

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

MAGSIL CORP., et al. : CIVIL ACTION
v. :
SEAGATE TECHNOLOGY, et al. : NO. 08-940

MEMORANDUM

Bartle, C.J. February 16, 2011

Plaintiffs MagSil Corporation and Massachusetts Institute of Technology (collectively "plaintiffs") have sued Hitachi Global Storage Technologies Inc., Hitachi America Ltd., Hitachi Data Systems Corporation, and Shenzhen ExcelStor Technology, Ltd. (collectively "defendants") for infringement of U.S. Patent No. 5,629,922 (the "'922 patent"), entitled "Electron Tunneling Device Using Ferromagnetic Thin Films."

Before the court are the parties' cross motions for summary judgment. Plaintiffs' motion asserts that defendants' hard drive products and components infringe the '922 patent and that one reference on which defendants rely is not prior art to the '922 patent. In their motion, defendants argue that plaintiffs cannot prove infringement, and alternatively, that the asserted claims of the '922 patent are invalid as obvious, insufficiently enabled, and lacking a sufficient written description.

I.

Summary judgment is appropriate when "the pleadings, the discovery and disclosure materials on file, and any affidavits show that there is no genuine issue as to any material fact and that the moving party is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(c); see Libel-Flarsheim Co. v. Medrad, Inc., 481 F.3d 1371, 1377 (Fed. Cir. 2007). In viewing the record, all justifiable inferences are to be drawn in favor of the non-moving party. Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 245 (1986); CFMT, Inc. v. Yieldup Int'l Corp., 349 F.3d 1333, 1337 (Fed. Cir. 2003). In determining whether summary judgment is appropriate, we "view the evidence presented through the prism of the substantive evidentiary burden that would inhere at trial." AK Steel Corp. v. Sollac, 344 F.3d 1234, 1238 (Fed. Cir. 2003) (quoting Anderson, 477 U.S. at 245) (internal quotation omitted).

II.

Plaintiff Massachusetts Institute of Technology is the assignee of the '922 patent, and plaintiff MagSil Corporation has an exclusive license to develop commercially the technology described in that patent. Defendants produce and sell hard disc drives and components of hard disc drives that plaintiffs contend infringe claims 1-5, 23-26 and 28 (the "asserted claims") of the '922 patent.

The application leading to the '922 patent was filed on March 21, 1995, and the U.S. Patent and Trademark Office ("PTO")

issued the '922 patent to inventors Jagadeesh Moodera, Terrilyn Wong, Lisa Kinder, and Robert Meservey on May 13, 1997. The '922 patent states claims relating to a multi-layered device, called a junction that consists of at least two thin electrodes separated by a thin layer of insulation. Independent claim 1 of the '922 patent teaches:

A device forming a junction having a resistance comprising:
a first electrode having a first magnetization direction,
a second electrode having a second magnetization direction, and
an electrical insulator between the first and second electrodes, wherein applying a small magnitude of electromagnetic energy to the junction reverses at least one of the magnetization directions and causes a change in the resistance by at least 10% at room temperature.

'922 patent at 8:43-54. Dependent claims 2 through 5 each add additional limitations to claim 1, none of which is relevant for present purposes. Independent claim 23 teaches:

A memory device for storing binary data comprising:
a movable read-write sensor head comprising two trilayer devices, each having a junction with a resistance, separated by a gap, wherein each device comprises:
a first film layer having a first magnetization direction,
a second film layer having a second magnetization direction, and
an electrical insulator layer between the first and the second film layers, wherein applying a small magnitude of electromagnetic energy to the junction reverses at least one of the magnetization directions and causes a change in the resistance by at least 10% at room temperature.

Id. at 10:25-37. Dependent claims 24 through 26 and claim 28 each add limitations to claim 23 that, similar to claims 2 through 5, do not bear on the motions before the court.

According to the patent specification, researchers had known "for many years" the basic theory of "tunnel resistance arising from conduction electron spin polarization." Id. at 2:3-5. In short, this resistance is a "quantum phenomenon" that arises when electric current is passed through electrodes separated by a "thin insulating layer." Id. at 1:17-23. Each of the electrodes has a magnetization direction, and the electrical resistance the junction exhibits depends on the relative alignments of the electrodes' magnetization directions. The junction's electrical resistance is minimized when the electrodes' magnetization directions are parallel and is maximized when the magnetization directions are antiparallel,¹ that is, offset by 180 degrees. Id. at 1:26-31. Applying magnetic fields to the junction rotates one or more of the electrodes' magnetization directions, and by controlling these rotations, the junction's electrical resistance can be increased or decreased. Id. at 2:15-33.

