

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
26 May 2006 (26.05.2006)

PCT

(10) International Publication Number  
**WO 2006/055801 A3**

- (51) **International Patent Classification:**  
*H04R 1/06* (2006.01)      *H04R 9/04* (2006.01)  
*H04R 7/18* (2006.01)
- (21) **International Application Number:**  
PCT/US2005/041868
- (22) **International Filing Date:**  
18 November 2005 (18.11.2005)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
10/904,628      19 November 2004 (19.11.2004)      US
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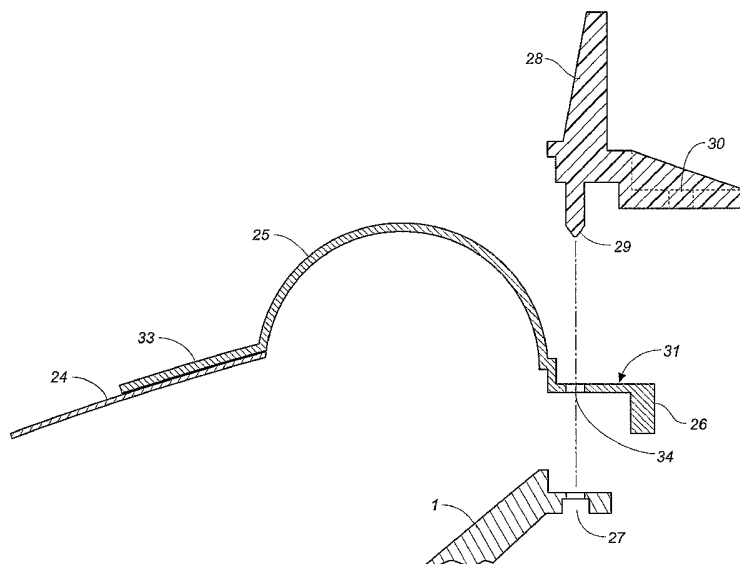
(81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, 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, IS, IT, LT, LU, LV, 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).

**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

[Continued on next page]

(54) **Title:** LOUDSPEAKER WITH ASSEMBLY AND PERFORMANCE IMPROVEMENTS



(57) **Abstract:** A loudspeaker incorporates features to improve performance and quality while reducing component and manufacturing costs. One embodiment of a loudspeaker has a frame with a generic mounting edge that mates with a secondary mounting component. The frame and mounting component are separated by an outer section of the diaphragm suspension annulus that provides vibration isolation. An additional outer section of the annulus can serve as a gasket to the mounting structure. Other embodiments have a plastic frame with an integrally molded spider, and a spider molded with individual legs that provides better control of the restorative force characteristic. The spider may also incorporate more than one plane of lateral stiffness to reduce a tendency for a voice coil to rock.

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

27 July 2006

*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

International application No  
PCT/US2005/041868

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. H04R1/06 H04R7/18 H04R9/04

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)  
 H04R

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, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 687 247 A (PRONI ET AL) 11 November 1997 (1997-11-11) column 1, lines 5-8 column 3, line 60 - column 4, line 6 column 4, lines 33-36 column 6, lines 60-64 figures 1,3a,3b,4a,4b	1-5
X	the whole document ----- -/--	6

Further documents are listed in the continuation of Box C.       See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier document but published on or after the international filing date	"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
"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)	"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.
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search <b>14 June 2006</b>	Date of mailing of the international search report <b>22/06/2006</b>
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentiaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <b>Fachado Romano, A</b>
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## INTERNATIONAL SEARCH REPORT

 Inter national application No  
 PCT/US2005/041868

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 26, 1 July 2002 (2002-07-01) -& JP 2001 268688 A (MATSUSHITA ELECTRIC IND CO LTD), 28 September 2001 (2001-09-28) For the evaluation of this document the examiner has used the automatic translation facility available at the IPDL website of the JPO. abstract figures 1b,3a,3c the whole document	1,2,4,5
X	the whole document	3
X	US 4 737 992 A (LATHAM-BROWN ET AL) 12 April 1988 (1988-04-12) figures 1,3,4	7
X	the whole document	8,9
Y	figures 1,3	10,11
Y	US 4 061 890 A (FROESCHLE ET AL) 6 December 1977 (1977-12-06) figures 1,2	10,11
Y	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 07, 31 August 1995 (1995-08-31) -& JP 07 107591 A (MATSUSHITA ELECTRIC IND CO LTD), 21 April 1995 (1995-04-21) abstract	10
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## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2005/041868

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>PATENT ABSTRACTS OF JAPAN vol. 1998, no. 03, 27 February 1998 (1998-02-27) -&amp; JP 09 307992 A (KENWOOD CORP), 28 November 1997 (1997-11-28) For the evaluation of this document the examiner has used the automatic translation utility available at the IPDL website of the JPO. the whole document</p>	12,13
X	<p>PATENT ABSTRACTS OF JAPAN vol. 1998, no. 11, 30 September 1998 (1998-09-30) -&amp; JP 10 155190 A (KENWOOD CORP; NIPPON ONKEN KK; PIONEER CONE CORP), 9 June 1998 (1998-06-09) For the evaluation of this document the examiner has used the automatic translation facility available at the IPDL website the JPO. the whole document</p>	14
X	<p>EP 0 720 415 A (KABUSHIKI KAISHA KENWOOD) 3 July 1996 (1996-07-03) the whole document</p>	14
A	<p>US 5 574 797 A (GEISENBERGER ET AL) 12 November 1996 (1996-11-12) column 1, lines 5-8 figures 1,2</p>	1-6
A	<p>EP 0 685 982 A (NOKIA TECHNOLOGY GMBH; HARMAN AUDIO ELECTRONIC SYSTEMS GMBH) 6 December 1995 (1995-12-06) figure 1 column 1, lines 1-7</p>	1-6
A	<p>PATENT ABSTRACTS OF JAPAN vol. 2000, no. 12, 3 January 2001 (2001-01-03) -&amp; JP 2000 261886 A (FOSTER ELECTRIC CO LTD), 22 September 2000 (2000-09-22) For the evaluation of this document the examiner has used the automatic translation facility available at the IPDL website of the JPO. figure 1 abstract</p>	1-6

# INTERNATIONAL SEARCH REPORT

International application No.  
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## 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.:

### Remark on Protest

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

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US2005 /041868

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-6

Mating components for attaching the annulus to the frame.  
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2. claims: 7-9

Join between spider and voice coil.  
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3. claims: 10,11

Spider material and design.  
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4. claims: 12-14

Electrical connections of the voice coil to the spider and frame.  
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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2005/041868

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