UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ANURAG BIST, STAN HSIEH, and NEIL J. BERSHAD

Appeal 2007-2459
Application 10/304,641
Technology Center 2600

Decided: June 11, 2008

Before KENNETH W. HAIRSTON, JOHN A. JEFFERY, and MARC S. HOFF, *Administrative Patent Judges*.

HAIRSTON, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from a final rejection of claims 1 to 35. We have jurisdiction under 35 U.S.C. § 6(b).

We will reverse the rejections.

STATEMENT OF THE CASE

Appellants have invented an echo channel apparatus and a method that comprises an enable generator that asserts a sparse update enable in response to the detection of at least one of a double talk condition and an impulse response change in the echo channel, and a main weight updater to transfer shadow weights of a shadow filter to N sets of sparse weights in a main filter according to the sparse update enable. The echo channel receives a far-end input, and a near-end input. The main filter filters the far-end input

non-adaptively to generate a main output, and the shadow filter filters the far-end input adaptively to generate a shadow output (Figures 1 and 2; Specification 5 to 9).

Claim 1 is representative of the claims on appeal, and it reads as follows:

1. An apparatus comprising:

an enable generator to assert a sparse update enable in response to detecting at least one of a double talk condition and an impulse response change in an echo channel, the echo channel receiving a far-end input and a near-end input; and

a main weight updater to transfer shadow weights of a shadow filter to N sets of sparse weights in a main filter according to the sparse update enable, the main filter filtering the far-end input non-adaptively to generate a main output, the shadow filter filtering the far-end input adaptively to generate a shadow output, and estimating delays of peaks of the sparse weights.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Hirano	US 5,699,424	Dec. 16, 1997
Gritton	US 5,857,167	Jan. 5, 1999
Park	US 6,181,794 B1	Jan. 30, 2001
Seibert	US 2004/0037417 A1	Feb. 26, 2004 (filed Aug. 23, 2002)
Younce	US 6,718,035 B2	Apr. 6, 2004 (filed Nov. 14, 1997)

Tomas Gansler, *A Robust Proportionate Affine Projection Algorithm for Network Echo Cancellation,* Acoustic, Speech, and Signal Processing, ICASSP ’00 Proceedings, Vol. 2, 793-796 (2000).

The Examiner rejected claims 1 to 5, 7 to 9, 11 to 15, 17 to 19, and 31 under 35 U.S.C. § 103(a) based upon the teachings of Park and Seibert.

The Examiner rejected claims 6 and 16 under 35 U.S.C. § 103(a) based upon the teachings of Park, Seibert, and Hirano.

The Examiner rejected claims 10 and 20 under 35 U.S.C. § 103(a) based upon the teachings of Park, Seibert, Hirano, and Gansler.

The Examiner rejected claims 21 to 25 and 27 to 29 under 35 U.S.C. § 103(a) based upon the teachings of Park, Seibert, and Younce.

The Examiner rejected claim 26 under 35 U.S.C. § 103(a) based upon the teachings of Park, Seibert, Younce, and Hirano.

The Examiner rejected claim 30 under 35 U.S.C. § 103(a) based upon the teachings of Park, Seibert, Younce, Hirano, and Gansler.

The Examiner rejected claims 32 to 35 under 35 U.S.C. § 103(a) based upon the teachings of Park, Seibert, and Gritton.

ISSUE

Appellants contend *inter alia* that the applied prior art to

> Park and Seibert, taken alone or in any combination, do not disclose, suggest, or render obvious (1) an enable generator to assert a sparse update enable in response to detecting at least one of a double talk condition and an impulse response change in an echo channel, (2) a main weight updater to transfer shadow weights of a shadow filter to N sets of sparse weights in a main filter according to the sparse update enable.

(Br. 10).

Thus, the issue before us is whether the applied prior art teaches or would have suggested to the skilled artisan an enable generator that asserts a sparse update enable in response to the detection of a condition or change in an

echo channel, and a main weight updater that transfers shadow weights of a shadow filter to N sets of sparse weights in a main filter according to the sparse update enable as set forth in the claims on appeal.

FINDINGS OF FACT

1. As indicated *supra*, the echo channel apparatus and method disclosed and claimed by Appellants transfers the shadow weights of the shadow filter to N sets of sparse weights in the main filter.

