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Datasheet for the decision of 18 February 2025

Case Number: T 2010/22 - 3.5.05

Application Number: 18206539.1

Publication Number: 3468222

IPC: H04R1/10, H04R1/26, H04R5/033

Language of the proceedings: EN

Title of invention:
Headphone

Patent Proprietor:
Bose Corporation

(Former) Opponent:
USound GmbH

Headword:
Locating headphone drivers/BOSE

Relevant legal provisions:
EPC Art. 54, 56, 84, 100(a), 111(1), 123(2)
RPBA 2020 Art. 11, 13(2)

Keywords:

Claim interpretation - objective claim construction vs. Plato's dialogues
Remittal to the opposition division - (no): Board can already decide on inventive step
Inventive step - main and auxiliary requests 1, 8 to 10 (no): alleged technical effect not credibly derivable within the meaning of G 1/19 and G 2/21
Clarity - auxiliary requests 2, 2A, 3 to 7, 11 and 12A (no)
Added subject-matter - auxiliary request 12 (yes)
Admittance of claim requests filed after Art. 15(1) RPBA communication - auxiliary requests 1mod to 7mod and 9mod to 12mod (no): no "exceptional circumstances"

Decisions cited:

G 0001/19, G 0002/21, T 1180/14, T 0862/16, T 2271/18, T 0655/21, T 0010/22

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Case Number: T 2010/22 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 18 February 2025

Appellant: (Patent Proprietor)	Bose Corporation The Mountain, Mail Stop 40 Framingham, MA 01701-9168 (US)
Representative:	Peterreins Schley Patent- und Rechtsanwälte PartG mbB Hermann-Sack-Straße 3 80331 München (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 30 June 2022 revoking European patent No. 3468222 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

I. The appeal of the proprietor (appellant) was lodged against the decision of the opposition division to revoke the present European patent.

The opposition division deemed the ground for opposition under Article 100(a) in conjunction with Article 54 EPC to prejudice the maintenance of the patent as granted. It further found that "auxiliary requests 1, 2, 2A, 3 to 12 and 12A" did not comply with at least one of Articles 54, 56, 84 and 123(2) EPC.

II. The former opponent withdrew its opposition in the course of the appeal proceedings.

III. A communication was issued under Article 15(1) RPBA including the board's preliminary opinion concerning novelty (Article 54 EPC) having regard to the following prior-art document:

D1: WO 96/28000.

IV. Oral proceedings before the board were held on 18 February 2025.

The appellant requested that the decision under appeal be set aside and that the opposition be rejected (**main request**). In the alternative, the appellant requested that the patent be maintained in amended form on the basis of the set of claims according to one of **auxiliary requests 1, 2, 2A, 3 to 12, 12A**, or one of the **auxiliary requests 1mod to 7mod and 9mod to 12mod** filed on 22 January 2025. Furthermore, the appellant requested to remit the case to the opposition division

for examination of inventive step.

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

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

(a) "A headphone (100) comprising:
(b) a support structure (106) that is adapted to sit on a head (102) or upper torso of a user;
(c) a low frequency acoustic driver (110) carried by the support structure such that the low frequency acoustic driver is located off of an ear (104) of the user, wherein the low frequency acoustic driver has front and rear sides;
(d) a high frequency acoustic driver (122) carried by the support structure such that the high frequency acoustic driver is located off of the ear of the user and is located closer to the ear than the low frequency acoustic driver, wherein the high frequency driver has front and rear sides; and
(e) a controller (132) that is configured to enable the low frequency driver to acoustically output sound in a first frequency range and enable the high frequency driver to acoustically output sound in a second frequency range, the second frequency range being higher than the first frequency range,
(f) wherein the low frequency driver is enclosed by a first housing (111) defining:
(g) a front chamber (114) acoustically coupled to the front side of the low frequency driver; and
(h) a rear chamber (116) acoustically coupled to the rear side of the low frequency driver;
(i) wherein the first housing comprises a first port (115) that is acoustically coupled to the

front chamber and a second port (117) that is acoustically coupled to the rear chamber."

VI. Claim 1 of **auxiliary request 1** includes all the features of claim 1 of the main request, with the alternative "upper torso" removed from feature (b) and with feature (d) being replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (d)):

(j) "a high frequency acoustic driver (122) carried by the support structure such that the high frequency acoustic driver is located off of the ear of the user and is located closer to the ear than the low frequency acoustic driver when the support structure sits on the head of the user, wherein the high frequency driver has front and rear sides; and".

VII. Claim 1 of **auxiliary request 2** includes all the features of claim 1 of auxiliary request 1, where feature (j) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (j)):

(k) "a high frequency acoustic driver (122) carried by the support structure such that the high frequency acoustic driver is located off of the ear of the user and is located closer to the ear than the low frequency acoustic driver when the support structure sits on the head of the user, wherein the high frequency driver has front and rear sides, and wherein the high frequency driver is mounted such that it radiates directly towards the ear when the support structure sits on the head

of the user;".

VIII. Claim 1 of **auxiliary request 2A** includes all the features of claim 1 of auxiliary request 2, where feature (k) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (k)):

(l) "a high frequency acoustic driver (122) carried by the support structure such that the high frequency acoustic driver is located off of the ear of the user and is located closer to the ear than the low frequency acoustic driver when the support structure sits on the head of the user, wherein the high frequency driver has front and rear sides, and wherein a diaphragm of the high frequency driver is mounted such that the diaphragm radiates directly into the ear when the support structure sits on the head of the user;".

