



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 339 256 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
22.06.2005 Bulletin 2005/25

(51) Int Cl.7: **H04R 25/00**

(43) Date of publication A2:
27.08.2003 Bulletin 2003/35

(21) Application number: **03004661.9**

(22) Date of filing: **03.03.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT SE SI SK TR**
Designated Extension States:
AL LT LV MK RO

- **Allegro, Silvia**
8618 Oetwil a/See (CH)
- **Pfisterer, Franziska**
8903 Birmensdorf (CH)

(71) Applicant: **PHONAK AG**
8712 Stäfa (CH)

(74) Representative: **Troesch Scheidegger Werner AG**
Schwäntenmos 14
8126 Zumikon (CH)

(72) Inventors:

- **Roeck, Hans-Ueli**
8634 Hombrechtikon (CH)

(54) **Method for manufacturing acoustical devices and for reducing wind disturbances**

(57) For reducing wind noise effects at a hearing device the output of an acoustical to electrical arrangement (3) of the hearing device is operationally connected to a high-pass filter arrangement (5) having a control input (C_5) for the high-pass corner frequency (f_c). The output of the high-pass filter unit (5) is operationally connected on one hand to a processor unit (PR) which fulfills transfer characteristic tailoring according to the needs of an individual. The output of the processor unit (PR) is op-

erationally connected to an output electrical to mechanical converter arrangement (7). On the other hand the output of the filter unit (5) is operationally connected to a statistic-forming unit (9) which thus acts as a low-pass type unit. The output of the statistic-forming unit (9) is operationally connected to the control input of the filter unit (5).

EP 1 339 256 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 00 4661

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	WO 87/00366 A (MOTOROLA INC) 15 January 1987 (1987-01-15) * page 1, line 22 - page 3, line 12 * * page 5, line 3 - line 8 * * page 6, line 20 - page 7, line 20 * * page 8, line 5 - page 9, line 36 * * page 11, line 3 - page 13, line 4 * * page 14, line 15 - line 24; figure 3 * -----	1-3,5-8, 10-13,16	H04R25/00 H04R25/00
Y	WO 97/10586 A (ERICSSON GE MOBILE INC) 20 March 1997 (1997-03-20) * page 5, line 30 - page 6, line 30 * * page 11, line 4 - line 18; figures 1,3 * -----	1-3,5-8, 10-13,16	
A	EP 0 588 526 A (NOKIA MOBILE PHONES LTD) 23 March 1994 (1994-03-23)	4,9,14, 15	
Y	* column 3, line 20 - column 5, line 39; figure 1 *	17-21	
A	DE 37 33 983 A (BOSCH GMBH ROBERT) 20 April 1989 (1989-04-20) -----		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
X	EP 0 843 427 A (AB TRANSISTOR) 20 May 1998 (1998-05-20)	17-21	H04R H04B H03H G10L G11B H04S
A	* the whole document *	22-24	
D,Y	US 2002/150264 A1 (ALLEGRO SILVIA ET AL) 17 October 2002 (2002-10-17) * the whole document *	17-21	
A	US 4 783 807 A (MARLEY ET AL) 8 November 1988 (1988-11-08) * the whole document * ----- -/--	17-24	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 April 2005	Examiner Fülöp, I
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document</p>			

2
EPO FORM 1503 03.82 (P44C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 00 4661

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 2002/057808 A1 (GOLDSTEIN JULIUS L) 16 May 2002 (2002-05-16) * paragraph '0012! - paragraph '0015! * * paragraph '0133! - paragraph '0139!; figure 1 *	25-31	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 5 483 617 A (PATTERSON ET AL) 9 January 1996 (1996-01-09) * the whole document *	25-31	
A	US 5 838 274 A (JOHNSON ET AL) 17 November 1998 (1998-11-17) * the whole document *	25-31	
X	WO 03/015460 A (RASMUSSEN DIGITAL APS) 20 February 2003 (2003-02-20)	33,34, 43,44, 52,54	
A	* the whole document *	60-74	
E	EP 1 351 544 A (GENNUM CORPORATION) 8 October 2003 (2003-10-08) * the whole document *	33,34, 43,44, 52,54	
X	US 5 511 128 A (LINDEMANN ET AL) 23 April 1996 (1996-04-23) * the whole document *	60-74	
A	US 2002/037088 A1 (DICKEL THOMAS ET AL) 28 March 2002 (2002-03-28) * abstract; figure 1 *	60-74	
A	US 5 666 433 A (WEHNER ET AL) 9 September 1997 (1997-09-09) * column 5, line 57 - column 11, line 24 *	75,78,81	
	-/--		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 April 2005	Examiner Fülöp, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (p04c01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 00 4661

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 793 875 A (LEHR ET AL) 11 August 1998 (1998-08-11) * column 4, line 36 - column 19, line 48 * -----	75,78,81	
A	WO 01/31972 A (ANDREA ELECTRONICS CORPORATION) 3 May 2001 (2001-05-03) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		15 April 2005	Fülöp, I
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

2

EPO FORM 1503 03.82 (P04C01)



European Patent
Office

Application Number
EP 03 00 4661

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 03 00 4661

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-16

apparatus comprising a predictor unit and corresponding method for reducing wind disturbances

2. claims: 17-24

apparatus comprising pitch filters and corresponding method for improving signal-to-noise ratio.

