NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

RULING MENG, PEI-HERNG HOR,
Plaintiffs-Appellants

v.

CHING-WU "PAUL" CHU,
Defendant-Appellee

2014-1746, 2015-1390

Appeals from the United States District Court for the Southern District of Texas in No. 4:08-cv-03584, Judge Keith P. Ellison.

Decided: April 5, 2016

BRENT C. PERRY, Law Office of Brent C. Perry, Houston, TX, argued for plaintiff-appellant Ruling Meng. Also represented by GORDON GRAY WAGGETT, Gordon G. Waggett, P.C., Houston, TX.

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Before PROST, *Chief Judge,* DYK and WALLACH, *Circuit Judges.*

PROST, *Chief Judge*.

Appellants Pei-Herng Hor ("Hor") and Ruling Meng ("Meng") filed this suit against Appellee Ching-Wu Chu ("Chu") under 35 U.S.C. § 256 for correction of inventorship of U.S. Patent Nos. 7,709,418 ("'418 patent") and 7,056,866 ("'866 patent"). Following an eight-day bench trial, the United States District Court for the Southern District of Texas denied both parties' claims. For reasons discussed below, we affirm.

BACKGROUND

A

The circumstances giving rise to this appeal are summarized in the district court's decisions, *Hor v. Chu*, No. 4:08-CV-3584, 2015 WL 269123 (S.D. Tex. Jan. 21, 2015) and *Hor v. Chu*, 765 F. Supp. 2d 903, 906 (S.D. Tex. 2011), *aff'd in part, rev'd in part and remanded*, *Hor v. Chu*, 699 F.3d 1331 (Fed. Cir. 2012). We provide information relevant to the issues here below.

The patents at issue generally relate to superconducting compounds that have transition temperatures higher than the boiling point of liquid nitrogen. The '418 patent, filed on January 23, 1989 and issued on June 6, 2006, covers compounds consisting of Yttrium, Barium, Copper, and Oxygen, assembled according to a 2-1-4 ratio of Yttrium to Barium to Copper. The '866 patent, filed on March 26, 1987 and issued on May 4, 2010, covers com-

pounds consisting of Yttrium and/or certain rare earth elements (such as Gadolinium, Europium, and Samarium), Barium, Copper, and Oxygen, assembled according to a 1-2-3 ratio. Chu is the sole named inventor on both patents.

Chu worked with Hor and Meng in the High Pressure Low Temperature ("HPLT") lab at the University of Houston. Chu was a physics professor and the lab's principal investigator. Hor was Chu's graduate student and, later, post-doctoral fellow. Meng served as an independent materials scientist.

In November 1986, Meng's Chinese mentor pointed her to an article entitled "Possible High T_c Superconductivity in the Ba-La-Cu-O System" by Bednorz and Müller, which she subsequently shared with Chu. Meng and Chu decided to reproduce the compound described in the article ("LBCO compound") using the solid state reaction method. Meng and Chu disagree as to whose idea it was to use the solid state reaction method, an approach that differed from Bednorz and Müller's, who used a co-precipitation method. Meng prepared the LBCO compound in late November, and the group observed it had superconducting qualities.

At some point between December 1986 and January 1987, the group contemplated substituting Yttrium for Lanthanum in the LBCO compound.[1] This substitution

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[1] Both Hor and Chu claim that they were the first to come up with the idea of substituting Yttrium for Lanthanum. *Compare* Appellee Br. 13–14, *with* Cross-Appellant Br. 8–10. This matter was disputed below as the basis for Hor's claims to inventorship of the '418 patent, which the district court found Hor failed to prove by clear and convincing evidence. J.A. 52. Hor does not challenge the district court's decision with respect to the

was first performed in late January using a 2-1-4 ratio of Yttrium to Barium to Copper. The resulting compound, YBCO-214, eventually became the subject of the '418 patent.

YBCO-214 contained a black phase, which was superconducting, and a green phase, which was not. Interested in isolating the black superconducting phase, Chu directed Meng to prepare samples of the black phase, so that its chemical formula and structure could be determined.

On or around February 22, 1987, the HPLT lab began work on pair-breaking experiments which partially substituted Gadolinium, the most magnetic rare earth element, for Yttrium in YBCO-214. Chu claims responsibility for these partial substitution experiments, Appellee Br. 18–19, and Hor has conceded that "it is possible that a compound with a small fraction substitution of Gadolinium for Yttrium was actually created—and even possibly created at the direction of Chu . . . ." Cross-Appellant Reply Br. 20. However, the parties dispute the extent to which synthesis work was completed and verified.

