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Datasheet for the decision of 10 December 2024

Case Number: T 1699/22 - 3.5.05

Application Number: 18163126.8

Publication Number: 3383067

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Language of the proceedings: EN

Title of invention:
Hearing device with adaptive sub-band beamforming and related method

Patent Proprietor:
GN Hearing A/S

Opponents:
Oticon A/S, Widex A/S, Sonova AG

Headword:
Monaural and binaural beamforming/GN HEARING

Relevant legal provisions:
EPC Art. 56, 84, 100(a)
RPBA 2020 Art. 13(2)

Keywords:

Inventive step - main request and 1st to 5th auxiliary requests (no): not possible to formulate an objective technical problem that is credibly solved over the whole scope claimed
Clarity - 3rd and 5th auxiliary requests (no)
Admittance of claim requests filed during oral proceedings before the board - 6th and 7th auxiliary requests (no): no exceptional circumstances

Decisions cited:

T 0206/91, T 2044/09, T 1009/12, T 2764/19, T 0687/22

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Case Number: T 1699/22 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 10 December 2024

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Representative:	Cohausz & Florack Patent- & Rechtsanwälte Partnerschaftsgesellschaft mbB Bleichstraße 14 40211 Düsseldorf (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 3 May 2022 concerning maintenance of the European Patent No. 3383067 in amended form.**

Composition of the Board:

Chair	K. Bengi-Akyürek
Members:	K. Peirs
	F. Bostedt

Summary of Facts and Submissions

I. The appeals lie from the interlocutory decision of the opposition division to maintain the opposed patent in amended form in accordance with the proprietor's "auxiliary request 6" filed at the oral proceedings before the opposition division (Article 101(3)(a) EPC).

In the appealed decision, the opposition division took into account the following prior-art document:

D2: US 2013/0259239 A1.

II. Oral proceedings before the board were held on 10 December 2024. The parties' final requests were as follows:

- The patent proprietor requested that the appealed decision be set aside and, as a **main request**, that the opposition be rejected. In the alternative, the proprietor requested that the patent be maintained in amended form based on the set of claims according to one of seven auxiliary requests (**auxiliary requests 1 to 7**). Auxiliary requests 6 and 7 were filed during the oral proceedings before the board.

- The opponents requested that the decision under appeal be set aside and that the patent be revoked.

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

III. Claim 1 of the **main request** (patent as granted) reads as follows (board's feature labelling):

(a) "A hearing device (2) for a binaural hearing system comprising the hearing device and a contralateral hearing device, the hearing device comprising:
(b) a transceiver module (4) for communication with a contralateral hearing device of the binaural hearing system, the transceiver module configured to obtain a contralateral beamform signal (5) from the contralateral hearing device;
(c) a set of microphones comprising a first microphone (6) for provision of a first microphone input signal (6A), and a second microphone (8) for provision of a second microphone input signal (8A);
(d) a first beamforming module (10), connected to the set of microphones, for provision of a first beamform signal (10A) based on the first microphone input signal (6A) and the second microphone input signal (8A);
(e) a filter bank (12), connected to the first beamforming module (10) and the transceiver module (4), for filtering the first beamform signal into a plurality of first sub-band beamform signals including a first bandpass beamform signal (12A), and for filtering the contralateral beamform signal into a contralateral bandpass beamform signal (14A);
(f) a second beamforming module (16) connected to the filter bank (12), the second beamforming module comprising a bandpass beamformer (17A) for provision of a second bandpass beamform signal (18A) based on the first bandpass beamform signal (12A) and the contralateral bandpass beamform signal (14A);

(g) an adder (20), connected to the bandpass beamformer, for provision of a beamformed input signal (22) based on the second bandpass beamform signal (18A),
(h) a processor (24) for processing the beamformed input signal and providing an electrical output signal (26) based on the beamformed input signal; and
(i) a receiver (28) for converting the electrical output signal (26) to an audio output signal,
(j) wherein the bandpass beamformer (17A) of the second beamforming module (16) is an adaptive beamformer."

