

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ERIC DOUGLAS ROMESBURG

Appeal No. 2002-1197
Application 09/131,167¹

ON BRIEF

Before BARRETT, DIXON, and GROSS, Administrative Patent Judges.
BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the final rejection of claims 1-41.

We affirm-in-part and enter a new ground of rejection.

¹ Application for patent filed August 7, 1998, entitled "Methods and Apparatus for Mitigating the Effects of Microphone Overload in Echo Cancellation Systems."

BACKGROUND

The invention relates to echo cancelation in a bi-directional communications link, such as a telephone system. In such systems, speech of a near-end user is detected by a near-end microphone for transmission over a communications link to a far-end loudspeaker and speech of a far-end user is detected by a far-end microphone and transmitted to a near-end loudspeaker for reproduction and presentation to the near-end user. At either end of the communications link, loudspeaker output detected by a proximate microphone may inadvertently be transmitted back over the communications link, resulting in unacceptable feedback or "echo." This is especially a problem in portable telephones of small size having a close distance between the loudspeaker and microphone and with hands-free speaker phones. Conventionally, echo suppression has been accomplished with echo canceling circuits which employ adaptive filters. According to appellant, practical experience has demonstrated that adaptive filtering does not work well when the source signal (i.e., the near-end microphone signal) becomes saturated. The present invention overcomes the problem by updating the filter coefficients of the adaptive filter only when the magnitude of the source signal is within a predetermined range of possible values less than the saturation level.

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Claim 17 is reproduced below.

17. A communications device, comprising:

an adaptive system configured to estimate a component of a source signal,

wherein variables of said adaptive system are updated only when a prevailing value of the source signal is within a predetermined range of possible source signal values.

The examiner relies on the following references:

Haneda et al. (Haneda)	5,721,772	February 24, 1998
Koski	6,192,126	February 20, 2001 (filed May 28, 1998)

Claims 1-41 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koski and Haneda. The examiner finds that Koski discloses the claimed subject matter except for the echo estimate. The examiner finds that Haneda teaches providing an echo estimate. The examiner concludes that it would have been obvious to modify Koski to provide an echo estimate, in view of the teachings of Haneda, to allow the echo component of the source signal to be subtracted out.

We refer to the final rejection (Paper No. 12) (pages referred to as "FR__") and the examiner's answer (Paper No. 18) (pages referred to as "EA__") for a statement of the examiner's rejection, and to the brief (Paper No. 17) (pages referred to as "Br__") and reply brief (Paper No. 20) (pages referred to as "RBr__") for a statement of appellant's arguments thereagainst.

OPINION

Grouping of claims

Appellant argues several groups of claims separately (Br7):
(1) claims 1-4, 8-28, and 32-37 stand or fall together;
(2) claims 5, 7, 29, and 31 stand or fall together; (3) claim 6 stands alone; (4) claim 30 stands alone; (5) claim 38 stands alone; and (6) claims 39-41 stand or fall together.

New ground of rejection pursuant to 37 CFR § 1.196(b)

Claims 1-24 are rejected under 35 U.S.C. § 112, first and/or second paragraph, because claims 1, 13, and 17 contain purely functional language that either lacks enabling disclosure for the scope of the claim or is indefinite.

Claim 1 recites "wherein filter coefficients of said adaptive filter are updated only when a prevailing value of the output signal of said microphone is within a predetermined range of possible output signal values." Claim 13 recites an almost identical limitation. Claim 17 recites "wherein variables of said adaptive system are updated only when a prevailing value of the source signal is within a predetermined range of possible source signal values." These limitations are purely functional because no structure or "means" has been recited to support the function. In Halliburton Oil Well Cementing Co. v. Walker, 329 U.S. 1, 71 USPQ 175 (1946), the Supreme Court held invalid an

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apparatus claim on the ground that it used a "means-plus-function" term which was considered to be purely functional. Such a claim was improper because the means term with a stated function merely described a particular end result, did not set forth any specific structure, and would encompass any and all structures for achieving that result, including those which were not what the applicant had invented. In Greenberg v. Ethicon Endo-Surgery Inc., 91 F.3d 1580, 1584, 39 USPQ2d 1783, 1785 (Fed. Cir. 1996), the Court of Appeals for the Federal Circuit noted that Congress enacted 35 U.S.C. § 112, sixth paragraph (originally third paragraph), to overrule that holding. In place of the Halliburton rule, Congress adopted a compromise solution, one that had support in the pre-Halliburton case law: Congress permitted the use of means-plus-function language in claims, but it limited the breadth of such claim language by restricting its scope to the structure disclosed in the specification and equivalents thereof. Thus, apparatus claims must either recite structure to perform a function or must recite means-plus-function to be interpreted under § 112, sixth paragraph; they cannot recite purely functional language. Although the statutory basis of the rejection is not clear, § 112, first paragraph, lack of enablement is appropriate because the scope of the enabling disclosure is not commensurate with the scope of the claim because the specification does not describe all structures for

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performing the function (this appears to be the rationale in Halliburton). Also, § 112, second paragraph, indefiniteness is appropriate because the purely functional limitations in the "wherein" clauses are not permitted under the Halliburton rationale and, hence, are not definite claim limitations.