Days later, on February 27 or 28, the HPLT group received preliminary results identifying black phase as YBCO-123, a compound having a 1-2-3 ratio of Yttrium to Barium to Copper. These results were finalized by March 8.

Pair-breaking experiments ramped up in early March, but with a new focus: instead of *partially* substituting magnetic rare earth elements for Yttrium in YBCO-214, the group *completely* substituted magnetic rare earth

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'418 patent in this appeal, Cross-Appellant Br. 28, so we need not reach the issue of whether Yttrium substitution originated with Chu or Hor.

elements for Yttrium in YBCO-123. These complete substitutions appear to have been contemplated as early as March 7, as a lab notebook entry shows chemical formulas for completely substituting rare earth elements in YBCO-123 on this date. At trial, Chu testified that this list of substitutions was "his." J.A. 4150. Hor does not claim responsibility for this entry. *See* Cross-Appellant Br. 19 n.3; Oral Argument at 15:35–45, *available at* http://oralarguments.cafc.uscourts.gov/default.aspx?fl=2014-1746.mp3. Over the next two weeks, the group synthesized and confirmed the superconductivity of at least ten different compounds, all created by completely substituting Yttrium with a magnetic rare earth element, including Europium (Eu), Samarium (Sm), Gadolinium (Gd), Cerium (Ce), Terbium (Tb), Neodymium (Nd), Erbium (Er), Dysprosium (Dy), Holmium (Ho), and Ytterbium (Yb).

Hor and Chu disagree as to how this new series of experiments came about. According to Chu, he originally had the idea to perform complete rare earth substitution back in February, when he performed partial rare earth substitution and observed that this did not suppress superconductivity. He then claims that, as a natural consequence of this activity, he instructed Meng in March to try complete substitution of Europium and Samarium, followed by Gadolinium and other rare earth elements. Hor does not claim responsibility for the Europium and Samarium substitutions, but instead dismisses them as "substitutions [likely] done by Meng as a part of a vast number of different elements being tried by the HPLT lab." Cross-Appellant Br. 19 n.3. Instead, he claims that the true surge in complete rare earth substitution experiments began with the successful substitution of Gadolinium on March 15. Hor claims that he—not Chu—triggered this activity on March 11 or 12, when he instructed Meng to synthesize a compound that completely substituted Gadolinium for Yttrium in YBCO-123.

Regardless of how they arose, the outcome of the complete rare earth substitution experiments was significant; they revealed an entire line of previously-unknown rare earth superconductors, all of which had a transition temperature higher than liquid nitrogen.

Publication, patent, and commercialization efforts for the rare earth superconductors soon followed. On March 16, Chu submitted a paper to the Physical Review Letters describing complete substitution of the rare earth elements in YBCO-123, which was published on May 4. J.A. 5304–07. Hor and Meng are listed as first and second authors to the paper, and Chu is listed last. J.A. 5304. The article does not mention partial substitution of rare earth elements in YBCO-214. *Id.*

On March 26, Chu submitted a continuation-in-part application which claimed partial and complete substitutions of the rare earth elements. This application eventually issued as the '866 patent.

In 1988, DuPont licensed the technology relating to the '418 and '866 patents. Chu shared the proceeds evenly with the University of Houston, and then, out of his remaining portion, gave $137,000 to Hor and $137,000 to Meng.

Chu, Hor, and Meng continued to work together at the University of Houston. In 1992, Chu wrote a letter of recommendation for Hor in support of his promotion and tenure at the university. The recommendation stated that "Pei's contributions to our research on high temperature superconducting (HTS) and related materials have been significant and numerous." J.A. 5301–02. It also asserted that "[h]e and colleagues under his direction discovered the whole series of the so-called 123 compounds $REBa_2Cu_3O_7$," the compounds created by complete rare earth substitution experiments. J.A. 5302.

Chu continued to publish articles on the rare earth superconductors through the 1990s. Several of these articles make statements about the timing of the conception events discussed above. Relevant here, four articles state that substitution of rare earth elements was undertaken after the chemical formula and structure of YBCO-123 was known. J.A. 5113, 5334, 5342, 5355.

B

Hor filed this action against Chu in December 2008, seeking correction of inventorship for the '418 and '866 patents under 35 U.S.C. § 256. Meng intervened in February 2010, also seeking correction of inventorship for the '418 and '866 patents.