The specification reveals that the work giving rise to the '922 patent has "consistently" yielded a change in resistance of 10% "in several tens of junctions" and that the inventors had

1. In physics, "antiparallel" means "parallel but oppositely directed" and is a term often used to describe vectors. WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 95 (1986).

observed resistance changes of "as much as 11.8%" at room temperature. Id. at 2:44-51, 5:32-38. The specification further explains that "[t]his increase in [resistance] is believed to depend, inter alia, on a decrease in surface roughness, which apparently directly couples the two electrodes ferromagnetically." Id. at 2:51-54. It states that the insulating layer between the junction's electrodes is an improvement over prior art and is "important in keeping the surface integrity of the [ferromagnetic] electrodes." Id. at 2:56-58. The specification also describes in some detail the method by which the inventors constructed their preferred embodiments and the means by which the junctions described in the patent may be incorporated into a data storage device. Id. at 3:52-4:38, 6:66-8:36.

III.

We first turn to defendants' argument that the invention claimed has not been enabled in the patent specification. It is the "quid pro quo" of the patent system that the inventor must disclose how "to practice the full scope of the claimed invention" in exchange for an exclusive right to practice the invention for a limited term. AK Steel Corp., 344 F.3d at 1244. This requirement arises from 35 U.S.C. § 112, which provides:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to

which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Inventors may claim their inventions in generic terms as long as the specification describes the invention with the specificity required by § 112. Amgen, Inc. v. Chugai Pharm. Co., Inc., 927 F.2d 1200, 1213 (Fed. Cir. 1991). As the Court of Appeals for the Federal Circuit has observed, "A patentee who chooses broad claim language must make sure the broad claims are fully enabled. The scope of the claims must be less than or equal to the scope of the enablement to ensure that the public knowledge is enriched by the patent specification to a degree at least commensurate with the scope of the claims." Sitrick v. Dreamworks, LLC, 516 F.3d 993, 999 (Fed. Cir. 2008) (internal quotations omitted). In order to satisfy the enablement requirement² of § 112, "the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without undue experimentation." Genetech, Inc. v. Novo Nordisk A/S, 108 F.3d 1361, 1365 (Fed. Cir. 1991) (internal quotations omitted). Whether the specification enables the full scope of its claims without undue experimentation is measured as of the filing date

2. The first paragraph of § 112 has also been construed to require an adequate "written description" of the invention and a disclosure of the "best mode" of practicing the invention. The "written description" and "best mode" requirements are distinct from the enablement requirement. Ariad Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1344-48 (Fed. Cir. 2010) (en banc).

of the patent application. Plant Genetic Sys., N.V. v. DeKalb Genetics Corp., 315 F.3d 1335, 1339 (Fed. Cir. 2003).

Because patents are presumed valid, an accused infringer must come forward with clear and convincing evidence that the specification does not enable the full scope of the asserted claims without undue experimentation. 35 U.S.C. § 282; Libel-Flarsheim, 481 F.3d at 1377 (Fed. Cir. 2007). Whether a patent enables the full scope of its claims is a question of law that turns on the underlying facts. Sitrick, 516 F.3d at 999. In considering these underlying facts, we draw all justifiable inferences in the patent holder's favor. Anderson, 477 U.S. at 245.

To evaluate whether the patent enables a person of ordinary skill in the art to practice the invention without undue experimentation, courts consider a non-exclusive list of items, often referred to as the Wands factors: "(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims." In re Wands, 858 F.2d 731, 737 (Fed. Cir. 1988). Courts need not consider each of the Wands factors; they are "are illustrative, not mandatory." Amgen, 927 F.2d at 1213.

The asserted claims of the '922 patent broadly describe a junction in which "applying a small magnitude of electromagnetic energy to the junction ... causes a change in the resistance by at least 10% at room temperature." '922 patent at 8:52-54 (emphasis added). At the heart of the asserted claims are the words, "causes a change in resistance by at least 10% at room temperature." Plaintiff's expert concedes that every other limitation of the asserted claims³ existed in the prior art.

According to defendants, plaintiffs are claiming a patent on junctions with resistive changes of 20%, 200%, 2000%, and up to infinity while the specification of the '922 patent merely teaches how to construct junctions with a maximum resistive change of up to 11.8%. Plaintiffs respond that the specification need only teach one mode of practicing the claimed invention, not all possible modes, and not all embodiments that became possible by virtue of later technology.

