UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DANIEL Y. ABRAMOVITCH

Appeal 2008-2243
Application 10/414,791
Technology Center 2600

Decided: August 18, 2008

Before ROBERT E. NAPPI, JOHN A. JEFFERY, and KEVIN F. TURNER, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134 from the Examiner's rejection of claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

Appellant invented a method for designing an Alexander-type or bang-bang phase lock loop (PLL). Specifically, the method selects values for the design of PLL that satisfy constraints defined by a candidate Lyapunov function and a first derivative of the candidate Lyapunov function. This design ensures stable implementation of the PLL.[1] Claim 1 is illustrative:

> 1 A method for designing an Alexander-type phase lock loop (PLL), comprising:
>
> defining a candidate Lyapunov function that is parameterized by design parameters of said Alexander-type PLL;
>
> deriving a set of design constraints from said candidate Lyapunov function and a first derivative of said candidate Lyapunov function; and
>
> selecting values for design parameters of said Alexander-type PLL such that said values satisfy said design constraints.

The Examiner relies upon the following as evidence in support of the rejection:

Friedman	US 2004/0114702 A1	Jun. 17, 2004 (filed Dec. 12, 2002)

Daniel Y. Abramovitch (Abramovitch), *Lyapunov Redesign of Analog Phase-Lock Loops*, 38 IEEE TRANSACTIONS ON COMM. 2197 (1990).

Claims 1-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Abramovitch and Friedman.

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[1] *See generally* Spec. ¶¶ 9, 18, 22-25, 28-30, and 37-43.

Rather than repeat the arguments of Appellant or the Examiner, we refer to the Briefs[2] and the Answer[3] for their respective details. In this decision, we have considered only those arguments actually made by Appellant. Arguments, which Appellant could have made but did not make in the Briefs, have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Regarding representative independent claim 1,[4] the Examiner essentially finds that the combination of Abramovitch and Friedman teaches all recited the elements (Ans. 3-4). Appellant argues that Friedman teaches away from the proposed combination with Abramovitch (App. Br. 4-5; Reply Br. 3). Appellant also argues Abramovitch is nonanalogous art (App. Br. 5-6; Reply Br. 3-4). Appellant does not dispute that Abramovitch discloses a method of implementing the steps recited in claim 1 on an analog PLL (FF4) or that Friedman discloses an Alexander-type PLL with the stated higher operating frequency and smaller static phase error benefits (FF7).

ISSUES

The issues are: (1) whether Friedman teaches away from combining with Abramovitch and (2) whether Abramovitch is analogous art.

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[2] We refer to the Appeal Brief filed June 15, 2007, and the Reply Brief filed October 5, 2007, throughout this opinion.
[3] We refer to the Examiner's Answer mailed August 7, 2007, throughout this opinion.
[4] Appellant argues claims 1-20 as a group (App. Br. 4-6). Accordingly, we select representative independent claim 1 to decide the appeal. 37 C.F.R. § 41.37(c)(1)(vii).

FINIDINGS OF FACT

1. The Specification states that PLLs are "well known devices that lock the phase of a generated signal to the phase of a reference signal" (Spec. ¶ 1).

2. The Specification explains that the purpose of the invention is to implement a stable PLL using an Alexander phase detector or PLL (Spec. ¶¶ 8 and 45).

3. The Specification describes a third order PLL embodiment with two zeros subjected to a candidate Lyapunov function and its first derivative (Spec. ¶¶ 14-16 and 31-35; Figs. 3A-C). The PLL is modeled with a phase detector and voltage control oscillator gain, a transfer function, and a voltage control oscillator (VCO).

4. Abramovitch discusses designing an analog PLL that includes the steps of defining a candidate Lyapunov function defined by parameters of an analog PLL, deriving a set of design constraints from the candidate function and a first derivative of the function, and selecting values for the parameters of the analog PLL that satisfy the design constraints (Abramovitch: 2197-2201; Ans. 3). Appellant has not disputed that Abramovitch discloses these limitations.

5. Abramovitch designs PLLs that guarantee stability and tracking (Abramovitch: 2197).

6. Abramovitch discloses a third order PLL with two zeros modeled with a phase detector and VCO gain, a transfer function, and a VCO (Abramovitch: 2200-2201; Figs. 12-14).

7. Friedman teaches that Alexander-type phase detectors or PLLs have

the ability to operate at higher frequencies and generate smaller static phase error (Friedman, ¶¶ 10, 11, 17, 18, and 28). Appellant has not disputed that Friedman discloses an Alexander-type PLL or has the above-disclosed benefits.

8. Friedman teaches that linear phase detectors may not work as well at extremely high bit rates and the static phase error may be relatively large (Friedman, ¶ 11).

PRINCIPLES OF LAW

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966).

Discussing the question of obviousness of a patent that claims a combination of known elements, *KSR Int'l v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007), explains:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Sakraida* [*v. AG Pro, Inc.*, 425 U.S. 273 (1976)] and *Anderson's-Black Rock*[*, Inc. v. Pavement Salvage Co.*, 396 U.S. 57 (1969)] are illustrative—a court must ask whether the improvement is more

> than the predictable use of prior art elements according to their established functions.