IV. Claim 1 of **auxiliary request 1** differs from claim 1 of the main request in that feature (h) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (h)):

(k) "a processor (24) <u>configured to compensate for hearing loss of a user and</u> for processing the beamformed input signal and providing an electrical output signal (26) based on the beamformed input signal; and".

V. Claim 1 of **auxiliary request 2** differs from claim 1 of the main request in that features (e) and (g) are replaced by the following features respectively (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis features (e) and (g)):

(l) "a filter bank (12), connected to the first beamforming module (10) and the transceiver module (4), for filtering the first beamform signal into a plurality of first sub-band beamform signals including a first bandpass beamform signal (12A)

and one or both of a first low-pass beamform signal (12B) and a first high-pass beamform signal (12C), and for filtering the contralateral beamform signal into a contralateral bandpass beamform signal (14A);"

(m) "an adder (20), connected to the bandpass beamformer and the filter bank (12), for provision of a beamformed input signal (22) based on the second bandpass beamform signal (18A) and one or both of the first low-pass beamform signal (12B) and the first high-pass beamform signal (12C) from the filter bank (12);".

VI. Claim 1 of **auxiliary request 3** differs from claim 1 of auxiliary request 2 in that feature (m) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (m)):

(n) "an adder (20), connected to the bandpass beamformer and the filter bank (12), for provision of a beamformed input signal (22) based on the second bandpass beamform signal (18A) and one or both of the first low-pass beamform signal (12B) and the first high-pass beamform signal (12C) from the filter bank (12), such that a second beamforming is not performed at low and high frequencies in order to maintain ITD and ILD of first beamform signals in the binaural hearing system;".

VII. Claim 1 of **auxiliary request 4** differs from claim 1 of the main request in that features (e) and (g) are replaced by the following features respectively (board's feature labelling and underlining, the latter

reflecting amendments vis-à-vis features (e) and (g)):

(o) "a filter bank (12), connected to the first beamforming module (10) and the transceiver module (4), for filtering the first beamform signal into a plurality of first sub-band beamform signals including a first bandpass beamform signal (12A) and a first high-pass beamform signal (12C), and for filtering the contralateral beamform signal into a contralateral bandpass beamform signal (14A);"

(p) "an adder (20), connected to the bandpass beamformer and the filter bank (12), for provision of a beamformed input signal (22) based on the second bandpass beamform signal (18A) and the first high-pass beamform signal (12C) from the filter bank (12);".

VIII. Claim 1 of **auxiliary request 5** differs from claim 1 of auxiliary request 4 in that feature (p) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (p)):

(q) "an adder (20), connected to the bandpass beamformer and the filter bank (12), for provision of a beamformed input signal (22) based on the second bandpass beamform signal (18A) and the first high-pass beamform signal (12C) from the filter bank (12), such that a second beamforming is not performed at high frequencies in order to maintain ILD of first beamform signals in the binaural hearing system;".

IX. Claim 1 of **auxiliary request 6** differs from claim 1 of the main request in that features (e) and (g) are replaced by the following features respectively (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis features (e) and (g)):

(r) "a filter bank (12), connected to the first beamforming module (10) and the transceiver module (4), for filtering the first beamform signal into a plurality of first sub-band beamform signals including a first bandpass beamform signal (12A), a first low-pass beamform signal (12B), and a first high-pass beamform signal (12C), and for filtering the contralateral beamform signal into a contralateral bandpass beamform signal (14A);"

(s) "an adder (20), connected to the bandpass beamformer and the filter bank (12), for provision of a beamformed input signal (22) based on the second bandpass beamform signal (18A), the first low-pass beamform signal (12B), and the first high-pass beamform signal (12C) from the filter bank (12), such that a second beamforming is not performed at low and high frequencies in order to maintain ITD and ILD of first beamform signals in the binaural hearing system;".

