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**Datasheet for the decision
of 5 December 2023**

Case Number: T 0174/21 - 3.5.03

Application Number: 11790853.3

Publication Number: 2783522

IPC: H04R25/00, A61B5/12, A61B5/00

Language of the proceedings: EN

Title of invention:

A method of estimating an acoustic transfer quantity by employing a hearing instrument, and hearing instrument therefor

Patent Proprietor:

Sonova AG

Opponent:

Oticon A/S / GN Hearing A/S / Widex A/S

Headword:

Real-ear to coupler difference/SONOVA

Relevant legal provisions:

EPC Art. 83, 100(b), 111(1), 114(1)
RPBA 2020 Art. 11

Keyword:

Sufficiency of disclosure - main and 1st to 7th auxiliary requests (no): disclosure of "at least one way" but not over the "whole scope claimed"

Remittal of the case - (no): alleged *ex officio* objection under Art. 114(1) EPC is *per se* no "special reason"

Decisions cited:

T 0862/16, T 2210/16, T 2773/18, T 0149/21, T 0867/21



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Case Number: T 0174/21 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 5 December 2023

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 15 December 2020 rejecting the opposition filed against European patent No. 2783522 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chair K. Bengi-Akyürek
Members: K. Peirs
R. Romandini

Summary of Facts and Submissions

I. The appeal of the opponent (appellant) lies from the decision of the opposition division to reject the opposition (Article 101(2) EPC). The opposition division deemed that none of the grounds for opposition invoked by the opponent under

- Article 100(a) EPC in conjunction with Articles 54 and 56 EPC,
 - Article 100(b) EPC in conjunction with Article 83 EPC
- and
- Article 100(c) in conjunction with Article 123(2) EPC

prejudiced the maintenance of the patent as granted.

II. A communication was issued under Article 15(1) RPBA 2020 including the board's negative preliminary opinion concerning sufficiency of disclosure (Article 100(b) EPC).

III. Oral proceedings before the board were held on 5 December 2023. The parties' final requests were as follows:

- The appellant requested that the decision under appeal be set aside and that the patent be revoked.
- The patent proprietor (respondent) requested that the appeal be dismissed. The respondent's **main request** therefore amounts to the claims as granted. In the alternative, the respondent 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**).

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

- (a) "A method of estimating an acoustic transfer quantity representative of a sound pressure transfer to the eardrum (9) of an ear, when a hearing instrument is coupled to the ear, the method comprising the steps of
- (b) - Measuring, by an ear canal microphone (11) of the hearing instrument, an acoustic signal in the ear canal when a sound signal is emitted into the ear canal by a receiver (5) of the hearing instrument, the ear canal microphone (11) being in acoustic communication with the ear canal,
- (c) - Determining, from the acoustic signal and from a frequency dependent ear independent reference characteristics of the hearing instrument, an ear canal impedance; and
- (d) - Calculating, from the ear canal impedance, an estimate of the acoustic transfer quantity".

V. Claim 1 of **auxiliary request 1** includes all the features of claim 1 of the main request and further includes, at the end, the following feature (board's feature labelling):

- (e) "; and
 - adjusting a hearing instrument signal processing parameter dependent on the results of the estimate of the transfer quantity".

VI. Claim 1 of **auxiliary request 2** includes all the features of claim 1 of the main request and further

includes, at the end, the following feature (board's feature labelling):

- (f) ",
 - wherein the transfer quantity is a Real-Ear-to-Coupler difference (RECD) or a Real Ear Occluded Gain (REOG)".

VII. Claim 1 of **auxiliary request 3** includes all the features of claim 1 of auxiliary request 1 and further includes, at the end, feature (f).