IX. Claim 1 of **auxiliary request 3** includes all the features of claim 1 of auxiliary request 1, where feature (j) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (j)):

(m) "a high frequency acoustic driver (122) carried by the support structure such that the high frequency acoustic driver is located off of the ear of the user and is located closer to the ear than the low frequency acoustic driver when the support structure sits on the head of the user, wherein the high frequency driver has front and rear sides, wherein a polar pattern of the high frequency acoustic driver exhibits a higher order directional

pattern, and
wherein the high frequency driver is mounted such that it radiates directly towards the ear when the support structure sits on the head of the user; and".

X. Claim 1 of **auxiliary request 4** includes all the features of claim 1 of auxiliary request 1, where feature (j) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (j)):

(n) "a high frequency acoustic driver (122) carried by the support structure such that the high frequency acoustic driver is located off of the ear of the user and is located closer to the ear than the low frequency acoustic driver when the support structure sits on the head of the user,
wherein the high frequency driver has front and rear sides,
wherein the high frequency driver is enclosed by a second housing (123), different from the first housing (111), defining a rear chamber acoustically coupled to the rear side of the high frequency driver, wherein a polar pattern of the high frequency acoustic driver exhibits a higher order directional pattern, and
wherein the high frequency driver is mounted such that it radiates directly towards the ear when the support structure sits on the head of the user; and".

XI. Claim 1 of **auxiliary request 5** includes all the features of claim 1 of auxiliary request 4 and further includes, at the end, the following feature (board's

feature labelling):

(o) ", wherein the low frequency driver is located off an ear of the user and outside of the pinna when viewed in the sagittal plane".

XII. Claim 1 of **auxiliary request 6** includes all the features of claim 1 of auxiliary request 5, where feature (o) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (o)):

(p) ", wherein the low frequency driver is located off an ear of the user and outside of the pinna when viewed in the sagittal plane when the support structure sits on the head of the user, the headphone further comprising a baffle (120) extending from the first housing on the side of the first port farthest from the ear, the baffle covering a portion of the pinna when viewed from the sagittal plane".

XIII. Claim 1 of **auxiliary request 7** includes all the features of claim 1 of auxiliary request 5, where feature (o) is replaced by the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (o)):

(q) ", wherein the low frequency driver is located off an ear of the user and outside of the pinna when viewed in the sagittal plane, the headphone further comprising a baffle (120) extending from the first housing on the side of the first port farthest from the ear, the baffle covering a portion of the pinna when viewed from the sagittal plane, and wherein the high frequency driver is carried by the

baffle".

XIV. Claim 1 of **auxiliary request 8** includes all the features of claim 1 of the main request, with the alternative "upper torso" removed from feature (b).

XV. Claim 1 of **auxiliary request 9** includes all the features of claim 1 of auxiliary request 8 and further includes, at the end, the following feature (board's feature labelling):

(r) "wherein the high frequency driver is enclosed by a second housing (123), different from the first housing (111), defining a rear chamber acoustically coupled to the rear side of the high frequency driver."

XVI. Claim 1 of **auxiliary request 10** includes all the features of claim 1 of auxiliary request 9 and further includes, at the end, the following feature (board's feature labelling):

(s) ", and wherein a polar pattern of the high frequency acoustic driver exhibits a higher order directional pattern."

XVII. Claim 1 of **auxiliary request 11** includes all the features of claim 1 of auxiliary request 8 and further includes, at the end, the following feature (board's feature labelling):

(t) "wherein the high frequency driver is mounted such that it radiates directly towards the ear".

XVIII. Claim 1 of **auxiliary request 12** includes all the features of claim 1 of auxiliary request 8 and further

includes, at the end, feature (q).

XIX. Claim 1 of **auxiliary request 12A** includes all the features of claim 1 of auxiliary request 8 and further includes, at the end, the following feature (board's feature labelling and underlining, the latter reflecting amendments vis-à-vis feature (q)):

(u) "wherein the low frequency driver is located off an ear of the user and outside of the pinna when viewed in the sagittal plane, the headphone further comprising a baffle (120) adjacent the low frequency acoustic driver (110) and extending from the first housing downward toward the transverse plane of the ear on the side of the first port farthest from the ear, the baffle covering a portion of the pinna when viewed from the sagittal plane, and wherein the high frequency driver is carried by the baffle".

XX. Claim 1 of **auxiliary requests 1mod to 7mod** (with the label "2mod" being used for two different, consecutive claim requests) and **auxiliary requests 9mod to 12mod** concerns a "method of using" the headphone according to claim 1 of auxiliary requests 1, 2, 2A, 3 to 7 and 9 to 12 respectively.

Reasons for the Decision

1. *Technical background*

1.1 The opposed patent concerns a headphone. It aims at providing a headphone that does not completely shield the wearer off from the outside acoustic environment. The appellant used in this context the term "open

headphone". A particular embodiment of the invention underlying the opposed patent is shown in Figure 5 (reproduced below).