X. Claim 1 of **auxiliary request 7** differs from claim 1 of auxiliary request 6 in that feature (s) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (s)):

(t) "an adder (20), connected to the bandpass beamformer and the filter bank (12), for provision of a beamformed input signal (22) based on the

second bandpass beamform signal (18A), the first low-pass beamform signal (12B), and the first high-pass beamform signal (12C) from the filter bank (12), such that a second beamforming of the second beamforming module is not performed at low and high frequencies in order to maintain ITD and ILD of first beamform signals in the binaural hearing system;".

Reasons for the Decision

1. *Technical background*

1.1 The opposed patent concerns a hearing device for use in a binaural hearing system, designed to improve speech intelligibility in noisy or complex acoustic environments.

1.2 This is achieved, according to the opposed patent, by employing binaural auditory steering, involving a process where the "left" hearing device of the binaural hearing system utilises signals from its own microphones and those of the "right" hearing device of the binaural hearing system. The process includes the transmission of microphone signals between these "left" and "right" hearing devices (or, more precisely regarding the sound-source location as a point of reference, "ipsilateral" and "contralateral" hearing devices) and the use of adaptive bandpass beamformers. These beamformers operate in specific frequency bands, allowing the hearing device to focus on desired sounds, such as speech, while preserving spatial cues like ILD ("interaural level difference") and ITD ("interaural time difference"), which mainly reside in the upper and lower frequency bands respectively. The opposed patent

indicates that, by selectively applying beamforming in certain frequency bands, noise can be reduced without compromising the brain's ability to localise sound sources, leading to a more "natural" listening experience.

1.3 Figure 1 of the opposed patent illustrates a specific embodiment of the (ipsilateral) hearing device:

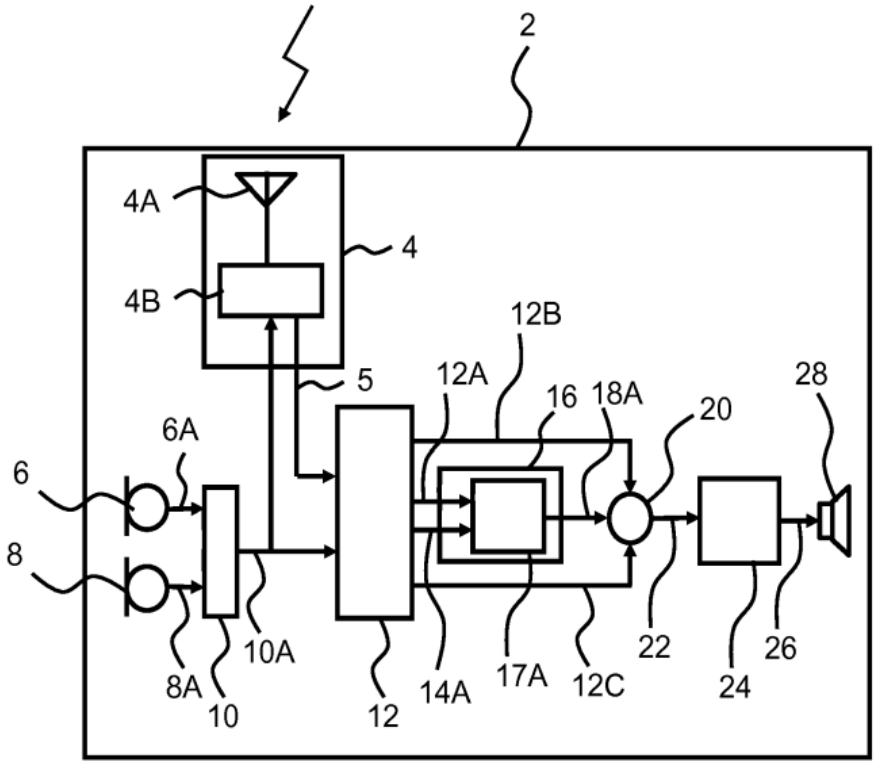

Fig. 1

1.3.1 The *ipsilateral* hearing device (2) includes a transceiver module (4) for wireless communication with the *contralateral* hearing device in the binaural hearing system. It also comprises microphones (6, 8) that provide first and second microphone input signals (6A, 8A), respectively.

