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Datasheet for the decision of 17 March 2023

Case Number: T 1940/17 - 3.2.05

Application Number: 11711059.3

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Language of the proceedings: EN

Title of invention:
Sonotrode

Patent Proprietor:
Tetra Laval Holdings & Finance S.A.

Opponent:
Telsonic Holding AG

Relevant legal provisions:
EPC Art. 54, 56
RPBA 2020 Art. 12(8)

Keyword:
Decision in written proceedings
Novelty - main request (yes)
Inventive step - main request (yes)

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Case Number: T 1940/17 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 17 March 2023

Appellant: (Opponent)	Telsonic Holding AG Industriestrasse 6b 9552 Bronschhofen (CH)
Representative:	Hepp Wenger Ryffel AG Friedtalweg 5 9500 Wil (CH)
Respondent: (Patent Proprietor)	Tetra Laval Holdings & Finance S.A. Avenue Général-Guisan 70 1009 Pully (CH)
Representative:	Di Sciuva, Michele Studio Torta S.p.A. Via Viotti, 9 10121 Torino (IT)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 27 July 2017 concerning maintenance of the European Patent No. 2550149 in amended form.**

Composition of the Board:

Chairman	P. Lanz
Members:	M. Holz
	C. Brandt

Summary of Facts and Submissions

I. The opponent appealed against the interlocutory decision of the opposition division finding that, account being taken of the amendments made by the patent proprietor during the opposition proceedings according to the main request, European patent No. 2 550 149 and the invention to which it related met the requirements of the EPC.

II. The following documents submitted during the first-instance proceedings are relevant to the present decision.

D2 EP 1 241 099 A1
D3 EP 1 127 794 A2
D4 EP 0 615 907 B1
D6 P.L.L.M. Derks: "The design of ultrasonic resonators with wide output cross-sections", 1984
D7 EP 1 097 869 A1
D8 Declaration by Dr. W. Littmann: "Analyse und Beurteilung spezifischer ultraschalltechnischer Merkmale in ausgewählten Dokumenten", 2017

III. The parties were summoned to oral proceedings before the board scheduled for 2 March 2023.

The board issued a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal of the European Patent Office applicable with effect from 1 January 2020 (RPBA 2020, see OJ EPO 2021, A35), which applies to the appeal in hand pursuant to Article 25(1) RPBA 2020. The board thereby informed the

parties, *inter alia*, of its preliminary opinion that the subject-matter of claim 1 of the respondent's main request was new and involved an inventive step. The board explained that, in view of this preliminary opinion, the appeal was likely to be dismissed.

By letter of 6 February 2023, the appellant withdrew its auxiliary request for oral proceedings and informed the board that it would not be attending the oral proceedings scheduled for 2 March 2023. It did not file any submissions regarding the merits of the case.

The oral proceedings were subsequently cancelled.

IV. The opponent (appellant) requests that the decision under appeal be set aside and that the patent be revoked.

The patent proprietor (respondent) requests that the appeal be dismissed or, as an auxiliary measure, that the decision under appeal be set aside and that the patent be maintained as amended based on the claims according to one of the first to eighth auxiliary requests filed with the reply to the appellant's statement of grounds of appeal on 23 May 2018.

V. Claim 1 of the main request on which the decision under appeal was based reads as follows (the feature numbering employed by the board is included in square brackets):

"**[1]** *A sonotrode (1) comprising:*
[2] *- a head (15) which defines a sealing surface (14) elongated along a first direction (A); and*
[3] *- at least one first and one second drive unit (12)*
[4] *distinct from one another,*

[5] *each comprising at least one piezo-electric element (13);*
[6] *wherein said first and second drive unit (12) are electrically connectable, in use, to a unique generator so as to cause the oscillation, in use, of said head (15) along a second direction (B) transversal to said sealing surface (14) with a wave having a given wavelength;*
[7] *the height (H) of said head (15) measured along said second direction (B) being substantially equal to the half of said wavelength of said oscillation in the direction of said second direction (B);*
[8] *said sonotrode (1) further comprising:*
- at least one first slot (23) which extends through said head (15) transversally to said first and second direction (A, B);
[9] *- at least a finite number of nodal points (20) at, which, in use, the amplitude of the oscillation of said head (15) is substantially equal to zero; and*
[10] *- a plane (P) on which at least some of said nodal points (20) lie and which divides said head (15) in a first portion (21) and in a second portion (22);*
characterized in that
[11] *said at least one first slot (23) extends completely within one (21) only of said first and second portion (21, 22) and at a certain distance from said plane (P).*"

VI. The parties' submissions relevant to the present decision may be summarised as follows:

(a) *Claim interpretation*

(i) *Appellant*

The plane defined in claim 1 was to be understood as a purely two-dimensional object which had no thickness.

