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**Datasheet for the decision
of 10 January 2008**

Case Number: T 1369/06 - 3.5.03

Application Number: 94307855.0

Publication Number: 0652686

IPC: H04R 3/00

Language of the proceedings: EN

Title of invention:
Adaptive microphone array

Patentee:
AT&T Corp.

Opponent:
K/S HIMPP (Hearing Instrument Manufacturers Patent Partnership)

Headword:
Adaptive microphone array/AT&T

Relevant legal provisions:
EPC Art. 52(1), 54, 84, 123

Keyword:
"Novelty - auxiliary request 1B (no)"
"Added subject-matter - auxiliary requests 2 and 8 (yes)"
"Clarity - auxiliary requests 3, 5 and 7 (no)"
"Main request and auxiliary requests 1A, 1C, 1D, 4 and 6 -
withdrawn"

Decisions cited:
-

Catchword:
-



Case Number: T 1369/06 - 3.5.03

DECISION
of the Technical Board of Appeal 3.5.03
of 10 January 2008

Appellant: K/S HIMPP (Hearing Instrument Manufacturers
(Opponent) Patent Partnership)
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Decision under appeal: Decision of the opposition division of the
European Patent Office posted 7 July 2006
rejecting the opposition filed against European
patent No. 0652686 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: A. S. Clelland
Members: F. van der Voort
R. Moufang

Summary of Facts and Submissions

- I. This appeal is against the decision of the opposition division rejecting an opposition filed against European patent No. 0652686 which is based on European patent application 94307855.0.
- II. The opposition was filed against the patent as a whole and on the grounds that the claimed subject-matter was not new, did not involve an inventive step (Article 100(a) EPC), and extended beyond the content of the application as filed (Article 100(c) EPC).
- III. The opponent (appellant) lodged an appeal against the decision and requested that the impugned decision be set aside and that the patent be revoked in its entirety. In support of the arguments the appellant submitted the following document:

D17: M.W. Hoffman and K.M. Buckley, "Constrained Optimum Filtering for Multi-Microphone Digital Hearing Aids", Conference Record of the 24th Asilomar Conference on Signals, Systems and Computers, 5-7 November 1990, Pacific Grove, California, US, IEEE, Maple Press, Vol. 1, pages 28 to 32.

The appellant argued, *inter alia*, that the subject-matter of claim 1 as granted lacked novelty having regard to the disclosure of D17. Oral proceedings were conditionally requested.

- IV. In response to the statement of grounds of appeal, the respondent (proprietor) filed a reply and requested that

the patent be maintained unamended in accordance with the decision of the opposition division, i.e. that the appeal be dismissed. Arguments in support were presented and oral proceedings were conditionally requested.

- V. The parties were summoned by the board to oral proceedings. In a communication accompanying the summons the board drew attention to issues to be discussed at the oral proceedings and gave a preliminary opinion.
- VI. In preparation for the oral proceedings the appellant filed a letter including further arguments.
- VII. The respondent submitted further arguments in a letter dated 10 December 2007 and, by way of auxiliary requests, requested that the patent be maintained in amended form on the basis of claims 1 and 10 of any one of auxiliary requests 1A to 1D and 2 to 8, as filed with the letter, and dependent claims 2 to 9 and 11 to 21 as granted.
- VIII. Oral proceedings were held on 10 January 2008.

The appellant requested that the decision under appeal be set aside and that the patent be revoked or, in the alternative, that the appeal proceedings be continued in writing or that the case be remitted to the department of first instance for further prosecution.

In the course of the oral proceedings, the respondent withdrew both the request that the appeal be dismissed and auxiliary requests 1A, 1C, 1D, 4 and 6, and filed amended versions of auxiliary requests 2 and 8.

The respondent requested that the decision be set aside

and that the patent be maintained in amended form on the basis of auxiliary request 1B as filed with the letter dated 10 December 2007 or, in the alternative, auxiliary request 2 as filed at the oral proceedings, auxiliary requests 3, 5 or 7 as filed with the letter dated 10 December 2007, or auxiliary request 8 as filed at the oral proceedings.