We agree with the defendants. The asserted claims read on any junction capable of generating a resistive change of "at least" 10% at room temperature, regardless of the method used to construct the junction or the materials from which it is made. These claims are broad and open-ended, with no upper limit on the percentage of change in resistance. Plaintiffs' expert acknowledged that the asserted claims embrace junctions with over

3. Unlike the asserted claims, Claim 9 of the '922 patent and the claims dependent thereon claim with great specificity the process Moodera and his team used to achieve the junctions described in the '922 patent's specification.

a 100% change in resistance and may embrace, for example, junctions with a change measuring 1,000%. Significantly, plaintiffs have not disclaimed the asserted claims' infinite scope in the area of resistive change. Yet the patent specification reveals that the inventors' best efforts yielded a maximum resistance change of 11.8% at room temperature. When asked whether he knew how to achieve a tunnel junction generating more than a 20% change in resistance at the time the patent application was filed, named inventor Robert Meservey responded, "No, I certainly didn't."

When the application was filed in March 1995, resistance in junctions was well known, but the maximum resistance a junction could produce was not. A scientist named Michel Julliere predicted in 1975 that an ideal junction could generate between 24% and 26% resistance.⁴ However, some twenty years later, a patent issued in February 1995 simply discloses junctions capable of generating a 4.40% to 4.75% change in resistance at room temperature. This patent arose from a 1991 application and shows the inventors contemplated using junctions in building read/write heads in disc drives.⁵

4. The '922 patent specification recites Julliere's prediction as 24%, but defendants' expert witness report quotes the figure as 26%.

5. Patent No. 5,390,061 discusses briefly a resistive change of 10%. Plaintiffs claim this resistive change arose, not in a junction, but in a "CPP," a term not further explained. Defendants have not explained whether a "CPP" otherwise meets the
(continued...)

A grant application Moodera, one of the inventors of the '922 patent, signed on August 5, 1994 is instructive as to the state of the prior art just prior to the invention at issue.⁶ In that application, Moodera observed that the study of tunneling between ferromagnets is "in an early stage.... [R]esults of tunneling between ferromagnets are rather divergent as well as the models that try to explain them." Similarly, he noted that "in tunneling between two ferromagnets through an insulating barrier, little work has been done and the experimental and theoretical pictures are still unclear.... The field of tunneling from or through semiconducting ferro/ferrimagnets has been only slightly explored."

Moodera's grant application also commented that Terunobu Miyazaki reported resistive changes of 2.7% at room temperature in 1991 and that researchers Mark Johnson and John Clarke "report values of $\Delta R/R$ from 24 to 70% at 300K, which are greater than expected from any published theory."⁷ Johnson and Clarke's results were published in 1990. Moodera suggested that he may be able to construct junctions in which the electrodes are

5. (...continued)
limitations of the asserted claims. Accordingly, we draw no inferences from this alleged 10% resistive change.

6. Plaintiffs assert Moodera's team reduced its invention to practice by August 15, 1994.

7. The formula for converting Kelvin into degrees Fahrenheit is given by: $^{\circ}\text{F} = 9/5(\text{K} - 273) + 32$. Thus, 300K is equal to 80.6 $^{\circ}\text{F}$.

"half metallic ferromagnets ..., which offer the possibility of $\Delta R/R = 100\%$ at 300K." Later, in September 1996, during prosecution of the '922 patent, the inventors argued to the PTO that they had achieved resistive changes of 18%, and that higher resistive changes "are predicted, and as yet there is no clear theoretical limit below the highest possible value of 100%."

After the '922 patent issued, many years were required to produce junctions that demonstrated resistive changes within the scope of the asserted claims beyond 10%. Plaintiffs' expert, Dr. Edward Murdock, testified at his deposition that a person of ordinary skill in the art could work from the art disclosed in '922 patent and create junctions that generate between 100% and 120% resistance without undue experimentation. Nonetheless, he conceded that the first junction that generated that level of resistance change was not developed until approximately 2006 or 2007, or about 12 years after the invention described in the '922 patent. Dr. Murdock noted that in order to achieve a junction generating 120% resistance, "experiments had to be done on materials for the electrodes and for the tunnel barrier insulator and on the processes to make those materials." His after-the-fact testimony that the specification in the '922 patent enabled the construction of a junction with a 100% to 120% change in resistance without undue experimentation is completely undermined by the twelve-year delay in achieving such junctions. However, even crediting Dr. Murdock's ultimate conclusion, he merely stated the claims were enabled up to resistive changes of 120%.

