

United States Court of Appeals for the Federal Circuit

01-1452

CFMT, INC. and CFM TECHNOLOGIES, INC.,

Plaintiffs-Appellants,

v.

YIELDUP INTERNATIONAL CORP.,

Defendant-Appellee.

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Appealed from: United States District Court for the District of Delaware

Judge Roderick R. McKelvie

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v.

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DECIDED: November 12, 2003

Before RADER, Circuit Judge, FRIEDMAN, Senior Circuit Judge, and LINN, Circuit Judge.

RADER, Circuit Judge.

On summary judgment, the United States District Court for the District of Delaware determined that CFMT, Inc.'s U.S. Patent No. 4,778,532 (the '532 patent) and U.S. Patent No. 4,917,123 (the '123 patent) are invalid, CFMT, Inc. v. YieldUp Int'l Corp., 92 F. Supp. 2d 359 (D. Del. 2000), and, after a bench trial, unenforceable, CFMT, Inc. v. YieldUp Int'l Corp., 144 F. Supp. 2d 305 (D. Del. 2001). Because the district court erred in applying both the enablement and inequitable conduct requirements, this court reverses-in-part, vacates-in-part, and remands.

I.

The '532 and '123 patents cover a system for cleaning semiconductor wafers. The process for manufacturing semiconductor wafers must keep them as free as possible from contamination to prevent defects in semiconductors. To keep the wafers clean, conventional processes sequentially immerse the wafers in various liquids in an open environment. This bathing procedure exposes the wafers to airborne contaminants and also exposes workers to hazardous chemicals.

The '532 and '123 patents claim improvements in these open cleaning systems. Specifically, the '532 and '123 patents claim a system that is closed to the outside environment and requires no human handling. Instead the wafers remain at all times in a closed container that sequentially introduces different chemicals to clean the wafers. Because the '123 patent is a divisional of the '532 patent, the two patents have identical disclosures. The parent '532 patent contains method claims only. Independent claims 1 and 55 are representative (emphases added):

1. An enclosed, full flow method for the cleaning of semiconductor wafers comprising positioning said wafers in a vessel, closing said vessel to the environment, and flowing process fluids sequentially and continuously past said wafers in said vessel, including the steps of
 - (a) contacting said wafers with at least one cleaning fluid to remove contaminants from said wafers;
 - (b) removing said cleaning fluid from said wafers with a rinsing fluid; and
 - (c) removing said rinsing fluid from said wafers with a drying fluid;whereby the processing does not require movement [sic] or operator handling of said wafers between said steps; and maintaining the vessel containing said wafers hydraulically full during each process step.

55. An enclosed, full flow method for the treatment of semiconductor wafers comprising positioning said wafers in a vessel, closing said vessel to the environment, and flowing process fluids in sequential steps continuously past said wafers in said vessel, including the step of reacting the surface of said wafers with at least one chemical reagent, whereby the processing does not require movement or handling of said wafers between said steps and maintaining the vessel containing said wafers hydraulically full during each process step.

The divisional '123 patent contains corresponding apparatus claims. Independent claims 1 and 20 are representative (emphases added):

1. Apparatus for wet processing of semiconductor wafers comprising:
 - (a) vessel means for supporting said wafers in a closed circulation process stream wherein process fluids may sequentially flow past said wafers, said vessel being hydraulically full with process fluid when said process fluids flow past said wafers;
 - (b) means for supplying at least one cleaning fluid to said process stream for removing contaminants from said wafers, and means for withdrawing said cleaning fluid from said process stream;
 - (c) means for supplying a rinsing fluid to said process stream for removing other fluids from said wafers, means for minimizing gas/liquid interfaces in said rinsing fluid and means for withdrawing said rinsing fluid from said process stream; and
 - (d) means for supplying a drying fluid to said process stream for removing other fluids from said wafers and means for withdrawing said drying fluid from said process stream.

20. Apparatus for wet processing of semiconductor wafers comprising:
 - (a) vessel means for supporting said wafers in a closed circulation process stream wherein process fluids may sequentially flow past said wafers and
 - (b) means for supplying at least one chemical reagent to said process stream for reacting with portions of said wafers, said process stream being positioned within said vessel means such that said vessel means is hydraulically full with process fluid.

