

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
3 February 2005 (03.02.2005)

PCT

(10) International Publication Number  
**WO 2005/011111 A3**

(51) International Patent Classification<sup>7</sup>: **H03G 3/32**, 5/16

(21) International Application Number:  
PCT/IB2004/051254

(22) International Filing Date: 19 July 2004 (19.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
03102310.4 28 July 2003 (28.07.2003) EP

(71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL];  
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **DE POORTERE, Gerrit, F., M.** [BE/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(74) Agent: **GROENENDAAL, Antonius, W., M.**; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,

CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

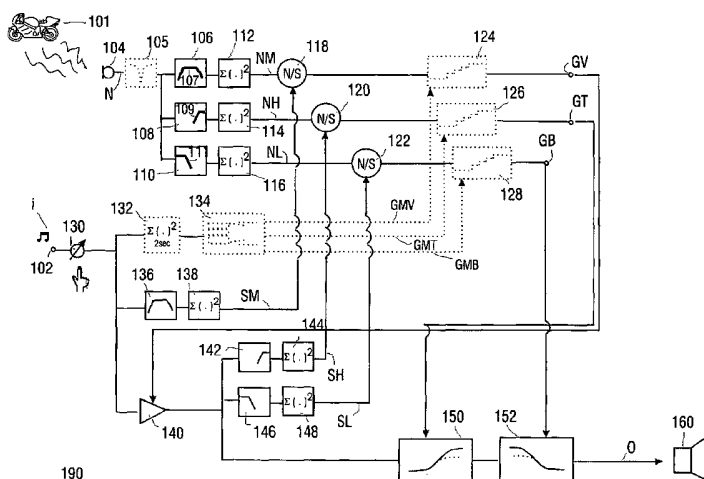
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM,

[Continued on next page]

(54) Title: AUDIO CONDITIONING APPARATUS, METHOD AND COMPUTER PROGRAM PRODUCT



(57) Abstract: The audio conditioning apparatus (190) for conditioning an audio signal (O) to be output, contains a noise characterizing unit (106, 112) arranged to evaluate a noise level (NM) of environmental noise yielding a noise level with which subsequently a volume amplification unit (140) amplifies a volume of the audio signal (O) by a volume gain (GV), depending on the noise level (NM). The audio conditioning apparatus (190) contains a further noise characterizing unit (108, 114), (110, 116) is comprised, arranged to evaluate a further noise level (NL, NH) of the environmental noise in a noise band of low bass or high treble noise frequencies, and based on this further noise level a further amplification unit (150, 152) amplifies by a further gain (GB, GT) the amplitude of frequency components in a to the noise band corresponding audio band of low respectively high audio frequencies of the audio signal (O). The result is a simple apparatus which achieves that the audio in a noisy environment substantially sounds as if there was no or less noise.



PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Published:**

— with international search report

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

**(88) Date of publication of the international search report:**

7 April 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

## INTERNATIONAL SEARCH REPORT

PCT/IB2004/051254

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H03G3/32 H03G5/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 H03G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC, COMPENDEX, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/067418 A (CHRISTOPH MARKUS ; HARMAN BECKER AUTOMOTIVE SYSTE (DE)) 29 August 2002 (2002-08-29) page 4, line 1 - page 6, line 2; claim 5	1,2,8-10
Y	abstract; figures 1,2,4,7a,8 page 10, line 28 - page 11, line 19 page 16, line 6 - page 17, line 18 page 3, line 7 - line 18	3-5
Y	----- US 4 868 881 A (ZWICKER EBERHARD ET AL) 19 September 1989 (1989-09-19)	3
A	abstract  column 2, line 55 - column 4, line 9; figure 2  ----- -/--	1,2,4,5, 8-10

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

10 November 2004

Date of mailing of the international search report

02.02.2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Wichert, B

## INTERNATIONAL SEARCH REPORT

PCT/IB2004/051254

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 4 641 344 A (KASAI JUNICHI ET AL) 3 February 1987 (1987-02-03) abstract; figures 3,11,14  column 3, line 6 - line 22 column 4, line 30 - line 35 column 7, line 4 - line 22 column 7, line 59 - column 8, line 24 -----	4  1-3,5, 8-10
Y A	US 5 046 105 A (BOHN DENNIS A) 3 September 1991 (1991-09-03) abstract; figures 1,2 column 2, line 51 - line 61 -----	5  1-4,8-10
A	US 5 434 926 A (WATANABE YOSHIKATSU ET AL) 18 July 1995 (1995-07-18) abstract; figures 1,2 -----	1-5,8-10

**INTERNATIONAL SEARCH REPORT**

PCT/IB2004/051254

**Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see annex

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5,8-10

Claims 1 and 9 claim an audio conditioning apparatus - and a corresponding method - for evaluating noise in dependency of the noise frequency range (one range being bass or treble) and for amplifying the volume of the audio signal and furthermore frequency components of the audio signal in the bass or treble frequency audio band dependent on this evaluation.

1.1. claim: 2

An audio conditioning apparatus having especially selected frequency ranges for the bass or the treble frequency band, respectively.

1.2. claim: 3

An audio conditioning apparatus comprising a gain consistency unit.

1.3. claim: 4

An audio conditioning apparatus comprising a gain dispatcher unit.

1.4. claim: 5

An audio conditioning apparatus comprising a shelving filter.

1.5. claim: 8

An audio reproduction apparatus comprising an audio conditioning apparatus.

1.6. claim: 10

A computer program product enabling a processor to execute a method of conditioning an audio signal.

---

2. claims: 6,7

An audio conditioning apparatus further comprising an active noise cancellation circuit, the audio conditioning and the active noise cancellation working according to different principles.

---

# INTERNATIONAL SEARCH REPORT

PCT/IB2004/051254

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 02067418	A	29-08-2002	DE 10107385 A1 WO 02067418 A2 EP 1366564 A2 US 2004076302 A1	05-09-2002 29-08-2002 03-12-2003 22-04-2004
US 4868881	A	19-09-1989	DE 3730763 A1 AT 98406 T DE 3886148 D1 EP 0307725 A2	30-03-1989 15-12-1993 20-01-1994 22-03-1989
US 4641344	A	03-02-1987	JP 60145714 A JP 60178711 A JP 1917296 C JP 6044698 B JP 61015408 A	01-08-1985 12-09-1985 23-03-1995 08-06-1994 23-01-1986
US 5046105	A	03-09-1991	NONE	
US 5434926	A	18-07-1995	JP 3056866 B2 JP 5226952 A	26-06-2000 03-09-1993