United States Court of Appeals for the Federal Circuit

03-1505, -1506, -1507, -1508, -1509

VLT, INC.,

Plaintiff-Appellant,

v.

ARTESYN TECHNOLOGIES, INC., ARTESYN NORTH AMERICA, INC., ARTESYN INTERNATIONAL LTD., ARTESYN IRELAND LTD., and ARTESYN AUSTRIA GmbH & Co. KG,

Defendants-Cross Appellants,

and

LUCENT TECHNOLOGIES, INC. and TYCO ELECTRONICS POWER SYSTEMS, INC.,

Defendants-Appellees,

and

POWER-ONE, INC.,

Defendant-Appellee.

VLT CORPORATION (now known as VLT, Inc.) and VICOR CORPORATION,

Plaintiffs-Appellants,

v.

LAMBDA ELECTRONICS, INC.,

Defendant-Appellee.

DECIDED: May 24, 2004

Before LOURIE, Circuit Judge, PLAGER, Senior Circuit Judge, and PROST, Circuit Judge.

LOURIE, Circuit Judge.

DECISION

VLT, Inc. ("VLT") appeals from four orders of the United States District Court for the District of Massachusetts entering final judgments of noninfringement of reissued United States Patent 36,098 in favor of Artesyn Technologies, Inc., Artesyn North America, Inc., Artesyn International Ltd., Artesyn Ireland Ltd., and Artesyn Austria GmbH & Co. KG (collectively, "Artesyn"); Lambda Electronics, Inc. ("Lambda"); Lucent Technologies, Inc. and Tyco Electronics Power Systems, Inc. (collectively, "Lucent"); and Power-One, Inc. ("Power-One").[1] Artesyn cross-appeals from the district court's order entering final judgment that claims 1 and 5 are not invalid.[2] Because the district court did not err in construing the disputed claim terms or in concluding that claims 1 and 5 of the '098 patent are not invalid for indefiniteness, we affirm.

BACKGROUND

VLT owns the '098 patent, which is a reissue of United States Patent 4,441,146. The '098 patent is directed to a mechanism for resetting a transformer's core in an electrical power converter known as a "single ended forward converter." Claim 1 reads as follows:

In a single ended forward converter in which energy is transferred from a primary winding to a secondary winding of a transformer during the ON period of a primary switch, circuitry for recycling the magnetizing energy stored in said transformer to reset it during the OFF period of said primary switch, comprising:

a storage capacitor;

an auxiliary switch connected in series with said storage capacitor;

a switch control circuit operating said auxiliary switch in accordance with a control logic such that (a) said auxiliary switch is opened prior [sic] the ON period of said primary switch, (b) said auxiliary switch remains open throughout the ON period of said primary switch, (c) said auxiliary switch is closed after the ON

period of said primary switch.

'098 patent, col. 8, ll. 52-67 (emphases added). Claim 5 depends from claim 1, further requiring that the recited auxiliary switch be a MOSFET transistor with an integral reverse diode. Id., col. 9, ll. 12-13.

VLT filed separate lawsuits against Artesyn, Lambda, Lucent, and Power-One for infringement of claims 1 and 5. In multiple claim construction orders,[3] the district court ruled that: (1) the phrase "recycling the magnetizing energy stored in said transformer to reset it" means that all of the transformer's magnetizing energy must be returned to the transformer to reset it; (2) the phrase "said auxiliary switch is opened prior [sic] the ON period of said primary switch" requires a useful delay between the opening of the auxiliary switch and the closing of the primary switch that allows the current to discharge parasitic capacitances non-dissipatively and includes a delay that eliminates or greatly reduces heat loss; (3) the term "ON period" refers to the time period when the primary switch is enabled to conduct current that it could otherwise block; (4) the term "single ended forward converter" refers to a converter in which a single switch controls power flow from source to load and energy transfer from the primary winding to the secondary winding of the transformer occurs during the ON period; and (5) the term "auxiliary switch" refers to a single switch that is connected in series with the storage capacitor and that does not control power flow from source to load. In the Artesyn case, the district court also held that the term "ON period" is not indefinite and therefore does not render claims 1 and 5 invalid.