At the end of the oral proceedings the board's decision was announced.

IX. Claim 1 of auxiliary request 1B reads as follows:

"A method of enhancing the signal-to-noise ratio of a microphone array, the array including a plurality of microphones and having a directivity pattern, the directivity pattern of the array being adjustable, based on one or more parameters, the method characterized by the steps of:

- a. evaluating (135) one or more parameters to realize an angular orientation of a directivity pattern null, which angular orientation reduces microphone array output signal level in accordance with a criterion, said evaluation performed under a constraint that the null be located within a predetermined region of space termed the background, the region of space not being the background being termed the foreground, and the null being precluded from being located within the foreground, the foreground comprising a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array;
- b. modifying output signals of one or more microphones of the array based on the one or more evaluated

- parameters; and
- c. forming (140) an array output signal based on one or more modified output signals and zero or more unmodified microphone output signals."

Claim 1 of auxiliary request 2 as filed at the oral proceedings differs from claim 1 of auxiliary request 1B in that step a) is amended to read as follows (underlining by the board):

"evaluating (135) one or more parameters to realize an angular orientation of a directivity pattern null, which angular orientation reduces microphone array output signal level in accordance with a criterion, and, after said evaluation, applying a constraint to the evaluated one or more parameters that the null be located within a predetermined region of space termed the background, the region of space not being the background being termed the foreground, and the null being precluded from being located within the foreground, the foreground comprising a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array;"

Claim 1 of auxiliary request 3 differs from claim 1 of auxiliary request 1B in that the preamble and step a) are amended to read as follows:

"A method of enhancing the signal-to-noise ratio of a microphone array, the array including a plurality of microphones and having a directivity pattern, the directivity pattern of the array being adaptively adjustable, based on one or more parameters, the method

characterized by the steps of:

- a. evaluating (135) one or more parameters to adaptively realize an angular orientation of a directivity pattern null, which angular orientation adaptively reduces microphone array output signal level in accordance with a criterion, said evaluation being constrained such that the null be precluded from being located within a predetermined region of space which comprises a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array;"

Claim 1 of auxiliary request 5 differs from claim 1 of auxiliary request 1B in that step a) is amended to read as follows:

"evaluating (135) one or more parameters to realize an angular orientation of a directivity pattern null, which angular orientation reduces microphone array output signal level in accordance with a criterion and applying a constraint to the evaluation such that the null is precluded from being located within a predetermined region of space which comprises a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array;"

Auxiliary request 7 includes two independent claims, i.e. claims 1 and 10. In view of the board's decision with respect to claim 10, only claim 10 is reproduced *verbatim* below:

"An apparatus for enhancing the signal-to-noise ratio of

a microphone array, the array including a plurality of microphones (10, 12) and having a directivity pattern, the directivity pattern of the array being adjustable, based on one or more parameters (β), characterized by

- a. means for evaluating (50) one or more parameters (β) to realize an angular orientation of a directivity pattern, which angular orientation reduces microphone array output signal level in accordance with a criterion, said evaluation performed under a constraint that the null be located within a predetermined region of space termed the background which comprises a range of directions about the array, and precluded from a predetermined region of space termed the foreground wherein there is no requirement that desired sources of sound be located in the foreground and there is no requirement that undesired sources of sound be located in the background;
- b. means (55) for modifying the output signals of one or more microphones of the array based on the one or more evaluated parameters; and
- c. means (60, 65) for forming an array output signal based on one or more modified output signals and zero or more unmodified microphone signals."