The wording "*at a certain distance from said plane (P)*" in feature 11 was not clear since it was not evident how small the distance must be. This wording could thus not delimit the claimed subject-matter from the prior art. According to paragraph [0064] of the patent, the wordings "*extend completely within*" and "*at a certain distance from plane P*" were used as synonyms for "*do not cross plane P*".

(ii) *Respondent*

The nodal plane of claim 1 was to be interpreted as a physical element that had a thickness. This view was supported by document D2 disclosing in column 4, lines 3 to 4 that a nodal plane was defined by an intermediate flange.

Feature 11 required the first slot to be at a distance from the nodal plane. This meant that the distance between the nodal plane and the first slot was greater than zero.

(b) *Respondent's main request - Novelty (Article 54 EPC)*

(i) *Appellant*

The subject-matter of claim 1 of the main request was not new over the contents of each of documents D2, D3, D6 and D7.

For the sonotrodes, paragraph [0028] of document D2 referred to document D4. Figure 4 of document D4 showed that the nodal plane was located centrally at about half the height of edge 6 or at least not exactly at the upper surface of edge 6. In view of document D2's reference to document D4, feature 11 was disclosed in document D2. Feature 11 even covered embodiments in which the distance between the slots and the nodal plane was zero.

In Figure 3 of document D3, the slots did not cross the nodal plane. Feature 11 was thus disclosed in document D3.

Document D6 was comprised in the state of the art under Article 54(2) EPC. On page 135, piezoelectric elements as defined in feature 5 were not expressly mentioned. According to the first paragraph on page 1 and the paragraph bridging pages 1 and 2 of document D6, however, transducers were designed as piezoelectric elements. Against this background, the skilled person would have understood that the transducers on page 135 had piezoelectric elements. In point 2.1 of declaration D8, Dr. Littmann set out that a skilled person in the art of ultrasonic technology would primarily ("*in erster Linie*") think of piezoelectric elements when confronted with the term "ultrasonic transducers",

since piezoelectric elements were by far the most commonly used ultrasonic transducers for exciting resonators to oscillate.

The embodiment shown in Figure 9 of document D7 disclosed all features of claim 1 of the respondent's main request.

(ii) *Respondent*

The subject-matter of claim 1 of the main request was new over the contents of each of documents D2, D3, D6 and D7.

Document D2 did not disclose features 6, 8 and 11 of claim 1 of the main request. Document D3 did not disclose features 5, 7 and 11 of claim 1 of the main request. Document D6 was not comprised in the state of the art under Article 54(2) EPC and did not disclose drive units which each comprised at least one piezo-electric element (see feature 5). The embodiment of Figure 9 of document D7 substantially corresponded to the embodiment of Figure 3 of document D3. Feature 11, at least, was not disclosed in the context of the embodiment of Figure 9 of document D7.

(c) *Respondent's main request - Inventive step (Article 56 EPC)*

(i) *Appellant*

The subject-matter of claim 1 did not involve an inventive step in view of the combination of documents D7 and D4. The objective technical problem in view of document D7 was to arrange the nodal plane at an alternative position in relation to the flange.

Figure 4 of document D4 showed that the nodal plane extended in the central plane (or at least not at the lower surface) of the flange. The skilled person would have applied the position of the nodal plane known from document D4 to the device according to document D7 and would thereby have arrived at a device in which the nodal plane was located in the centre of the flange or at least not exactly at its lower edge. In such an arrangement, the slots were located at a distance from the nodal plane (see feature 11).

The subject-matter of claim 1 did not involve an inventive step in view of document D6. Regarding feature 5, for the skilled person, a piezoelectric element was the most obvious implementation of an ultrasonic transducer. The use of piezoelectric elements was furthermore obvious in view of the piezo elements 7 in document D1 or the piezoelectric exciter device 27 in document D2.

The subject-matter of claim 1 did not involve an inventive step in view of document D2, D3 or D7 either.