Following the claim construction orders, VLT entered into stipulation agreements with each of the four defendants. In the Artesyn case, the parties agreed that Artesyn's E-series converters infringe claims 1 and 5; that Artesyn's B-series, N-series, and BXE200-300 converters do not infringe given the court's constructions of the "recycling" and "prior" limitations; and that claims 1 and 5 are not invalid or unenforceable. In the Lambda and Lucent cases, the parties stipulated that Lambda's PH50 and PH75 converters and certain of Lucent's converters do not infringe in light of the court's construction of the "recycling" limitation. In the Power-One case, the parties agreed that Power-One's Q-series converters with active clamp do not infringe given the court's construction of the "prior" limitation. Accordingly, the court entered final judgment of partial infringement, partial noninfringement, and no invalidity in the Artesyn case and, pursuant to Federal Rule of Civil Procedure 54(b), entered final judgments of

noninfringement in the Lambda, Lucent, and Power-One cases.

VLT appealed the four judgments of noninfringement to this court, and Artesyn cross-appealed the judgment of no invalidity. All four cases have been consolidated on appeal. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

DISCUSSION

The only issues raised on appeal relate to claim construction and validity. Claim construction is a question of law that we review de novo. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc). Indefiniteness under 35 U.S.C. § 112, 2 is also a question of law that we review without deference. Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1378 (Fed. Cir. 1999).

A. The "Recycling" Limitation

On appeal, VLT first contests the district court's construction of the phrase "recycling the magnetizing energy stored in said transformer to reset it." VLT asserts that the "recycling" limitation requires that the magnetizing energy removed from the transformer's core be put to some use, which may include powering the load, and not be dissipated as heat. Artesyn, Lambda, and Lucent respond that the court did not err in interpreting the "recycling" limitation to require that all of the magnetizing energy removed from the transformer's core be returned to the transformer to reset it.

We agree with Artesyn, Lambda, and Lucent that the district court correctly interpreted the "recycling" limitation. To begin with, claim 1 provides that "recycling the magnetizing energy" occurs for a specific purpose: to reset the transformer. The claim language itself thus suggests that "recycling" involves returning the magnetizing energy to the transformer. In addition, the specification clearly teaches that the claimed reset mechanism returns all of the transformer's magnetizing energy back to the core. The summary of the invention explains that the invention resets the transformer's core by implementing a "magnetizing current mirror," which takes the magnetization at the end of the primary switch's ON period and reflects it through the storage capacitor to create a "mirror image" of the

magnetization prior to the next conversion cycle. '098 patent, col. 4, ll. 9-13. Resetting the core's magnetization to its "mirror image" — i.e., a value that is equal in magnitude but opposite in orientation — enables the reset mechanism to maximize the available flux swing. Id., col. 4, ll. 20-26 ("The new apparatus . . . maximizes the available flux swing, as it creates a mirror image of the magnetic flux between ON periods . . . ."). Resetting the core's magnetization to its mirror image and maximizing flux swing can only be achieved by recycling all of the transformer's magnetizing energy to the core. The specification thus teaches that "recycling the magnetizing energy" to reset the transformer requires all of the magnetizing energy to be returned to the transformer.

VLT argues, however, that the specification refers to the use of a current mirror and the maximization of flux swing only as objectives that are implemented in the preferred embodiment. We disagree. Not only do all of the disclosed embodiments utilize a current mirror, but the patent explains that the invention, in all its varied forms, employs a magnetizing current mirror as its reset mechanism. E.g., id., col. 7, ll. 12-14 ("A different perspective on the operation of the magnetizing current mirror as a reset mechanism for single ended forward converters is offered by FIG. 4d . . . ."); id., col. 7, ll. 60-63 ("Useful variations of the new reset mechanism are indeed obtained by connecting the mirror in parallel with different transformer windings."). Furthermore, as discussed above, the specification repeatedly and consistently describes the claimed invention, and not just the preferred embodiment, as a current mirror that maximizes flux swing. The patent thus leaves no doubt that the claimed invention requires all of the magnetizing energy to be returned to the transformer.