Obviousness

Claims 1-4, 8-28, and 32-37

The issue with respect to the independent claims in this group is whether the combination of Koski and Haneda discloses or suggests that the "filter coefficients of said adaptive filter are updated only when a prevailing value of the output signal of said microphone is within a predetermined range of possible output signal values" (claim 1 and an almost identical limitation in claim 13), or "variables of said adaptive system are updated only when a prevailing value of the source signal is within a predetermined range of possible source signal values" (claim 17), or "updating filter coefficients of the adaptive filter . . . only when a prevailing value of the communications signal is within a predetermined range of possible signal values" (claim 25). Initially, we must interpret these limitations without reading in limitations from the specification. The limitation of "within a predetermined range of possible signal values" is very broad and does not exclude the "predetermined

range" from being the full range of possible signal values. Thus, updating the filter coefficients "only when a prevailing value of the output signal of said microphone is within a predetermined range of possible output signal values" (claim 1) does not preclude always updating the filter coefficients where the "predetermined range" is the entire range. The claims do not define a "predetermined range" as being less than the total possible range; compare claim 2, which recites only updating when a value of the output signal is "below a predetermined threshold value" and claim 38, which recites only updating when a value of the output signal is "less than a saturation constant." Although the word "only" implies that there are some values of output signal for which the filter coefficients are not updated, we decline to read this as a limitation on what is covered by a "predetermined range." See In re Zletz, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) ("[D]uring patent prosecution when claims can be amended, ambiguities should be recognized, scope and breadth of language explored, and clarification imposed."). Accordingly, the claims, as presented, do not define over the admitted prior art where coefficients of an adaptive filter are always updated and where saturation may occur. We next consider the examiner's rejection.

For the limitation of updating the filter coefficients only when a prevailing value of the output signal is within a

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predetermined range the examiner points to Koski, column 1, lines 43-47; column 3, lines 20-36; column 5, lines 45-50; and column 6, lines 1-10 (FR4). The examiner states that Koski discloses a double talk detector "to freeze the adaptation of the filter coefficients when the output signal of the microphone, which is the superposition of the near-end speech signal and the far end speech signals[,] said far end speech signal [being] the cause of the echo, reaches a threshold that causes the detector to freeze said coefficients" (FR2). The examiner states (FR3): "Koski states that the filter coefficients of the adaptive filter will only be aloud [sic, allowed] to update, i.e., they are frozen, unless the signal from the microphone (the source) is below a value. The signal from the microphone being the near end users signal plus the echo signal coming from the speaker of the communication device" (FR3).

Appellant argues: (a) Koski only freezes updating of the coefficients upon detection of "double talk" and double talk is not equivalent to an output signal of the microphone (Br9-10); and (b) the filter coefficients in Koski are not updated only when the value of the microphone output is within a predetermined range (Br10-12). Appellant does not argue the other limitations of the claims or the propriety of the combination with Haneda. Arguments not raised are waived. See 37 CFR § 1.192(c)(8)(iv) (1998) (brief must point out errors in the rejection); cf.

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In re Baxter Travenol Labs., 952 F.2d 388, 391, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991) ("It is not the function of this court to examine the claims in greater detail than argued by an appellant, looking for nonobvious distinctions over the prior art.").

We find that Koski teaches the limitation that "filter coefficients of said adaptive filter are updated only when a prevailing value of the output signal of said microphone is within a predetermined range of possible output signal values" (claim 1), as interpreted. Koski discloses that echo cancelers are known and usually employ an adaptive digital filter where the parameters (coefficients) are updated whenever far-end speech occurs (col. 1, lines 21-42). Koski teaches that an improvement is to not update the filter coefficients during double talk to overcome the problem of distortion (col. 1, lines 43-63), which indicates that the prior condition was to always update the coefficients for every signal, which is considered to meet the limitations of claims 1, 13, 17, and 25, as broadly interpreted. Because these are the only limitations argued, we sustain the rejection of claims 1-4, 8-28, and 32-37.