Claim 1 of auxiliary request 8 as filed at the oral proceedings differs from claim 1 of auxiliary request 1B in that step a) is amended to read as follows:

"evaluating (135) one or more parameters to determine a scale factor used to realize an angular orientation of a directivity pattern null, which angular orientation reduces microphone array output signal level in accordance with a criterion, said evaluation performed under a constraint that the null be located

within a predetermined region of space termed the background, the region of space not being the background being termed the foreground, and the null being precluded from being located within the foreground, the foreground comprising a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array wherein the constraint is applied to the scale factor such that the scale factor is held at a first value if the scale factor is at or above the first value and the scale factor is held at a second value if the scale factor is at or below the second value;"

Reasons for the Decision

1. *Late-filed document D17 and late-filed auxiliary requests*
 - 1.1 At the oral proceedings the respondent explicitly stated that he had no objection to the introduction of document D17 into the appeal proceedings.
 - 1.2 The appellant made no objection to the admission of the auxiliary requests which were filed by the respondent either in preparation for or in the course of the oral proceedings.
 - 1.3 In view of the above and since the board saw no reason to raise objections of its own motion, the board exercised its discretion pursuant to Articles 12(4) and 13(1) RPBA to admit both D17 and the auxiliary requests.

2. *Main request and auxiliary requests 1A, 1C, 1D, 4 and 6*

As pointed out above (see point VIII), the main request and auxiliary requests 1A, 1C, 1D, 4 and 6 were withdrawn by the respondent in the course of the oral proceedings.

3. *Auxiliary request 1B*

3.1 *Interpretation of claim 1*

3.1.1 Claim 1 of auxiliary request 1B differs from claim 1 as granted only in that, in step a), the constraint is redefined as follows:

"that the null be located within a predetermined region of space termed the background, the region of space not being the background being termed the foreground, and the null being precluded from being located within the foreground, the foreground comprising a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array"

which replaces the following wording of claim 1 as granted:

"that the null be precluded from being located within a predetermined region of space which comprises a range of directions about the array, which range reflects a predetermined directional variability of the desired acoustic energy with respect to the array".

3.1.2 The board notes that in the present claim the step of evaluating under the constraint requires that the background is predetermined. However, since the background is defined in terms of its complementary region, namely the foreground, the claim implicitly requires that the foreground is also predetermined.

Further, in the board's view, the mere labelling of the predetermined region of space as "background" and the region of space not being the background as "foreground" does not as such imply any technical features of the claimed method and, hence, does not limit the scope of the claim.

3.1.3 However, the wording of both claim 1 as granted and claim 1 of auxiliary request 1B is ambiguous in that it is unclear whether or not the parameters which are evaluated (see step a)) are the same parameters on which the directivity pattern is based (see the preamble of the claim). Further, the reference to "predetermined directional variability" in step a) is ambiguous in that it could refer to the direction of the desired acoustic energy changing in time with respect to the array or to the acoustic energy impinging on the array from any one of a predetermined set of directions.

Following the established case law, the board therefore interprets claim 1 in the light of the patent as a whole:

From the description, it is clear that the parameters which are evaluated are the parameters on which the directivity pattern is based (see paragraph [0009] of the patent as published, the summary of the invention): "Directivity pattern (and thus null) orientation is

adjustable based on one or more parameters. These one or more parameters are evaluated under the constraint to realize the desired orientation." (underlining by the board).

The description does not provide a literal disclosure of the term "variability". However, in paragraph [0009], in relation to the background, the predetermined region of space is said to be a region from which undesired acoustic energy is expected to impinge upon the array, implicitly irrespective of the location of the sources which generate the undesired acoustic energy, see also paragraph [0028]. Thus, the board interprets the wording "predetermined directional variability of the desired acoustic energy with respect to the array" in claim 1 in relation to the foreground as referring to a region from which desired acoustic energy is expected to impinge upon the array, irrespective of the location of the source which generates the desired acoustic energy. In the context of claim 1, the term "variability" is therefore understood as meaning that the acoustic energy may impinge on the array from any one of a predetermined set of directions with respect to the microphone array. This interpretation is also in line with the respondent's interpretation of the term, see the respondent's reply to the statement of grounds of appeal, page 3, section I.A.2.