The record in this case shows that the inventors installed for Texas Instruments (TI) a machine that performed the claimed method. At first the apparatus did not meet this customer's standards for wafer cleanliness. The inventors adjusted the apparatus and experimented for months before meeting the customer's standards. In fact, the inventors obtained a third patent claiming the improvements in their initial apparatus.

CFMT and CFM Technologies, Inc.* (collectively CFMT) sued YieldUp International Corp. (YieldUp) for infringement of the '532 and '123 patents. In turn, YieldUp denied infringing and asserted that the patents were invalid as nonenabled and were unenforceable for inequitable conduct before the United States Patent and Trademark Office (PTO). YieldUp moved for summary judgment that the patents were invalid for lack of enablement. CFMT filed a cross-motion for summary judgment that the patents were enabled.

YieldUp based its nonenablement argument on problems CFMT faced in setting up a

commercial embodiment of the invention, the “beta tool Full Flow” machine. As noted before, CFMT had installed the Full Flow machine at a TI site. In its first runs, the machine did not meet TI’s cleanliness standards. After months of experiments, the inventors identified the problem in a drying step and solved it. Concurrently, a patent application that led to the ’532 patent was pending before the PTO. While prosecuting the application, CFMT submitted a list of advantages of the invention to the PTO, but did not tell the PTO of the problems at TI. The examiner allowed the case and the ’532 patent issued. As also noted, the inventors eventually filed a patent application on the improvement that solved the problem. That application matured into U.S. Patent No. 4,911,761 (the ’761 patent).

On April 5, 2000, the district court granted YieldUp’s motion for summary judgment that the ’532 and ’123 patents were invalid for nonenablement. The district court construed the claims of the ’532 patent as limited by the preamble terms “cleaning” and “treatment,” which the district court construed to mean removing contaminants from the wafer surface. CFMT, Inc., 92 F. Supp. 2d at 371-72. Similarly, the district court construed the claims of the ’123 patent as limited by the preamble term “wet processing,” which the district court construed to mean the same as “cleaning.” Id. at 374. The district court stated that the specification “must enable one skilled in the art to clean semiconductor wafers using the Full Flow system.” Id. at 377. The district court found that “the Full Flow system that was based on the ’532 and ’123 patents could not clean” wafers, that the “inventors experimented with the Full Flow system for more than six months,” and “that the solution to the problem eventually resulted in the ’761 patent demonstrates that the experimentation required . . . was not routine.” Id.

The district court further conducted a bench trial to determine whether CFMT committed inequitable conduct in prosecuting the application that matured into the ’523 patent. On June 6, 2001, the district court entered judgment that the ’532 and ’123 patents are unenforceable due to inequitable conduct before the PTO. The district court relied on two events during prosecution of the application leading to the parent ’532 patent. First, CMFT did not report to the PTO the initial TI test results (the TI data). The court concluded that the data was material because “a reasonable examiner would have considered data rebutting [the invention’s] advantages in deciding whether to allow” the patents. CFMT, Inc., 144 F. Supp. 2d at 317. Second, during prosecution, the applicants traversed an

obviousness rejection and stated eleven advantages of the invention. The district court found that the undisclosed TI data contradicted these laudatory statements. Because it considered the TI data highly material, the district court inferred that CMFT intended to deceive the PTO.

The district court then entered final judgment that the claims of the '532 and '123 patents were invalid and unenforceable. CFMT appealed to this court, which has jurisdiction under 28 U.S.C. § 1295 (a)(1) (2000).

II.

This court reviews without deference a district court's grant of summary judgment. Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1309 (Fed. Cir. 1999). A court considering summary judgment must "view the evidence presented through the prism of the substantive evidentiary burden." Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 245 (1986). The court must also draw all reasonable inferences in favor of the nonmovant. Id. at 255.

This court also reviews claim construction without deference. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1454 (Fed. Cir. 1998) (en banc). Enablement is a question of law with factual underpinnings; this court reviews the ultimate legal conclusion without deference. Plant Genetic Sys., N.V. v. DeKalb Genetics Corp., 315 F.3d 1335, 1339 (Fed. Cir. 2003). This court reviews a determination of inequitable conduct for abuse of discretion and reviews the underlying factual issues of materiality and intent for clear error. Bristol-Myers Squibb Co. v. Rhone-Poulenc Rorer, Inc., 326 F.3d 1226, 1234 (Fed. Cir. 2003).