VIII. Claim 1 of **auxiliary request 4** includes all the features of claim 1 of the main request and further includes, at the end, the following features (board's feature labelling):

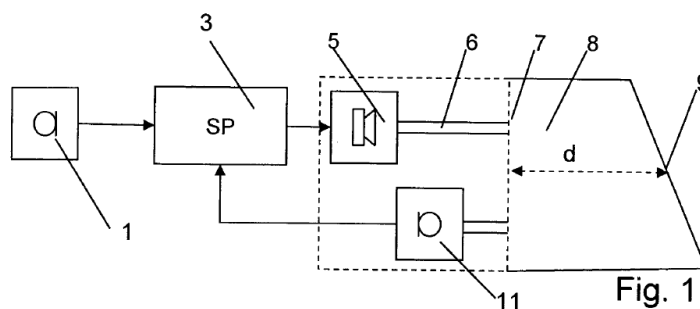
- (g) ", wherein the ear independent reference characteristics is a reference characteristics of an acoustic quantity of the hearing instrument coupled to a standard acoustic coupler (52) and
- (h) wherein the method further comprises, prior to the step of determining the ear canal impedance, the steps of
 - coupling the hearing instrument to a standard acoustic coupler (52),
 - emitting, by the receiver (5) of the hearing instrument, a sound signal into the standard acoustic coupler (52),
 - measuring a standard coupler acoustic signal by the ear canal microphone (11) coupled to the standard coupler, and
 - obtaining the reference characteristics from the standard coupler acoustic signal".

- IX. Claim 1 of **auxiliary request 5** includes all the features of claim 1 of auxiliary request 4 and further includes feature (e) between features (d) and (g).
- X. Claim 1 of **auxiliary request 6** includes all the features of claim 1 of auxiliary request 4 and further includes, at the end, feature (f).
- XI. Claim 1 of **auxiliary request 7** includes all the features of claim 1 of auxiliary request 6 and further includes feature (e) between features (d) and (g).

Reasons for the Decision

1. *Technical background*

1.1 The invention concerns a hearing instrument to be coupled to the ear of a user as illustrated in Figure 1 of the opposed patent (reproduced below). It deals in particular with the question how well the output signal emitted by receiver 5 results in a signal received at eardrum 9.



1.2 There are several influences that can impact this signal at the eardrum. First, the hearing instrument could suffer from an "acoustic leakage" after having been inserted into the user's ear canal. Such an acoustic leakage causes the sound pressure at the eardrum to be lower than expected. Secondly, the

ear-canal wall typically dampens part of the sound emitted by the hearing instrument's receiver. Thirdly, any contaminations of the ear canal or eardrum (e.g. by cerumen) could also result in a decreased sound pressure at the eardrum. These influences should typically all be taken into account when fitting a hearing instrument.

1.3 It is, however, not always possible to measure the acoustic pressure at the eardrum (see also paragraph [0004] of the opposed patent). In those cases, the amplification characteristic of the hearing instrument is often measured outside the ear with a tube ("coupler") connected to the receiver output. This tube simulates the ear canal. The so-called "2cc coupler" (see also paragraph [0018] of the opposed patent) has become a standard in the art for this purpose. To be able to draw conclusions on how a sound pressure measured with the 2cc coupler translates into the sound pressure experienced at a real ear, a parameter called the "real-ear-to-coupler difference (RECD)" can be used. This parameter refers to a measurement in which, for a test person, the difference is determined between the sound pressure measured at the 2cc coupler and measured in the real ear for the same transducer generating the same sound signal.

1.4 The claimed method relates more specifically to determining the RECD while avoiding the use of a probe microphone close to the eardrum (see paragraph [0011] of the opposed patent). This is achieved by the steps underlying **features (b) to (d)** of claim 1. How these steps are implemented according to the invention is described in paragraphs [0058] and [0059] of the opposed patent. These paragraphs illustrate that the

"ear-canal impedance" according to feature (c) can be determined from two quantities. The first quantity is the acoustic signal p_{ec} measured by ear-canal microphone 11 (cf. Figure 1 of the opposed patent reproduced in point 1.1 above). The second quantity is the ratio between the impedance of the 2cc coupler Z_{2cc} and the pressure p_{2cc} measured with a microphone in the 2cc coupler. This second quantity is referred to as the "frequency dependent ear independent reference characteristics of the hearing instrument" in feature (c). Paragraph [0058] of the opposed patent indicates the determination of the ear-canal impedance Z_{ec} via the following equation:

$$Z_{ec} = Z_{2cc} \cdot \frac{p_{ec}}{p_{2cc}}$$

Moreover, paragraph [0059] of the opposed patent teaches to calculate an estimate of the RECD, i.e. the "acoustic transfer quantity" according to feature (d), using the following formula (" e_{12} " and " e_{22} " being ear-canal parameters that can be estimated by the one of the three options set out in paragraphs [0061] to [0068] of the opposed patent):

$$RECD = \frac{Z_{trans}}{Z_{2cc}} = \frac{e_{22}Z_{ec} - e_{12}}{Z_{2cc}} .$$

2. *Main request: claim 1 - sufficiency of disclosure*

2.1 With regard to **feature (c)** of claim 1, in order to be able to carry out the claimed invention over the whole range claimed, the skilled person in the field of hearing aids must in fact select a suitable "frequency-dependent ear-independent reference characteristic of the hearing instrument". This has to be done to determine the respective "ear-canal

impedance" in order to then be able to calculate the "estimate of the acoustic transfer quantity" in accordance with feature (d).

- 2.2 According to Reasons 2.2.1, 2.2.3, 2.2.5 and 2.2.7 of the appealed decision, the opposition division considered the opposed patent to specify "at least one way" to carry out the method of claim 1. However, this does not mean that the opposed patent discloses the claimed invention, i.e. the subject-matter of claim 1, in a manner sufficiently clear and complete for it to be carried out by the skilled person. This is only the case if the "at least one way" covers, possibly augmented with the skilled person's common general knowledge, the "whole range claimed" (cf. **T 867/21**, Reasons 3.2). With reference to **T 2773/18**, the respondent expressed some doubts as to the applicability of the "whole range claimed"-requirement in the field of audiology. However, the board considers that these doubts are unfounded. The board refers in this respect to the conclusions drawn in **T 149/21** (Reasons 3.4 and 3.6).

For the following reasons, the board agrees with the appellant that the invention defined in claim 1 as granted is not sufficiently disclosed for the skilled person to carry it out over the whole range of the subject-matter claimed:

- 2.2.1 The claimed method of "estimating an acoustic transfer quantity representative of a sound pressure transfer to the eardrum of an ear" cannot be carried out for all kinds of frequency-dependent and ear-independent reference characteristics encompassed by **feature (c)**. In particular, a "microphone characteristic" constitutes one example of a hearing-instrument

characteristic that is frequency-dependent and ear-independent but for which the claimed method cannot be carried out. This is because a microphone characteristic will typically bear no information on how the ear canal actually impacts incident sound. Such information is however crucial when determining the "ear-canal impedance" in accordance with feature (c). As a result, a "microphone characteristic" cannot be used to carry out the method defined in claim 1.

2.2.2 The respondent objected to the fact that the board had raised the issue referred to in the previous paragraph *ex officio*. It was of the opinion that the board, as a judicial body, should refrain from doing so. Accordingly, it requested the board not to pursue this issue or to remit the case to the opposition division to decide on it first.

The board makes the following observations in this respect:

- From a substantive point of view, the respondent did not convince the board that this issue was "entirely new". This is because the "determining" step in accordance with feature (c) of the "ear-canal impedance" by means of the "frequency-dependent ear-independent reference characteristics of the hearing instrument" was already challenged regarding sufficiency of disclosure in the first-instance proceedings (see e.g. the "Notice of opposition", last paragraph of page 8 and first sentence of page 9). This challenge was, as correctly noted by the respondent, only substantiated by suggesting that the "acoustic signal" and the "frequency-dependent ear-independent reference characteristics"

according to feature (c) alone were not sufficient to determine the "ear-canal impedance" in accordance with that feature. Nevertheless, in the board's view, the patent proprietor was informed that the "determining" step in accordance with feature (c) was potentially of a contentious nature. By providing this additional argument mentioned in point 2.2.1 above *ex officio*, the board merely illustrated this contentious nature by drawing upon its technical expertise to provide a concrete example of a "frequency-dependent ear-independent reference characteristics" in accordance with feature (c) for which the "determining" step according to this feature is not sufficiently disclosed.