3.2 *Novelty - claim 1*

3.2.1 Document D17 discloses, using the language of claim 1 of auxiliary request 1B, a method of enhancing the signal-to-noise ratio of a microphone array for a hearing aid, in which the array includes a plurality of microphones

and provides a directivity pattern (see page 28, "Introduction", first paragraph, and Figs 3(a) and 6(b)). The directivity pattern of the array is adjustable, based on one or more parameters, i.e. array weights w , see page 29, section II. More specifically, Fig. 4 shows a block diagram of a generalized sidelobe canceller (GSC) with an adaptive weight set w_a . The weights w are evaluated in accordance with a power minimization criterion under linear and/or quadratic constraints in order to realize an angular orientation of a directivity pattern null at which the microphone array output signal level is reduced (see page 29, section II, first paragraph, equations (1), (6) and (7), and Fig. 6(b)). Fig. 6(b) illustrates a resulting speech-weighted beam pattern of the proposed sidelobe canceller for a scenario in which the desired speech signal is located at 5° and an interfering signal of equal power is located at 60° . The resulting pattern using linear-only constraints (see Fig. 6(b), the dotted line) accordingly shows a maximum around the boresight (0°) and a minimum around 60° .

The linear constraints applied may be a set of look direction constraints which fix the beamformer response in the look direction of the person wearing the hearing aid. Subject to this fixed response, the output power from the beamformer is minimized (see page 30, left-hand col., lines 8 to 12). In the simulations illustrated in Figs 5 to 9, the look direction constraints span the region from -4 to 4 degrees (page 31, left-hand col., lines 25 to 27), which therefore comprises a range of directions about the microphone array (see Fig. 3(a)), i.e. a predetermined set of directions with respect to the microphone array along which the acoustic energy may

impinge on the array. Further, since the beamformer response is fixed in the look direction and the output power minimization is subject to this fixed response, it is implicit that a null is precluded from the region from -4 to 4 degrees. Hence, if this region is labelled "foreground" and the region which is not the foreground is labelled "background", the evaluation is carried out under a constraint that the null be precluded from being located within the foreground and therefore that the null be located within the background.

The method of D17, see Fig. 4, further includes the steps of modifying output signals of one or more microphones (signal samples $x(n)$) of the array based on the one or more evaluated weights w and the step of forming an array output signal $e(n)$ based on one or more modified output signals and zero or more unmodified microphone output signals.

- 3.2.2 At the oral proceedings the respondent argued that D17 did not disclose step a) in that it did not disclose an evaluation in order to realize an angular orientation of a directivity pattern null, but rather in order to realize a high sensitivity towards a desired look direction. Further, D17 did not disclose that the null be precluded from a predetermined range, but from one or more individual look directions only. It was also argued that in the method of D17 there was no constraint applied after the evaluation as in the claimed method, in which the constraint is overlaid on the evaluation.

The board notes however that Fig. 6(b) gives an example of an evaluation which results in a minimum of the beam pattern around 60° , which is a directivity pattern null

in the same sense as used in the patent in suit, see paragraph [0004] ("Low or reduced array sensitivity at a given source angle (or range of angles) is referred to as a directivity pattern null."). Further, in D17 the look direction constraints span, i.e. not merely fall within, the region from -4 to 4 degrees, which is a range for which the beamformer response is fixed. Since the output power of the beamformer is minimized subject to this fixed response, a null is always precluded from this range, see also each of the beam patterns as shown in Figs 5(a), (b), Fig. 6(a), (b), and Figs 7 to 9, each showing a maximum sensitivity at 0 dB around 0°. The board notes that in the declaration of one of the inventors, Dr. Elko, which was submitted with the reply to the statement of grounds of appeal, it is stated (see page 5, first full paragraph) that "D17 constrains the norm of the weights to preclude the null from getting too close to the desired source or even forming a null", which, if the desired source is expected to be within the range from -4 to 4 degrees, would be in line with the board's view that in D17 a null is always precluded from this range. As to the argument that in D17 there is no constraint applied after the evaluation, the board notes that claim 1 does not require this either. The claim merely defines that the step of evaluating is performed "under a constraint", which encompasses an evaluation in the course of which the constraint is used as in D17 (see D17, equations (1), (6) and (7)).