A. Nonenablement

The district court based its nonenablement judgment on two grounds: (1) lack of utility or inoperability and (2) undue experimentation needed to carry out the invention. The district court first

construed each of the preamble terms “cleaning,” “treatment,” and “wet processing” as requiring “removal of contaminants.” Based on that construction, the district court concluded that “the claims of the ’532 and ’123 patents must enable one skilled in the art to clean semiconductor wafers using the Full Flow system.” The district court considered that “the first wafers processed with the Full Flow system appeared clean to the naked eye” but looked “filthy” viewed using laser scanning. The district court concluded that the TI data showed that the claimed system did not remove particles until the inventors developed the improvements leading to the ’716 patent. The district court found that “the Full Flow system that was based on the ’532 and ’123 patents could not clean semiconductor wafers.” The district court considered that the inventors experimented “for more than six months” making “hundreds of modifications.” The district court concluded that the “fact that the solution to the problem eventually resulted in the ’761 patent demonstrates that the experimentation required to enable the ’532 and ’123 patents was not routine.”

The parties do not challenge the district court’s construction of the preamble terms “cleaning,” “treatment,” and “wet processing” as a limitation requiring “removal of contaminants.” The parties also do not dispute that the record shows CFMT’s initial efforts to build the claimed apparatus and to carry out the individual steps of the claimed method required undue experimentation. Instead, this case asks this court to examine whether these claims required a specific level of contaminant removal that the disclosure did not enable. Further, this court must consider whether the improvements in the ’716 patent show that the ’532 and ’123 patents did not enable the scope of those claimed inventions.

At the outset, the district court erred in requiring that the patent disclosures enable a single embodiment, the Full Flow system, to meet TI’s commercial standards. In essence, the district court set the enablement bar too high. Enablement does not require an inventor to meet lofty standards for success in the commercial marketplace. Title 35 does not require that a patent disclosure enable one of ordinary skill in the art to make and use a perfected, commercially viable embodiment absent a claim limitation to that effect.

Title 35 requires only that the inventor enable one of skill in the art to make and use the full

scope of the claimed invention. Thus, when an invention claims a general system to improve the cleaning process for semiconductor wafers, the disclosure enables that invention by showing improvements in the overall system. See, e.g., Engel Indus., Inc. v. Lockformer Co., 946 F.2d 1528, 1533 (Fed. Cir. 1991) (“The enablement requirement is met if the description enables any mode of making and using the claimed invention.”). Of course, if a patent claimed a system that achieved cleanliness up to a specified numerical particle-free range, then enablement would require disclosure of a method that enables one of ordinary skill to achieve that range without undue experimentation. Thus, the level of disclosure necessary to satisfy section 112 of title 35 varies according to the scope of the claimed invention. Durel Corp. v. Osram Sylvania Inc., 256 F.3d 1298, 1306-07 (Fed. Cir. 2001); In re Wright, 999 F.2d 1557, 1561 (Fed. Cir. 1993); In re Wands, 858 F.2d 731, 737 (Fed. Cir. 1988).

The claims of the '532 and '123 patents state no standard of cleaning. As the district court correctly found, “cleaning” in the context of this invention means generally removing contaminants from the wafer surface. Absent some standard for cleanliness in the claims, this court proceeds to examine the record for a showing that the disclosures of the CFMT patents would enable a person of skill in the art to make and use a system or apparatus to achieve any level of contaminant removal without undue experimentation. See Engel Indus., 946 F.2d at 1533.

The record contains evidence that the inventors' prototype removed grease stains. The inventors testified that before setting up the TI apparatus, they verified by naked eye that a prototype of the invention removed penciled grease marks. This record evidence is probative of whether the “removal of contaminants” limitation is enabled. This court also notes that the record contains no evidence that a person of ordinary skill would have to undertake undue experimentation to build a similar prototype and carry out the claimed method to remove the contaminants -- in this instance, grease marks.