1.3.2 A first beamforming module (10) processes these input signals, generating a first beamform signal (10A). A filter bank (12) connected to the first beamforming module (10) filters the first beamform signal (10A) into multiple sub-band signals, including a first bandpass beamform signal (12A). The filter bank also filters a contralateral beamform signal (received via the transceiver module (4)) into a contralateral bandpass beamform signal (14A).

1.3.3 A second beamforming module (16) comprises an adaptive bandpass beamformer (17A) that generates a second bandpass beamform signal (18A) based on the first bandpass beamform signal (12A) and the contralateral bandpass beamform signal (14A). An adder (20) combines this signal 18A with other sub-band signals (12B, 12C) from the filter bank to create a beamformed input signal (22). Importantly, the second beamforming does not affect the low and high frequencies carried by signals 12B and 12C, respectively, thus preserving the ITD and ILD spatial cues necessary for sound localisation.

1.3.4 The ipsilateral hearing device further includes a processor (24) that processes the beamformed input signal (22) and generates an electrical output signal (26), which is then converted into an audio output signal by the receiver (28).

2. *Main request: claim 1 - inventive step*

2.1 Reasons 2.2 of the appealed decision started out from document **D2** in order to carry out an inventive-step analysis. The parties do not contest that D2 is suitable for this purpose, nor does the board.

2.2 The proprietor considered D2 not to disclose the following underlined subject-matter in **features (b), (e), (f), (g) and (h):**

(b) a transceiver module for communication with a contralateral hearing device of the binaural hearing system, the transceiver module configured to obtain a contralateral beamform signal from the contralateral hearing device;

(e) a filter bank, connected to the first beamforming module and the transceiver module, for filtering the first beamform signal into a plurality of first sub—band beamform signals including a first bandpass beamform signal, and for filtering the contralateral beamform signal into a contralateral bandpass beamform signal;

(f) a second beamforming module connected to the filter bank, the second beamforming module comprising a bandpass beamformer for provision of a second bandpass beamform signal based on the first bandpass beamform signal and the contralateral bandpass beamform signal;

(g) an adder, connected to the bandpass beamformer, for provision of a beamformed input signal based on the second bandpass signal;

(h) a processor for processing the beamformed input signal and providing an electrical output signal based on the beamformed input signal.

With regard to the technical effect associated with these differences, the proprietor maintained that "the differences which are inter-related have the technical effect of provision of a hearing device with optimized beamforming to accommodate both selective/targeted listening and situational awareness, which is specifically outlined in the application as filed, cf.,

page 3, lines 5-6".

2.3 It is apparent to the board that the technical effect suggested by the proprietor aligns with the "subjective" technical problem, i.e. the technical problem mentioned in paragraph [0012] of the opposed patent. However, this technical effect is not credibly achieved across the whole scope claimed. This is because features (a) to (j) do not concern any "optimized beamforming", "selective/targeted listening" or "situational awareness". More in detail, the board observes the following:

2.3.1 The "optimisation" of beamforming can involve many aspects, such as making the beamformer more accurate or robust, reducing the computational complexity involved, minimising energy consumption or improving user comfort. None of the differences in subject-matter identified by the proprietor relates to any of these aspects. In particular, similar to the correct finding in Reasons 2.4 of the appealed decision that the "adder" in accordance with **feature (g)** does not credibly achieve any technical effect over the whole scope claimed, the board considers that claim 1 as granted does not define the purpose of the "filter bank" according to **feature (e)** either, other than that the filter bank should provide a plurality of sub-band signals. The requirement mentioned in feature (e) that the signal filtered by the filter bank is not provided directly by the microphones, but, instead, indirectly by the first beamformer (as the "first beamform signal") evidently cannot reduce the computational complexity. Contrary to a proper application of the problem-solution approach, the opposition division's recognition, in Reasons 2.8 of the appealed decision, of a reduction in computational burden was based on the

impact on the prior-art arrangement in D2, and not on the claimed features. Nonetheless, in support of its argument regarding the subjective technical problem, the proprietor maintained that the 48 channels processed by binaural beamformer 28 in D2 imposed a high computational burden. It argued that this burden is reduced by utilising a "filter bank" according to feature (e) after the "first beamforming module" mentioned in feature (d), because this decreased the number of channels involved in the actual beamforming process. The proprietor further explained that the optimisation of the beamforming consisted in the fact that the "filter bank" as per feature (e) enabled the "second beamforming module" according to feature (f) to focus on the particular frequency sub-band which normally comprises the speech part of the signals picked up by the microphones mentioned in feature (c). This in turn meant that this second beamforming module could be controlled in a highly efficient manner.

The board notes, however, that claim 1 as granted is silent as to the number of channels or any specific frequency ranges (e.g. those dedicated to speech). Moreover, the opponents correctly submitted that the "second beamforming module" according to feature (f) may very well operate on broadband signals because claim 1 as granted does not require the second beamforming module to act on *only* the first and contralateral bandpass beamform signals. By the same token, the presence of the "filter bank" as per feature (e) between the first and second beamforming modules does not guarantee any reduction in the number of channels, either upstream or downstream. This is particularly so because the "first beamforming module" according to feature (d) could already include a multi-channel processing stage. Moreover, the "filter

bank" as per feature (e) may split the signal into multiple sub-bands, but the total number of channels across all sub-bands could be less than, equal to or even greater than the number of channels in the first beamforming module's output. Furthermore, the second beamforming module, comprising a "*bandpass* beamformer" according to feature (f), could process multiple sub-band signals, again, in one or more channels. Therefore, the actual number of channels involved in the claimed hearing device will depend on the specific implementation of each component of the hearing device and its overall signal-processing scheme, on which however claim 1 as granted is silent.

2.3.2 The board recognises that a binaural hearing system which takes into account a "first beamform signal" from the microphones of the ipsilateral hearing device as well as a "contralateral beamform signal" from the contralateral hearing device as in claim 1 as granted *may* indeed provide for a selective-listening experience. Moreover, the "filter bank" as per feature (e) *may* in fact allow the hearing device to selectively amplify or attenuate different frequencies based on the user's wishes and the sound environment, which *may* play a role in targeted listening. However, claim 1 as granted does not *require* a specific sound source to be selected or targeted: it describes the components of the claimed "hearing device" and their connections but does not define a specific listening scheme or goal. It therefore provides, at most, a framework for selective or targeted listening, but does not *mandate* to do so.

2.3.3 Moreover, the board understands the term "situational awareness" to relate to the scenario where a user can remain alert to important sounds originating from their

surroundings, such as approaching vehicles or warning signals, while still focusing on a primary speaker. This requires a proper balance between the part of the signals picked up by the "microphones" according to feature (c) relating to the surrounding environment and the part concerning the speech signal of the primary speaker. However, such a balance is not apparent in claim 1 as granted. This is because there is no classification in the claimed "hearing device" of the specific types of incoming sounds. In particular, there is no distinction between "speech" and "surrounding sounds". The board acknowledges that the term "bandpass" is used several times in claim 1 as granted but the actual frequency range involved is not specified. Moreover, even if certain types of incoming sounds were somehow distinguished by the term "bandpass", the board notes that "speech" and "surrounding sounds" do not always occupy different frequency bands, so that it is not credible that "situational awareness" is indeed achieved in any way.