Accordingly, we affirm the district court's construction of the phrase "recycling the magnetizing energy stored in said transformer to reset it" as requiring that all of the magnetizing energy removed from the transformer's core be returned to the transformer to reset it. As such, claim 1 does not read on reset mechanisms that transfer some of the transformer's magnetizing energy to the load.

B. The "Prior" Limitation

VLT next argues that the district court erred in construing the phrase "said auxiliary switch is opened prior [sic] the ON period of said primary switch." VLT asserts that that limitation simply

requires some delay between the opening of the auxiliary switch and the closing of the primary switch. Artesyn and Lambda also disagree with the district court's interpretation of the "prior" limitation, but for a different reason: they maintain that the limitation does not require any switching delay. In contrast, Power-One defends the district court's construction, arguing that the "prior" limitation requires a switching delay that is useful to charge and discharge parasitic capacitances and that eliminates or greatly reduces heat loss.

We agree with Power-One that the district court correctly interpreted the "prior" limitation to require a useful switching delay. As the district court observed, the claim language — "said auxiliary switch is opened prior [sic] the ON period of said primary switch" — simply means that the opening of the auxiliary switch must occur before the closing of the primary switch. But we must turn to the other intrinsic evidence of record to determine whether the "prior" limitation requires a switching delay and, if so, how long that switching delay must be.

Although the district court cited the specification as one reason for narrowing the scope of the "prior" limitation, we do not read the specification as identifying any particular delay that must occur between the opening of the auxiliary switch and the closing of the primary switch. On the contrary, the detailed description of the invention refers to opening the auxiliary switch and closing the primary switch at the same time. '098 patent, col. 5, ll. 59-60 ("At time t_1, the auxiliary switch 21 is opened and the primary switch 10 is closed, initiating the first ON period."). Elsewhere, the specification teaches that any delay between the opening of the auxiliary switch and the closing of the primary switch should be kept to a minimum in order to avoid "dead time." Id., col. 7, ll. 4-8. It also discloses, however, that "a small delay is useful to allow the magnetizing current to charge and discharge parasitic capacitances associated with the switches and windings." Id., col. 7, ll. 8-11. To be sure, that statement suggests that a small switching delay may be desirable, but it does so in the context of discussing the design trade-offs between minimizing "dead time" and utilizing a delay during such "dead time" to charge and discharge parasitic capacitances. Viewing the teachings of the specification as a whole, we cannot say that the patentee clearly disavowed reset mechanisms that do not use a small switching delay.

Nevertheless, the prosecution history compels us to construe the "prior" limitation as requiring a switching delay that allows the magnetizing current to charge and discharge parasitic capacitances. During the reissue proceedings, the patentee repeatedly emphasized that the claimed invention, unlike the prior art, introduces a small switching delay for that purpose. For example, the inventor pointed out the lack of "a single prior art reference mentioning the use of a delay in a single-ended forward converter involving active reset for achieving charging and discharging of parasitic capacitances." He further declared that the specification's reference to a "small delay that is useful to allow the magnetizing current to charge and discharge parasitic capacitances" would be sufficient to enable a skilled artisan to achieve "the benefit of the invention." We read those and other statements made by the inventor during the reissue proceedings to represent the patentee's clear disavowal of reset mechanisms that do not employ a small delay for charging and discharging parasitic capacitances.[4] See Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 452-53 (Fed. Cir. 1985) (stating that claims should be construed so as to exclude any interpretation that a patentee disclaimed during reissue proceedings in order to obtain claim allowance).

Moreover, the examiner relied on the patentee's characterization of the invention as requiring a useful switching delay in allowing the reissued claims, including claim 1, over the prior art. In the Notice of Allowability, the examiner explained that one reason for allowance was that the prior art did not teach "controlling the primary switch to close a short time after the auxiliary switch is opened at the end of the reset interval or [that] the switch timing (small delay) is useful to allow the magnetizing current to charge of [sic] discharge parasitic capacitances associated with the switches and the windings." Although an examiner's statement does not always limit a claim, the examiner's reasons for allowance in this case make clear that both the patentee and the examiner understood the claimed invention to require a small switching delay. See ACCO Brands, Inc. v. Micro Sec. Devices, Inc., 346 F.3d 1075, 1078-79 (Fed. Cir. 2003) (relying on an examiner's reasons for allowance in interpreting a claim). Thus, in view of the patentee's representations to the PTO during the reissue proceedings and the examiner's reliance on those representations, we conclude that the "prior" limitation of claim 1 requires a small delay between the opening of the auxiliary switch and the closing of the primary switch

that is useful to allow the magnetizing current to charge and discharge parasitic capacitances associated with the switches and windings.