The lengthy experiments at TI do not show nonenablement because the inventors undertook that work to satisfy TI's particular commercial requirements, not to show enablement of the scope of the claimed inventions. “Patents are not production documents, and nothing in the patent law requires that a patentee must disclose data on how to mass-produce the invented product. . . . [T]he law requires that

patents disclose inventions, not mass-production data, and that patents enable the practice of inventions, not the organization and operation of factories.” Christianson v. Colt Indus. Operating Corp., 822 F.2d 1544, 1562 (Fed. Cir. 1987). Reliance on the TI data alone also betrays another error, namely that this court gauges enablement at the date of the filing, not in light of later developments. In re Wright, 999 F.2d 1557, 1563 n.8 (Fed. Cir. 1993).

The district court essentially concluded that the invention claimed in the patents at issue simply did not work, that is, could not clean wafers, and therefore it would require undue experimentation to carry out the invention. See 35 U.S.C. § 101 (2000). This court has recognized the relationship between the enablement requirement of § 112 and the utility requirement of § 101. See, e.g., In re Swartz, 232 F.3d 862, 863 (Fed. Cir. 2000) (“[I]f the claims in an application fail to meet the utility requirement because the invention is inoperative, they also fail to meet the enablement requirement because a person skilled in the art cannot practice the invention”); EMI Group N. Am., Inc. v. Cypress Semiconductor Corp., 268 F.3d 1342, 1348 (Fed. Cir. 2001). In this case, however, the district court similarly set the standard for utility too high for this invention. While the district court’s major premise is correct that an inoperable invention is not enabled, the district court erred in its minor premise that the claimed invention is inoperable and lacks utility.

The inoperability standard for utility applies primarily to claims with impossible limitations. See, e.g., Process Control Corp. v. HydReclaim Corp., 190 F.3d 1350, 1359 (Fed. Cir. 1999) (claims found inoperable because they require violating the principle of conservation of mass); Newman v. Quigg, 877 F.2d 1575 (Fed. Cir. 1989) (claims to a perpetual motion machine ruled inoperable). Moreover, where a patent discloses several alternative combinations of methods (as most systems claims will), the party asserting inoperability must show that all disclosed alternatives are inoperative or not enabled. EMI Group, 268 F.3d at 1349. The ’532 and ’123 patents do not claim an impossible result or an inoperative invention.

Because the preamble term “cleaning” means only “removal of contaminants,” not removal of all contaminants or removal of contaminants according to the TI commercial standard, the inventor shows

utility and enables the invention by disclosing “removal of contaminants.” Even if the single Full Flow embodiment does not achieve complete cleaning, that alone would not render the invention inoperative. See Moleculon Research, 793 F.2d at 1269 (claims had utility despite only a partial description of how to reach the claimed goal of “restoring a preselected pattern” in a puzzle; it sufficed to describe a general approach to solving the puzzle); EMI Group, 268 F.3d at 1349. Nor would it render the claims invalid as nonenabled. See Engel Indus., 946 F.2d at 1533. In this case, with its specific claims and invention, the specification needed to teach one of ordinary skill to make and use a system or apparatus that removes any contaminants. In sum, any meaningful “cleaning” would satisfy the claimed goal of “cleaning of semiconductor wafers.”

The district court’s second ground for nonenablement invoked the ’761 improvement patent as evidence that the inventors engaged in undue experimentation to “clean” semiconductor wafers. The district court reasoned that the inventor had not enabled the ’532 and ’123 patents because only the further invention of the ’761 improvement patent sufficed to meet TI’s commercial standard.

Improvement and selection inventions are ubiquitous in patent law; such developments do not alone cast doubt on enablement of the original invention. See Hormone Research Found., Inc. v. Genentech, Inc., 904 F.2d 1558, 1568 (Fed. Cir. 1990) (citing In re Hogan, 559 F.2d 595 (CCPA 1977)). In general, few patented inventions are an immediate commercial success. Rather, most inventions require further development to achieve commercial success. Thus, additional inventive work does not alone show nonenablement.