2.3.4 Consequently, the subjective technical problem as set out in paragraph [0012] of the opposed patent is not credibly solved by the features of claim 1 as granted.

2.4 The proprietor submitted several alternative formulations of possible objective technical problems at the oral proceedings before the board, but none of them convinced the board:

2.4.1 As a first alternative, the proprietor posited that at least the technical effect of "improving beamforming" should lead to an objective technical problem that is credibly solved. It did not, however, provide any details as to why this would be the case. The board fails to see how features (a) to (j) could "improve"

the beamforming process, whatever the criterion may be for testing that improvement.

2.4.2 In a refinement, the proprietor considered the technical effect of "an improved beamformed input signal to the processor", again without giving further details. Also here, the board fails to see how the "beamformed input signal" mentioned in feature (g) would be "improved" by the features of claim 1 as granted.

2.4.3 In a further iteration, the proprietor formulated the objective technical problem as "how to provide an alternative hearing device".

However, in order for a modification of an electronic circuit as described in claim 1 as granted to be considered "not obvious to a person skilled in the art", the modification must, as a prerequisite, yield a discernible technical effect. Without such an effect, it is not possible to formulate an objective technical problem that is credibly solved in relation to such a modification (cf. **T 687/22**, Reasons 2.3.4).

2.5 Referring to Reasons 2.8, 7.2 and 7.3 of the appealed decision, the opponents had considered, in their statement of grounds of appeal, the objective technical problems of "to find a less complex layout for the hearing device" and "to preserve spatial cues in the upper frequency bands of the hearing aid signals output to the user". However, for the reasons set out, respectively, in point 2.3.1 above and point 3.3.3 below, the board is not convinced that these technical problems are credibly solved either.

2.6 Given that claim 1 merely describes the components of the claimed "hearing device" and their connections but does not specify the intended outcome or purpose of these components and connections (cf. points 2.3.1 to 2.3.3 above), the board is also not able to formulate any objective technical problem that is credibly solved over the whole scope claimed *ex officio*. These components and connections are not even suitable for solving the *subjective* technical problem (i.e. optimised beamforming to accommodate both selective/targeted listening and situational awareness) and may thus be considered "arbitrary features" which can normally be disregarded in the assessment of inventive step (see e.g. **T 206/91**, Reasons 5.5; **T 2044/09**, Reasons 4.6; **T 1009/12**, Reasons 2.7; **T 2764/19**, Reasons 3.3.3).

2.7 In the absence of any objective technical problem which is credibly solved by the subject-matter underlined in features (b), (e), (f), (g) and (h) in point 2.2 above, no inventive step can be acknowledged on account of this subject-matter. Therefore, the ground for opposition under Articles 100(a) and 56 EPC prejudices the maintenance of the patent according to the main request.

3. *Auxiliary requests 1 to 5: allowability*

The amendments underlying **auxiliary requests 1 to 5** do not render the respective claim requests allowable either. The reasons for this are as follows:

3.1 Concerning **feature (k)**, the proprietor contested that paragraph [0003] of D2 implied the presence of hearing-loss compensation. It stated that this paragraph, at most, related to "hearing-aid processing

in the frequency domain". However, the board considers that the use of employing hearing-loss compensation is unequivocally indicated by the phrase "[h]earing devices here represent wearable hearing apparatuses, which serve to assist people with hearing difficulties" in paragraph [0003] of D2. Thus, the "hearing apparatus" shown in Figure 2 of D2 is, in fact, a hearing aid and, as such, will necessarily perform hearing-loss compensation at some point in its processing chain.