The asserted claims, however, claim resistance changes beyond 120% and up to infinity. Many of the changes above 120% still have not been achieved over fifteen years after the invention described in the '922 patent.⁸

On similar facts, the Court of Customs and Patent Appeals found a patent application's claims not enabled. There, the application recited two claims that each contained the same initial limitation: "An adrenocorticotrophic hormone preparation containing at least 1 International Unit of ACTH per milligram and containing no more than 0.08 units of vasopressin and no more than 0.05 units of oxytocin per International Unit of ACTH." In re Fisher, 427 F.2d 833, 835 (C.C.P.A. 1970) (emphasis supplied). The specification of the proposed patent showed that previous experimentation had yielded compounds with a maximum potency of 50%, or 0.5 International Units. Id. at 834. The applicants, however, had achieved compounds with ACTH potencies between 111% and 230%, or between 1.11 and 2.30 International Units per milligram. Id. The question before the court was:

whether an inventor who is the first to achieve a potency of greater than 1.0 for certain types of compositions, which potency was long desired because of its beneficial effect on humans, should be allowed to dominate all such compositions having potencies greater than 1.0, including future compositions having potencies far in excess of those obtainable from his teachings plus ordinary skill.

8.The highest resistive change known to Dr. Murdock is 604%.

Id. at 839. The court reasoned that § 112 "requires that the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art." Id. It held that the inventors had not enabled potencies beyond 2.3 International Units per milligram and were not entitled to a patent containing the claims at issue. Id.

Similarly, the Court of Appeals for the Federal Circuit considered whether a patent's specification enabled claims to "all possible DNA sequences that will encode any polypeptide having an amino acid sequence 'sufficiently duplicative' of [erythropoietin, EPO] to possess the property of increasing production of red blood cells." Amgen, Inc. v. Chugai Pharm. Co., Ltd., 927 F.2d 1200, 1212 (Fed. Cir. 1991). The specification revealed only a few specific DNA sequences that would create EPO or a protein with analogous function. Id. at 1213. The court determined that "having made the gene and a handful of analogs whose activity has not been clearly ascertained," the inventors could not "claim all possible genetic sequences that have EPO-like activity." Id. at 1214. The claims to all DNA sequences that yield a protein capable of increasing red blood cell production were held to be invalid.

More recently, in Plant Genetic Systems, the Court of Appeals affirmed a district court's ruling that claims to all plant cells genetically altered to make those cells invulnerable to a certain herbicide were invalid as not enabled. Plant

Genetic Sys. v. DeKalb Genetics Corp., 315 F.3d 1335, 1337-38 (Fed. Cir. 2003). The specification of the patent at issue demonstrated how to transform genetically several plant species to inhibit a particular cellular activity and thereby create resistance to a common herbicide. Id. All of the species discussed in the specification were dicotyledons ("dicots"), and the patent did not disclose how to use the genetic transformation process to achieve the same resistance in plant species that are monocotyledons ("monocots"). Id. Nevertheless, the claims at issue read on all plant cells genetically modified to inhibit the relevant cellular activity, whether monocot or dicot. Id.

The testimony before the district court at trial demonstrated that someone with ordinary skill in the art could not use the process described in the patent to transform genetically monocots at the time the application was filed. Plant Genetic Sys. v. DeKalb Genetics Corp., 175 F. Supp. 2d 246, 257 (D. Conn. 2001). Indeed, the inventors themselves could not successfully use the patent process in monocots until three years after the patent application was filed. Id. at 255, 260. It was undisputed that monocot cells were known at the time of the patent application and that herbicide-resistant monocots were desirable. 315 F.3d at 1340. In its analysis, the Court of Appeals cited to Fisher with approval. Id. at 1339-40.

Here, the undisputed facts and relevant case law compel the conclusion that plaintiffs did not enable the full scope of the asserted claims without undue experimentation. The inventors

of the '922 patent could not create a junction with a 20% change in resistance, yet they laid claim to all resistive changes above 10% up to infinity. In a field in a professedly "early stage," plaintiffs claimed all the resistance any junction could ever possibly create.

When the inventors created a junction generating resistance of 11.8%, they had still managed to achieve less than half of the maximum resistance predicted by Julliere twenty years earlier. Moodera was aware of observed resistive changes exceeding these predictions and considered them unexplainable by current theory. In fact, Moodera speculated that electrodes made of "half metallic ferromagnets" might lead to resistance changes of 100%, and during prosecution, the inventors represented to the PTO that no theoretical limit prevented junctions with resistive changes of 100%. Yet the inventors claimed resistive changes up to infinity even though they could not explain how this could be done.