The parties further dispute, however, whether the switching delay must also be sufficient to reduce heat loss. We hold that it must. During the reissue proceedings, the inventor criticized the prior art for its "switching losses" caused in part by the "dissipation of energy stored in parasitic capacitances at times when switches are turned on." More importantly, he stated several times that the purpose of using a small delay to charge and discharge parasitic capacitances is to reduce switching losses. We therefore conclude that the switching delay should be long enough to reduce switching losses and, as the district court concluded, includes delay that eliminates or greatly reduces heat loss.

In sum, we affirm the district court's construction of the "prior" limitation as requiring a small delay between the opening of the auxiliary switch and the closing of the primary switch that is useful to allow the magnetizing current to charge and discharge parasitic capacitances associated with the switches and windings. We also agree with the district court that the delay should be long enough to reduce switching losses and that it includes delay that eliminates or greatly reduces such losses.[5]

C. "Single Ended Forward Converter"

As an alternative ground for affirming their respective judgments of noninfringement, Lambda and Lucent challenge the district court's construction of the term "single ended forward converter."[6] Although they do not contest the court's conclusion that a single ended forward converter transfers power from the primary winding of the transformer to the secondary winding during the ON period of the primary switch, Lambda and Lucent argue that the patent defines the term "single ended forward converter" more narrowly to require that any energy transfer to the load occur only during the ON period. VLT responds that power transfer to the load in a single ended forward converter may occur during the OFF period as well as during the ON period.

We agree with VLT that the district court did not err in its interpretation of the term "single ended forward converter." The preamble of claim 1 refers to "a single ended forward converter in which

energy is transferred from a primary winding to a secondary winding of a transformer during the ON period of a primary switch." Lambda and Lucent argue that claim 1 establishes the complementary nature of the primary switch's ON and OFF periods and, in so doing, implicitly requires that forward energy transfer occur only during the ON period. We cannot agree, for nothing in the intrinsic evidence restricts the term "single ended forward converter" in such a way. On the contrary, the patentee acted as his own lexicographer in defining the term. The specification states:

> [T]he invention relates to converters of the forward type, in which the power transformer is simultaneously connected to the source and the load. More particularly, the invention relates to forward converters of the single ended type, in which the power flow from source to load is controlled by a single solid state switch.
>
> . . .
>
> A converter in that class is referred to as a 'single ended forward' coverter [sic] because power flow is gated by a single switch 10 and energy is transferred forward, from the primary winding to the secondary winding of the transformer 11, during the ON period of the switch 10.

'098 patent, col. 1, ll. 22-37. The district court's interpretation of the term "single ended forward converter" is entirely consistent with — indeed, it is identical to — the specification's definition: it requires that a single switch control power flow from source to load, that energy be transferred forward from the primary winding to the secondary winding of the transformer during the ON period of the primary switch, and that the transformer be simultaneously connected to the source and the load. Again, nothing in the intrinsic evidence mandates a narrower interpretation. We therefore affirm the district court's claim construction and hold that the term "single ended forward converter" does not require that forward energy transfer from source to load occur only during the ON period of the primary switch.

D. "Auxiliary Switch"

Lucent offers one more argument for affirming the judgment of noninfringement in its favor, urging that its accused devices do not infringe under the district court's construction of the term "auxiliary switch." However, as VLT accurately points out, Lucent does not challenge the district court's conclusion that the term "auxiliary switch" refers to a single switch that does not control power flow from source to load. Instead, Lucent argues that its accused devices do not have "auxiliary

switches" because they use two switches to control power flow from source to load. As Lucent's argument raises only factual issues that relate to the question of infringement and the district court did not reach that issue, we decline to address Lucent's "auxiliary switch" argument.