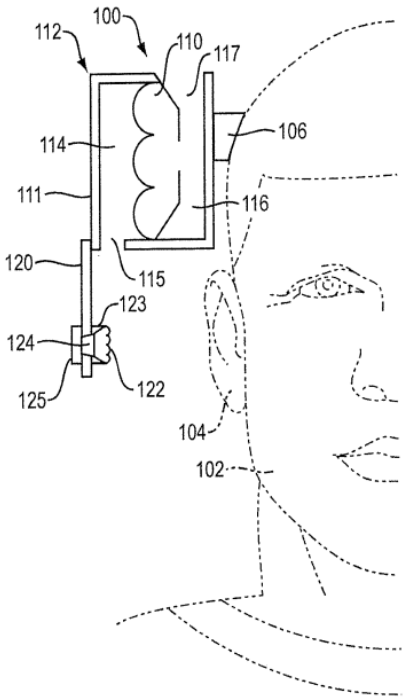

FIG. 5

1.2 This figure shows headphone 100 with support structure 106 that includes high-frequency acoustic driver 122 and low-frequency acoustic driver 110. The latter is in turn enclosed by housing 111 that defines a front chamber 114 and a rear chamber 116. Port 115 is acoustically coupled to the front of low-frequency acoustic driver 110 and port 117 to its rear. Moreover, reference numeral 120 is supposed to depict a "baffle".

2. *Main request: claim 1 - novelty*

2.1 In Reasons 13.1.4.2 of the appealed decision, the opposition division found that document **D1** disclosed all the features of claim 1 as granted.

2.2 The appellant disputed that this document disclosed parts of **features (d) and (f) to (i).**

2.3 As to **feature (d)**, the appellant could persuade the board that D1 indeed fails to disclose directly and unambiguously that the "high-frequency acoustic driver" is supposed to be located "closer" to the user's ear, i.e. D1 fails to disclose the following sub-feature of feature (d):

(d_1) the high-frequency acoustic driver is carried by the support structure such that the high-frequency acoustic driver is located closer to the user's ear than the low-frequency acoustic driver.

The board understands this "result to be achieved" language of sub-feature (d_1) as meaning that it is the "support structure" of the claimed "headphone" that actually ensures the relative location of the "high-frequency acoustic driver" as claimed, and not the headphone user. According to the opposed patent itself (see paragraph [0040] of the patent description), this result is in fact achieved by arranging the headphone such that the high-frequency driver "is carried by or otherwise mechanically coupled" to a "baffle". This, however, is not indicated in claim 1. Nevertheless, in the appellant's favour and in order to dispel the appellant's apparent doubts as to the board's objective claim interpretation (see the appellant's assertion in relation to features (c) and (d) that it corresponded to an "interpretation of a sophist playing with words with a mind desirous to misunderstand" in its reply letter of 22 January 2025 and point 6.1 below), the board assumes in what follows that the "support structure" *alone* is able to ensure

that particular positioning.

2.4 In relation to the remainder of feature (d) and regarding features (f) to (i), the board makes the following observations:

2.4.1 Concerning **feature (d)**, the board agrees with Reasons 13.1.1.2 and 13.1.3.2 of the appealed decision to the extent that the skilled reader would readily gather from the paragraph bridging pages 13 and 14 and from lines 23 and 24 of page 23 of D1 that the "alternate embodiment" involving a low-frequency acoustic driver combined with a high-frequency one described starting from line 29 of page 15 of D1 can well be applied to any of the embodiments shown in Figures 5 to 8 and 13 to 15 of D1. The skilled reader would also immediately recognise that "woofer" speaker 158 and "tweeter" speaker 164 mentioned at lines 4 to 13 of page 16 of D1 are examples of such low-frequency and high-frequency acoustic drivers, respectively. Hence, the board concurs with Reasons 13.1.3.2 of the appealed decision in that the skilled reader would instantly understand that transducers 122 and 124 shown on the opposite sides of a user's head in Figures 13 and 14 of D1 can both be replaced by a combination of a "woofer" and a "tweeter" speaker. Accordingly, this results in a configuration where the low- and high-frequency drivers are unequivocally located "off of the ear of the user".

The reasons why the appellant's arguments in this regard failed to convince are as follows:

(a) The appellant argued that document D1's "alternate embodiment" was only an abstract teaching that provided no concrete implementation of the

"tweeter/woofer arrangement" mentioned e.g. at page 11, line 8 in the arrangements of Figures 13 to 15 of D1. It emphasised that direct replacement of a low-frequency driver with a smaller high-frequency driver was impractical due to their "difference in footprint".

The board does not find this convincing because the *technically skilled* reader would readily recognise, based on their common general knowledge, the need for either an enclosure adaptation or the use of multiple smaller drivers in the arrangements of Figures 13 to 15 of D1. The board, however, sees a direct and unambiguous indication for the latter alternative in D1, given the passage at lines 23 to 27 of page 23 of D1 explicitly teaching to use multiple low-frequency transducers to increase bass response and the phrase at lines 29 to 32 of page 15 disclosing that multiple transducers of both types are to be used together.

(b) Moreover, the board does not share the appellant's concern that replacing transducers 122 and 124 by a woofer/tweeter combination, as suggested in D1's "alternate embodiment", would contradict document D1's focus on improving the low-frequency response. While such an improvement is, of course, a major challenge for the headphone arrangements shown in Figures 13 to 15 of D1, it is, contrary to what the appellant suggested, not D1's *sole* focus: the "alternate embodiment" of D1 clearly aims at improving "over-all high fidelity performance" (cf. the sentence bridging pages 15 and 16 of D1), as will be analysed more in-depth in point 4.9 below.

2.4.2 In relation to **features (f) to (i)**, the board concurs with Reasons 13.1.3.2 and 13.1.4.2 of the appealed decision. Hence, it does not agree with the appellant that the opposition division added technical information to the disclosure of D1 by using "a generic statement in D1 mentioning the possibility of providing a tweeter and a woofer to simply replace transducers in each and every concrete embodiment of D1": in the board's view, the skilled reader would directly and unambiguously understand from D1, for the reasons set out in point 2.4.1 above, that this replacement is indeed possible and technically sensible, at least for the embodiments reflected in Figures 5 to 8 and 13 to 15 of D1.

