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Datasheet for the decision of 20 February 2018

Case Number: T 0034/13 - 3.5.03

Application Number: 07764441.7

Publication Number: 2036396

IPC: H04R25/00

Language of the proceedings: ΕN

Title of invention:

A HEARING INSTRUMENT WITH ADAPTIVE DIRECTIONAL SIGNAL PROCESSING

Patent Proprietor:

GN ReSound A/S

Opponent:

Sivantos GmbH

Headword:

Hearing aid/GN RESOUND

Relevant legal provisions:

EPC Art. 56, 114(2)

Keyword:

Admissibility of proprietor's appeal (yes) Inventive step (yes) - claims as granted

Dec			

Catchword:



Beschwerdekammern **Boards of Appeal** Chambres de recours

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Case Number: T 0034/13 - 3.5.03

DECISION of Technical Board of Appeal 3.5.03 of 20 February 2018

Appellant II: GN ReSound A/S Lautrupbjerg 7 (Patent proprietor)

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Appellant I: Sivantos GmbH

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FDST Patentanwälte Representative:

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Interlocutory decision of the Opposition Decision under appeal:

> Division of the European Patent Office posted on 31 October 2012 concerning maintenance of the European Patent No. 2036396 in amended form.

Composition of the Board:

Chairman F. van der Voort

Members: T. Snell

P. Guntz

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Summary of Facts and Submissions

I. This case concerns appeals filed by both the opponent and the proprietor against the interlocutory decision of the opposition division in opposition proceedings concerning European patent No. EP 2 036 396. The opposition division held that the ground for opposition according to Article 100(a) EPC prejudiced the maintenance of the patent as granted (here, lack of inventive step), but that, account having been taken of the amendments made by the proprietor in accordance with a first auxiliary request, the patent and the invention to which it relates according to this request met the requirements of the EPC. In particular, the opposition division held that claim 1 of the first auxiliary request complied with Article 123(2) and (3) EPC and that its subject-matter was both new and involved an inventive step, in particular in the light of the disclosures of the following documents:

D1: WO 01/97558 A;

D3: US 5 473 701 A;

E2: H. Warncke, "Künstliche Intelligenz - was ist das überhaupt" ["Artificial intelligence - what indeed is that?"], Hörakustik, Vol. 7/2005, pages 12 to 27; and

E3: EP 1 653 768 A

II. The parties initially made the following requests in their respective notices of appeal:

The opponent (henceforth "appellant I") requested that the decision revoking the patent ("Beschluss über den Widerruf des Patents") be set aside.

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The proprietor (henceforth "appellant II") requested that the decision under appeal be set aside "to the extent that the patent was not maintained as granted".

III. In its statement of grounds of appeal, appellant I amended its request to revocation of the patent in its entirety, arguing that this had been the intention all along despite the incorrect formulation in the notice of appeal. Appellant I argued that claim 1 of the patent as amended infringed Article 123(2) EPC and that its subject-matter did not involve an inventive step having regard to the disclosure of E3 combined with the common general knowledge, the combination of E3 and E2, or the combination of E3 and a newly-cited document E6:

E6: DE 103 27 889 B3.

Appellant I conditionally requested oral proceedings.

IV. In its statement of grounds of appeal, appellant II requested that the decision under appeal be set aside and that the patent be maintained as granted (i.e. that the opposition be rejected) (main request) or, in the alternative, that the patent be maintained in amended form on the basis of the first auxiliary request filed with the letter dated 13 September 2012 and held allowable by the opposition division (corresponding to dismissal of appellant I's appeal), or that the patent be maintained on the basis of the second auxiliary request filed with the letter dated 13 September 2012.

Appellant II conditionally requested oral proceedings.

V. In a reply to the appeal of appellant II, appellant I requested inter alia that appellant II's appeal be held

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inadmissible due to a lack of substantiation. In addition, appellant I argued inter alia that the subject-matter of claim 1 of the main request did not involve an inventive step in the light of the combination D1 and E2.

