


# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TW10275WO	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/EP2009/050759	International filing date (day/month/year) 23.01.2009	Priority date (day/month/year)	
International Patent Classification (IPC) or national classification and IPC INV. H04R25/00			
Applicant WIDEX AS			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of <u>5</u> sheets, as follows:</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 20px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3bis of Annex C of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  22.11.2010		Date of completion of this report  09.05.2011	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465		Authorized officer  Heiner, Christoph  Telephone No. +49 89 2399-7628	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2009/050759

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on
- the international application in the language in which it was filed
  - a translation of the international application into , which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3(a) and 23.1(b))
    - publication of the international application (under Rule 12.4(a))
    - international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-27 as originally filed

**Claims, Numbers**

1-13 filed with telefax on 22-11-2010

**Drawings, Sheets**

1/11-11/11 as originally filed

- a sequence listing - see Supplemental Box Relating to Sequence Listing.
3.  The amendments have resulted in the cancellation of:
- the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
5.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 70.2 (e)).
6.  Supplementary international search report(s) from Authority(ies) have been received and taken into account in drawing up this report (Rule 45bis.8(b) and (c)).

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2009/050759

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	<u>5, 9, 12, 13</u>
	No: Claims	<u>1-4, 6-8, 10, 11</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>5, 9, 12, 13</u>
Industrial applicability (IA)	Yes: Claims	<u>1-13</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

- D1 WO 2008/017326 A1 (WIDEX AS [DK]; NORDAHN MORTEN AGERBAK [DK]) 14 February 2008 (2008-02-14) cited in the application
- D2 US 2003/053646 A1 (NIELSEN JAKOB [CA] ET AL) 20 March 2003 (2003-03-20)

**Re Item VIII**

**Certain observations on the international application (clarity)**

The application does not meet the requirements of Article 6 PCT, as in claim 1 it is not clear if the system is part of the hearing aid or if it is separated from the hearing aid. It appears, that the system is part of the hearing aid.

The application does not meet the requirements of Article 6 PCT, as the subject-matter of claim 8 appears to be a repetition of subject-matter in claim 1 and thus seems to be superfluous.

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1.1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not novel.

D1 discloses in the wording of claim 1 [references in brackets applying to this document]:

A system for measuring the occlusion effect comprising a hearing aid adapted for operation in a sound amplification mode and for operation in an occlusion measurement mode (p.3, 4th paragraph), said hearing aid comprising

- a microphone adapted for transforming an acoustic sound level external to a hearing aid users ear canal into a first electrical signal, said first electrical signal being guided to an A/D converter forming a first digitized electrical signal (p.10, 2nd paragraph),

- a receiver adapted for generating acoustic sounds in the ear canal of a user when in said amplification mode, and adapted for, when in said occlusion measurement mode, transforming the acoustic sound level in the ear canal into a second electrical signal (p.13, 2nd paragraph), and

- means for directing the second electrical signal obtained by the receiver in occlusion measurement mode to an A/D converter forming a second digitized electrical signal (directly resp. implicitly disclosed at p.13, 2nd paragraph),

said system comprising a signal processing means comprising a filter bank with means for splitting an electrical signal into different frequency bands (p.10, last paragraph), characterized in that said system is adapted for when measuring the occlusion effect, said hearing aid is in occlusion measurement mode and said signal processing means are adapted for splitting the first and the second digitized electrical signals into a first and a second band split digitized electrical signals, respectively, applying said filter bank, said first and second band split digital electric signals each representing the signal in a number of separate frequency bands (p.10, last paragraph: the said input signals consist of a "first input signal" and a "second input signal" as defined in the 3rd paragraph, which are split into a plurality of frequency bands. Hence, there must be in D1 also an arrangement like a filter bank as claimed) and wherein said hearing aid comprises means for transmitting simultaneous samples of the first and the second band split digitized electrical signals to calculating means for calculating the occlusion effect (p.11, l.18-20 indicates the simultaneous processing of the signals), said calculating means comprising a detector bank for measuring the level of the signal in each frequency band (implicitly disclosed on p.11, last paragraph, which speaks about producing band-split occlusion effect values, and at p.11, l.18, which speaks about the level, which is recorded. Hence, there must be in D1 an arrangement like a "detector bank" for measuring the level in each frequency band) and said calculation being based on a ratio between simultaneous samples of the first and the second band split digital electric signals (p.11, l.20: calculation of ratios).