2.5 In conclusion, the subject-matter of claim 1 is indeed new over D1 (Article 54 EPC), but only on account of **sub-feature (d_1)**.

3. *Request for remittal*

3.1 The appellant supported its request for remittal of the case to the opposition division for further prosecution (cf. point IV above) by pointing out that the issue of inventive step was not addressed in the appealed decision regarding the main request. In its view, this issue was not part of the appeal proceedings. Furthermore, the appellant alleged that it was not customary for a board - also in view of the purported practice of *other* boards - to extend the scope of judicial review as defined by Article 12(2) RPBA.

3.2 The board recalls however that Article 12(2) RPBA mainly concerns obligations on the parties and not the board (cf. **T 862/16**, Reasons 2.8 and 8, in particular Reasons 8.3.1). In addition, Article 12(2) RPBA states

that there is a "primary object of the appeal proceedings", which is the review of the contested decision in a judicial manner; however, where there is a *primary* object, there must also be a *secondary* object, and part of this secondary object is in fact the board's *ex-officio* powers as enshrined in Article 114(1) EPC. The board does not see, therefore, any restriction of its power conferred by Article 114(1) EPC to raise new objections of its own motion (see also **T 655/21**, Reasons 1.7, in particular Reasons 1.7.1). Moreover, as acknowledged by the appellant, at least two written submissions addressed the issue of inventive step in the course of the overall proceedings, namely the notice of opposition and the statement of grounds of appeal. In both submissions, this was done with respect to **sub-feature (d_1)**, based on which the board acknowledged novelty over D1 (see point 2 above).

3.3 Therefore, the board considers that it is not necessary and appropriate to remit the case to the opposition division for further prosecution (Article 111(1), second sentence, EPC). In particular, it sees no "special reasons" to do so (Article 11 RPBA).

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

4.1 For the reasons set out in point 2.3 above, the board finds that D1 does not directly and unambiguously disclose **sub-feature (d_1)**. Hence, the positioning of the claimed drivers relative to the user's ear is the sole distinguishing feature in view of document D1.

4.2 Although this distinguishing feature appears to constitute the result of a straightforward selection exercise relating to binary implementation choices

dictated by practical needs, namely locating one of the respective drivers "closer" to the user's ear than the other one, again in the appellant's favour, the board provides an in-depth inventive-step analysis below.

4.3 Given that the appealed decision only concerned novelty in relation to claim 1 of the main request, the board will conduct its inventive-step analysis starting from document **D1** based on the two written submissions mentioned in point 3.2 above:

- In its notice of opposition, the opponent considered the following technical problem (**TP**) associated with feature (d_1):

> "den 'high frequency acoustic driver' und den 'low frequency acoustic driver' derart am Ohr anzuordnen, dass sowohl die hohen Frequenzen des 'high frequency acoustic driver' als auch die tiefen Frequenzen des 'low frequency acoustic driver' zuverlässig zum Ohr gelangen",

which reads in translation:

> "arranging the 'high frequency acoustic driver' and the 'low frequency acoustic driver' relative to the ear in such a way that both the high frequencies of the 'high frequency acoustic driver' and the low frequencies of the 'low frequency acoustic driver' reliably reach the ear".

The board will refer in what follows to the opponent's technical problem using the label "**TPO**".

- Conversely, in its statement of grounds of appeal, the appellant considered the associated technical problem of (board's labelling):

  TPP:
  "improving an open headphone with low spillage".

It will be explained in points 4.4 to 4.6 below that neither technical problem **TPO** nor technical problem **TPP** can actually be derived from effects directly and causally related to the technical features of the claimed invention. The board's formulation of the objective technical problem is to be found in point 4.7 and the associated obviousness analysis in points 4.8 and 4.9 below.

4.4 In the board's view, **TPO** relies on the implicit assumption that the closer "high-frequency driver" position as per sub-feature (d_1) directly translates to a closer acoustic source as perceived by the user's ear. This assumption is reasonable in a basic, *direct*-radiating *open* headphone, but this is not explicitly required by claim 1. The board finds that the claim language encompasses acoustic manipulations (such as ports, chambers or waveguides) that could in fact decouple the configuration of the acoustic-driver positions from the perceived sound-source location. Stated differently, there is a potential disconnect in the context of claim 1 between the relative geometric positioning in accordance with sub-feature (d_1) and any resulting acoustic behaviour. This in turn means that the effect of sound reliably reaching the user's ear is *possible* if the sound radiates "directly", but is not *guaranteed* by the claim wording.

4.5 In relation to **TPP**, the board finds that none of the features (a) to (i) specifically concern an *open* headphone (cf. point 1.1 above), contrary to the appellant's allegations. The appellant posited in this regard that the limitations according to features (c) and (d) that both drivers are located "off of the ear" of the user necessitates an *open* arrangement.

