Adaptive Directional Noise Cancelling Microphone System

Abstract: The present invention provides a noise cancelling microphone system which comprises an omni-directional microphone (1), a normal (e.g., cardioid-type) directional microphone (2), preamplifiers (3, 4), analogue-to-digital (A/D) converters (5, 6), an adaptive filtering circuit (7), a digital-to-analogue (D/A) converter (8) and a case (11) specially designed for the system. The omni-directional microphone (1) can receive the sounds from any directions with a same or very similar gain. The directional microphone (2) can receive sounds from the first directions, except the second directions, with a similar gain. The two microphones are combined together with a closely acoustically-coupled way.
INTERNATIONAL SEARCH REPORT

PCT/SG 00/00080

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04R3/00

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 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)

WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
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</table>
| X        | EP 0 569 216 A (SONY CORP)  
10 November 1993 (1993-11-10) | 1-6,9                 |
| Y        | abstract                  
page 3, line 12 - line 51  
page 5, line 5 - line 7  
figures 2,3 | 7,8                      |
| Y        | PATENT ABSTRACTS OF JAPAN  
vol. 1995, no. 01.  
28 February 1995 (1995-02-28)  
& JP 06 292291 A (SONY CORP),  
18 October 1994 (1994-10-18) | 7,8                      |
| A        | abstract                  
figures 1,4,5 | 1-6,9                 |

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 April 2002

Date of mailing of the international search report:

06.06.02

Name and mailing address of the ISA:

European Patent Office, P.O. Box 00000, 23311 Rijswijk,  
Tel.: (+31-70) 340-3000, Fax: (+31-70) 340-3016

Authorized officer:

Masche, C
**INTERNATIONAL SEARCH REPORT**

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<tr>
<td>A</td>
<td>EP 0 756 407 A (MATSUSHITA ELECTRIC IND CO LTD) 29 January 1997 (1997-01-29) abstract column 6, line 4 - line 26 column 7, line 20 - line 40 figures 2-4</td>
<td>1,2,3-9</td>
</tr>
</tbody>
</table>
INTERNATIONAL SEARCH REPORT

Box I  Observations where certain claims were found unsearchable (Continuation of item 1 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 II  Observations where unity of invention is lacking (Continuation of item 2 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.:

   1-9

Remark on Protest

□ The additional search fees were accompanied by the applicant’s protest.

□ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (1)) (July 1998)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-9
   
   using 2 separate adaptive filters for the digitized signals from the 2 microphones

2. Claims: 10-12
   
   mechanical construction of the case for the microphone system
<table>
<thead>
<tr>
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