The respondent's arguments are therefore not convincing.

- 3.2.3 The board concludes that the subject-matter of claim 1 of auxiliary request 1B lacks novelty having regard to the disclosure of D17. Auxiliary request 1B is therefore

not allowable.

4. *Auxiliary request 2*

4.1 Claim 1 of auxiliary request 2 differs from claim 1 as originally filed *inter alia* in that in step a) the wording "said evaluation performed under a constraint that ..." is replaced by "and, after said evaluation, applying a constraint to the evaluated one or more parameters that ...".

4.2 As discussed during the oral proceedings, the application as originally filed does not however provide a basis for this amendment. The reasons are as follows:

4.3 The reference to applying a constraint to the evaluated parameters defines an additional step, in between the step of evaluating the parameters (i.e. the first part of step a)) and the step of modifying the output signals (i.e. step b)). The evaluation step no longer refers to any constraint, which implies that the evaluation may be performed unconstrained. Further, since step b) merely requires that modifying of the output signals is "based on" the evaluated parameters, the claim now implies that either the evaluated parameters from the evaluation step or the evaluated parameters after the application of the constraint may be used for modifying the output signals. However, neither the description nor the claims as filed provide a basis for this broader definition. More specifically, claim 1 as originally filed requires that the evaluation is carried out using the constraint ("said evaluation performed under a constraint that ..,") and that the step of modifying is based on these evaluated parameters. Further, the description as filed

explicitly refers to an evaluation step only in the summary of the invention, see the passages at page 2, lines 35 to 37 and 40 to 46, of the application as published ("... evaluated under the constraint ...", "The output signals ... are modified based on these evaluated parameters ...", "the signal-to-noise ratio of the array is enhanced by evaluating the one or more parameters", "The evaluation of parameters is performed under a constraint that ...", and "The one or more evaluated parameters are used to modify output signals ...") and page 7, lines 7 and 8 ("Parameters are evaluated to provide an angular orientation of a given subband null."). The latter passage relates to a fourth embodiment in which a β -processor 220 (see Figs 7 and 8) outputs constrained values of β (see equation (13)) for modifying the array output signals. None of these passages therefore provide a basis for an unconstrained evaluation, followed by the application of a constraint to the evaluated parameters, or for a subsequent modification of the output signals using the unconstrained evaluated parameters.

The board notes that at least in some of the illustrative embodiments the parameter or scale factor β is firstly computed and subsequently constrained to be within a specific range. However, directly after these steps, the array output signals are modified on the basis of the constrained value of β , see Fig. 4. In the board's view, the computation of β and the application of the constraint correspond to the evaluation step a) of present claim 1 and the modification of the array output signals to step b) of present claim 1. Consequently, these embodiments do not provide a basis for the above-mentioned additional step of applying the

constraint to the evaluated parameters either. Nor do the claims as originally filed, in particular claims 1, 6, 8, 9, 11, 15, 16, 19 and 20, each of which refers to the evaluation step, disclose this additional step and, in this respect, the respondent has not argued otherwise.

4.4 The board therefore concludes that the subject-matter of claim 1 of auxiliary request 2 extends beyond the content of the application as filed and that the amendments contravene Article 123(2) EPC. Auxiliary request 2 is therefore not allowable.

5. *Auxiliary requests 3, 5 and 7*

At the oral proceedings the respondent suggested the amendment to claim 1 of auxiliary requests 3, 5 and 7 so as to include the same definition of the constraint as given in auxiliary request 1B. This suggested amendment was not made the subject of any formal request and in any case was not relevant to the objections which were discussed during the oral proceedings in respect of each of these requests, as set out below. Nor did the respondent argue otherwise.

