the first step in the process requires indigo in prereduced form. It is undisputed that reduced indigo by any reduction method, not just catalytic hydrogenation, has been used in the indigo dyeing process. The prior art involving indigo reduction by other methods is thus not merely analogous art, it is the same art. Accordingly, all limitations recited by claim 1 of the '992 patent—including the immediate use of leuco indigo solution for dyeing—are contained in the prior art.<sup>2</sup>

***b. Does the prior art teach away from the claimed invention?***

We reject DyStar's assertion that contemporaneous articles by Wimmer and Brochet teach away from the combination of Brochet and Chaumat, and thus the claimed process. DyStar acknowledges that no specific language in these references

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<sup>2</sup> Because the only difference between the claimed invention and the cited prior art is the method of indigo reduction, which we have held is irrelevant to an indigo dyeing process employing prereduced indigo, we do not separately discuss this second Graham factor.

teaches away from the invention of the '992 patent. Rather, because these references do not discuss the stabilization of leuco indigo solution (in solution form) for immediate addition to a dyebath, DyStar somehow concludes that these references teach that leuco indigo solution "cannot be used to dye but is instead useful only as an intermediate."

Although Wimmer's contemporaneous article only describes the use of indigo solution as an intermediate product, he does not retract his patent language indicating that "the solution can be filtered and the filtrate (which contains a high percentage of indigo white) can be placed on the market without any further treatment". Wimmer, II.33-37. Likewise, the Brochet patent, directed toward all vat dyestuffs, broadly teaches that the process "produce[s] mother-liquors which can be diluted immediately before use, or be treated by evaporation under reduced pressure or by any other means to obtain concentrated products for sale." Brochet, II.66-70. This language implies that all vat dyestuffs, including indigo, may either be used immediately for dyeing or concentrated prior to sale. In his contemporaneous article, Brochet stated that his catalytically hydrogenated solution could be used "economically to obtain concentrated indigo white [i.e., leuco indigo] solutions that are free of impurities and alkaline salts, that can be concentrated in vacuum in order to obtain white indigo as a paste". This mere failure to discuss immediate use of his leuco indigo solution for dyeing is not the same thing as Brochet stating in his article that, though most dyestuffs may be used immediately or stored in oxygen-excluding containers, his leuco indigo solution may only be concentrated in paste form. We will not read into a reference a teaching away from a process where no such language exists.

**c. Is there a motivation to combine?**

DyStar argues that this court's "suggestion test" for obviousness requires the cited references themselves to contain a suggestion, teaching, or motivation to combine them, and that it must be explicitly stated. DyStar then points out, correctly, that Brochet does not suggest combining his invention with those of Chaumat or Wimmer to stabilize his leuco indigo solution in oxygen-excluding containers until either using it directly in the dyebath or placing it on the market for sale, respectively. Absent such a teaching, urges DyStar, the invention of claim 1 of the '992 patent cannot be obvious.

DyStar's argument misreads this court's cases and misdescribes our suggestion test, echoing notions put forth recently by various commentators and accepted in major reports. A 2003 report by the Federal Trade Commission, for example, quoted testimony of certain witnesses that this court requires "specific and definitive [prior] art references with clear motivation of how to combine those references" and requires the PTO to find "the glue expressly leading you all the way [to obviousness]" and "connect the dots . . . very, very clearly." Fed. Trade Comm'n, To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy ch. 4, at 11 (2003). Similarly, a 2004 report by the National Academy of Sciences summarized views of a few commentators that "standards of patentability—especially the non-obviousness standard—have become too lax as a result of court decisions" by the Federal Circuit, leading to the deterioration of patent quality. Nat'l Research Council, A Patent System for the 21st Century 3 (Stephen A. Merrill et al. eds., 2004). But see Am. Intellectual Prop. Law Ass'n, AIPLA Response to the National Academies Report entitled "A Patent System for the 21st Century" 10 (2004) ("AIPLA believes that the courts, including the

Federal Circuit, have applied the standard of non-obviousness with both the needed rigor and the appropriate vigor, and they have done so with a commendable consistency over the past two decades. If a difficulty exists with application of the non-obviousness standard today, it does not lie in the patent statute or in substantive law of non-obviousness as applied in the courts.")