While the board acknowledges that it is a plausible understanding that there may be an *open* arrangement, it is not the only one that is technically sound. The skilled reader would in particular be aware that the phrase "off of the ear" does not necessarily exclude the presence of circumaural or supra-aural earcups. Quite the contrary: in common headphone designs, especially those with earcups, the acoustic driver itself is typically not in direct physical contact with the ear. There is usually a physical separation, for an earcup-type headphone often including intervening materials like foam or fabric. This again shows how important it is that a claim is interpreted from the view point of a reader skilled in the relevant field (i.e. the field of "hearing devices" here). Therefore, features (c) and (d) are in fact consistent with, and do not preclude, the presence of earcups that create a sealed or semi-sealed acoustic chamber around the user's ear. Claim 1 describes a geometric relationship (namely acoustic-driver positions relative to the ear) rather than explicitly defining the overall acoustic architecture as "open" or "closed". The absence of any features excluding earcups further underlines this.

4.6 Moreover, still in relation to **TPP**, "spillage" is not necessarily of any concern according to the claimed features. The appellant made in that regard several references to paragraphs of the patent specification,

explaining that these references demonstrated that TPP actually relied on a technical effect that was "encompassed" by the technical teaching of the originally disclosed invention underlying the opposed patent within the meaning of **G 2/21** (Headnote II).

4.6.1 The board is not convinced. Before addressing the appellant's references in detail, the board wishes to clarify that the derivability of a credible technical effect (for the purposes of assessing inventive step) from the original description may, if at all, only be seen as a *necessary* requirement but not a *sufficient* one in view of e.g. **G 1/19**, Reasons 124 (in particular the sentence: "[...] only those technical effects that are at least implied in the claims should be considered in the assessment of inventive step"). This means that the conclusions of **G 2/21** cannot be used to bypass the fundamental requirement that the claimed features must credibly achieve the asserted technical effect: the decisive question remains whether the claimed features themselves, as understood by the skilled person, credibly bring about the technical effect over the entire scope claimed.

4.6.2 The appellant explained that the behaviour of high- and low-frequency sound normally differed in terms of directivity and spillage. In that context, it referred to paragraph [0031] of the opposed patent, where it was disclosed that, for the frequency range from 20 to 2000 Hz, it is desirable to implement the associated low-frequency driver with a polar pattern in the form of a *dipole* because such a polar pattern involved a cancellation of the sound in its far-field region. Conversely, for high frequencies it was desirable to reduce the radiation from the back and achieve a *(hyper-)cardioid* pattern as the sound radiated to the

environment at these frequencies was perceived to be "more annoying".

Yet, feature (d_1) only specifies the relative physical positions of the acoustic drivers and does not provide details on how the sound actually reaches the user's ear (cf. point 4.4 above). Instead, paragraph [0031] of the opposed patent describes the *intended* or *desired* acoustic behaviour and not the claimed structure. It mainly focuses, in a *single-driver* context illustrated in Figure 1 of the opposed patent, on acoustic "impedance matching" between the front and rear sides of driver 32, which is presented as crucial for achieving the desired dipole behaviour at low frequencies. This strongly suggests that the acoustic design of the chambers and openings/ports, and the use of acoustic resistance materials, are the primary means for achieving the desired radiation patterns – not simply the relative distance of the driver from the user's ear. Critically, paragraph [0031] of the opposed patent does not even mention the relative positioning of a high-frequency and low-frequency driver. Rather, it discusses the behaviour of a *single* driver (or, implicitly, a *dual*-driver system where the drivers are treated independently at their respective frequency ranges). The concept of "closer to the ear" is however absent from this discussion. Furthermore, even if the design intent was related to dipole/cardioid behaviour, claim 1 does not prevent the use of acoustic elements that could significantly alter the sound path and effective source location, undermining any direct link between driver positions and a perceived spillage. The claim does not define from which point the sound is emitted. Also, claim 1 does not mention any "impedance matching". A headphone could well meet the claim language without having any impedance-matched "front

and rear chambers" and therefore without achieving the intended "dipole behaviour". Moreover, in order to achieve "low spillage" to the acoustic environment by means of such a dipole behaviour, the low-frequency acoustic driver's cancellation plane must necessarily be oriented such that it minimises sound radiating *outwards*, i.e. away from the user's head. Nonetheless, claim 1 is entirely silent as regards such an orientation.

4.6.3 The appellant further explained its viewpoint by referring to Figure 5 of the opposed patent. There, it was shown that the low-frequency driver was positioned further away from the user's ear because low-frequency sound travelled "more freely" and was "less annoying" than high-frequency sound. This was the reason, in the appellant's view, why low-frequency acoustic driver 110 was depicted as "floating" over the ear, instead of "occluding" the ear. Conversely, high-frequency acoustic driver 122 was "closer" to the ear such that the user could hear signals at higher frequencies better.

Nonetheless, a distinction between "floating" and "occluding" is not part of the claim language. Claim 1 simply requires both acoustic drivers to be "off of an ear". Whether these acoustic drivers are "floating", attached to a "baffle" (see point 2.3 above) or enclosed in a (non-sealing) housing is however not specified.

4.6.4 The appellant also referred to the test results shown in Figures 6a and 6b and to paragraph [0042] of the opposed patent, which illustrated the "dipole" behaviour at *low* frequencies and the "[h]ighly directional" behaviour at *high* frequencies.

However, Figures 6A and 6B and paragraph [0042] of the opposed patent do not support the appellant's argument. They demonstrate that the desired acoustic behaviour *can* be achieved, but they do so by showing a specific implementation that relies on many (partly unknown) factors beyond the relative acoustic-driver positioning specified in feature (d_1).