- VI. In a reply to the statement of grounds of appeal of appellant I, appellant II requested that E6 be not admitted to the proceedings and that the appeal of appellant I be dismissed. Inter alia, arguments were given as to why its own appeal should be held admissible.
- VII. In a response, appellant I submitted further arguments in support of the admissibility of E6 and the inadmissibility of appellant II's appeal.
- VIII. In a communication accompanying a summons to attend oral proceedings, the board gave a preliminary opinion that, inter alia, both appeals were admissible, that E6 should not be admitted, and that the subject-matter of independent claims 1 and 15 of the main request involved an inventive step.
- IX. In response to the board's communication, appellant II submitted with a letter dated 10 January 2018 a new first auxiliary request and resubmitted the previously filed first and second auxiliary requests, respectively renumbered as second and third auxiliary requests (hence the second auxiliary request corresponds to the version considered allowable by the opposition division in the impugned decision).
- X. In response to the board's communication, appellant I submitted a letter dated 10 January 2018 in which it argued that the subject-matter of claim 1 of the main

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request did not involve an inventive step having regard to the disclosure of E3 (or D3) and common general knowledge, the combination of E3 (or D3) and E2, or the combination of E3 (or D3) and E6. Further, it argued that the subject-matter of claim 15 was obvious to the person skilled in the art.

XI. Oral proceedings were held on 20 February 2018. During the oral proceedings, appellant I withdrew its request that the appeal of appellant II be held inadmissible.

The parties final requests were as follows:

Appellant I requested that the decision under appeal be set aside and that the patent be revoked or, in the alternative, that the appeal of appellant II be dismissed.

Appellant II requested that the decision under appeal be set aside and that the opposition be rejected (main request) or, in the alternative, that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of a first auxiliary request filed with the letter dated 10 January 2018 or, by way of a second auxiliary request, that the appeal of the opponent be dismissed, or that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of a third auxiliary request filed with the letter dated 10 January 2018.

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

XII. Claim 1 of the main request (claim 1 as granted) reads as follows:

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"A hearing instrument with at least two microphones for reception of sound and conversion of the received sound into corresponding electrical sound signals that are input to a signal processor, wherein the signal processor is adapted to process the electrical sound signals into a combined signal with a directivity pattern with at least one adaptive null direction θ , characterized in that

the signal processor is further adapted to prevent the at least one null direction θ from entering a prohibited range of directions, wherein the prohibited range is a function of a parameter of the electrical sound signals."

XIII. Claim 15 of the main request (claim 15 as granted) reads as follows:

"A hearing instrument with at least two microphones for reception of sound and conversion of the received sound into corresponding electrical sound signals that are input to a signal processor, wherein the signal processor is adapted to process the electrical sound signals into a combined signal with a directivity pattern with at least one adaptive null direction θ , prevent the at least one null direction θ from entering a prohibited range of directions, and move at least one null direction θ outside the prohibited range of directions."

XIV. In view of the board's decision, it is not necessary to reproduce the claims of the auxiliary requests.

Reasons for the Decision

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- 1. Admissibility of the appeal of the proprietor (appellant II)
- 1.1 Appellant I initially requested that the appeal of appellant II be held inadmissible due to a lack of substantiation, in particular regarding the failure to deal with the objections of lack of inventive step when starting out from document E3 and D3, respectively. Although the request was subsequently withdrawn, the admissibility of the appeal is a matter to be considered by the board ex officio.
- 1.2 The board considers that it is clear from the impugned decision that E3 and D3 are regarded as equivalent starting points to D1 (cf. points 19.6, 19.11 and 19.12 of the impugned decision). The reasoning given in appellant II's statement of grounds regarding the combination D1+E2 therefore implicitly applies, mutatis mutandis, to the combinations E3+E2 and D3+D2. The board notes further that the main argument advanced in appellant II's statement of grounds of appeal concerns not the respective contents of E3, D1 and D3, but rather the opposition division's allegedly wrong evaluation of E2. This argument is self-evidently applicable to any combination involving E2. Therefore, the statement of grounds contains sufficient reasoning to substantiate why the decision under appeal should be reversed or amended (cf. Article 108 and Rule 99(2) EPC and Article 12(2) RPBA).
- 1.3 The board therefore holds that the appeal of appellant II is admissible.
- 1.4 The board also holds the appeal of appellant I to be admissible. In view of the board's decision, it is not

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necessary to give reasons. The admissibility has in any case not been challenged.