Seeking to support their assertions about Federal Circuit caselaw, these few commentators have quoted isolated statements from three of our precedents in particular, including Dembiczak, 175 F.3d at 1000, wherein we stated that the analysis by the Board of Patent Appeals and Interferences ("Board") "fails to demonstrate how the [two cited] references teach or suggest their combination" (emphasis added), and In re Lee, 277 F.3d 1338, 1341, 1344 (Fed. Cir. 2002), where we characterized the Board's statement that "[t]he conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference" as "[o]mission of a relevant factor required by precedent". They have also cited our repeated use of the word "references" in the following list from Ruiz v. A.B. Chance Co., 234 F.3d 654 (Fed. Cir. 2000), where we suggested a motivation to combine may be found:

- 1) in the prior art references themselves;
- 2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; or
- 3) from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem.

Id. at 665 (emphasis added) (internal quotation marks omitted).

Despite containing arguably imprecise language in these statements, quoted out of context, each of the above-cited cases correctly applies the suggestion test and by

no means requires an explicit teaching to combine to be found in a particular prior art reference. Dembiczak involved the combination of a reference in the plastic trash bag art with children's arts and crafts books that included, among innumerable fanciful drawings, jack-o-lanterns. Contrary to some interpretations, we stated explicitly that evidence of a motivation to combine need not be found in the prior art references themselves, but rather may be found in "the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved." 175 F.3d at 999 (citation omitted). When not from the prior art references, the "evidence" of motive will likely consist of an explanation of the well-known principle or problem-solving strategy to be applied. Our analysis in Dembiczak focused on an explicit teaching in the prior art not because our case law requires it, but because the Board had stated that "the [two cited] references would have suggested the application of . . . facial indicia to the prior art plastic trash bags." Id. at 1000 (emphasis added). We held the Board's obviousness determination legally insufficient because, in addition to failing to make Graham findings, the Board's analysis was "limited to a discussion of the ways that the multiple prior art references can be combined to read on the claimed invention", "rather than pointing to specific information in [the two references] that suggest the combination". Id. On appeal to this court, the Commissioner of Patents and Trademarks attempted to defend the Board decision by laying out, using the Graham factors, a clear—and likely affirmable—rationale establishing the level of ordinary skill and explaining the motivation to combine. Id. at 1001. We declined to consider these arguments, newly raised on appeal, stating that they did "little more than highlight the shortcomings of the decision below." Id.

In Ruiz, as in Dembiczak, we vacated a conclusion of obviousness because the factfinder failed to make Graham factor findings. 234 F.3d at 660. Far from requiring evidence of an explicit motivation to combine, we suggested in Ruiz that there may have existed an implicit motivation to combine, based on testimony that the invention was an improvement over the prior art because it is "easy to install" and "low cost". Id. at 666. We explained that such "[e]vidence which suggests that the combination of two references would suggest the resulting improvement is one way in which to determine a reason, suggestion, or motivation to combine" and instructed the district court to consider the evidence on remand. Id.

Likewise, a close reading of In re Lee reveals that our objection was not to the Board's statement that "[t]he conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference", but its utter failure to explain the "common knowledge and common sense" on which it relied. See 277 F.3d at 1341, 1344. Lee involved a patent combining a prior art video game instruction handbook describing a "demonstration mode" with a prior art television set having a menu display allowing video and audio adjustments. The Board, without comment, adopted the Examiner's Answer, which merely stated that the combination of the two cited references "'would have been obvious to one of ordinary skill in the art since the demonstration mode is just a programmable feature which can be used in many different devices for providing automatic introduction by adding the proper programming software' and that 'another motivation would be that the automatic demonstration mode is user friendly and it functions as a tutorial.'" Id. at 1341. We explained that

"[c]onclusory statements such as those here provided do not fulfill the agency's obligation" to explain all material facts relating to a motivation to combine. Id. at 1344. In other words, we instructed the Board to explain why "common sense" of an ordinary artisan seeking to solve the problem at hand would have led him to combine the references. We noted that our predecessor court held more than thirty years earlier that "common knowledge and common sense" were sufficient to establish a motivation to combine, In re Bozek, 416 F.2d 1385 (C.C.P.A. 1969), and distinguished that case because, in Bozek, the examiner first "established that this knowledge was in the art". Id. at 1390. We instructed that assumptions about common sense cannot substitute for evidence thereof, as the Board attempted to do in Lee. 277 F.3d at 1345; see also In re Zurko, 258 F.3d 1379, 1383, 1385 (Fed. Cir. 2001) (reversing as unsupported by substantial evidence a finding of motivation to combine cited references, where the Board adopted Examiner's unsupported assertion that claim limitation missing from cited references was "basic knowledge" and it "would have been nothing more than good common sense" to combine the references, and explaining that "[t]his assessment of basic knowledge and common sense was not based on any evidence in the record"); In re Rouffet, 149 F.3d 1350, 1357 (Fed. Cir. 1998) (affirming finding of high level of ordinary skill and the Board's explanation as to why cited reference implicitly would suggest missing claim limitation to ordinary artisan, but reversing its reliance on high level of ordinary skill as basis of motivation to combine, and stating, "The Board did not, however, explain what specific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination. Instead, the Board merely invoked the high level of skill in the field of art. If such a rote

invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance.").

It is difficult to see how our suggestion test could be seen as rigid and categorical given the myriad cases over several decades in which panels of this court have applied the suggestion test flexibly. Obviousness is a complicated subject requiring sophisticated analysis, and no single case lays out all facets of the legal test. DyStar's argument and the above-cited commentary highlight the danger inherent in focusing on isolated dicta rather than gleaning the law of a particular area from careful reading of the full text of a group of related precedents for all they say that is dispositive and for what they hold. When parties like Dystar do not engage in such careful, candid, and complete legal analysis, much confusion about the law arises and, through time, can be compounded.<sup>3</sup>

Our suggestion test is in actuality quite flexible and not only permits, but requires, consideration of common knowledge and common sense. See, e.g., In re Kotzab, 217 F.3d 1365, 1369 (Fed. Cir. 2000) ("A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and

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<sup>3</sup> Indeed, the United States Supreme Court recently granted certiorari in a case involving this court's application of the suggestion test. KSR Int'l Co. v. Teleflex, Inc., 2006 U.S. LEXIS 4912 (June 26, 2006). In KSR, we vacated a district court's grant of summary judgment of invalidity for obviousness. The district court found a motivation to combine not in the references but "largely on the nature of the problem to be solved", which we did not deem erroneous. Teleflex, Inc. v. KSR Int'l Co., 119 Fed. App'x 282, 287 (Fed. Cir. 2005) (unpublished). Rather, we vacated because the court did not explain sufficiently its rationale, and failed to make "findings as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of [the] invention to make the combination in the manner claimed." Id. at 288 (citation omitted).

the then-accepted wisdom in the field."); Motorola, 121 F.3d at 1472 ("[T]he suggestion to combine may come from the prior art, as filtered through the knowledge of one skilled in the art."); Bozek, 416 F.2d at 1390 ("Having established that this knowledge was in the art, the examiner could then properly rely, as put forth by the solicitor, on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.'").

Indeed, we have repeatedly held that an implicit motivation to combine exists not only when a suggestion may be gleaned from the prior art as a whole, but when the "improvement" is technology-independent and the combination of references results in a product or process that is more desirable, for example because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient. Because the desire to enhance commercial opportunities by improving a product or process is universal—and even common-sensical—we have held that there exists in these situations a motivation to combine prior art references even absent any hint of suggestion in the references themselves. In such situations, the proper question is whether the ordinary artisan possesses knowledge and skills rendering him capable of combining the prior art references.

In Pro-Mold & Tool Co., Inc. v. Great Lakes Plastics, Inc., 75 F.3d 1568 (Fed. Cir. 1996), for example, we analyzed asserted obviousness of a claimed invention of a sports trading card holder only slightly larger than the trading card. We stated that "[w]e start from the self-evident proposition that mankind, in particular, inventors, strive to improve that which already exists". Id. at 1573. We required no documentary evidence

of motive. We explained that the motivation to combine "a reference describing an elegant card holder and cover arrangement with a reference describing a card holder no larger than necessary to enclose the card . . . was thus evident from the very size of the card itself."<sup>4</sup> Id. at 1573. Because an ornamental card holder just large enough to enclose the card would be more efficient, there existed an implicit, indeed common-sensical, motivation to combine the two references.

Similarly, in Sandt Tech., Ltd. v. Resco Metal & Plastics Corp., 264 F.3d 1344, 1355 (Fed. Cir. 2001), we held invalid for obviousness a patent claim for a stainless steel cover for pay telephones. The only relevant difference between the claimed invention and the prior art covers was that the former attached the steel cover to the telephone via studs and the latter attached it with welds. Id. We noted that the difference between attaching with welds and studs was merely a "slight variation that produced convenience". Id. We found a clear motive to alter the prior art welded cover simply because "[u]sing studs was a cheaper, faster, and more convenient method of attachment", id., absent even a hint of suggestion to combine.