The proprietor posited that it would only make technical sense to provide this hearing-loss compensation in part "V" of processor 14 shown in Figure 2 of D2, i.e. in the signals "S1" or "B1" (instead of signal "H1"), because this was where the processing in D2 takes place in the frequency domain. It suggested that the associated amplifier would then most probably be implemented as a final stage of one of the beamformers 26 or 28 shown in Figure 2 of D2. The board finds this plausible and notes that this means that feature (k) would have been at least obvious in the view of the skilled person's common general knowledge. This is because the opponents correctly observed that feature (k) does not specify the signal on which the "processor" is supposed to perform hearing-loss compensation: as in D2, this compensation simply has to "happen" at some point. The board acknowledges that feature (h) might indicate that this signal *could* be the "beamformed input signal" from the adder as per feature (g), but, contrary to what the proprietor suggested, claim 1 as granted does not require the processor to have *only* one input. Instead, assuming, for the sake of argument, that the hearing-loss compensation must be performed on one of the signals expressly mentioned in claim 1 as granted,

the board finds the "second bandpass beamform signal" according to feature (f) to be a viable alternative to the "beamformed input signal (22)" according to feature (g), because, as a bandpass signal which the opposition division mapped onto the signal "B1" shown in Figure 2 of D2 in Reasons 2.2 of the appealed decision, it could, depending on the specific signal-processing scheme of the claimed "hearing device" (cf. point 2.3.1 above), contain the speech signal in which the user is actually interested.

3.2 Concerning **features (l) and (m)**, the board cannot discern any technical effect that can be credibly achieved by these features over the whole scope claimed. The proprietor continued to refer to the subjective technical problem mentioned in paragraph [0012] of the opposed patent (cf. point 2.3 above) but, again, did not provide further details in this regard. While the terms "low-pass" and "high-pass" in features (l) and (m) may, arguably, hint at some coarse division of the associated "beamform signals" into low and high frequency bands, the board cannot see how this could lend itself to any "optimized beamforming", "selective/targeted listening" or "situational awareness".

3.3 As regards **feature (n)**, the board identified multiple deficiencies:

3.3.1 The board agrees with the opponents that the expression "first beamform signals in the binaural hearing system" renders claim 1 not clear (Article 84 EPC). This is because it would not be apparent to the skilled reader to which "signals" this expression relates. These "signals" cannot be formed by the "first beamform signal" according to feature (d) because the latter

does not concern a plurality of signals. To resolve this dilemma, the term could be understood to refer to the "first beamform signal" of both the ipsi- and the contralateral hearing device of the binaural hearing system. However, the board finds this to be rather speculative, especially as it is not apparent how the contralateral hearing device would transmit its "first beamform signal" to the ipsilateral one and how this would relate to the "contralateral beamform signal" according to feature (b). There is also no objective indication in claim 1, other than the use of the plural form, for the proprietor's assertion that the "first beamform signals" in feature (n) refer to the "first sub-band beamform signals" according to feature (e) and not to the "first beamform signal" as per feature (d). The proprietor argued that this must follow from the very reason why the "first sub-band beamform signals" were needed in the first place, namely to bypass the "second beamforming module" in accordance with feature (f). However, in the board's view, claim 1 does not necessarily express this "bypass" because the "second bandpass beamform signal" according to feature (f) can be based on more than just the "first bandpass beamform signal" and the "contralateral bandpass beamform signal". Moreover, feature (n) does not require such a "bypass" either, given that it does not specify to which signal the "low and high frequencies" belong. One could, in the proprietor's favour, take the term "bandpass" in feature (e) to imply a vague distinction between "low" and "high" frequencies, but even then the proprietor's construction would not make technical sense. This is because, in order for feature (n) to preserve ITD and ILD cues, it must take into account signals from both the ipsilateral and contralateral sides of the binaural hearing system: the "first sub-band beamform signals"

alone, stemming from only one side as per the term "first beamform signal" in feature (e), are not sufficient in this context.

3.3.2 Similarly, the board considers the term "a second beamforming" of feature (n) to be at least broad because this term is not necessarily linked to the "second beamforming module" as per feature (f). The board was not persuaded by the proprietor's argument that the label "second" linked the "beamforming module" and the "beamforming" together in this regard: the mere labelling of features does not in itself link them or imply a specific relationship, at least not in an *objective* assessment from the point of view of a skilled reader.