(ii) *Respondent*

The subject-matter of claim 1 involved an inventive step in view of the combination of documents D7 and D4. The objective technical problem in view of document D7 did not solely reside in finding an alternative position of the slot but involved obtaining a sonotrode which was able to generate a considerably long sealing band, wherein the vibration was affected as little as possible by additional parasitic frequencies. Neither document D7 nor document D4 provided any suggestion as to how to solve this technical problem. Document D6 did

not anticipate the subject-matter of claim 1 of the main request either.

Reasons for the Decision

1. Decision in written proceedings

Initially, both parties requested oral proceedings as an auxiliary measure. By letter of 6 February 2023, the appellant withdrew its auxiliary request for oral proceedings and informed the board that it would not be attending the oral proceedings scheduled for 2 March 2023.

In the communication under Article 15(1) RPBA 2020, the board had previously informed the parties, *inter alia*, of its preliminary opinion that the subject-matter of claim 1 of the respondent's main request was new and involved an inventive step, and that, consequently, the appeal was expected to be dismissed. In deciding not to attend the oral proceedings, the appellant effectively chose not to avail itself of the opportunity to present its observations and counter-arguments orally, thus choosing instead to rely on its written submissions set out in the statement of grounds of appeal, which are duly considered by the board below.

Since the respondent's main request is allowed, its auxiliary request for oral proceedings remained without procedural consequences.

Therefore, in the present case, the oral proceedings could be cancelled, and the case could be decided in written proceedings (Article 12(8) VOBK 2020).

2. Claim interpretation

The parties have different views on how the skilled person would interpret some of the features of claim 1.

2.1 "*plane*" (feature 10)

The respondent sets out that the nodal plane of claim 1 was to be interpreted as a physical element that had a thickness. The appellant, however, is of the opinion that the skilled person understood the plane defined in claim 1 to be a purely two-dimensional object having no thickness.

According to the Oxford English Dictionary, the term "*plane*" can mean, for example, "*[a] flat geometrical surface which has the property that every straight line joining any two points of the surface lies wholly in the surface, the intersection of two such surfaces being a straight line; a two-dimensional continuum of zero curvature*" (see entry 1.a)) or "*[a] flat or level surface of a material body. Also: the flatness of a material surface*" (see entry 3.a)). These definitions employ the term "surface", which, according to the Oxford English Dictionary, can mean "*[a] continuous extent having only two dimensions (length and breadth, without thickness), whether plane or curved, finite or infinite; ...*" (see entry 3.).

In view of the above, the term "plane" can be understood - at least in one interpretation - as a two-dimensional object. This interpretation is further consistent with paragraph [0056] of the patent ("*... the points of edge 20 define a so-called nodal surface, in particular a so-called nodal plane P...*") and with

the wording of feature 10 ("*... a plane (P) on which at least some of said nodal points (20) lie ...*").

To support its view, the respondent submits that document D2 disclosed in column 4, lines 3 to 4, that a nodal plane was defined by an intermediate flange.

That passage of document D2, however, is not adequate for demonstrating the skilled person's common understanding of the term "plane" used in claim 1. The passage does not contradict the above claim interpretation either. A (flat) flange defines, for example, a first plane comprising the points on the top surface of the flange, a second plane comprising the points on the bottom surface of the flange and a third plane having points which are at the same distance from the first and second planes (i.e. a central plane).

2.2 "*at a certain distance from said plane (P)*" (feature 11)

The appellant submits that the wording "*at a certain distance from said plane (P)*" in feature 11 was not clear since it was not evident how small the distance must be. This wording could thus not delimit the claimed subject-matter from the prior art. According to the respondent, however, feature 11 requires that the first slot be at a distance from the nodal plane, meaning that the distance between the nodal plane and the first slot must be greater than zero.

To support its view, the appellant submits that, according to paragraph [0064] of the patent (the board presumes that a reference to paragraph [0063] is intended), the wordings "*extend completely within*" and

"*at a certain distance from plane P*" were synonyms for the wording "*do not cross plane P*".

The board does not share this view. The last sentence of paragraph [0063] ("*In other words, ...*") can be understood as explaining a consequence of the previously described features. If the slots 23, 27 extend at a certain distance from plane P, they do not cross plane P. This interpretation is also consistent with the subsequent sentence (see paragraph [0064]).

The skilled person thus understands the above-mentioned portion of feature 11 as requiring the first slot to extend at a (non-zero) distance from the plane (P). This interpretation excludes arrangements in which, for example, the first slot crosses or touches the nodal plane.