E. "ON Period"

In its cross-appeal, Artesyn argues that the district court erred in concluding that claims 1 and 5 of the '098 patent are not invalid under 35 U.S.C. § 112, ¶ 2. More specifically, Artesyn contends that claims 1 and 5 are indefinite because a person of ordinary skill in the relevant art would not have understood from the patent whether the term "ON period" was meant to have, for example, a current-based definition or a voltage-based definition. VLT responds that the term "ON period" is not indefinite.

We agree with VLT that the district court did not err in concluding that the term "ON period" is not indefinite. Admittedly, the district court found that the patent does not expressly define the term "ON period" and that the term had no single meaning in the relevant art at the time of the original patent application's filing date. Nevertheless, the court determined that the term was "quite amenable to construction" because the specification's reference to "dead time" as well as undisputed expert testimony demonstrated that one of ordinary skill in the art would have understood the term "ON period" to have a current-based definition. See Exxon Research & Eng'g Co. v. United States, 265 F.3d 1371, 1375 (Fed. Cir. 2001) (stating that a claim is not indefinite "[i]f the meaning of the claim is discernible, even though the task may be formidable and the conclusion may be one over which reasonable persons will disagree"). We discern no flaw in the district court's reasoning, and Artesyn points to no persuasive basis for reversal. Accordingly, we affirm the district court's conclusion that claims 1 and 5 of the '098 patent are not invalid for indefiniteness due to the claim term "ON period."

CONCLUSION

For the foregoing reasons, we conclude that the district court did not err in construing the claim limitations that are raised on appeal or in concluding that claims 1 and 5 are not invalid for

indefiniteness. Accordingly, the final judgments of the district court are affirmed.

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[1] VLT, Inc. v. Artesyn Techs., Inc., No. 01-CV-10238-PBS (D. Mass. May 31, 2003); VLT Corp. v. Lambda Elecs., Inc., No. 01-10957-PBS (D. Mass. June 20, 2003); VLT, Inc. v. Lucent Techs. Inc., No. 00-11049 PBS (D. Mass. June 20, 2003); VLT, Inc. v. Power-One, Inc., No. 01-10207-PBS (D. Mass. June 20, 2003).

[2] VLT, Inc. v. Artesyn Techs., Inc., No. 01-CV-10238-PBS (D. Mass. May 31, 2003).

[3] VLT, Inc. v. Lucent Techs., Inc., No. 00-CV-11049-PBS (D. Mass. Oct. 18, 2001); VLT, Inc. v. Artesyn Techs., Inc., Civ. Action No. 01-10238-PBS (D. Mass. Jan. 3, 2003); VLT, Inc. v. Lucent Techs., Inc., No. 00-CV-11049-PBS (D. Mass. Jan. 3, 2003); VLT, Inc. v. Power-One, Inc., No. 01-CV-10207-PBS (D. Mass. Jan. 3, 2003); VLT Corp. v. Lambda Elecs., Inc., No. 01-CV-10957-PBS (D. Mass. Jan. 3, 2003).

[4] Although certain claims that were added during reissue specifically recite a "small delay period," the patentee's prosecution remarks also apply to claim 1. During the reissue proceedings, the inventor represented to the Patent and Trademark Office ("PTO") that there are "clearly defined delay requirements" in claim 1 "both as granted and as sought to be amended." The inventor also referred to "the notion (disclosed and claimed in the [original] '146 patent) of using a switching delay to charge and discharge circuit capacitances." (emphasis added).

[5] Although it is unnecessary for us to reach the issue, we are not inclined to limit claim 1 through judicial estoppel, as Power-One urges, when the district court did not expressly exercise its discretion to do so. See New Hampshire v. Maine, 532 U.S. 742, 750 (2001) (observing that "judicial estoppel is an equitable doctrine invoked by a court at its discretion" (citation omitted)).

[6] Our disposition of the "recycling" limitation makes it unnecessary for us to address this limitation. However, in the interest of judicial economy, we take this opportunity to review the district court's construction of the term "single ended forward converter" because the parties have fully briefed the issue on appeal and, according to Lambda, it is "central" to issues of infringement that remain pending in the district court.