Moreover, the district court’s reasoning presumes incorrectly that development of an improvement patent, the ’761 in this case, implies extensive experimentation. To the contrary, patent acquisition does not require any threshold level of effort or ingenuity. See 35 U.S.C. § 103(a) (2000) (“Patentability shall not be negated by the manner in which the invention was made.”); 35 U.S.C. § 103 Revision Notes and Legislative Reports, 1952 Notes (“[I]t is immaterial whether [the invention] resulted from long toil and experimentation or from a flash of genius.”); Life Techs., Inc. v. Clontech Labs., Inc., 224 F.3d 1320, 1325 (Fed. Cir. 2000) (stating that “the path that leads an inventor to the

invention is expressly made irrelevant to patentability by statute”). Thus, the ’761 improvement patent alone is not conclusive evidence of undue experimentation.

Because the district court misapplied the law of enablement in concluding that the claims of the ’532 and ’123 patents are invalid, this court vacates that part of the decision. While the record at this stage does not appear to present a genuine issue of material fact about whether a person of ordinary skill in the art could achieve any level of cleaning with the claimed invention without undue experimentation, this court remands for the district court to reconsider that question. The district court may decide, under the correct legal standard, whether to grant CFMT’s cross-motion for summary judgment of enablement or whether to proceed to trial on that issue.

B. Inequitable Conduct

Inequitable conduct requires proof that a patent applicant did not disclose material information to the PTO with intent to deceive. Kingsdown Med. Consultants, Ltd. v. Hollister Inc., 863 F.2d 867, 872 (Fed. Cir. 1988). More specifically, “[i]nequitable conduct includes affirmative misrepresentation of a material fact, failure to disclose material information, or submission of false material information, coupled with an intent to deceive.” Molins PLC v. Textron, Inc., 48 F.3d 1172, 1178 (Fed. Cir. 1995). These elements must be shown with clear and convincing evidence. Id. The district court applied the pre-1992 standard for materiality, because the relevant acts took place before 1992. Under that standard, information is material if “there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.” See Molins, 48 F.3d at 1179 n.8.

The district court concluded that CFMT committed inequitable conduct in its comments about the advantages of the invention during prosecution of the ’532 patent to overcome a rejection for obviousness and in its failure to disclose the TI data. The district court inferred intent based on the inventors’ knowledge of the materiality of the comments and omissions.

1. Misrepresentations to the PTO

The district court found that the applicants, in traversing an obviousness rejection during prosecution before the PTO, misrepresented the invention by stating its advantages without disclosing the TI data. The statements at issue appear in an amendment filed in December 1988 (emphases added):

The new and/or unexpected results and advantages achieved by the presently claimed invention include:

1. reduction of contamination by airborne particles;
2. reduction of contamination from human or robotic operators;
3. good heat transfer between process chemicals and wafers;
4. uniform exposure of the wafers to reagent chemicals at uniform concentrations for precisely limited periods of time;
5. reduction of hazards to personnel by minimizing exposure to chemicals;
6. minimizing stagnant conditions and avoiding filming effects; and
7. providing a mechanically simple process and apparatus which allow for easy operation and cleaning while minimizing the possibility [sic] contaminant build-ups in the apparatus.

Still further advantages are provided by preferred embodiments of the present invention, including:

1. the reduction of quantities of hazardous process fluids used due to recirculation of the process fluids;
2. the ability to provide quality drying fluids to displace the residual rinsing fluid;
3. the ability to provide a high-quality rinsing fluid having both low suspended solids and low dissolved impurities; and
4. the ability to provide high flow rates of rinsing fluid to rinse the wafers and precisely dilute concentrated chemical reagents.

The net effect of all the above advantages is to reduce the risk of introducing contaminants while simultaneously improving the yield of non-defective semiconductor devices.

The district court found that an examiner would have considered the TI data important because it rebuts those stated advantages. The district court focused on the final sentence quoted above, treating it as a “summary of the advantages distinguishing the Full Flow system from the Aigo tool” and interpreting “contaminants” to include all undesirable materials mentioned in the enumerated advantages. The district court concluded that “the inventors’ statements in response to the obviousness rejection were inaccurate and constituted a misrepresentation.”

The district court clearly erred in finding that the applicants’ statements were material misrepresentations. In the first place, the statements were not inaccurate. As recognized by the examiner in the Notice of Allowance, the invention advances the art by closing the system for cleaning semiconductor wafers. A closed system provides the inherent advantage of less contamination by airborne particles.