2. Park describes an echo canceler for canceling an echo signal mixed in an input signal received from a hybrid circuit 26 (Figure 1; Abstract; col. 3, ll. 22 to 24). The echo canceler has a double filter structure that comprises an adaptive filter 21 and a fixed filter 22. The adaptive filter 21 receives the input signal and generates a first echo estimation according to a filter coefficient thereof, and the fixed filter 22 receives the same input signal and generates a second echo estimation signal according to a filter coefficient thereof. Thereafter, the first echo estimation signal is subtracted from the input signal in adder 23 to generate a first echo-canceled signal, and the second echo estimation signal is subtracted from the input signal in adder 24 to generate a second echo-canceled signal. A mode controller 25 detects double talk from the voice signals and the first and second echo-canceled signals (col. 3, ll. 37 to 39).

3. Seibert describes an echo cancellation circuit that uses Least Mean Squares (LMS) adaptive filtering during the location of echoes and the detection of double talk (Figure 1; paragraphs 0002 and 0016). Seibert recognizes that an adaptive filter should not be run over the entire length of an echo because the echo path is usually sparse (paragraph 0038). Seibert uses an echo locator circuit 12 that incorporates a double-talk and path

change detector 22 to derive coefficients that are used to adjust the operating characteristics of adaptive filter 10 (Figure 3; paragraphs 0025, 0038, and 0044).

4. According to the Examiner,

> Hirano teaches a short-term power estimator **(103)** to estimate a short-term power of the far-end input (i.e. **reference input signal)**; a long-term power estimator **(105)** to estimate a long-term power of the far-end input (i.e. **reference input signal)**; and an adaptation enabler to enable adaptation (i.e. **updating)** of the shadow filter in response to the short-term power being greater than an indication of the long-term power [Fig. 2; col. 4, lines 18-28; col. 6, lines 8-16].

(Ans. 10).

5. "Gansler et al teach an affine projection adaptation (APA) for echo cancellation [Page 794]" (Ans. 11).

6. "Younce et al teach a method for implementing an echo canceller comprising non-adaptive and adaptive filters shown in Fig. 2, using a machine-accessible (i.e. **computer-readable)** medium [col. 4, lines 11-38; col. 18, lines 15-44]" (Ans. 14).

7. "Gritton et al teach a combined speech coder and echo canceller system shown in Figs. 1-5; comprising: a send input {S1} decoder [Fig. 1, **element 36**] to receive encoded speech from a near end; and a send output {RO} encoder [Fig. 1, **element 40**] to provide speech compression [col. 3, lines 46-67; col. 7, line 55 to col. 7, line 45 [sic]]" (Ans. 19).

PRINCIPLES OF LAW

The Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If that

burden is met, then the burden shifts to the Appellant to overcome the prima facie case with argument and/or evidence. *See id*.

The Examiner's articulated reasoning in the rejection must possess a rational underpinning to support the legal conclusion of obviousness. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

ANALYSIS

We agree with the Examiner that Seibert detects a double-talk condition, and uses the detected condition to adjust the operating characteristics of the adaptive filter 10 (Ans. 4 and 5) (Finding of Fact 3). We additionally agree with the Examiner that "it would have been obvious to a person of ordinary skill in the art to use the adaptive filter and echo locator of Seibert to replace the adaptive filter (21) of Park et al to reduce unnecessary computations in an echo cancellation system [Seibert; Para: 0038]" (Ans. 5). We do not, however, agree with the Examiner's reasoning (Ans. 5) that the applied prior art teaches or would have suggested to the skilled artisan "a main weight updater (i.e. **echo locator 12)**, shown in Fig. 3, to transfer shadow weights (i.e. **adaptive weights)** of a shadow filter (i.e. **adaptive filter 10)** to N sets of sparse weights in N sparse filters (i.e. **N sub-bands)** of a main filter (i.e. **adaptive filter 10)** according to the sparse update enable" because the sparse update enable in Seibert creates a condition in which the main weight updater transfers shadow weight coefficients to change the operating characteristics of the shadow/adaptive filter, and not the sparse/main filter as set forth in the claims on appeal.

Turning to the teachings of Hirano, Gansler, Younce, and Gritton, we find that none of the teachings of these references cures the noted shortcoming in the teachings of Park and Seibert.

CONCLUSION OF LAW

The Examiner has not established the obviousness of claims 1 to 35.

ORDER

The obviousness rejections of claims 1 to 35 are reversed.

REVERSED

tdl/gw

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