In January 2014, the district court held an eight-day bench trial on the merits. On January 21, 2015, the district court issued an order denying both Meng's and Hor's claims. With respect to Meng, the district court found that Meng had not met her burden under § 256 because her testimony on who decided to use the solid state reaction method was "hopelessly at odds" with Chu's, she had not presented enough factual evidence that she conceived of using this method, and she had not shown that her contribution exceeded the ordinary skill in the art. With respect to Hor, the district court found that he had not met his burden under § 256 with respect to the '418 patent because he did not have sufficient corroborating evidence, and that he had not met his burden with respect to the '866 patent because "the evidence as to what was tested when, and by whom, is so conflicting that the Court cannot deem it clear and convincing." J.A. 52.

Meng and Hor now appeal the district court's decision. We have jurisdiction under 28 U.S.C. § 1295(a).

DISCUSSION

Section 256 provides for correction of inventorship on an issued patent. 35 U.S.C. § 256; *MCV, Inc. v. King–*

Seeley Thermos Co., 870 F.2d 1568, 1570 (Fed. Cir. 1989). Because issued patents are presumed to correctly name their inventors, the burden of proving nonjoinder of inventors is a "heavy one," which must be demonstrated by clear and convincing evidence. *See Hess v. Advanced Cardiovascular Sys.*, 106 F.3d 976, 980 (Fed. Cir. 1997). In order to prevail on a § 256 claim, an alleged co-inventor must show that he contributed to the conception of the claimed invention and that his contribution was "not insignificant in quality, when that contribution is measured against the dimension of the full invention." *Acromed Corp. v. Sofamor Danek Grp.*, 253 F.3d 1371, 1379 (Fed. Cir. 2001). An alleged co-inventor's testimony regarding his contribution must be corroborated, which courts assess under a "rule of reason" analysis. *Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1461 (Fed. Cir. 1998).

"Conception, and consequently inventorship, are questions of law" which we review de novo. *Sewall v. Walters*, 21 F.3d 411, 415 (Fed. Cir. 1994). We review underlying factual determinations for clear error. *Id.* "Credibility determinations are entitled to strong deference." *Hess*, 106 F.3d at 980.

On appeal, Hor challenges the district court's denial of his claims to joint inventorship with respect to the '866 patent. Meng challenges the district court's denial of her claims to joint inventorship with respect to the '418 and '866 patents. We address each challenge in turn.

A

Hor contends that he made a significant contribution to the conception of the rare earth superconductors claimed in the '866 patent because he initiated the complete replacement of Yttrium with Gadolinium on or around March 11. In support of this argument, Hor offers: (1) his own testimony that he conceived of complete replacement of Gadolinium; (2) testimony from Meng and

other individuals associated with the HPLT lab, including Dr. Jeffrey Bechtold and Dr. Kenneth Forster; (3) documentary evidence, including Chu's 1992 letter of recommendation and excerpts from Chu's publications which state that Gadolinium replacement was undertaken after the chemical formula and structure of YBCO-123 were determined; and (4) circumstantial evidence, including the timing of the "surge" of synthesis activity in March 1987, the timing of the continuation-in-part application and Chu's Physical Review Letters paper (Chu's first publication on rare earth substitutions, which was submitted after the Gadolinium substitutions that Hor claims credit for), the fact that Hor had been named a first author on a publication, and the fact that Chu shared the proceeds of the DuPont license with Hor. Hor argues that this evidence corroborates his claim to have invented the rare earth superconductors in March, and thus satisfies his burden under § 256.

Chu responds that the evidence cited by Hor is insufficient to meet his burden. In particular, Chu claims that Hor's arguments ignore evidence that Chu had fully conceived of the '866 patent before Hor's Gadolinium experiments, first through the February partial-substitution experiments and then through the March Europium and Samarium substitutions. Chu also attacks Hor's corroborating witnesses as interested and/or lacking personal knowledge, and rebuts Hor's other evidence as equivocal.

We agree with Chu and the district court that, in light of the record evidence, Hor did not prove his claim for joint inventorship by clear and convincing evidence. As Hor and Chu agreed at oral argument, a lab notebook entry dated March 7, 1987 contained chemical formulas for the complete substitution of rare earth elements in YBCO-123. *See* Oral Argument at 15:35–45, 33:35–34:50; J.A. 5058–60. Hor does not claim responsibility for these formulas. *See* Cross-Appellant Br. 19 n.3; Oral Argument

at 15:35–45. Instead, the earliest date he cites for his version of the rare earth conception story is March 11, when he claims he instructed Meng to synthesize a compound by completely substituting Gadolinium for Yttrium in YBCO-123. Cross-Appellant Br. 14. Accordingly, even if we accept Hor's version of events, this would not be sufficient to establish that he was the first to conceive of complete rare earth substitution.