The final sentence of the applicants’ advantages advocacy refers to reducing contaminants as described in the enumerated examples. Moreover, the only specific contaminants in those examples are airborne particles (the only mention of “particles”) and contaminants from human or robotic operators. Thus, the advantages advocacy recited only the natural, expected results of a closed system. The final quoted sentence at most overemphasizes the benefits of the invention. This advocacy does not rise to the level of misrepresentation.

The district court also clearly erred in finding that the examiner relied on the applicants’ advantages advocacy. To the contrary, the examiner, in supplying reasons for allowance, stated only that the art of record does not teach a closed, hydraulic system as claimed. Thus, the examiner concluded that no combination of the prior art, even if supported by a motivation to combine, would disclose all the limitations of the claims. In other words, the examiner detected, in light of all limitations of the claims, no obviousness. See In re Gulack, 703 F.2d 1381, 1385 n.9 (Fed. Cir. 1983); In re Royka, 490 F.2d 981, 985 (CCPA 1974) (obviousness requires a suggestion of all limitations in a claim). Therefore the examiner did not appear to resort to consideration of secondary considerations, such as the unexpected results and advantages in the quoted statements, to surmount the obviousness objection. In

sum, the advantages advocacy was not as highly material as the district court seemed to think.

An applicant cannot prove unexpected results with attorney argument and bare statements without objective evidentiary support. See In re Lindner, 457 F.2d 506, 508 (CCPA 1972); In re Geisler, 116 F.3d 1465 (Fed. Cir. 1997) (“attorney argument [is] not the kind of factual evidence that is required to rebut a prima facie case of obviousness”); In re Soni, 54 F.3d 746, 750 (Fed. Cir. 1995) (“It is well settled that unexpected results must be established by factual evidence. Mere argument or conclusory statements . . . [do] not suffice.” (quoting In re De Blauwe, 736 F.2d 699, 705 (Fed. Cir. 1984))). During prosecution, an applicant may submit objective factual evidence to the PTO in the form of patents, technical literature, and declarations under 37 C.F.R. § 1.132 (2003) submitting expert testimony and, at times, test data. The advantages advocacy in this case does not fit any of these categories and was unaccompanied by and not asserted to be supported by any factual evidence. Therefore, a reasonable examiner would not have found it important in deciding whether to allow the application. Instead, the examiner expressly stated the grounds for allowance, namely that the art of record does not teach a closed, hydraulic system as claimed.

In sum, the district court clearly erred in finding that the applicants’ statements to the PTO were misrepresentations and in finding that those statements were highly material to the examiner’s actions.

2. Failure to disclose the TI data

The district court also concluded that CFMT breached the duty of candor because it did not disclose the TI data to the PTO. The district court considered the TI data material to enablement.

As already noted, the TI data was temporally and substantively of very marginal relevance to enablement of the claims as filed. As noted, the TI data reflects a commercial, not a statutory, standard for enablement. The district court therefore clearly erred in concluding that the TI data was highly material.

3. Intent

This court recognizes that a district court may infer intent to deceive the PTO. However, even gross negligence does not alone suffice to establish intent. Kingsdown Med. Consultants, Ltd. v. Hollister Inc., 863 F.2d 867, 876 (Fed. Cir. 1988). Instead, “the involved conduct, viewed in light of all the evidence, including evidence indicative of good faith, must indicate sufficient culpability to require a finding of intent to deceive.” Id.

This court discerns no evidence that CFMT intended to deceive the PTO. As explained above, the materiality of the undisclosed subject matter is low. Therefore, the trial court had little basis for inferring intent. The district court clearly erred in finding that the applicants intentionally withheld material information and therefore abused its discretion in concluding that the applicants engaged in inequitable conduct in prosecuting the patents at issue.

Accordingly, this court reverses the district court’s decision on inequitable conduct.

CONCLUSION

The district court erred in granting summary judgment that the patents at issue do not meet the enablement requirement of 35 U.S.C. § 112 and in ruling after trial that the patents are unenforceable due to inequitable conduct before the PTO. This court therefore reverses-in-part, vacates-in-part, and remands.

COSTS

Each party shall bear its own costs.

REVERSED-IN-PART, VACATED -IN-PART, and REMANDED

* CFM Technologies, Inc. assigned the patents to holding company CFMT, Inc., which in turn granted CFM Technologies, Inc. an exclusive license.