- 2. Admissibility of document E6
- 2.1 E6 has been cited by appellant I in respect of claim 1 of the main request, i.e. claim 1 as granted, for the first time in these appeal proceedings. In accordance with Article 114(2) EPC, the board may disregard evidence which is not submitted in due time.
- 2.2 One established criterion for determining whether a new document should be admitted is whether the document is prima facie highly relevant to the decision, which appellant I alleged was indeed the case.
- 2.3 The board however finds that E6 is not prima facie relevant to the decision (cf. points 3.4.10 to 3.4.14 below), and therefore decided to not admit the document.
- 3. Main request claim 1 as granted inventive step
- 3.1 Background
- 3.1.1 The patent in suit concerns a hearing "instrument", e.g. a hearing aid, with adaptive directional signal processing, meaning that electrical signals from at least two microphones are combined in such a way that at least one null is created in the directivity pattern, resulting in suppression of sound sources from that direction, e.g. noise. The general aim of the invention is to improve the capability of suppression of [unwanted] sound sources from all directions (cf. paragraph [0006] of the patent).

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3.1.2 The board adopts the nomenclature M1 to M4 for the features of claim 1 referred to in the impugned decision (cf. point 19.1 of the reasons):

M1: A hearing instrument with at least two microphones for reception of sound and conversion of the received sound into corresponding electrical sound signals that are input to a signal processor.

M2: The signal processor is adapted to process the electrical sound signals into a combined signal with a directivity pattern with at least one adaptive null direction θ .

M3: The signal processor is further adapted to prevent the at least one null direction θ from entering a prohibited range of directions.

M4: The prohibited range is a function of a parameter of the electrical sound signals.

3.2 Features M1 to M3 in the prior art

It is common ground that features M1 to M3 are disclosed in each of the documents E3, D1 and D3 (cf. point 19.2 ff. of the impugned decision).

- 3.3 The technical problem
- 3.3.1 The opposition division considered that, when starting out from E3, D1 or D3, the problem to be solved was "to provide a prohibited range that follows, or adapts to, the direction of desired sound sources" (cf. point 19.6 of the reasons, last sentence). However, this formulation of the problem inadmissibly includes part of the solution, and is therefore based on hindsight.

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- 3.3.2 Appellant I held that, when starting out from E3, the problem could be formulated as to simplify the operation of the hearing instrument in order to increase user comfort (cf. the letter dated 10 January 2018, page 2, third paragraph). The board however considers that the technical effect of feature M4 is not to simplify operation, since documents E3 (and D3) disclose hearing aids which adjust automatically. Appellant I alternatively considered that the problem could be formulated as to identify noise sources (cf. the letter dated 10 January 2018, page 5, lines 3 and 4). However, this problem is based on hindsight as it inadmissibly gives a pointer to the solution.
- 3.3.3 In the same letter, appellant I suggested that the problem could be formulated variously as to automatically [better] adapt the hearing aid to the current conditions, to ensure that desired signals are not falsely suppressed (cf. page 3, last paragraph) or, with respect to E3, to set the limits for parameter "a" for the individual frequency bands (cf. page 2, last paragraph, and page 5, last paragraph, to page 6, first paragraph).
- 3.3.4 For the sake of argument, the board formulates the problem to be solved starting out from E3, D1 or D3 in relation to distinguishing feature M4 as to automatically better adapt the hearing aid to the current conditions, but notes that even if the problem were formulated in either of the other ways given in the previous paragraph, this would not lead the skilled person to include feature M4, essentially for the same reasons as given below.