6. *Auxiliary request 3*

6.1 Claim 1 of auxiliary request 3 differs from claim 1 as granted in that the term "adaptively" is inserted in the preamble and in step a) (twice) and in that "said evaluation performed under a constraint that" is replaced by "said evaluation being constrained such that".

6.2 The claim is thereby rendered unclear in that it does

not define which parameters are adaptively controlled, i.e. which parameters are automatically adjusted as the conditions change so as to optimize the performance. According to the description, see paragraphs [0042], [0048] and [0049], and Fig. 4, parameter β is adaptively adjusted as the microphone array output signals change due to moving sources of noise. This is done by repeating all of the method steps for subsequent sets of microphone array output samples, see Fig. 4 at block 155 and claim 2 as granted. In line with this, in paragraph [0048] reference is made to "null tracking speed", which the board understands as relating to the processing speed of the processor, i.e. its capability to dynamically adjust β such that the resulting null in the beam pattern can track a moving source of noise. The claim does not however define that the parameters are adaptively controlled, nor that the adjustment is dependent on a change in the microphone array output signals, nor that steps a) to c) are to be repeated for that purpose. Instead, the claim only vaguely refers to various, different adaptive operations, namely adaptively adjusting the directivity pattern, adaptively realizing an angular orientation of a directivity pattern null, and adaptively reducing the microphone array output signal level, without it being clear how these operations affect the evaluating, modifying and forming steps of the claimed method. Hence, it is unclear which limitations are imposed on the method by the insertion of the term "adaptively".

- 6.3 The board concludes that the amendments made to the claim result in the claim not being clear and, hence, that the requirements of Article 84 EPC are not met. Consequently, auxiliary request 3 is not allowable.

7. *Auxiliary request 5*

7.1 Claim 1 of auxiliary request 5 differs from claim 1 of auxiliary request 2 *inter alia* in that in step a) the wording ", and, after said evaluation, applying a constraint to the evaluated one or more parameters that" is replaced by "and applying a constraint to the evaluation such that".

7.2 This amendment results in the claim being ambiguous in that the wording "evaluating ... and applying a constraint to the evaluation" may either be interpreted such that the step of applying the constraint is carried out after the evaluation or that it is applied during the evaluation. The claim therefore lacks clarity, Article 84 EPC. In any case, if the first interpretation were followed, the objection under Article 123(2) EPC as raised in respect the amendment in claim 1 of auxiliary request 2, see point 4 above, would apply *mutatis mutandis* to this claim. If the second interpretation were followed, the scope of the claim would be broader than the subject-matter of claim 1 of auxiliary request 1B and the claimed subject-matter would lack novelty (Articles 52(1) and 54 EPC) for the same reasons, applied *mutatis mutandis*, as set out at point 3.2 above in respect of the subject-matter of claim 1 of auxiliary request 1B.

7.3 Consequently, auxiliary request 5 is not allowable.

8. *Auxiliary request 7*

8.1 The board notes that claim 10 as granted does not refer

to the location of the source which produces the "desired acoustic energy". This is in agreement with paragraph [0028] which makes it clear that it is not the location of the source which is relevant, but only, possibly after one or more reflections, the direction along which the desired energy is expected to impinge on the microphone array, see also point 3.1.3 above.

- 8.2 Claim 10 of auxiliary request 7 differs from claim 10 as granted *inter alia* in that the following wording is added:

"wherein there is no requirement that desired sources of sound be located in the foreground and there is no requirement that undesired sources of sound be located in the background".

- 8.3 This additional wording makes claim 10 unclear in that it is not clear to what extent the scope of the claim is limited by this wording. More specifically, it is noted that neither the desired nor the undesired sources referred to are part of the claimed apparatus. Even if it were assumed that these sources were part of the claimed apparatus, since the added wording is tantamount to stating that the sources may be located anywhere, it would be unclear which limitations the wording would impose in terms of the technical features and/or capabilities of the apparatus compared to a definition of the apparatus without this wording.