IF the claims recited updating the filter coefficients only upon the condition that the output signal of the microphone is within a predetermined range of possible output signal values, where the predetermined range was less than the total range of possible output signal values, the examiner's rejection could not

be sustained. We discuss this situation because of the dependent claims and for the benefit of any further prosecution. Column 1, lines 43-63, of Koski states:

Double-talking refers to the condition when the near end subscriber (the user of the phone) and the far-end subscriber talk simultaneously. When both parties talk simultaneously, i.e. during double talk, the echo canceller is no longer able to effectively block echo signals. This is because the echo signals are included in the near-end subscriber's signals to be transmitted, i.e. a desired signal to be transmitted and an echo signal are simultaneously applied to the send input. The superpositioning of these signals causes distortion of the adjustment of the echo canceller when it considers both the echo signal and the desired signal to be transmitted. This means that the replica produced by the echo canceller no longer sufficiently cancels the current echo signal. Accordingly, it is a current practice to provide a double talk detector for preventing the disturbing influence of double talk on echo canceller adjustment. This means that the parameters of the adaptive filter performing the echo cancellation are not updated during double talk. Echo and double talk are problems especially in speaker phones and in phones with hands-free equipment in which the far-end signal from the speaker is captured by the microphone. [Emphasis added.]

The superposition of the near-end and echo (far-end signals coupled from the loudspeaker into the microphone) signals must refer to superposition of signals to become the output signal of the microphone, as noted by the examiner (e.g., FR3). The superposition of the near-end and echo signals during double talk creates an output signal that causes a distortion in the echo canceller, and the need to prevent distortion suggests that the resultant superposed signal be kept below a predetermined value that causes distortion, i.e., that the output of the microphone

should be kept within a predetermined range that does not cause distortion. However, Koski teaches not updating the filter coefficients based on the condition of double talk detection, not only updating the coefficients based upon the condition that the output signal of the microphone is within a predetermined range of possible output signal values, as claimed. Not updating the filter coefficients based on double talk detection will indirectly keep the output signal of the microphone within a predetermined range of output signal values, but this is not the same as updating based on the output signal value. We agree with appellant's argument "that when double-talk does not exist, the double-talk detector of Koski will not prevent the parameters of the adaptive filter from being updated, regardless of the prevailing value of the output signal of the microphone because Koski discloses freezing the parameters of the adaptive filter only when double-talk exists" (RBr3). Thus, the condition under which Koski freezes the coefficients of the adaptive filter are not based on whether the output signal is within a predetermined range. The examiner has not presented any reasoning that since distortion is caused when the magnitude of the superposed near-end and echo signals is too great, due to double talk, it would have been obvious to one skilled in the art to freeze the coefficients based on the magnitude of the output signal rather than based on the presence of double talk.

The examiner's findings that Koski acts "to freeze the adaptation of the filter coefficients when the output signal of the microphone . . . reaches a threshold that causes the detector to freeze said coefficients" (FR2) and that "Koski states that the filter coefficients of the adaptive filter will only be allowed [sic, allowed] to update, i.e., they are frozen, unless the signal from the microphone (the source) is below a value" (FR3) are in error. As noted by appellant (Br11), Koski only freezes adaptation of the filter coefficients when double talk exists, not when the output signal of the microphone reaches a threshold. The thresholds in Koski have to do with detection of double talk and are not used for comparison with the output signal.

Claims 5, 7, 29, and 31

The examiner finds that Koski discloses updating filter coefficients only when the output signal is at a predetermined threshold value, referring to column 5, line 20, to column 6, line 15 (FR6). The examiner states that "Koski discloses that the threshold values are based in part on the distortion through A to D conversion (see col. 4 lines 25-62)" (FR6).

Appellant argues that the combination of Koski and Haneda does not disclose or suggest that the first predetermined threshold value is less than or equal to an upper full-scale value of the analog-to-digital converter (ADC) and that the second predetermined threshold value is greater than or equal to

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a lower full-scale value of the ADC, as recited in claims 5 and 29 (Br13). It is argued that column 4 of Koski does not disclose or suggest threshold values, much less that the threshold values are based in part on distortion through the ADC or on an upper and lower full-scale value of an ADC (Br13-14).

The examiner states that Koski states (col. 1, lines 50-55) that the reason for setting the threshold is to stop distortion and therefore Koski is setting two thresholds to stop distortion in the device (EA10).

We will not sustain the rejection. The thresholds in Koski, columns 5 and 6, are for determining whether there is double talk based on whether the power ratio (PR) of the far-end signal to the near-end signal in the sub-channels are above or below the threshold, taken in conjunction with the voice activity detector (VAD) signal. Koski does not determine whether the output signal is above or below a threshold, much less that the threshold values relate to full-scale values of the ADC, as recited in claims 5 and 29, or that at least one of the predetermined threshold values is adjusted to account for ringing of the ADC converter, as recited in claims 7 and 31. The fact that Koski seeks to prevent distortion does not mean that it prevents distortion in the way that is claimed. The rejection of claims 5, 7, 29, and 31 is reversed.