The cases cited by plaintiff do not suggest a different conclusion. Plaintiffs rely on U.S. Steel Corp. v. Phillips Petroleum, Co., in which the district court found after a trial that the defendants had infringed a generic claim to a form of polypropylene. 865 F.2d 1247, 1248-50 (Fed. Cir. 1989). The claims at issue did not include limitations for either the molecule's weight or viscosity. Because the accused product had greater weight and viscosity than the preferred embodiments, the accused infringer argued that the specification did not enable

the full scope of the claims. Id. at 1249-51. The Court of Appeals for the Federal Circuit disagreed. It reasoned that the specification enabled the *claimed* invention, which contained no limitation for weight or viscosity. Id. at 1251-52. The court noted that claims cannot be found non enabled merely because they read on later art that "no one thought ... possible" when the patent application was filed. Id. at 1252.⁹

Plaintiffs reliance on U.S. Steel is misplaced for two reasons. First, the accused infringer in U.S. Steel argued that the specification did not enable an aspect of the invention the inventors did not claim. Conversely, the asserted claims of the '922 patent do include a limitation for change in resistance. A resistance change of at least 10% at room temperature was, in fact, the only limitation of the asserted claims not disclosed in prior art. Second, in U.S. Steel, "no one thought it possible" at the time of the invention that molecules could be produced with the weight and viscosity of the accused product. Id. at 1252. In contrast, some resistive changes above 10% in junctions at room temperature had been predicted and reported (but not explained, at least above 11.8%) at the time the '922 patent application was filed.

9. The facts before the court showed that, "[U]ntil 1954 [a year after the priority date] ... no one thought it possible that propylene monomers could be polymerized into polypropylene with an intrinsic viscosity of 1.7 to 2.0 and an average molecular weight approaching 50,000. Similarly insufficient is defendants' evidence that the art since 1930 recognized the desirability of high molecular weight polymers." Id. at 1252.

Plaintiffs also rely on Hormone Research Foundation v. Genetech, Inc., 904 F.2d 1558 (Fed. Cir. 1990). The District Court for the Northern District of California ruled on summary judgment that a patent's claims to a method of producing human growth hormone were not enabled by the specification. See Hormone Research Found. v. Genetech, Inc., 708 F. Supp. 1096, 1108 (N.D. Cal. 1988). In reaching this conclusion, the district court determined that the process claimed could not produce the hormones described because the desired hormone could not be created using the techniques available at the time the patent application was filed. Id. at 1109. The Court of Appeals reversed and remanded for further consideration. It held that genuine issues of material fact existed as to whether the claimed products could be produced using the methods in existence when the patent application was filed. 904 F.2d at 1567-68.

Commenting on the district court's analysis, the Court of Appeals noted that, "Merely because purer and more potent forms of the ... compound might be produced using later-discovered technology does not necessarily mean that the '833 patent specification did not provide sufficient enabling disclosures as of the filing date of the application." Id. at 1569. As in U.S. Steel, the claims at issue in Hormone Research Fund did not contain a limitation for purity or potency, and so are distinguishable from the asserted claims of the '922 patent. Id. at 1560.

Plaintiffs also cited In re Hogan, 559 F.2d 595 (C.C.P.A. 1977). There, the inventors filed a patent application with claims that read on both amorphous and crystalline propylene, but the specification only revealed how to make crystalline propylene. Id. at 605-07. The Court of Customs and Patent Appeals found that the patent enabled its claims because, as of the application's priority date, only crystalline propylene existed. Id. In contrast, when the inventors filed the application leading to the '922 patent, resistance changes in junctions were known, desired, obtained in smaller amounts, and predicted in higher amounts.

As the Court of Appeals for the Federal Circuit recently observed in Plant Genetic Systems, "We do not read Hogan as allowing an inventor to claim what was specifically desired but difficult to obtain at the time the application was filed, unless the patent discloses how to make and use it." Plant Genetic Sys., 315 F.3d at 1340. In Plant Genetic Systems, the Court of Appeals reviewed both Hormone Research Fund and Hogan and found that neither case altered the requirement, articulated in Fisher, that "the claims must bear a reasonable correlation to the scope of enablement provided by the specification." Id. at 1339-42; see also Sitrick v. Dreamworks, LLC, 516 F.3d 993, 1000-01 (Fed. Cir. 2008).

Even drawing all inferences in favor of plaintiffs, defendants have established by undisputed evidence, which is clear and convincing, that the specification of the '922 patent

is insufficient to enable one of ordinary skill in the art to make and use the full scope of asserted claims 1-5, 23-26, and 28. The asserted claims cover all junctions with a change in resistance over 10% at room temperature. The specification simply does not explain how to achieve the full range of changes in resistance above 10% without undue experimentation. Thus, these claims are invalid because of lack of enablement. Accordingly, we need not reach the other issues before us.