## 1.2

The subject-matter of claim 13 is not considered to be inventive (A.33(3) PCT) for the following reason: A hearing aid is claimed comprising the features of the hearing aid of claim 1 and which is adapted to carry out the occlusion-measurement according to the system of claim 1, i.e. the processing steps as claimed in claim 1 are carried out in the hearing aid. It is considered to be obvious for the skilled person to integrate the system of claim 1, which is adapted for carrying out the occlusion measurement, into a hearing aid for practical reasons as the measurement of occlusion is advantageous only together with the hearing aid, which finally causes this effect.

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The dependent claims do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, because they have already been employed for the same or similar purpose in a same or similar realisation or they are obvious, for example:

The subject-matter of claims 2-4 and 6 is obvious resp. disclosed in D1, p.10, 3. and 4.paragraph and p.13, 2.paragraph.

The subject-matter of claim 5 is not inventive for the following reason: For calculation of the OE the ratio of the signals recorded externally and internally of the ear are required by using microphones having the same transfer function. As the loudspeaker (used as microphone) and the microphone have different transfer functions, equalization is important to make it possible to compare their signals, cf. descr. p.7, l. 29-p.8, l.4; l.11-15; l.27-32. Therefore, the technical problem has to be solved of how to make the transfer functions of the two transducers, which record the external and internal sound, as identical as possible, i.e. the provision of two microphones having the same amplitude and phase response.

From D2 (§3,6,22) the skilled person knows that for matching microphones in the field of hearing aids filtering of their output signals takes place which ensures equal magnitude and phase response in a specified frequency range (equalisation). Even if this fact is mentioned in combination with a solution of another problem (in D2 satisfactory directionality enhancement is tried to be achieved), the generalization of this teaching is not adversely affected, i.e. whenever two transducers having different transfer functions shall behave equally, equalization of their signals is an obvious option.

As a consequence, the skilled person would apply this technique (equalization) to the subject-matter of D1 in order to solve the technical problem of providing two microphones giving the same response for the same sound pressure (cf. the identified problem in the present application on p.6, l.9-13), thus arriving at the claimed subject-matter of claim 5.

The subject-matter of claim 7 is disclosed in principle in D1, p.18, l.4-5.

The subject-matter of claim 8 is disclosed in D1, p.14, last 3 lines - p.15, l.2.

The subject-matter of claim 9 is not considered to be inventive as a method is claimed which carries out the measurement according to the system of claims 1-8, which subject-matter is not considered to be patentable (see objections above), by method steps which correspond directly to the features of these claims.

The subject-matter of claims 10 and 11 can be found in D1, p.11, l.16-18.

The subject-matter of claim 12 has in principle already been discussed with claim 5.

Therefore, the subject-matter of the dependent claims 2-4,6,7,8,10,11 is not novel (A.33(2) PCT) and that of dependent claims 5,9,12,13 is not inventive (A.33(3) PCT).

The industrial applicability is given in the field of occlusion measurements with hearing aids.

**Claims**

1. A system for measuring the occlusion effect comprising a hearing aid adapted for operation in a sound amplification mode and for operation in an occlusion measurement mode, said hearing aid comprising

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- a microphone adapted for transforming an acoustic sound level external to a hearing aid users ear canal into a first electrical signal, said first electrical signal being guided to an A/D converter forming a first digitized electrical signal,
  - 10 - a receiver adapted for generating acoustic sounds in the ear canal of a user when in said amplification mode, and adapted for, when in said occlusion measurement mode, transforming the acoustic sound level in the ear canal into a second electrical signal, and
  - 15 - means for directing the second electrical signal obtained by the receiver in occlusion measurement mode to an A/D converter forming a second digitized electrical signal,

said system comprising a signal processing means comprising a filter bank with means for splitting an electrical signal into different frequency bands,

20 characterized in that said system is adapted for, when measuring the occlusion effect, said hearing aid is in occlusion measurement mode and said signal processing means are adapted for splitting the first and the second digitized electrical signals into a first and a second band split digitized electrical signals, respectively, applying said filter bank, said

25 first and second band split digital electric signals each representing the signal in a number of separate frequency bands, and wherein said hearing aid comprises means for transmitting simultaneous samples of the first and the second band split digitized electrical signals to calculating means for calculating the occlusion effect, said calculating

30 means comprising a detector bank for measuring the level of the signal in each frequency band, and said calculation being based on a ratio



between simultaneous samples of the first and the second band split digital electric signals.