4.7 In view of the above considerations, the board finds it difficult to discern a technical effect which **feature (d_1)** would credibly achieve over the whole scope claimed. As indicated by the board during the oral proceedings before it, this feature provides, at most, a practical arrangement of the high- and low-frequency acoustic drivers in terms of their relative positions (see point 4.2 above). This means however that the objective technical problem (**OTP**) can, at best, be formulated as "how to practically arrange the high- and low-frequency acoustic drivers in the 'alternate embodiment' of D1 in terms of their relative positions".

4.8 In relation to obviousness, the board finds that the skilled person, starting from D1 and faced with the above OTP, would have made a choice between two equally likely alternatives, namely to locate either the low-frequency acoustic driver or the high-frequency acoustic driver "closer" to the user's ear when the headphone is worn as shown in Figures 13 to 15 of D1. As a result, sub-feature (d_1) cannot lead to the acknowledgement of an inventive step.

4.9 The appellant disputed that these two alternatives were equally likely. It argued that there was a "strong teaching" in D1 that the sound-output opening for one frequency range was as close to the user's ear as

possible (while the opening for another frequency range was arranged as far away from the ear as possible). In that regard, it referred to page 4, lines 17 to 19 of document D1 to support this. The appellant explained this further in view of page 4, lines 7 and 8 of D1 and argued that, in a "tweeter/woofer arrangement", this "closer sound-output opening" related to the "woofer" since D1 was relying on boosting low-frequency output. The appellant also referred to page 2, lines 25 to 27 of D1 in this regard to illustrate that D1 focused on the "low-frequency response" even for a *single*-speaker arrangement. The appellant argued that D1 only pointed away from sub-feature (d_1) and that the skilled person would not have overridden the general teaching of D1 to focus on the low-frequency response. It concluded that the skilled person would therefore not have put the high-frequency driver "closer" to the user's ear.

However, assuming that the passages on pages 2 and 4 as cited by the appellant indeed go beyond stating merely how the "best results" can be obtained, the board disagrees that document D1's focus is solely on the "low-frequency response". Instead, D1 aims at a balanced sound, not just boosted bass, as is apparent from the expression "over-all high fidelity performance" in the context of the "alternate embodiment" which is used in the sentence bridging pages 15 and 16 of D1 (cf. point 2.4.1(b) above). In fact, this explicit mention of "over-all high fidelity performance" reinforces the obviousness of placing the "high-frequency driver" closer to the user's ear. This is because high fidelity, by definition, requires accurate reproduction of both high and low frequencies. A skilled person would have therefore known, from basic acoustics, that high-frequency driver positioning is more critical for achieving high-fidelity sound than

low-frequency driver placement and that it is in this respect beneficial to place the high-frequency driver closer to the user's ear when in use.

4.10 In conclusion, the subject-matter of claim 1 of the main request does not involve an inventive step (Article 56 EPC). As a result, the ground for opposition under Article 100(a) in conjunction with Article 56 EPC indeed prejudices the maintenance of the patent as granted.

5. *Auxiliary requests 1, 2, 2A, 3 to 12 and 12A: claim 1 - allowability*

As regards **auxiliary requests 1, 2, 2A, 3 to 12 and 12A**, the board cannot see how the amendments underlying claim 1 of these claim requests could render the associated claim requests allowable under the EPC. The reasons for this are as follows:

5.1 In relation to **auxiliary requests 1 and 8**, the board notes that amended **feature (b)** of present claim 1 (cf. points VI and XIV above) is still disclosed in Figures 13 to 15 of D1, even with the alternative "upper torso" being removed. In addition, and further relating to **auxiliary request 1**, the same applies to the phrase "when the support structure sits on the head of the user" mentioned in **feature (j)**. Hence, these amendments do not require any alteration of the board's reasoning set out in points 4.7 to 4.9 above. As a consequence, auxiliary requests 1 and 8 are not allowable under Article 56 EPC either.

5.2 Concerning **auxiliary requests 2 and 2A** and the associated **features (k) and (l)**, the board notes that the direction of propagation of the acoustic waves

produced by the "high frequency driver", in particular by its "diaphragm", will typically depend on several factors (which are however not reflected in claim 1). One of these factors is the presence of *other* loudspeakers that could result in the formation of acoustic beams in certain directions. Another factor is the casing surrounding the "high-frequency acoustic driver". This casing could, for instance, comprise a guiding structure that directs the sound wave in a particular direction. Claim 1 of **auxiliary request 2** is however silent regarding these factors. The wording of claim 1 even encompasses the case that the headphone user mounts the respective driver accordingly. This in turn means that the skilled reader cannot verify whether the "high-frequency acoustic driver" in accordance with feature (k) will have at least one orientation of the claimed "headphone" where a direct "acoustic path" is present from the "high-frequency acoustic driver" to the user's ear. The same applies for the "diaphragm" mentioned in feature (l). Therefore, the board agrees with Reasons 19.3 and 23.3 of the appealed decision in that features (k) and (l) render claim 1 unclear (Article 84 EPC). In that regard, the appellant's argument that the phrase "radiates directly towards the ear" used in feature (k) was clear because it described a *structural* mounting arrangement of the "high-frequency driver" could not convince. This is because this argument conflates the aspect of describing a *structure* with ensuring a *functional* outcome: defining a mounting arrangement *per se* does not warrant the acoustic performance of "direct radiation". In particular, claim 1 lacks limitations on materials, baffle shape, driver orientation on the baffle and other factors that could prevent "direct" radiation, even if the "high-frequency driver" is mounted as required in claim 1. This applies also when

taking into account the appellant's reference to Figure 5 of the opposed patent: while this figure may illustrate a particular example of direct radiation, the reference to a specific drawing cannot, by itself, clarify a claim that is unclear on its merits. Hence, auxiliary requests 2 and 2A are not allowable under Article 84 EPC.