- From a procedural point of view, the board is not aware of any provision of the Rules of Procedure of the Boards of Appeal (RPBA) which could and would limit the powers and the duties provided for in Articles 114 and 111(1) EPC, respectively, in appeal proceedings. The same applies in particular to Article 12(2) RPBA 2020: this provision states that the "primary object of the appeal proceedings" is to "review the decision under appeal in a judicial manner". However, it does not limit the way in which the board is to carry out this review. Nor does it prevent the board from considering other (secondary) objects. Instead, this provision is primarily concerned with the obligations of the parties, not the board. Moreover, even if a provision of the RPBA were to limit the powers and duties of the board under Articles 111(1) and 114(1) EPC to examine or raise an issue of its own motion, such a provision would not only be "incompatible with the spirit and purpose of the

Convention" (see Article 23 RPBA 2020). It would also be inapplicable. The RPBA as "secondary legislation" (see Article 23(4) and Rule 12c EPC) could never take precedence over the provisions of the EPC itself (cf. Article 23(3) EPC, see also **T 862/16**, Reasons 8.3.1). As regards the remittal of the case to the opposition division, the board notes that the ground for opposition under Article 100(b) EPC has already been considered in Reasons 2.2 of the contested decision. The board therefore sees no "special reasons" within the meaning of Article 11 RPBA 2020 which could justify the respondent's request in this respect.

- 2.2.3 The respondent contested that the skilled reader would consider a "microphone characteristic" to be a "frequency-dependent ear-independent characteristic" within the meaning of feature (c). In the respondent's view, the common patent-law practice of drafting claims as a generalisation of the description's disclosure inherently meant that some "non-working embodiments" could not be explicitly ruled out. It emphasised in this respect that *"[i]n the application of any teaching, the claim is to be interpreted with the eyes of the skilled person who is willing and capable to understand and to make a distinction between tools that work and tools that don't work"*.

The board notes, however, that the issue at hand is not whether certain embodiments "work" or not. Instead, it concerns whether the skilled person can carry out the claimed method over the "whole scope claimed". To establish whether that is the case, the "whole scope claimed" must indeed be determined through the eyes of the skilled reader, i.e. based on objective criteria and closely following the wording of a claim. This

practice avoids taking into account embodiments which are theoretically possible but not "technically meaningful". However, this does not mean that only those claim interpretations can be considered "technically meaningful" where the requirements of the EPC are met (cf. **T 2210/16**, Reasons 3.12). In the board's view, a "microphone characteristic" is a characteristic that is frequency-dependent and which does not depend on a particular human ear. Given that the "hearing instrument" mentioned in claim 1 comprises at least the "ear-canal microphone" according to feature (b), the characteristic of this *ear-canal microphone* is a characteristic of the *hearing instrument*. Therefore, the reasoning set out in point 2.2.1 above concerns indeed a technically meaningful interpretation of claim 1.

- 2.2.4 The respondent could not persuade the board that **feature (c)** would be enabled even with a microphone characteristic as "frequency-dependent and ear-independent reference characteristics". This is because, as already mentioned in point 2.2.1 above, a "microphone characteristic", taken by itself, simply does not comprise the necessary information to determine the "ear-canal impedance" in accordance with feature (c). The board does not doubt in this respect that there is some influence of the characteristics of the "receiver" providing the incident sound and of the "microphone" detecting the pressure in the ear canal on the results of the method of "estimating an acoustic-transfer quantity" according to feature (a). This is also acknowledged in the first sentence of paragraph [0018] of the opposed patent. This influence can, of course, be taken into account to *increase* the accuracy of the estimation of the "acoustic-transfer quantity" according to feature (a). However, this

presupposes that the acoustic-transfer quantity can be estimated to some (reasonably accurate) extent based on other characteristics, such as the characteristics mentioned in point 1.4 above. It does not mean that the acoustic-transfer quantity can be calculated - or, in view of features (c) and (d), that the "ear-canal impedance" can be determined - based solely on the receiver and microphone characteristics.