3. claims: 25-32

apparatus comprising a combination of bandpass filters, modulators and lowpass filter and corresponding method for increasing the signal-to-noise ratio

4. claims: 33-59

apparatus comprising a beamformer amplification characteristic analyser and corresponding method for canceling wind disturbances

5. claims: 60-74

beamforming apparatus and corresponding method for controlling beamforming

6. claims: 75-83

apparatus comprising spectrum calculation unit and corresponding method of detecting wind noise.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 00 4661

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-04-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 8700366	A	15-01-1987	US 4630304 A	16-12-1986
			US 4630305 A	16-12-1986
			US 4628529 A	09-12-1986
			DE 3689035 D1	21-10-1993
			DE 3689035 T2	20-01-1994
			EP 0226613 A1	01-07-1987
			FI 870642 A ,B,	16-02-1987
			HK 19297 A	20-02-1997
			JP 2714656 B2	16-02-1998
			JP 63500543 T	25-02-1988
			KR 9409391 B1	07-10-1994
			WO 8700366 A1	15-01-1987
WO 9710586	A	20-03-1997	AU 724111 B2	14-09-2000
			AU 7078496 A	01-04-1997
			BR 9610290 A	16-03-1999
			CA 2231107 A1	20-03-1997
			CN 1201547 A ,C	09-12-1998
			DE 69613380 D1	19-07-2001
			EE 9800068 A	17-08-1998
			EP 0852052 A1	08-07-1998
			JP 11514453 T	07-12-1999
			NO 981074 A	13-05-1998
			PL 325532 A1	03-08-1998
			RU 2163032 C2	10-02-2001
			TR 9800475 T1	22-06-1998
			WO 9710586 A1	20-03-1997
EP 0588526	A	23-03-1994	FI 924174 A	18-03-1994
			DE 69317968 D1	20-05-1998
			EP 0588526 A1	23-03-1994
			JP 6197085 A	15-07-1994
DE 3733983	A	20-04-1989	DE 3733983 A1	20-04-1989
EP 0843427	A	20-05-1998	EP 0843427 A1	20-05-1998
			SE 9603982 A	01-05-1998
US 2002150264	A1	17-10-2002	WO 0147335 A2	05-07-2001
			AU 4627801 A	09-07-2001
			CA 2409835 A1	20-11-2002
			EP 1380028 A2	14-01-2004
			JP 2004512700 T	22-04-2004
US 4783807	A	08-11-1988	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 00 4661

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-04-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002057808 A1	16-05-2002	US 6868163 B1	15-03-2005
		AT 236501 T	15-04-2003
		AU 6397199 A	10-04-2000
		DE 69906560 D1	08-05-2003
		DE 69906560 T2	05-02-2004
		EP 1121834 A2	08-08-2001
		WO 0018184 A2	30-03-2000
US 5483617 A	09-01-1996	GB 2234078 A	23-01-1991
		AT 124834 T	15-07-1995
		DE 69020736 D1	10-08-1995
		DE 69020736 T2	21-03-1996
		EP 0473664 A1	11-03-1992
		WO 9014739 A1	29-11-1990
		JP 4505372 T	17-09-1992
US 5838274 A	17-11-1998	US 5479168 A	26-12-1995
		US 5638074 A	10-06-1997
		US 5640161 A	17-06-1997
		US 5808574 A	15-09-1998
		US 5872531 A	16-02-1999
		US 5864311 A	26-01-1999
		US 5854600 A	29-12-1998
		AT 183328 T	15-08-1999
		AT 255267 T	15-12-2003
		AT 221690 T	15-08-2002
		AT 222396 T	15-08-2002
		AT 222019 T	15-08-2002
		AU 669114 B2	30-05-1996
		AU 2161892 A	08-01-1993
		CA 2110182 A1	10-12-1992
		DE 69229786 D1	16-09-1999
		DE 69229786 T2	10-08-2000
		DE 69232713 D1	05-09-2002
		DE 69232713 T2	06-05-2004
		DE 69232729 D1	12-09-2002
		DE 69232729 T2	24-04-2003
		DE 69232734 D1	19-09-2002
		DE 69232734 T2	24-04-2003
		DE 69233256 D1	08-01-2004
		DE 69233256 T2	27-05-2004
		EP 0586565 A1	16-03-1994
		EP 0810599 A2	03-12-1997
		EP 0810600 A2	03-12-1997
		EP 0810601 A2	03-12-1997
		EP 0810602 A2	03-12-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 00 4661

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-04-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5838274	A		ES 2135408 T3	01-11-1999
			HK 1008368 A1	20-04-2000
			JP 6509201 T	13-10-1994
			JP 3459417 B2	20-10-2003
			WO 9222060 A1	10-12-1992
WO 03015460	A	20-02-2003	WO 03015460 A2	20-02-2003
			EP 1415503 A2	06-05-2004
EP 1351544	A	08-10-2003	CA 2420989 A1	08-09-2003
			EP 1351544 A2	08-10-2003
			US 2003169891 A1	11-09-2003
US 5511128	A	23-04-1996	AT 176116 T	15-02-1999
			AU 1833395 A	08-08-1995
			DE 69507452 D1	04-03-1999
			DE 69507452 T2	02-06-1999
			DK 740893 T3	13-09-1999
			EP 0740893 A1	06-11-1996
			WO 9520305 A1	27-07-1995
US 2002037088	A1	28-03-2002	DE 10045197 C1	07-03-2002
			DK 200101330 A	14-03-2002
US 5666433	A	09-09-1997	CA 2076288 A1	19-02-1994
			WO 9405133 A1	03-03-1994
			DE 69302392 D1	30-05-1996
			DE 69302392 T2	05-12-1996
			EP 0657085 A1	14-06-1995
			JP 8501913 T	27-02-1996
US 5793875	A	11-08-1998	AU 2732897 A	12-11-1997
			CA 2252447 A1	30-10-1997
			EP 0895705 A1	10-02-1999
			WO 9740645 A1	30-10-1997
WO 0131972	A	03-05-2001	WO 0131972 A1	03-05-2001