3. Respondent's main request - Novelty (Article 54 EPC)

3.1 *Document D2*

The parties disagree on whether feature 11 is disclosed in document D2.

The appellant submits that, regarding the sonotrodes, paragraph [0028] of document D2 referred to document D4. Figure 4 of document D4 showed that the nodal plane was located centrally at about half the height of edge 6 or at least not exactly at the lower surface of edge 6.

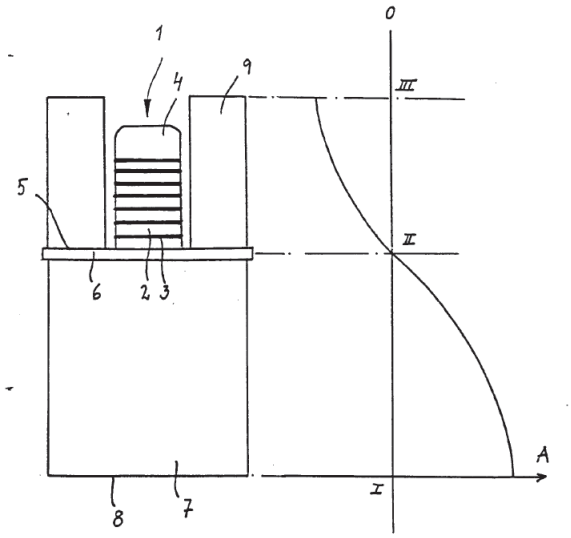


Fig. 4

The board does not share this view. Document D4, to which reference is made in paragraph [0028] of document D2 regarding the type of sonotrode, does not unambiguously and directly disclose that the nodal plane is located centrally at about half the height of edge 6. In Figures 1 to 3 and on the left-hand side of Figure 4 of document D4, reference numeral 5 (designating the nodal plane) apparently refers to the upper surface of fixation edge 6 and not to a central plane of the edge 6. On the right-hand side of Figure 4 of document D4, however, the nodal plane lies in the centre of fixation edge 6. According to column 4, lines 7 to 10, of document D4, the nodal plane 5 in principle "consists" of the fixation edge 6 of the device. In view of these differing characterisations of the nodal plane, its exact position (i.e. within or at the surface of fixation edge 6) is not unambiguously and directly derivable from document D4.

Therefore, with the sonotrodes disclosed in document D4 being used in the device of document D2 (see Figure 4 of document D2 below), it cannot be ascertained that the slots (i.e. the voids between adjacent sonotrode

heads) extend at a (non-zero) distance from the nodal plane. If, for example, the nodal plane 5 is located at the upper surface of fixation edge 6 (as shown in Figures 1 to 4 of document D4), the nodal plane touches or even crosses the slots. As set out above in point 2.2, such an arrangement does not meet the definition of feature 11.

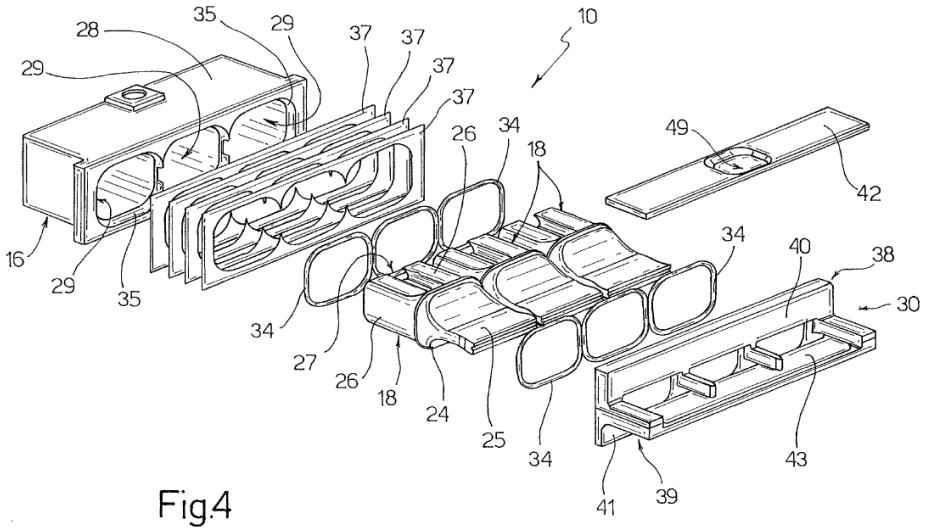


Fig.4

Therefore, feature 11 is not disclosed in document D2. The subject-matter of claim 1 of the main request is thus new over document D2.