2.2.5 The respondent also contended that the "microphone characteristic" could well be an example of the claimed "reference characteristic", without expressly indicating to which microphone (i.e. "input microphone 1" according to Fig. 1 of the opposed patent or "ear-canal microphone 11" according to feature (b) of claim 1 or any other microphone) of the overall system it may actually belong. It also argued that such a "reference characteristic" could relate to both a "receiver sensitivity" and a "microphone sensitivity". On the other hand, the opposed patent itself indicates in paragraph [0018] that such a "reference characteristic" may relate to a "microphone signal" measured by the ear-canal microphone when the hearing instrument is coupled to a "standard acoustic coupler" such as a "2cc coupler". The opposed patent also teaches in paragraph [0058] that the "ear-canal microphone" depends on a characteristic like the "impedance of the 2cc coupler". Thus, this reinforces rather than mitigates the doubts as to whether the skilled person would indeed gather from the overall disclosure, without undue burden, what type of "reference characteristic" should actually be used for finally implementing the claimed invention.

2.3 In conclusion, contrary to the finding set out in Reasons 2.2.7 of the appealed decision, the ground for

opposition under Article 100(b) EPC prejudices the maintenance of the opposed patent in its granted form.

3. *Auxiliary requests 1 to 7: claim 1 - sufficiency of disclosure*

3.1 The amendments underlying claim 1 of **auxiliary requests 1 to 7** do not provide a remedy for the objection raised against claim 1 of the main request in point 2 above. This is because, contrary to what was alleged by the respondent, **features (e) to (h)** do not preclude the construction set out in point 2.2.1 above. Indeed, also in the amended wording of claim 1, the "frequency-dependent ear-independent reference characteristic of the hearing instrument" mentioned in feature (c) can be a "microphone characteristic". In particular, the board notes the following:

3.1.1 Regarding **feature (g)**, the "reference characteristics of an acoustic quantity of the hearing instrument" according to feature (g) can still encompass a microphone characteristic: even when coupled to a "standard acoustic coupler", a microphone typically provides the acoustic input for a hearing instrument, thereby determining the hearing instrument's acoustic intake, which is in fact an "acoustic quantity". The microphone characteristic can then well be seen as a "reference characteristics" of that acoustic quantity.

3.1.2 Concerning **feature (h)**, the board agrees with the respondent that the four steps of "coupling", "emitting", "measuring" and "obtaining" according to this feature will typically bear influences of three parameters, namely the *receiver characteristic*, the *transfer function* of the standard acoustic coupler and the *ear-canal microphone characteristic*. During the

oral proceedings before the board, however, the appellant submitted that the four steps according to feature (h) could be seen as a way to measure the characteristic of the hearing instrument's "ear-canal microphone". The board concurs insofar as these four steps are indeed at least suitable to do so if the "receiver characteristic" is known. In particular, the "standard acoustic coupler" mentioned in feature (h) can be any standardised tube: it need not necessarily be the "2cc coupler" mentioned in point 1.3 above. A practical scheme for determining the "microphone characteristic" with such a standardised tube can then consist of the following three operations:

- to couple the standardised tube to the hearing instrument such that the hearing instrument's receiver is coupled to the ear-canal microphone of the hearing instrument in an acoustically sealed way;
- to emit a reference signal from the hearing instrument's receiver into one end of that standardised tube;
- to measure the resulting pressure at the other end of the standardised tube with the ear-canal microphone.

Because of the acoustically sealed way of coupling the standardised tube to the hearing instrument, the deviation between the reference signal that is emitted by the hearing instrument's receiver having a known characteristic and the sound pressure measured by the ear-canal microphone can only be due to

- the transfer function of the standardised tube (which is already known because the tube is a *standardised* one) and

- the microphone characteristic.

As a result, the "microphone characteristic" can indeed be obtained from the measured deviation. The board acknowledges that more sophisticated methods typically exist to measure the characteristic of a microphone, involving e.g. the use of a calibrated reference microphone, specialised software and a highly controlled test environment. While these more sophisticated methods may yield more accurate results, the practical scheme set out above at least provides a basic means to evaluate such a "microphone characteristic". Overall, feature (h) specifies nothing more than a broader version of this practical scheme. Therefore, the skilled reader would not discard the example provided in point 2.2.1 above, and the objection raised against claim 1 of the main request in point 2 above cannot be overcome.

3.2 In conclusion, auxiliary requests 1 to 7 are not allowable under Article 83 EPC either.

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