In Mazzari v. Rogan, 323 F.3d 1000 (Fed. Cir. 2003), we affirmed a district court grant of summary judgment of invalidity for obviousness of a patent claiming the use of underwater acoustic waves to kill zebra mussels. The Board had upheld the rejection of an application based on two prior art patents: an acoustic wave generator that enabled altering wave intensity and focusing acoustic energy along a particular angle, and a method of using water-borne acoustic waves to kill zebra mussels. The Board held that

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<sup>4</sup> We vacated the district court's grant of summary judgment of invalidity for other reasons, finding genuine disputes of material fact on the issue of commercial success. Id. at 1573.

a motivation to combine the two references existed because an ordinary artisan would have been aware of both references and that combination of the two was "more efficient". Id. at 1002-03. The inventor then brought a civil suit against the Director of the PTO pursuant to 35 U.S.C. § 145, and the district court granted summary judgment in favor of the Director. We deemed sufficient the Board's explanation of a motivation to combine and affirmed "because the references illustrate that it is well known in the art to use acoustic energy to kill and repel zebra mussels." Id. at 1006; see also Ruiz, 234 F.3d at 666 (remanding for determination of whether testimony that claimed invention was "easy to install" and "low cost" established motivation to combine).

In situations where a motivation to combine is based on these principles, the invention cannot be said to be nonobvious. Our precedent on this point, moreover, is consistent with the Supreme Court's holdings in Graham and three other obviousness decisions pre-dating the establishment of this court. See Sakraida v. AG Pro, Inc., 425 U.S. 273, 282 (1976); Anderson's-Black Rock, Inc. v. Pavement Salvage Co. 396 U.S. 57 (1969); United States v. Adams, 383 U.S. 39 (1966).

In Anderson's-Black Rock, the Supreme Court held invalid for obviousness a patent covering (1) a radiant burner for heating asphalt (2) attached to the front of a standard asphalt-paving machine. Both elements were well-known in the prior art individually, with the difference being that previously, radiant-heat burners were not used in paving, but merely for patching limited areas of asphalt. 396 U.S. at 58-59. Because asphalt is usually laid sequentially in parallel strips, the adjoining strip cools before the next strip is laid, leading to what is known as a "cold joint"—an area of poor bonding into which water and dirt enter, causing deterioration. Id. at 57-58. By

reheating the adjoining edge of the earlier-laid strip as a new strip is laid, the invention sought to eliminate the cold joint. No explicit suggestion to combine the prior art references would have been necessary because the invention merely improved the efficiency of the already-known process of laying pavement through the already-known method of merging two sections of asphalt through re-heating the earlier laid section—both of which would have been common knowledge to ordinary artisans in the field of laying asphalt. See also Graham, 383 U.S. at 24-25 (holding invalid for obviousness Graham's patent disclosing a spring clamp on a plow shank, where claimed invention merely improved mechanical weakness in prior Graham patent, because ordinary artisan would have had mechanical skills sufficient to "immediately see that the thing to do was what Graham did"); id. at 36-37 (holding invalid for obviousness Cook Chemical's patent disclosing a plastic finger sprayer with a "hold-down" lid serving as a built-in dispenser for bottles of liquid products, where differences from prior art were "exceedingly small and quite nontechnical" and device was "old in the art").

Likewise, in Sakraida, the Supreme Court held invalid for obviousness a patent for a barn having "a paved, sloped barn floor with downhill drains", "elevated" cow stalls, and a "dam" behind which water may be stored and abruptly released in order to "send a sheet of water cascading through the dairy sweeping the manure to the downhill drains." Ag Pro, Inc. v. Sakraida, 474 F.2d 167, 168 (5th Cir. 1973) (quoting U.S. Patent No. 3,223,070), rev'd by 425 U.S. 273. Because the cleaning action from an uphill release of water was superior to that from a hose, the claimed invention reduced the quantity of water necessary to clean the barn floor and obviated additional hand labor, e.g., brooms or shovels, shortening the cleaning process from a few hours to a

few minutes. Id. The Supreme Court nonetheless negated patent protection, characterizing the invention as "the work of the skillful mechanic, not that of the inventor." Sakraida, 425 U.S. at 279 (internal quotation marks omitted). The Court aptly noted that "[e]xploitation of the principle of gravity adds nothing to the sum of useful knowledge". Id. Under this court's case law, there would have been no need for "evidence" of a motivation to combine a prior art reference with a universally-known physical principle to achieve more powerful and simultaneous sweep of water.