5.3 As regards **auxiliary requests 3 to 7**, the board agrees with Reasons 20 of the appealed decision that the phrase "wherein the high frequency driver is mounted such that it radiates directly towards the ear when the support structure sits on the head of the user" formulated again in a "result to be achieved" language in **features (m) and (n)** is not clear either (Article 84 EPC). In particular, the board concurs with the opposition division's assessment made in Reasons 19.3 of the appealed decision regarding the lack, in the claimed "headphone", of *structural* features from which a "specific radiation direction associated with the high frequency driver" would indeed be apparent. In that context, the opposition division is right that a "high frequency driver" typically radiates in various directions. The requirement that this driver "radiates directly towards the ear" introduces an ambiguity in the sense that it could mean that

- there must be an unobstructed straight line between the driver's "diaphragm" and some part of the user's ear

or that

- there are no solid objects blocking the sound path, but allows for acoustic elements like ports,

waveguides or even air gaps.

This ambiguity entails that there is no objective way to determine whether a given headphone actually meets this requirement. It is not resolved by **features (o) to (q)** either. In particular, it is not clear to the skilled reader whether the respective sound signal has to travel through the "baffle" to reach the user's ear. Even if so, the "baffle" mentioned in **features (p) and (q)** does not necessarily ensure a *direct* radiation of the "high frequency driver" towards the user's ear. Quite the opposite: this "baffle" actually increases the ambiguity about "direct radiation", as the baffle itself could be seen as interfering with "direct" radiation depending on whether or not the baffle has some openings through which the sound signal may travel. Hence, also auxiliary requests 3 to 7 are not allowable under Article 84 EPC.

5.4 Concerning **auxiliary requests 9 and 10**, the board finds that **features (r) and (s)** are, at most, mere matters of routine design. As set out in point 2.4.1(a) above, "enclosure adaptations" in the sense of introducing a dedicated housing for each of the acoustic drivers in the system of D1 belongs to the skilled person's common general knowledge. Moreover, the board notes that, when the headphone is in use, the "second housing" as per feature (r) need not be located on the same side of the user's head as the "first housing" in accordance with features (f) to (i). The appellant's reference to the term "the ear" in accordance with feature (d) could not persuade the board that the first and second housings recited in claim 1 must be located on the same side with respect to the user's head: while the use of the definite article in this term indeed means that the *same* ear is used as a reference for the location of the

low- and high-frequency acoustic driver, implying a relationship *relative to the (same) ear*, it does not define a relationship of the two acoustic drivers *relative to each other*, at least not to the extent that both need to be placed on the same side. In other words, the term "the ear" according to feature (d) does not prevent these acoustic drivers from being arranged on the opposite sides of the user's head when the "headphone" is in use. In sum, auxiliary requests 9 and 10 are not allowable under Article 56 EPC either.

5.5 In relation to **auxiliary request 11**, the same reasoning as set out in point 5.3 above applies in view of the phrase "the high frequency driver is mounted such that it radiates directly towards the ear" in accordance with **feature (t)**. This, however, means that this feature similarly renders the associated claim unclear and that this auxiliary request is likewise not allowable under Article 84 EPC.

5.6 Concerning **auxiliary request 12**, the board endorses the opposition division's assessment regarding compliance with Article 123(2) EPC given in Reasons 38.3 of the appealed decision. The opposition division rightly observed that "for the possibility that the housing is located behind the ear [cf. the fifth sentence of paragraph [0048] of the description as filed], there is no disclosure of another arrangement of the baffle than extending downward from the housing". In contrast, the "baffle" as per **feature (q)** covers a portion of the user's "pinna", irrespective of the baffle's orientation.

The appellant's arguments in this regard could not sway the board:

5.6.1 The appellant contended that claim 1, even with **feature (q)**, still defined the "relative arrangement" of the housing and baffle with respect to the user's pinna. However, this is irrelevant to the issue of added subject-matter. The explicit directional limitation ("downward toward the transverse plane of the ear") disclosed in paragraph [0049] of the application as filed, in conjunction with the function of covering a portion of the user's pinna as stated in that paragraph [0049], defines a *specific* spatial relationship. Removing this limitation, however, broadens the claim's scope beyond what was originally disclosed, encompassing baffle orientations that are not directly and unambiguously derivable from the application as filed.

5.6.2 The board also disagrees with the appellant's understanding of the original disclosure as to the baffle's orientation. While paragraph [0048] as filed allows, as the appellant observed, some flexibility in the housing's position ("above or behind" the user's ear), paragraph [0049] as filed explicitly links the baffle's "downward" extension to a housing positioned *above* the user's ear and its function of covering the user's pinna. For a housing *behind* the ear, the requirement of achieving the same pinna coverage implies a "forward" extension on the part of the baffle. This means that the original disclosure consistently links the baffle's orientation to two features, namely the housing position and the pinna coverage. The appellant, however, inferred from the flexibility in housing position that any directional limitation for the baffle can be omitted. Yet, the application as filed does not provide a direct and unambiguous disclosure for disconnecting the baffle's orientation from these two features. Neither the

explicitly disclosed "downward" extension nor the implied "forward" extension supports removing all directional limitations regarding the "baffle".