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- 3.4 Inventive step starting out from E3
- 3.4.1 E3 discloses filter functions with a parameter "a" which influences the directional characteristic. As "a" is increased, the null directions move forwards (cf. paragraph [0017]). By setting a maximum value of "a", e.g. 2, a range is established around 0° (here, +/- 60°) in which signal sources are either not at all or only slightly attenuated (cf. paragraph [0021]), i.e. the chosen maximum value of "a" (to be called a_{max}) establishes a prohibited range in the sense of claim 1. E3 further discloses that noise reduction can be adapted separately in different frequency bands (cf. claim 3). E3 does not disclose that a_{max} may take different values in each frequency band or that the value of a_{max} is in any way adaptable.
- 3.4.2 Appellant I argued at the oral proceedings that it was self-evident that a single value of a_{max} set during manufacture would not take account of the different situations in which the hearing aid would be used. It followed that a_{max} had to be adaptable. The skilled person could either arrange for this to be done manually or for adaptation to be automatic. Considering that the latter was far preferable with respect to user comfort, automatic adaptation would be obvious. It was further obvious that the automatic adaptation had to be carried out in response to a parameter of the electrical sound signals, as no other basis for adaptation was available.
- 3.4.3 The board finds this line of argumentation unconvincing. Even if the skilled person were to recognise that it would be advantageous to use different values of a_{max} in different environments, the adaptation of this value automatically based on a

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parameter of the electrical sound signals is neither hinted at in E3 nor belongs to the common general knowledge of the person skilled in the art. In the board's view, for a step to be deemed obvious, the skilled person would have to have a clear idea of how to implement it, since he would only take a step which would have a clear expectation of success. In the present case, the skilled person would need to know from common general knowledge or another document how to use a parameter of the electrical sound signals to adapt a_{max} , which is not the case here.

- 3.4.4 In the statement of grounds of appeal, appellant I argued alternatively as follows: in E3, each frequency band is processed individually. This would lead the skilled person to choose a different value for a_{max} in each frequency band. Consequently, the size of the prohibited range would be a function of frequency and, hence, of a parameter of the electrical sound signals.
- 3.4.5 The board however also finds this argument unconvincing. Even if the skilled person were to allow a_{max} to take different values in each frequency band (even though, as already stated, E3 contains no hint to do this), the various chosen values of a_{max} would not be a function of a parameter of the received electrical sound signals. In E3, only the variable parameter "a" in each frequency band (the optimal value of "a" being referred to as " a_{min} ", cf. paragraph [0019] and Fig. 5) would be derived from a parameter of the electrical signals (cf. paragraph [0028]), but the prohibited range is not a function of this value.
- 3.4.6 Appellant I further argued that the skilled person would arrive at the subject-matter of claim 1 by combining E3 with E2.

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- 3.4.7 E2 describes a hearing aid with a directional characteristic. The direction and strength of the various signals are measured. Noise signals are recognised by means of a modulation analysis and only these are suppressed ("ausgeblendet"). The directional characteristic can then apparently concentrate on one speaker ("ein Sprecher angepeilt wird"), whereby the directional characteristic can be directed at a particular speaker over a full 360° (cf. page 15, right-hand col., penultimate paragraph). At the same time, four noise sources can be suppressed also over a range of 360° (cf. page 18, right-hand paragraph, second paragraph). However, technical implementation details are largely lacking. That notwithstanding, E2 discloses at least conceptually a system with the capability to function over 360° without using prohibited ranges.
- 3.4.8 Appellant I argued at the oral proceedings that, starting out from E3, the skilled person would extract from E2 the teaching to identify the dominant speech signal and the noise signals and adapt the filter of E3 accordingly. This would lead the skilled person to adapt the prohibited range, since this would logically follow the dominant speech signal.
- 3.4.9 The board finds this argument unconvincing. As already stated, E2 achieves suppression of several noise sources and emphasis of the dominant speaker over 360° without any need for a prohibited range. It is therefore not obvious why this solution would be combined with that of E3. Further, even if for the sake of argument, E2 is understood as suggesting that the directional characteristic of the microphone array should be rotated in order to follow the dominant

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speaker, there is no disclosure as to how this is done. This means that the skilled person would not know whether this aspect of the solution could be easily or meaningfully applied to the system of E3. In this respect, this does not appear to be simply a matter of adapting the delays of the two microphone channels of E3, as implied by the opposition division (cf. page 12 of the decision, 4th paragraph). There is also no evidence on file that rotating a directional characteristic is a step which can be easily carried out based on the common general knowledge of the skilled person.

- 3.4.10 Appellant I further argued that the subject-matter of claim 1 did not involve an inventive step in the light of the combination of E3 and E6.
- 3.4.11 E6 was cited by appellant I for the first time in these appeal proceedings (see above, point III).