KSR, 127 S. Ct. at 1740. If the claimed subject matter cannot be fairly characterized as involving the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement, a holding of obviousness can be based on a showing that "there was an apparent reason to combine the known elements in the fashion claimed." *Id*. at 1741. Such a showing requires,

> 'some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness' . . . . [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ. *Id*. at 1741 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

If the Examiner's burden is met, the burden then shifts to the Appellant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. *See In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

ANALYSIS

At the outset, we note that the obviousness rejection combines the teaching relating to the benefits of the binary or Alexander-type phase detector taught by Friedman with the method disclosed by Abramovitch and not the reverse of using the circuitry of Abramovitch with a method disclosed by Friedman. Thus, any arguments relating to incompatibility of combining or implementing the circuitry of Abramovitch with the method of

Friedman are unpersuasive. Additionally, Friedman describes known benefits of Alexander-type PLLs by those skilled in the art at the time of the invention. Friedman teaches that Alexander-type PLLs have the ability to operate a phase detector at higher frequencies and generate smaller static phase error (FF7; Ans. 4). One skilled in the art at the time of the invention would have, therefore, recognized the teaching of Friedman would improve the analog PLL disclosed by the method in Abramovitch in the same way by providing the Abramovitch method the ability to operate at higher frequencies and to generate smaller static phase error. Such an incorporation of the Alexander-type PLL into the method of Abramovitch yields a predictable result of operating at higher frequencies and generating smaller static errors and does not rely on hindsight.

Moreover, while Friedman discloses linear phase detectors have potential limitations at higher frequencies (FF8), this disclosure does not teach away or prohibit the implementation of a binary PLL with an analog PLL (App. Br. 4-5). Rather, this disclosure provides all the more reason to look to the Friedman's teaching regarding binary PLLs to solve possible design limitations associated with analog PLLs. Additionally, Appellant has not provided evidence that combining the teachings of Friedman with Abramovitch, such that an Alexander-type PLL is incorporated into the analog PLL design, would destroy the Abramovitch device or render its circuitry inoperable. Thus, Friedman provides ample reason to incorporate an Alexander-type PLL with the method disclosed by Abramovitch, and Appellant has not persuasively rebutted the prima facie case of obviousness.

Appellant further contends that the Abramovitch is nonanalogous art (App. Br. 5-6; Reply Br. 3-4). Specifically, Appellant argues that the

distinctions between analog PLLs, like Abramovitch, and digital PLLs, like Appellant's, are "divergent," including the functionality, size, scale, signals, and power requirements (App. Br. 6). As stated in *In re Kahn*, 441 F.3d 977 (Fed. Cir. 2006), "[t]he analogous-art test requires that the Board show that a reference is either in the field of the applicant's endeavor or is reasonably pertinent to the problem with which the inventor was concerned in order to rely on that reference as a basis for rejection." *Id.* at 986-87 (citing *Oetiker*, 977 F.2d at 1447). We find that Abramovitch is reasonably pertinent to the problem with which the inventor was concerned. The Specification describes that the inventor is concerned with stability of the PLL design (FF2). Similarly, Abramovitch discusses designing a PLL to make the system more stable (FF5). Thus, one of ordinary skill would look to Abramovitch for solutions related to the stability of PLLs, and we, therefore, find that Abramovitch is reasonably relevant to the problem with which Appellant was concerned.

Additionally, we are unpersuaded that an Alexander-type PLL is so distinguishable from an analog PLL, like Abramovitch, that it does not come from the same field of endeavor. First, Abramovitch's PLL is modeled similar to and has many of the same components as Appellant's PLL. One embodiment of Appellant's PLL is a third order PLL with two zeros with a phase detector and VCO gain, a transfer function, and a VCO (FF3). Similarly, Abramovitch discloses a third order PLL with two zeros having a phase detector and VCO gain, a transfer function, and a VCO (FF6). Second, the Abramovitch PLL functions in the same manner as Appellant's PLL by locking the phase of a generated signal to the phase a reference signal (FF1) and provides stability to the system (FF2; FF5). Third, while

Abramovitch's analog PLL *may* have different size, scale, and power requirements, Appellant has not presented any evidence of the distinctions, such as was done in *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858 (Fed. Cir. 1993), to demonstrate that one skilled in the art would not look to its teachings. Appellant also has not presented evidence that the Alexander-type PLL cannot be implemented with the circuitry of the analog PLL in Abramovitch. Arguments made by counsel do not take the place of evidence in the record. *In re Schulze*, 346 F.2d 600, 602 (CCPA 1965); *see also In re Geisler*, 116 F.3d 1465 (Fed. Cir. 1997). Thus, we find that Abramovitch addresses the same field of endeavor as Appellant's invention.

Lastly, while the Examiner correctly states the terms analog and digital are not claim 1 (Ans. 13), the claim does recite an Alexander-type or digital PLL. "When a work is available in one field of endeavour, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars patentability." *KSR*, 127 S. Ct. at 1740. As stated previously, we find that Friedman provides a design incentive to incorporate a digital or Alexander-type PLL into the Abramovitch PLL so that the PLL can operate at higher frequencies and reduce static phase error (FF7) and yields a predictable variation of a PLL. Additionally, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *Id.* at 1741. That is, with the advent of the digital age, one skilled in the art would have recognized numerous benefits of digital PLLs over its analog counterpart, including a reduction

the size of the PLL. Also, where a combination is an adaptation of an old idea or invention using newer technology that is commonly available and understood in the art, one of ordinary skill in the art would have found it obvious to make the combination in order to gain the commonly understood benefits of such adaptation. *Leapfrog Enterprises, Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007). We, thus, find that one skilled in the art would have reasonably looked to and combined the teachings of Abramovitch and Friedman in order to arrive at the recited subject matter of claim 1.

CONCLUSION

For the foregoing reasons, Appellant has not shown error in the Examiner's obviousness rejection of representative independent claim 1 based on Abramovitch and Friedman. Accordingly, we will sustain the Examiner's rejection of claim 1, as well as claims 2-20 which fall with claim 1.

DECISION

The decision of the Examiner to reject the claims is affirmed.

No period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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