3.2 *Document D3*

The respondent submits that document D3 did not disclose, for example, feature 5 of claim 1. In the appeal proceedings, the appellant has not set out why it considered that feature 5 was disclosed in document D3.

Document D3 does not disclose the use of piezoelectric elements (according to feature 5) in the context of the embodiment shown in Figure 3. The use of piezoelectric elements is not unambiguously and directly derivable

from the way in which the device 10 is depicted in Figure 3 either.

Feature 5 is thus not disclosed in the context of the embodiment shown in Figure 3 of document D3. The subject-matter of claim 1 is therefore new over document D3.

3.3 *Document D6*

The parties are in dispute, *inter alia*, as to whether document D6 discloses feature 5 in the context of the resonator shown on page 135.

The appellant acknowledges that, on page 135, piezoelectric elements (as defined in feature 5) are not expressly mentioned. However, according to the first paragraph of page 1 and the paragraph bridging pages 1 and 2 of document D6, transducers were designed as piezoelectric elements. Against this background, the skilled person would have understood that the transducers on page 135 had piezoelectric elements. In point 2.1 of declaration D8, Dr. Littmann set out that a skilled person in the field of ultrasonic technology would primarily ("*in erster Linie*") think of piezoelectric elements when confronted with the term "ultrasonic transducers", since piezoelectric elements were by far the most commonly used ultrasound transducers for exciting resonators to oscillate.

The board notes that document D6, in the passages on pages 1 and 2 cited by the appellant, neither refers to the resonator of page 135 nor states that all transducers necessarily comprise piezoelectric elements. At the top of page 5, document D8 specifically mentions magnetorestrictive converters as

an alternative to piezoelectric converters. Consequently, it is not immediately apparent to the skilled person that in the figure on page 135 of document D6 nothing other than a transducer having a piezoelectric element is disclosed. This also applies when assuming that this was the most common type of ultrasonic transducer.

Therefore, feature 5, at least, is not disclosed in the context of the resonator shown on page 135 of document D6. The subject-matter of claim 1 is thus new over document D6.

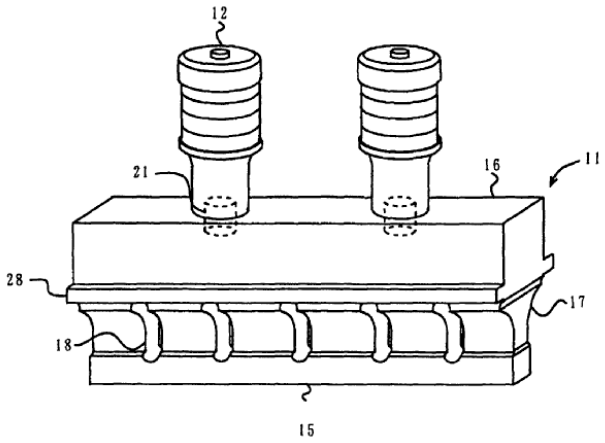
It is furthermore in dispute between the parties whether document D6 belongs to the state of the art under Article 54(2) EPC. This question can, however, be left open since, for the above reasons, document D6 does not disclose all features of claim 1 of the main request and is therefore not prejudicial to the novelty of the subject-matter of claim 1.

3.4 *Document D7*

The parties are at odds, *inter alia*, as to whether document D7 discloses feature 11. Regarding this feature, the appellant refers to Figure 9 of document D7. The respondent submits that the embodiment of Figure 9 of document D7 substantially corresponded to the embodiment of Figure 3 of document D3 and did not disclose feature 11.

According to the last sentence of paragraph [0061] of document D7, in Figure 9, the attaching flange becomes the fixing position of the ultrasonic sealing apparatus and a nodal plane closer to the sealing face.

Fig. 9



However, neither the exact position of the nodal points in (or on) the flange 28 nor the shape and extension of the slots 18 in the horn 11 are clearly derivable from Figure 9 and the description of document D7. At least feature 11 is thus not disclosed in document D7. The subject-matter of claim 1 is therefore new over document D7.

3.5 *Summary on novelty*

The subject-matter of claim 1 of the respondent's main request is new over the cited prior art (Article 54 EPC).