 Consequently, in order to determine whether to admit E6, the board examined its prima facie relevance with respect to inventive step starting out from document E3.
- 3.4.12 E6 discloses that the directivity characteristic of a microphone array can be made dependent on the level and/or frequency of the microphone signals (cf. paragraphs [0030] to [0032]) by switching between characteristics of different orders. The adaptation operates on the principle of the microphone noise level not exceeding a level above the rest hearing threshold ("Ruhehörschwelle") of the wearer which is considered tolerable (cf. paragraph [0030]). It may also take account of a masking threshold ("Maskierungsschwelle") which determines for a particular wearer the point at which the signal level in each frequency band masks the

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noise produced by the microphone (cf. paragraph [0032]).

- 3.4.13 Appellant I argued that it was known from E3, Fig. 5, that the microphone noise increases as the parameter "a" increases. Based on the teaching of E6, the skilled person would then set a_{max} such that the microphone noise level does not exceed the tolerable noise level. Since the tolerable noise level depends on frequency, the skilled person would make a_{max} dependent on frequency.
- 3.4.14 The board however did not consider this argument convincing. The board notes that E3 discloses a solution which takes account of total noise, i.e. both the microphone noise and the external noise signal level in order to find an "optimum" value of the parameter "a" (i.e. amin) in each frequency band. This solution is based on minimising the total noise whilst having a fixed value of a_{max} (cf. E3, paragraphs [0019] to [0021]). E6 describes a different concept aimed at limiting microphone noise to a tolerable level by switching between directional characteristics of different orders, whereby the tolerable level also apparently takes account of the level of the received signal (cf. E6, paragraph [0032]). E6 does not mention whether the directional characteristics have prohibited ranges. In the board's view, the skilled person would not straightforwardly combine these quite different concepts. Consequently, the combination of E3 and E6 would not, prima facie, lead obviously to the subjectmatter of claim 1. The same applies, mutatis mutandis, to the combination D3 and E6, which was also proposed by appellant I (D3 is discussed in more detail below). The board therefore used its discretion under Article 114(2) EPC to not admit E6 (see point 2 above).

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- 3.4.15 For the above reasons, the board concludes that the subject-matter of claim 1 was not obvious to the person skilled in the art when starting out from E3 and taking into account the common general knowledge or having regard to the combination of E3 and E2 (Articles 52(1) and 56 EPC).
- 3.5 Inventive step starting out from D1 or D3
- 3.5.1 D1 and D3 both disclose features M1 to M3 but not M4, and thus provide a similar starting point as E3. In both D1 and D3, as in E3, the prohibited zone is predetermined by chosen constraints on the values of an adaptable parameter (i.e. the maximum value chosen for the parameter a in E3, cf. col. 4, lines 34 to 40, i.e. a_{max} , see point 3.4.1 above); the limiting values chosen for the coefficient W1(n) in D1, cf. page 7, lines 4 and 5; and the maximum value chosen for the coefficient β in D3, cf. col. 5, lines 46 to 49). Neither document contains any hint to modifying the limiting values W1(n) in D1 or β in D3, i.e. do not disclose setting the prohibited range as a function of the electrical sound signals.
- 3.5.2 Appellant I argued that D3 disclosed three different scenarios for a division of the space into a foreground and a background (cf. Fig. 1a to 1c). The example of Fig. 1c was also "exotic", being asymmetrical, which was clearly not a scenario which would be set during manufacture for all time. It followed that it would be obvious to adapt the prohibited range, which could either be done manually or obviously automatically. If done automatically, this could only be done as a function of the microphone signals.