5.6.3 In the same vein, the appellant considered the baffle's extension direction not to be inextricably linked to its function. However, this is incorrect: paragraph [0049] as filed actually presents the baffle's orientation "extending from housing 111 downward toward the transverse plane of the ear" as part of a functional description, namely of how the baffle covers a part of the user's pinna and redirects sound. The direction is not presented as arbitrary or optional here: it is rather integral to how the baffle achieves its stated purpose in the disclosed context. Removing this directional limitation allows for configurations where the baffle would not necessarily perform its disclosed function. As a consequence, auxiliary request 12 is indeed not allowable under Article 123(2) EPC.

5.7 As regards **auxiliary request 12A**, the board concurs with Reasons 40.3 of the appealed decision that claim 1 is unclear (Article 84 EPC). The opposition division correctly regarded the baffle's acoustic property of "re-directing [of radiation leaving port 115] toward the ear of the user" as set out in paragraph [0049] of the description as filed to be "non-optional". The features of claim 1, in particular **feature (u)**, do not guarantee that the "baffle" mentioned in feature (u) actually achieves its intended function: feature (u) defines the presence and position of the baffle but not its acoustic properties. This means that, as rightly observed by the opposition division, claim 1 of auxiliary request 12A "does not define all the features essential to the definition of the invention".

The board did not find the appellant's arguments in this regard persuasive:

5.7.1 The appellant argued that present claim 1 defined the structural relationship of the baffle, low-frequency driver housing, first port and user's ear, and that this structural arrangement inherently led to the desired effects of constraining and redirecting sound from the first port towards the user's ear. The appellant further asserted that it was unnecessary to explicitly include these effects as claim limitations and that no essential features were therefore missing.

5.7.2 However, the fundamental requirement of Article 84 EPC is that the claims be clear *in themselves*. Moreover, an independent claim should explicitly specify all of the "essential features" needed to define the invention in order to comply with the provisions of Article 84 EPC (see also Rule 43(1)(a) EPC) and, according to the jurisprudence of the Boards of Appeal, "essential features" are those features which are necessary to obtain the desired effect or to solve the technical problem with which the application is concerned (see e.g. **T 1180/14**, Reasons 2.1.1, and the decisions cited therein).

In the present case, the technical effect relied upon is, as acknowledged in Reasons 40.3 of the appealed decision, "reduced spillage" (or, as referred to more broadly by the appellant, "improved sound delivery to the ear"). Yet, claim 1 fails to meet the above requirement of Article 84 EPC. Instead, it crucially omits any limitations on the baffle's acoustic properties (e.g. its material or shape) that would ensure its intended function of redirecting sound. Furthermore, it gives no details on the precise

position of a port such as port 115 as disclosed in paragraph [0049] of the description as filed. Thus, the appellant's assertion that the defined structural relationship "leads to" the desired effect is insufficient. The claimed features must *ensure*, not merely *suggest*, that the relied-upon technical effect is credibly achieved over the whole scope claimed. In other words, claim 1 describes a structure that *might* achieve the desired effect under certain conditions and parameter constellations, but it does not *require* the structure to do so. Therefore, essential features that are necessary to ensure the functional outcome are missing. Thus, auxiliary request 12A is not allowable under Article 84 EPC either.

5.8 Hence, auxiliary requests 1, 2, 2A, 3 to 12 and 12A are not allowable under Articles 56, 84 or 123(2) EPC.

6. *Auxiliary requests 1mod to 7mod and 9mod to 12mod: admittance*

6.1 The appellant filed **auxiliary requests 1mod to 7mod** and **9mod to 12mod** in response to the board's communication under Article 15(1) RPBA. It did so since the board had introduced "a variety of different new lines of attacks and arguments". It particularly found fault with the board's claim interpretation. In this respect, when addressing the board's claim interpretation of claim 1 of the main request, the appellant mentioned in its response, *inter alia*, that this interpretation was one "of a sophist playing with words with a mind desirous to misunderstand (of the type appearing in one of Plato's dialogs)".

6.2 The assertion comparing the board to a "sophist playing with words" is, of course, not only unbefitting but

also does certainly not help the appellant in its case. Such an assertion says more about the overly broad claim wording than about how the board has interpreted the respective claim. In that regard, the board reiterates its established position on claim interpretation. As stated in **T 10/22** (Reasons 2.3), the frequently invoked concept of "a mind willing to understand" simply means that the skilled reader, when considering a claim, should rule out interpretations that are illogical or that do not make technical sense. This understanding of the concept, however, cannot be disregarded based on what a party might find convenient in specific circumstances.

6.3 Furthermore, the board recalls its position on the purpose of a board's preliminary opinion contained in its Article 15(1) RPBA communication. As the board observed in **T 2271/18** (Reasons 3.3), a clear and detailed preliminary opinion is intended to facilitate thorough preparation for the imminent hearing and a focused response from the parties. It is not an invitation to introduce new submissions, especially not submissions that are accompanied by unsubstantiated assumptions on the board's claim construction comparing it to a way of argumentation of ancient Greek philosophers. The board does not accept that it introduced "new lines of attack" in its communication. It may well have given "new arguments" which relate to the interpretation of the claims but the appellant failed to demonstrate that this does, as such, constitute "exceptional circumstances".

6.4 The board therefore considers the reasons provided by the appellant regarding the admittance of auxiliary requests 1mod to 7mod and 9mod to 12mod not to justify the presence of "exceptional circumstances" within the

meaning of Article 13(2) RPBA. Hence, the board decided not to admit these auxiliary requests into the appeal proceedings.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

B. Brückner K. Bengi-Akyürek

Decision electronically authenticated