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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HOON-JAE KI

Appeal 2010-005320
Application 11/305,370
Technology Center 2600

Before JOHN A. JEFFERY, THOMAS S. HAHN, and
JENNIFER L. McKEOWN, *Administrative Patent Judges*.

McKEOWN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 5, 6, 12, 13, 18, 20, 21, 23, 24, and 26-28. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

STATEMENT OF THE CASE

Appellant's invention is a coefficient update circuit for an adaptive equalizer that can efficiently update filter coefficients even when the levels of the delayed input signals and an error signal change dramatically. *See generally* Abstract, Spec. 5. Claim 18 is illustrative:

> 18. A coefficient update circuit of an adaptive equalizer, comprising:
>
> an error level detector, which detects a level of an error signal that is a difference between a level of an output signal of the adaptive equalizer and a desired signal level, wherein the level of the error signal is determined directly from a sign and a magnitude of the error signal; and
>
> a plurality of coefficient generators, generating a plurality of current filter coefficient values using level detection, each coefficient generator comprising:
>
> an input level detector configured to detect a level of a delayed input signal directly from a sign and a magnitude of the delayed input signal; and
>
> an update value table comprising 3 or more update values as positive and negative multiples of an update size, the update value table coupled to the input level detector and the error level detector and configured to output one of the update values based directly on the level of the error signal and the level of the delayed input signal;
>
> wherein the coefficient generator combines a previous filter coefficient with the output update value to generate a current coefficient value, and

wherein the generated current filter coefficient values are provided to a filter included in the adaptive equalizer.

THE REJECTION

The Examiner rejected claims 5, 6, 12, 13, 18, 20, 21, 23, 24, and 26-28 under 35 U.S.C. § 103(a) as unpatentable over Applicant Admitted Prior Art (AAPA), Alfred O. Hero & Robby Gupta, *Optimal Bit Allocation For The Quantized LMS Adaptive Algorithm*, IEEE (1998) ("Hero"), and Pietraski (US 2006/0128326 A1; June 15, 2006 (filed Dec. 9, 2004)). (Ans. 3-15).[1]

CONTENTIONS

The Examiner finds that AAPA discloses every recited feature of exemplary claim 18 except (1) a level detector that detects the level of the error signal based on sign *and magnitude* (because AAPA detects the level of the error signal based *only on sign*); (2) a level detector that detects the level of the delayed input signal based on sign *and magnitude* (because the AAPA detects the level of the delayed input signal based *only* on sign) and (3) an update value table comprising three or more update values. (Ans. 3-5, 17-19). The Examiner, however, relies on Hero to teach or suggest level detection of the error and input delayed signals based on the sign and magnitude, and on Pietraski to teach or suggest an update value table comprising three or more update values. (Ans. 4-5, 18-20).

[1] Throughout this opinion, we refer to (1) the Appeal Brief filed July 6, 2009; (2) the Examiner's Answer mailed October 2, 2009; and (3) the Reply Brief filed December 2, 2009.

Appellant argues that the Examiner did not establish a prima facie case of obviousness for level detection because AAPA only teaches or suggests *sign* detection, not *level* detection. (Reply Br. 5). Moreover, Hero is said to not teach level detection as required by claim 18, but instead teaches quantization. (App. Br. 11-13). Appellant also argues that the combination of AAPA and Hero is improperly founded on hindsight reconstruction, and adds that one of ordinary skill in the art would not be motivated to combine the quantization features of Hero with the sign detectors of AAPA because Hero teaches away from the claimed level detectors. (App. Br. 12-13). More specifically, Appellant contends that Hero teaches away from a level detection least mean square (LD LMS) algorithm, which Appellant asserts is inherently required by claim 18. (App. Br. 12). Appellant further argues, among other things, that the AAPA, Hero, and Pietraski collectively fail to teach the update value table of claim 18 and that the cited combination of AAPA, Hero, and Pietraski is improper because it is based on impermissible hindsight. (App. Br. 18-21).

ISSUES

1. Under § 103, has the Examiner erred by finding that AAPA, Hero, and Pietraski, collectively, would have taught or suggested:

> (1) an error level detector that detects a level of an error signal directly from a sign and a magnitude of the error signal as recited in claim 18?
>
> (2) an input level detector that detects a level of a delayed input signal directly from a sign and a magnitude of the delayed input signal as recited in claim 18?

(3) an update value table comprising 3 or more update values as positive and negative multiples of an update size as recited in claim 18?

2. Is the Examiner's reason to combine the teachings of these references supported by articulated reasoning with some rational underpinning to justify the Examiner's obviousness conclusion?

ANALYSIS

Claim 18

On this record, we find no error in the Examiner's obviousness rejection of exemplary claim 18.