4. Respondent's main request - Inventive step (Article 56 EPC)

4.1 *Combination of documents D7 and D4*

The appellant is of the opinion that the subject-matter of claim 1 did not involve an inventive step in view of the combination of documents D7 and D4.

As explained above (see point 3.4), document D7 does not disclose at least feature 11.

The objection raised by the appellant relies on the assumption that Figure 4 of document D4 showed that the nodal plane extended in the central plane (or at least not at the upper surface) of the flange. Such an arrangement of the nodal plane cannot, however, be unambiguously and directly derived from document D4 for the reasons set out above in point 3.1. The exact position of the nodal plane (for example, within or at the upper surface of fixation edge 6) is not unambiguously and directly derivable from document D4. For these reasons alone, the appellant's objection of lack of inventive step in view of a combination of documents D7 and D4 is not convincing.

Since neither document D7 nor document D4 discloses feature 11, the subject-matter of claim 1 (including feature 11) is not obvious in view of the combination of these documents.

The skilled person would thus not have arrived at the subject-matter of claim 1 in an obvious manner in view of a combination of documents D7 and D4.

4.2 *Document D6 as the closest prior art*

The appellant submits reasons why, in its view, the skilled person starting from the resonator disclosed on page 135 of document D6 would have used transducers comprising piezoelectric elements (see feature 5) and would thereby have arrived at the subject-matter of claim 1 of the respondent's main request in an obvious manner.

Notwithstanding the question of whether document D6 is comprised in the state of the art, for the following reasons, the skilled person would not have considered the resonator shown on page 135 of document D6 as a starting point for the development proposed by the appellant.

In document D6, the wide-output resonator according to Stepanenko is described in appendix 3 (on page 135) while other resonator designs are discussed in the main part of document D6. The resonator on page 135 is mentioned mainly because Stepanenko suggested a mathematical model for calculating the resonance condition for it (see penultimate paragraph on page 4 and point 6.5 of document D6). As far as the practical use of the wide-output resonator according to Stepanenko is concerned, the penultimate paragraph on page 4 of document D6 states the following (see also the second paragraph on page 55):

> "*It is, however, not generally applicable for designing ultrasonic resonators, because the theory is not based on the requirements as to obtain a uniform output-amplitude (the measured difference between minimum and maximum amplitude was 30%) (see appendix 3).*"

Even more explicitly, on the penultimate page of document D6 (which does not have a page number), in point 2., it is stated in Dutch that the method proposed by Stepanenko for making slots in an ultrasonic welding tool with large transverse dimensions is fundamentally unsuitable for obtaining an output amplitude that is constant in magnitude over the entire surface.

However, at various points, document D6 sets out that, wherever the resonator is in contact with the plastic parts, the amplitude should be as equal as possible in order to guarantee a uniform energy absorption (see, for example, the first paragraph on page 4). According to the third paragraph on page 121, in order to transmit vibrational energy to the welding process adequately, the resonator must vibrate in a mode with a uniform amplitude along the output surface in order to guarantee a constant energy input (at least 90% uniformity is required) (see also the first paragraph on page 4).

The skilled person reading document D6 would thus not have contemplated starting from a resonator that, according to this document, is fundamentally unsuitable for obtaining uniform output amplitudes. This is especially the case since the basic problem in document D6 is to design resonators producing uniform output amplitudes along the output surface (see the last sentence of the first paragraph on page 4). Moreover, document D6 discloses various other resonator designs which apparently meet this requirement (see chapters 6 to 8 of document D6, for example, Table 3.1 on page 23) and would thus provide a more suitable starting point for further development.

The skilled person would therefore not have arrived at the subject-matter of claim 1 in an obvious manner in view of the resonator shown on page 135 of document D6.

4.3 *Documents D2, D3 or D7*

On pages 15 and 16 of the statement of grounds of appeal, the appellant submits that the subject-matter of claim 1 did not involve an inventive step, thereby

referring to documents D2, D3 and D7, each taken on its own.

However, the appellant's submissions in this regard do not go beyond the mere allegation that the claimed subject-matter did not involve an inventive step and they are thus not convincing.

4.4 *Summary on inventive step*

The subject-matter of claim 1 of the main request involves an inventive step in view of the cited prior art (Article 56 EPC).

5. Conclusions

In view of the above, the patent as amended according to the respondent's main request meets the requirements of the EPC. The appeal thus had to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Schneider P. Lanz

Decision electronically authenticated