In Adams, a companion case to Graham, the Supreme Court upheld the validity of a patent for a non-rechargeable water-activated battery having magnesium and cuprous chloride electrodes. Adams, 383 U.S. at 51. The Court recognized that "each of the elements of the Adams battery was well known in the prior art", but rejected the United States' obviousness argument because the prior art taught away from the Adams patent's combination. As the Court succinctly stated:

To combine [the references] as did Adams required that a person reasonably skilled in the prior art must ignore that (1) batteries which continued to operate on an open circuit and which heated in normal use were not practical; and (2) water-activated batteries were successful only when combined with electrolytes detrimental to the use of magnesium.

Id. at 51-52. The Court instructed that such "known disadvantages in old devices . . . may be taken into account in determining obviousness", id. at 52, and we have incorporated this notion into our case law. See, e.g., Fulton, 391 F.3d at 1199-1200 (instructing the factfinder to determine "[w]hat the prior art teaches, whether it teaches away from the claimed invention, and whether it motivates a combination of teachings from different references").

Although this court customarily discusses a motivation to combine as part of the first Graham factor, the scope and content of the prior art, see SIBIA Neurosciences, 225 F.3d at 1356, motivation to combine is also inextricably linked to the level of ordinary skill. If, as is usually the case, no prior art reference contains an express suggestion to combine references, then the level of ordinary skill will often predetermine whether an implicit suggestion exists. Persons of varying degrees of skill not only possess varying bases of knowledge, they also possess varying levels of imagination and ingenuity in the relevant field, particularly with respect to problem-solving abilities. If the level of skill is low, for example that of a mere dyer, as DyStar has suggested, then it may be rational to assume that such an artisan would not think to combine references absent explicit direction in a prior art reference. If, however, as we have held as a matter of law, the level of skill is that of a dyeing process designer, then one can assume comfortably that such an artisan will draw ideas from chemistry and systems engineering—without being told to do so.

A dyeing process designer would have been aware that reducing leuco indigo in-house was time-consuming as well as expensive and that it created much pollution on the dyehouse floor and in public sewers. He would have known that purchasing solid prereduced indigo would save time, space, and money: dyers would no longer spend time creating stock vats, and the dyehouse would require far less hydrosulfite and caustic soda. A dyeing process designer reading Chaumat would have learned that leuco indigo solution "may be drawn off protected from the air and preserved indefinitely in receptacles which are either soldered or closed in any other hermetic manner." Chaumat, II.84-87. From his chemistry background, he would have known how to close

off a receptacle hermetically. He would have known that, if he could thus stabilize leuco indigo solution, he would save even more time, space, and money: dyers would no longer need stock vats or preparation tanks because they could simply pour the prereduced solution directly into the dyebath itself, and they would no longer need to purchase any hydrosulfite or caustic soda. A dyeing process designer reading Brochet would have realized that catalytic hydrogenation provided advantages over other methods of indigo reduction in that the leuco indigo was "free from impurities and mineral salts". Brochet, I.90. Naturally, then, an ordinary artisan with knowledge of Chaumat, reading Brochet, would have realized that, by stabilizing catalytic hydrogenated leuco indigo solution in oxygen-excluding containers, he could devise a "cheaper, faster, and more convenient" indigo dyeing process. See Sandt, 264 F.3d at 1355. Although the '992 patent claimed a new, more efficient, way of performing a known function, dyeing indigo—the asserted innovation, storing leuco indigo solution in airtight containers for immediate use in dyebaths, is merely "exploitation" of the well-known principle of vacuum packaging. See Sakraida, 425 U.S. at 279. In sum, it is the work of a skilled chemist, not of an inventor.