Moreover, even if Hor cannot establish that he was the first to conceive of complete rare earth substitution, he has not otherwise provided clear and convincing evidence that he contributed to conception. "An alleged co-inventor's testimony, standing alone, cannot rise to the level of clear and convincing evidence; he must supply evidence to corroborate his testimony." *Symantec Corp. v. Computer Assocs. Int'l, Inc.*, 522 F.3d 1279, 1295 (Fed. Cir. 2008). The district court evaluated the entirety of Hor's corroborating evidence and found it insufficient. J.A. 52. In particular, the district court found that Meng's testimony was only "mildly persuasive," that the lab records "do not conclusively point one way or the other," and that circumstantial evidence such as Hor being named first author, the 1992 letter of recommendation, and DuPont payments were "just not especially convincing." *Id.*

We see no reason to disturb the district court's assessment. Neither Dr. Forster nor Dr. Bechtold testified that Hor ordered (or even discussed) experiments to completely substitute Gadolinium for Yttrium in YBCO-123, and, even though Meng testified to this fact, she is an interested witness and the district court found her testimony only "mildly persuasive." J.A. 52. Chu's 1992 letter of recommendation was written five years after the relevant time period and is a document designed to impart a favorable impression of Hor, not a neutral recitation of past events. Hor's listing as first author and receipt of a portion of the DuPont proceeds at most show that he had

a substantial involvement in the rare earth superconductor work at HPLT, but can neither prove nor disprove that he contributed to the specific idea of complete rare earth substitutions. Finally, none of the remaining evidence cited by Hor provides any indication of the scope of his personal involvement. For example, the alleged "surge" in synthesis activity (drawn from lab records which the district court found "do not conclusively point one way or the other," J.A. 52) could just as easily support Chu's contention that he initiated complete rare earth substitution experiments in March, as it could Hor's. Accordingly, considering the record evidence as a whole, we are not persuaded that the district court erred in finding that Hor failed to provide sufficient corroboration.

Because we agree with the district court that Hor did not meet his burden to show that he contributed to the conception of the rare earth superconductors in March 1987, we need not reach Chu's arguments that he conceived of the rare earth superconductors in February 1987. We affirm the district court's determination that Hor did not prove his claim to correction of inventorship under § 256 by clear and convincing evidence.

B

Meng contends that she should be named a joint inventor of the '418 and '866 patents because she developed and implemented the solid state reaction methods by which the claimed superconducting compounds were synthesized. Meng asserts that her efforts, "through extensive experimentation and analysis, required more than the exercise of ordinary skill." Appellant Br. 34. She emphasizes that Chu only provided her with general directions, and that she worked independently to come up with the specific steps for creating the superconducting compounds.

Conception of a chemical compound "requires knowledge of both the specific chemical structure of the

compound and an operative method of making it." *Fina Oil & Chem. Co. v. Ewen*, 123 F.3d 1466, 1473 (Fed. Cir. 1997). However, where the operative method requires "nothing more than the use of ordinary skill in the art," this "would not normally be a sufficient contribution to amount to an act of joint inventorship." *Falana v. Kent State Univ.*, 669 F.3d 1349, 1357 (Fed. Cir. 2012).

The district court considered Meng's use of the solid state reaction method and concluded that "the evidence is not clear and convincing enough for the Court to find that suggesting [use of the solid state reaction method] was anything beyond that of ordinary skill in the profession." J.A. 51. Although Meng asserts the contrary, she does not specifically explain what differentiates her efforts from what would have been the ordinary efforts of a skilled artisan. Meng seems to suggest that she exercised more than ordinary skill because she "worked independently" and engaged in "excessive experimentation," but these are only characterizations of the organizational structure of the lab and the quantity of work that Meng performed, not the level of skill she exercised. Accordingly, we agree with the district court that Meng's work does not exceed the level of ordinary skill in the art.

Given that Meng's only asserted contribution to the '418 and '866 patents does not, under the facts and circumstances of this case, rise to the level of an act of joint inventorship, her claims under § 256 fail. Because of this fatal flaw, we do not need to reach the remainder of Meng's arguments, nor the district court's decision with respect to corroboration. We affirm the district court's determination that Meng did not prove her claim to correction of inventorship under § 256 by clear and convincing evidence.

CONCLUSION

For the foregoing reasons, we affirm the district court's determination that neither Hor nor Meng is entitled to correction of inventorship under § 256.

AFFIRMED