Claim 6

Appellant argues that the combination of Koski and Haneda does not disclose or suggest that at least one of the first and second predetermined threshold values is adjusted to account for analog distortion (Br14).

As discussed in connection with claim 5, the thresholds in Koski relate to the detection of double talk and Koski does not determine whether the output signal from the microphone is below a first threshold or above a second threshold. Because Koski does not have predetermined thresholds, as claimed, it does not teach or suggest that one of the predetermined threshold values is adjusted to account for analog distortion. Although Koski may detect double talk to prevent distortion, this does not suggest keeping the output signal below or above a threshold value to account for analog distortion. The rejection of claim 6 is reversed.

Claim 30

Appellant argues that the combination of Koski and Haneda does not disclose or suggest that at least one of the first and second predetermined threshold values is adjusted to account for analog compression (Br14).

As discussed in connection with claim 5, the thresholds in Koski relate to the detection of double talk and Koski does not determine whether the output signal from the microphone is below

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a first threshold or above a second threshold. Because Koski does not have predetermined thresholds, as claimed, it does not teach or suggest that one of the predetermined threshold values is adjusted to account for analog compression. Although Koski may detect double talk to prevent distortion, this does not suggest keeping the output signal below or above a threshold value to account for analog compression. The rejection of claim 30 is reversed.

Claims 38-41

The issue is whether the combination of Koski and Haneda discloses or suggests "means for updating filter coefficients of said adaptive filter only when an absolute value of the output signal of the microphone is less than a saturation constant" (claim 38). Unlike claims 1, 13, 17, and 25, claim 38 positively limits the updating of coefficients when the output is less than the full range of the output signal and, as discussed in connection with the rejection of claim 1, this is not taught by Koski. The rejection of claims 38-41 is reversed.

Requirement under 37 CFR § 1,196(d)

The specification describes that "practical experience" has demonstrated that adaptive filtering techniques do not work well when the source signal (e.g., the near-end microphone signal) becomes saturated. Specification, p. 3, first full paragraph.

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It is not clear whether appellant is describing a known problem in the art or a problem which he discovered. This fact may have a bearing on the obviousness analysis; e.g., if the saturation problem was known, the issue would be whether it would have been obvious to freeze the coefficients when the source signal was of a magnitude that would cause saturation. In any response to this opinion, appellant is required to state whether the problems described in this paragraph on page 3 were known to those in the art of echo cancelation. It will be sufficient if appellant admits, denies, or states that he is without knowledge of whether the described problems were known in the art.

CONCLUSION

The rejection of claims 1-4, 8-28, and 32-37 is sustained. The rejection of claims 5-7, 29-31, and 38-41 is reversed.

A new ground of rejection has been entered as to claims 1-24 pursuant to 37 CFR § 1.196(b).

In addition to affirming the Examiner's rejection of one or more claims, this decision contains a new ground of rejection pursuant to 37 CFR § 1.196(b) (amended effective Dec. 1, 1997, by final rule notice, 62 Fed. Reg. 53,131, 53,197 (Oct. 10, 1997), 1203 Off. Gaz. Pat. & Trademark Office 63, 122 (Oct. 21, 1997)). 37 CFR § 1.196(b) provides, "A new ground of rejection shall not be considered final for purposes of judicial review."

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Regarding any affirmed rejection, 37 CFR § 1.197(b) provides:

(b) Appellant may file a single request for rehearing within two months from the date of the original decision

37 CFR § 1.196(b) also provides that the Appellants, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of proceedings (37 CFR § 1.197(c)) as to the rejected claims:

(1) Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner. . . .

(2) Request that the application be reheard under § 1.197(b) by the Board of Patent Appeals and Interferences upon the same record. . . .

Should appellants elect to prosecute further before the primary examiner pursuant to 37 CFR § 1.196(b)(1), in order to preserve the right to seek review under 35 U.S.C. §§ 141 or 145 with respect to the affirmed rejection, the effective date of the affirmance is deferred until conclusion of the prosecution before the examiner unless, as a mere incident to the limited prosecution, the affirmed rejection is overcome.

If appellants elect prosecution before the examiner and this does not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Board of

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Patent Appeals and Interferences for final action on the affirmed rejection, including any timely request for rehearing thereof.

A requirement has also been entered pursuant to 37 CFR § 1.196(d). Any response to this opinion, whether to the Board or to the examiner, either in response to the new ground of rejection or by way of further prosecution, must respond to this requirement.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART - 37 CFR §§ 1.196(b) & 1.196(d)

LEE E. BARRETT)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
JOSEPH L. DIXON)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
)	
)	
)	
ANITA PELLMAN GROSS)	
Administrative Patent Judge)	

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COATS & BENNETT, PLLC
P.O. BOX 5
RALEIGH, NC 27602