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- 3.5.3 The board however sees no essential difference between the disclosures of D3 (or D1) and E3. Even if the skilled person were to conclude that different foreground/background scenarios were possible, there is no hint to switch between any of these scenarios on the basis of a function of a parameter of the electrical sound signals, essentially for the same reasons as given in connection with E3. D3 even recognises that the direction of the desired source may move around, even outside the prohibited (foreground) range, but even here does not suggest to change the prohibited range (cf. col. 4, lines 6 to 11). Indeed, the fact that all three documents E3, D1 and D3 describe essentially the same type of microphone array with a prohibited range, but none suggests adapting the prohibited range, corroborates the board's assessment that the step M4 involves an inventive step starting out from one of these documents combined with common general knowledge.
- 3.5.4 Appellant I also argued on the basis of either D1 or D3 combined with E2, relying essentially on the same arguments as given in connection with the combination of E3 and E2. The board's reasoning given in connection with the combination of E3 and E2 applies, mutatis mutandis (cf. points 3.4.7 to 3.4.9).
- 3.5.5 For the sake of completeness, the board notes that in the impugned decision, the opposition division held that the subject-matter of claim 1 did not involve an inventive step based on the combination of D1 and E2 (cf. point 19.6 ff. of the decision). In this respect, it argued that D1 disclosed features M1 to M3, but that D1 assumed that the desired sound originated from straight-ahead, i.e. 0°. The problem to be solved was considered as "to provide a prohibited range that

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follows, or adapts to, the direction of desired sound sources". The opposition division considered that E2 solved this problem by targeting the directivity pattern at the most dominant speaker, i.e. based on a function of a parameter of the electrical sound signals, although it did not contain details how the first or latest generation directional microphones function [to achieve this]. This was however known from D1, cf. Figs. 3, 4a and 4b. This would lead the skilled person to implement the prohibited ranges disclosed in D1, page 7, lines 1 to 5 "around the direction of the most dominant speaker instead of 0° azimuth". The opposition division also comments (cf. page 12, 4th paragraph) that "It is furthermore commonly known by a skilled person that turning of the directivity pattern can be achieved by suitable delays between a front and back directed directional microphone."

- 3.5.6 This line of argumentation is considered to be based on hindsight. Firstly, the problem inadmissibly contains a pointer to the solution. Secondly, the combination of D1 and E2 fails essentially for the same reasons as given in connection with the combination of E3 and E2, cf. point 3.4.7 ff. above, whereby the board disagrees that D1 contains any solution as to how to direct the directivity pattern at the dominant speaker. Finally, no document is on file which demonstrates what is alleged as common general knowledge with respect to turning the directivity pattern by adjusting delays.
- 3.5.7 The board therefore concludes that the subject-matter of claim 1 involves an inventive step when starting out from either D1 or D3 and taking into account the common general knowledge or having regard to the combination of D1 (or D3) and E2 (Articles 52(1) and 56 EPC).

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- 4. Main request claim 15 as granted inventive step
- 4.1 Claim 15 differs from claim 1 in that, instead of feature M4 discussed above, it includes the following feature referred to in the impugned decision as M5:

"the signal processor is adapted to move at least one null direction $\boldsymbol{\theta}$ outside the prohibited range of directions."

- This feature refers to embodiments described in paragraphs [0077] to [0083] of the patent. In brief, the broadening of the prohibited range may cause an existing null direction to reside in the prohibited range. Therefore, according to an exemplary embodiment, a null position monitor may be provided for monitoring the current null position and, when the current null position resides within the adapted prohibiting range of directions for more than, e.g. 1 second, the signal processor moves the null outside the prohibited range of directions.
- Therefore, although claim 15 does not explicitly require that the prohibited range may change, it is because of this aspect that the problem may arise at all that a null is found within the prohibited range. This is in contrast to the situation in each of documents E3, D1 and D3, since there the prohibited range is predetermined and fixed by limits on the choice of certain parameters, meaning that nulls can apparently never move into the prohibited range. It has already been explained above in connection with claim 1 why it would not be obvious to adapt these limiting values having regard to these documents. Consequently, there is no reason starting out from these documents to incorporate a feature for moving a null outside of the

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prohibited range. The inclusion of feature M5 is therefore not obvious.

The board concludes that the subject-matter of claim 15 involves an inventive step starting out from either E3, D1 or D3 and taking into account the common general knowledge or having regard to the combination of E3 (or D1 or D3) and E2 (Articles 52(1) and 56 EPC).

5. Conclusion

The ground for opposition pursuant to Article 100(a) EPC invoked by appellant I does not prejudice the maintenance of the patent as granted. It follows that the decision under appeal is to be set aside and that the opposition is to be rejected.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The opposition is rejected.

The Registrar:

The Chairman:



M. Schalow

F. van der Voort

Decision electronically authenticated