3.3.3 The board notes that the phrase "a second beamforming is not performed at low and high frequencies in order to maintain ITD and ILD of first beamform signals in the binaural hearing system" used in feature (n) is reflected in paragraph [0099] of the opposed patent. There, the phrase is used in the context of "first low-pass beamform signal 12B" and "first high-pass beamform signal 12C" bypassing "second beamforming module 16" shown in Figure 1 of the opposed patent in order to preserve the spatial cues ITD and ILD (cf. point 1.3 above). Even if feature (n) were understood in this sense, this would not lead to the recognition of an inventive step (Article 56 EPC) either. This is because the subjective technical problem as set out in paragraph [0012] of the opposed patent, to which the proprietor continued to refer also in the context of feature (n), is still not credibly solved, essentially for the same reasons as set out in point 2.3 above. In particular, it is immediately apparent that the preservation of the ITD and ILD spatial cues neither

optimises beamforming nor allows for selective/targeted listening. At most, it may contribute to some "situational awareness" in a restricted sense, namely of "spatial awareness", because the spatial cues ITD and ILD allow the brain to localise sound sources and create a mental map of the acoustic environment. However, even in this restricted sense, it is not credible that the claimed "hearing device" *as a whole* is able to preserve the user's "spatial awareness" because there is no restriction in claim 1 on how the "contralateral beamform signal" as per feature (b) and the "first beamform signal" according to feature (d) relate to each other and whether, by virtue of feature (n), the spatial cues are indeed preserved in the "audio output signal" in accordance with feature (i). In this respect, the board considers the opposition division's statement in Reasons 7.3 of the appealed decision that spatial cues "are a form of binaural information which are not affected by monaural beamforming" to be an oversimplification: while monaural beamforming does in fact not directly alter the ITD and ILD spatial cues, it *can* introduce delays that, if not properly compensated for, disrupt the binaural hearing system's ability to accurately process those cues. Paragraph [0036] of D2 illustrates this, teaching that, as also invoked by the proprietor, beamformer 34 in fact operates in the time domain to avoid significant signal delays introduced by frequency-domain processing. This demonstrates that a monaural beamformer can indeed introduce delays that disrupt the proper time alignment between left and right sound signals, essential for spatial-cue processing.

3.4 The same considerations as set out in points 3.2 and 3.3 above for features (l) to (n) apply also to

features (o) to (q).

3.5 Hence, auxiliary requests 1 to 5 are not allowable under Articles 56 and/or 84 EPC.

4. *Auxiliary requests 6 and 7: admittance*

4.1 The proprietor filed **auxiliary requests 6 and 7** during the oral proceedings before the board (cf. point II above) and, hence, after notification of the board's communication under Article 15(1) RPBA. The admittance of these auxiliary requests is therefore at the board's discretion (cf. Article 13(2) RPBA).

4.2 The proprietor justified this late-filing by stating that the objection under Article 84 EPC raised against auxiliary requests 3 and 5 had never been discussed before. In particular, the board had not addressed it in its communication under Article 15(1) RPBA. Such a new objection represented, in the proprietor's view, "exceptional circumstances".

4.3 The opponents, however, rightly pointed out that they had raised objections under Article 84 EPC to the term "first beamform signals" as mentioned in features (n) and (q) already on page 14 of their statement of grounds of appeal and on page 36 of their written reply to the proprietor's statement of grounds of appeal. As such, the board considers that there was no reason for the proprietor to postpone until the oral proceedings before the board the filing of amendments addressing these objections, irrespective of which objections the board had retained in its preliminary opinion issued under Article 15(1) RPBA.

4.4 The board therefore cannot see any "exceptional circumstances". Accordingly, it decided not to admit auxiliary requests 6 and 7 into the appeal proceedings.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chair:

B. Brückner K. Bengi-Akyürek

Decision electronically authenticated