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2. A system according to claim 1, wherein the signal processing means including the filter bank is part of said hearing aid.
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3. A system according to claim 1 or 2, wherein said filter bank comprises bandpass filters for dividing an electrical signal into a bandpass filtered electrical signals.
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4. A system according to any one of the preceding claims, wherein said hearing aid comprising switching means for switching the receiver between sound amplification mode and occlusion measurement mode.
- 20
5. A system according to any one of the preceding claims, wherein said second electrical signal is equalized in order to compensate the frequency dependent transfer functions of the hearing aid receiver when used as microphone.
- 25
6. A system according to any one of the preceding claims, wherein said calculating means are arranged within the hearing aid.
- 30
7. A system according to claim 6, wherein said calculating means comprises means for detecting and discarding invalid data.
8. A system according to claim 6 or 7, wherein said calculating means comprises ratio calculation means for calculating the occlusion effect from said simultaneous samples of the first and the second band split digitized electrical signals.
9. A method for measuring the occlusion effect by application of a system according to any one of the claims 1 – 8, comprising the steps of

- 5                   - arranging a hearing aid at a hearing aid users ear with the earmould or the hearing aid housing fitting tightly in the ear canal,
- operating the hearing aid in the occlusion measurement mode,
- transforming an acoustic sound external to a hearing aid users ear into a first electrical signal by application of a microphone in the hearing aid,
- transforming an acoustic sound level in the hearing aid users ear canal into a second electrical signal by application of the receiver in the hearing aid,
- 10               - converting said first and second electrical signals into first and second digitized electrical signals,
- splitting the first and the second digitized electrical signals into a first and a second band split digitized electrical signals, respectively, said first and second band split digital electric
- 15               signals each representing the signal in a number of separate frequency bands,
- transmitting simultaneous samples of the first and the second band split digitized electrical signals to calculating means for calculating the occlusion effect, said calculating means
- 20               comprising a detector bank for measuring the level of the signal in each frequency band, and
- said calculation being based on a ratio between simultaneous samples of the first and the second band split digital electric signals.
- 25               -

10.A method according to claim 9, wherein the hearing aid users own voice is applied as sound source during the measuring of the occlusion effect.

30               11.A method according to claim 10, wherein said first and second electrical signals are applied for determining if the hearing aid users own voice is the sound source at a specific time.

12. A method according to claim 9, 10 or 11, wherein said second digitized electrical signal is being equalized in order to compensate the specific transfer function of a receiver used as microphone.

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13. A hearing aid adapted for operation in a sound amplification mode and for operation in an occlusion measurement mode, said hearing aid comprising

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- a microphone adapted for transforming an acoustic sound level external to a hearing aid users ear canal into a first electrical signal, said first electrical signal is guided to an A/D converter forming a first digitized electrical signal,
- a receiver adapted for generating acoustic sounds in the ear canal of a user when in said amplification mode, and adapted for, when in said occlusion measurement mode, transforming the acoustic sound level in the ear canal into a second electrical signal,
- means for directing the second electrical signal obtained by the receiver in occlusion measurement mode to an A/D converter forming a second digitized electrical signal, and
- signal processing means comprising a filter bank with means for splitting an electrical signal into different frequency bands,

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characterized in that when in said occlusion measurement mode said signal processing means are adapted for, splitting the first and the second digitized electrical signals into a first and a second band split digitized electrical signals, respectively, applying said filter bank, said first and second band split digital electric signals each representing the signal in a number of separate frequency bands and wherein said hearing aid comprises means for transmitting simultaneous samples of the first and the second band split digitized electrical signals to calculating means for calculating the occlusion effect, said calculating means comprising a detector bank for measuring the level of the signal in each frequency band, and said calculation being based on a ratio

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between simultaneous samples of the first and the second band split digital electric signals.