### **3. Secondary Considerations of Nonobviousness**

The presence of certain secondary considerations of nonobviousness are insufficient as a matter of law to overcome our conclusion that the evidence only supports a legal conclusion that claim 1 would have been obvious. To be sure, the jury heard testimony that DyStar has enjoyed considerable commercial success from the introduction of its product, and all parties agree that eighty years elapsed between Brochet's invention and another inventor's thought to vacuum-seal the Brochet solution

and add it directly to the dyebath. However, Mr. Schnitzer's testimony that BASF's "people from production"—who we here assume arguendo were dyeing process designers—believed that leuco indigo solution added directly to the dyebath might "stain the yarn with indigo pigment" or "block[ ] pipes" was a bare assertion that is not only undocumented and non-specific, but also unsupported by even a brief explanation of the chemistry underlying this assumption. As such, it does not constitute substantial evidence of a secondary consideration favoring nonobviousness.

Moreover, another secondary consideration cited by DyStar—i.e., failed attempts—actually detracts from its argument, and heavily so. DyStar points out that another chemical company, Buffalo Color, abandoned a 1979 effort to market a prerduced indigo solution made by hydrosulfite reduction. The record shows, however, that Buffalo was only mildly concerned with instability problems—it noted only that the instability of leuco indigo "would require special (and costly) shipping conditions to protect it from oxidation". Rather, Buffalo decided against selling a leuco indigo solution because it would involve increased shipping costs, might require customers to invest in additional storage facilities, and would cost more to produce, likely forcing it to increase prices to customers. Buffalo's decision was thus not a failed attempt, but a calculated business judgment to abandon a potential new product line.

## C

Our inquiry does not end here, however, because we must evaluate obviousness on a claim-by-claim basis. Dayco Prods., Inc. v. Total Containment, Inc., 329 F.3d 1358, 1370 (Fed. Cir. 2003) ("[D]ependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim.").

Claims 2-4 depend from process claim 1. Claim 2 requires that the resulting solution contain from 10% to 35% by weight of leuco indigo; claim 3 requires that the solution contain from 2% to 10% by weight of alkali; and claim 4 requires that the solution contain from 2% to 10% by weight of sodium hydroxide. Dr. Blackburn, DyStar's own expert witness, confirmed that the plain language of Wimmer sets forth a "30 percent aqueous solution of leuco indigo", which falls within the range prescribed by claim 2. Dr. Blackburn also testified that the solution disclosed by Wimmer contains "5.1 percent" by weight of alkali—the claim language says "at least six and a half percent", both of which fall between 2% and 10%, as required by claim 3. Likewise, Wimmer indicates that his example solution uses "NaOH", sodium hydroxide, and Mr. Schnitzer agreed with Bann's counsel's assertion that the term "caustic" is "chemically the same thing as sodium hydroxide", which meets the requirement of claim 4. DyStar does not dispute these concessions on appeal. Thus, given DyStar's testimony and the plain language of Wimmer, claims 2-4 do not recite a nonobvious invention beyond that recited in claim 1. Accordingly, claims 2-4 must also be held invalid for obviousness as a matter of law.

### III

In sum, because an ordinary artisan is a person designing an optimal textile dyeing process with some expertise in chemistry, the jury's implicit finding that the level of ordinary skill in the art is a dyer is unsupported by substantial evidence; its corresponding decision to disregard the primary cited prior art as nonanalogous was also erroneous. Under the correct level of ordinary skill, it would have been obvious from Chaumat and Brochet, in view of Wimmer and other references, to stabilize

catalytically hydrogenated leuco indigo solution through vacuum conditions and to introduce the solution directly into the dyebath.

Because all claims are held invalid for obviousness, we need not address alleged anticipation of claim 1 or lack of enablement as to claims 1-4. Likewise, whether the '992 patent is unenforceable due to inequitable conduct need not be decided. Finally, we do not address the request for a new trial as all asserted claims are held invalid as a matter of law for obviousness. Accordingly, the trial court's denial of JMOL that claims 1-4 of the '992 patent are invalid for obviousness is reversed.

REVERSED.

United States Court of Appeals for the Federal Circuit

06-1088

DYSTAR TEXTILFARBEN GMBH & CO DEUTSCHLAND KG,

Plaintiff-Appellee,

v.

C.H. PATRICK CO., and BANN QUIMICA LTDA,

Defendants-Appellants.

SCHALL, Circuit Judge, concurring.

I concur in the judgment of reversal. See Alza Corp. v. Mylan Labs., Inc., No. 06-1088, 2006 U.S. App. LEXIS 22616, at 4-7 (Fed. Cir. Sept. 6, 2006); In re Kahn, 441 F.3d 977, 987-88 (Fed. Cir. 2006); Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc., 424 F.3d 1293, 1322 (Fed. Cir. 2005).