- 8.4 At the oral proceedings the respondent argued that the claim was further limited in that it limited the environment within which the apparatus could be used. This argument does not convince the board, since the

claim is directed to an apparatus and not to the use of the apparatus.

8.5 The board therefore concludes that the amendments made in claim 10 of auxiliary request 7 do not meet the requirements of Article 84 EPC. Auxiliary request 7 is therefore not allowable.

9. *Auxiliary request 8*

9.1 In claim 1 of auxiliary request 8 the term "scale factor" is inserted in step a) as follows: "evaluating (135) one or more parameters to determine a scale factor used to realize an angular orientation of a directivity pattern null ...".

9.2 The respondent argued that a basis for this amendment could be found in the application as published at page 5, lines 6 and 7, and page 6, lines 32 to 37, with reference to equation (6). This equation defines a scale factor β as a function of the microphone array output signal samples $c_B(n)$ and $c_F(n)$, in which "n" is the time and runs from 0 to N-1 for a block of N microphone samples (see page 6, lines 26 to 28). The respondent argued that from these passages it was clear that the microphone output signals were the parameters which were evaluated under a constraint in order to determine the scale factor β .

9.3 The board does not find this argument convincing. In the context of each of the six embodiments as illustrated in Figs 3, 4, 5, 7, 11 and 12, the parameter which is evaluated is the scale factor β , see paragraph [0042], equations (5) and (6). This interpretation is also in

line with the claims, see claim 10 as granted ("one or more parameters (β)", twice), claim 17 as granted ("the means for evaluating comprises means for determining a parameter reflecting a ratio of ..."), and claim 18 as granted ("the means for evaluating (50) comprises means for determining a scale factor (β)"). More specifically, the scale factor β is computed and subsequently constrained to be within a range which is determined by the range of directions from which the desired acoustic energy is expected to impinge on the microphone array, see paragraphs [0039] ("The β processor 50 first computes a value for β and then constrains β to be $0 < \beta < 1$ which effectuates a limitation on the placement of a directivity pattern null to be in the rear half-plane."), [0041], [0048] ("... the computation of scale factor β ..."), [0049] ("The value of β is then constrained to be within the range of zero and one."), [0053] ("The embodiment computes a value for β (or a related parameter) on a subband-by-subband basis."), and [0059], equation (13). The board also notes that, both in claim 1 as granted and claim 1 of auxiliary request 8, reference sign 135 in "evaluating (135) one or more parameters" refers to block 135 of Fig. 4, which contains the text: "calculate β ; constrain β : $0 \leq \beta \leq 1$ ", which is in accordance with the above interpretation that the parameter which is evaluated is the scale factor β .

- 9.4 It follows that the application as filed does not provide a basis for making a distinction, as in present claim 1, between parameters and a scale factor. Nor does it provide a basis for, as in present claim 1, the use of a scale factor to realize a null on the one hand and a modification of the output signals of the microphones

based on the parameters on the other hand.

9.5 Claim 1 does not therefore comply with the requirements of Article 123(2) EPC.

9.6 If for the sake of argument the microphone output signals were considered to constitute the parameters referred to in the claim, as argued by the respondent at the oral proceedings, the claim would be inconsistent and, hence, unclear (Article 84 EPC) in that the claim would define a plurality of microphones and, hence, a plurality of microphone output signals, but at the same time cover an evaluation of one parameter only ("one or more parameters"). It would also amount to a shift of the protection of the claims as granted, since the claims as granted are interpreted such that the scale factor is an example of the "one or more parameters", see point 9.3 above. Hence, the claim would violate Article 123(3) EPC.

9.7 Auxiliary request 8 is therefore not allowable.

10. The board concludes that none of the respondent's requests is allowable and, hence, that the patent is to be revoked. Further, since the board thereby accedes to the appellant's main request, the appellant's auxiliary requests need not be further considered.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

D. Magliano

A. S. Clelland