First, we agree with the Examiner that "AAPA clearly teach[es] the error level detector [of claim 18] itself." (Ans. 17 (citing AAPA, Fig. 3, element 240; *see also* Ans. 4)). Appellant's arguments to the contrary are unavailing. The Examiner explains that AAPA teaches an error level detector that determines the level of the error signal based only on the sign of the error signal, but not the sign *and magnitude* as required by claim 18. (Ans. 4, 17). The disclosed error sign detector or "level detector" of AAPA is detecting either a positive level or a negative level, which would be considered a positive or negative signal level by one of skill in the art.[2]

[2] Furthermore, AAPA at least implicitly teaches level detection, including determining the magnitude of a signal. The Examiner did not rely on the AAPA for this feature, but AAPA discloses that the "error signal [] is [the] difference between *the level of the output signal* and a desired signal level." (Ans. 7) (emphasis added). One of skill in the art would recognize that in order to calculate the difference between the *level* of a signal and a desired reference level, one must first determine the *level*, including at least the magnitude, of the signal. Thus, level detection is taught by AAPA.

Next, we agree with the Examiner that Hero teaches level detection by determining the magnitude of a signal. (Ans. 4-5, 17-18). Hero teaches quantization. (App. Br. 11-12; Ans. 4, 16). Appellant and the Examiner provide similar definitions for quantization. Appellant states,

> "quantization is the process of approximating ('mapping') a continuous range of values (or a very large set of possible discrete values) by a relatively small ('finite') set of … discrete symbols or integer values."

(App. Br. 11 (citing Wikipedia, Quantization (Signal Processing) Web page)).[3] The Examiner defines quantization as "approximating a signal by one of a discrete and finite set of values." (Ans. 16).

Based on the presented evidence, we disagree with the Appellant's arguments regarding quantization. Under Appellant's provided definition, a signal will be *approximated* or *mapped* into a different form. Yet, to one of ordinary skill in the art, establishing the magnitude of a signal is a necessary step in quantization. This is because absent such a magnitude determination, one could not approximate or map the signal into discrete values. Therefore, the Examiner correctly found that quantization, as taught by Hero, is a form of level detection that would teach or suggest determining the magnitude of a signal as required by claim 18. Finally, while Appellant disputes the operation of quantization circuitry from the perspective of one of skill in the

[3] Because Appellant and the Examiner agree on the definition of quantization, we do not address the reliability of the definition from the Wikipedia website. We note, however, that Wikipedia has been found to be an unreliable source of information. *See e.g., Techradium, Inc. v. Blackboard Connect Inc.*, 2009 WL 1152985, at *4, n.5 (E.D. Tex. 2009); *Badasa v. Mukasey*, 540 F.3d 909, 910 (8th Cir. 2008).

art (App. Br. 11-12), Appellant nonetheless presents no persuasive evidence to support this assertion. The arguments of counsel cannot take the place of evidence in the record. *In re Schulze*, 346 F.2d 600, 602 (CCPA 1965).

A number of Appellant's additional arguments incorrectly focus *only* on the teaching of Hero, without considering the teachings of AAPA. One cannot show nonobviousness by attacking references *individually* where, as here, the rejections are based on a combination of references. *See In re Keller*, 642 F.2d 413, 426 (CCPA 1981); *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

For example, Appellant contends that Hero does not teach or suggest *directly* detecting the sign and magnitude of the error signal. (App. Br. 13). However, as discussed above, AAPA teaches this feature. Since AAPA's error sign detector or level detector directly receives the error signal, it therefore directly determines the sign of the error signal. The Examiner merely relies on Hero to teach or suggest level detection by determining the *magnitude* of a signal, and demonstrates it was well known in the art at the time of the invention.

Appellant also argues that the Examiner failed to explain *how* the quantizers of Hero would be added to AAPA. (App. Br. 13). Yet, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *Keller*, 642 F.2d at 425. *See also In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review.").

Appellant also argues that Hero teaches away from the claimed level detection because "[w]hile the phrase LD LMS does not appear in claim 18 explicitly, it is inherent in claim 18 through the use of the error level detector 410 and input level detector 431." (App. Br. 12). Appellant, however, fails to provide any evidence to support this argument. During examination, claim terms are given their broadest reasonable interpretation consistent with the Specification. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1316-17 (Fed. Cir. 2005) (en banc). Although the claims are interpreted in light of the Specification, limitations from the Specification are not read into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). Nothing in the record before us suggests that we should limit level detection of claim 18 to an LD LMS algorithm. As such, we need not reach the issue of whether or not Hero teaches away from an LD LMS algorithm.

Finally, with respect to error level detection, we disagree with Appellant that the cited combination is improperly based on hindsight. As discussed above, AAPA and Hero demonstrate that level detection using only the sign of a signal and level detection using the magnitude of a signal were both well known in the art at the time of the invention. Therefore, it would have been obvious to one of ordinary skill in the art to simply substitute detecting only the sign of the error signal with detecting the sign and magnitude of the error signal to obtain predictable results.

Moreover, the Examiner sufficiently explains why one of ordinary skill in the art would combine the teachings of AAPA and Hero. Assuming *arguendo* that the combination is not a mere simple substitution of known elements to obtain predictable results, the holding of obviousness can be based on a showing that there was an apparent reason to combine the known elements. 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.

KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

Here, the Examiner states that one of ordinary skill in the art would modify AAPA to detect both the sign and magnitude of the error signal, as taught by Hero, "to generate filter coefficients accurately." (Ans. 5). The Examiner further elaborates that "[i]t is well known in the art that use of more information gives better results" and therefore one of ordinary skill in the art would recognize that detecting both the sign and magnitude would produce better results than detecting only the sign alone. (Ans. 18). Appellant does not provide any evidence, nor articulate any explanation, as to why the Examiner's reason to combine the cited references lacks rational underpinning. In fact, Appellant admits that the cited reasoning "to generate coefficients accurately" is "undoubtably a typical goal of filter coefficient circuits." (App. Br. 13). We therefore find the Examiner sufficiently provides articulated reasoning with some rational underpinning to justify the obviousness conclusion.

Next, Appellant's arguments regarding input level detector of claim 18 and error level detection are synonymous. (App. Br. 14-15, Reply Br. 6-7). For the reasons discussed above, we therefore find Appellant's arguments regarding input level detection unavailing. Based on the evidence before us, we find that one of ordinary skill in the art would reasonably conclude from reviewing AAPA and Hero that it would have been obvious to detect the sign and magnitude of the delayed input signal, rather than just the sign of the delayed input signal, to produce more accurate coefficient results.

With respect to the update value table, we find that the Examiner correctly finds that the update value table of claim 18 would have been obvious based on the combination of AAPA, Hero, and Pietraski. (Ans. 6-7).

Here, AAPA teaches an update value circuit. (Ans. 4). The circuitry within the coefficient update circuit 240 (i.e., 262, 263, 264, and 265) provide updated coefficient values. (Ans. 4, Spec. 5:3-9). We agree with the Examiner that AAPA also teaches update values as positive and negative multiples of an update size. (Ans. 4). More specifically, AAPA teaches two update levels, +μ or -μ, to update the filter coefficient. (Spec. 5:19-20, Fig. 3). Thus, absent from AAPA are *three* or more update values (because AAPA only includes two update levels), provided in a table format. We agree with the Examiner, however, that Pietraski teaches or suggests these features. (Ans. 5-6).

Pietraski's look up table (LUT) provides *sets* of updated coefficient values, and the LUT can be updated to cover different ranges based on observed conditions. (Ans. 5). For example, Pietraski's table may include "sets" of coefficient filter values for "as few as six (6) filters." (Pietraski [0018]; Ans. 5, 20). In other words, Pietraski discloses including at least six values in a table format. Thus, the combination of AAPA, Hero, and

Pietraski would teach or suggest to one of skill in the art including three or more update values in a table as required by claim 18.

Further with respect to the update value table, Appellant presents a number of arguments incorrectly focusing *only* on the teaching of Pietraski, without considering the teachings of AAPA. As discussed above, this is unpersuasive. *See Keller*, 642 F.2d at 426; *Merck*, 800 F.2d at 1097. As also discussed above, AAPA teaches an update value circuit that generates two update values as positive and negative multiples of an update size. Pietraski cures the deficiencies of AAPA by disclosing use of three or more update values in a table. Therefore, AAPA and Pietraski together teach or suggest each of the features of the update value table of claim 18.

Appellant also argues that Pietraski teaches away from plural coefficient generators because Pietraski teaches a global LUT for plural filters. (App. Br. 20). This argument, however, is not persuasive. Pietraski at most teaches a general preference for using a single table instead of multiple tables. This is insufficient to support Appellant's argument. *See DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (citations and quotations omitted) ("A reference does not teach away [...] if it merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into the claimed invention."). Here, Appellant has not pointed to any evidence to suggest that Pietraski would discourage one of ordinary skill from using multiple update value tables. We therefore find this argument unavailing.

Finally, we disagree with the Appellant's contention that the cited combination is improperly based on hindsight. (App. Br. 20-21). The

Examiner identifies that using look up tables, including three or more update values, was well known at the time of the invention, and that it was well known to substitute "a lookup table instead of . . . a circuit to calculate the values [to] reduce the computational complexity in the device." (Ans. 5, 20-21). Appellant has not provided any evidence, nor articulated any explanation, as to why the Examiner's articulated reason lacks rational underpinning. We therefore find the Examiner sufficiently provides articulated reasoning with some rational underpinning to justify the obviousness conclusion.

We are therefore not persuaded that the Examiner erred in rejecting claim 18.

THE OBVIOUSNESS REJECTION OF THE REMAINING CLAIMS

Claims 5, 6, 12, 13, 20, 21, 23, 24, and 26-28

Because Appellant presents the same arguments with respect to the remaining claims (App. Br. 22-31), we also sustain the Examiner's obviousness rejection of claims 5, 6, 12, 13, 20, 21, 23, 24, and 26-28 (Ans. 5-15) for the reasons noted above.

CONCLUSION

The Examiner did not err in rejecting claims 5, 6, 12, 13, 18, 20, 21, 23, 24, and 26-28 under § 103.

ORDER

The Examiner's decision rejecting claims 5, 6, 12, 13, 18, 20, 21, 23, 24, and 26-28 is affirmed.

No time 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

gvw