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(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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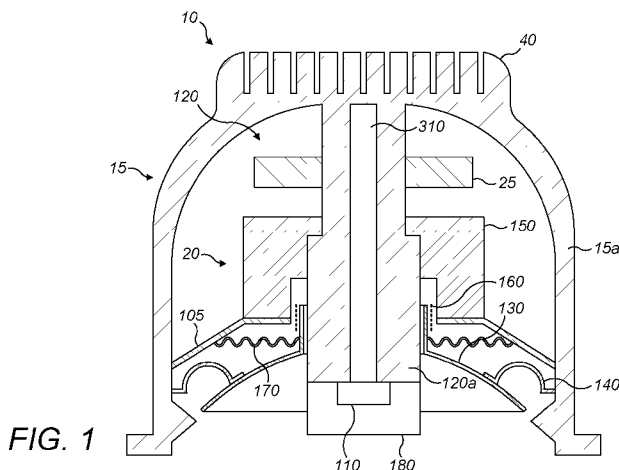
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- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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

24 November 2016

(54) Title: LIGHT AND LOUDSPEAKER DRIVER DEVICE



(57) Abstract: A combined light and loudspeaker driver device (10) is suitable for mounting in, for example, a ceiling void. It comprises a housing (15) that supports a loudspeaker driver (20), a heat removal element (120), electronic components (25) and a light source (110). The heat removal element (120) includes a column (120a) extending along a central longitudinal axis of the housing (15) to a base of the housing 15, where it meets a heat sink (40) formed around the central longitudinal axis to the rear of the housing (15). The light source (110) provides task lighting and is a source of heat. It is mounted on a front end of the column distal from the heat sink (40) at the base of the housing (15), so as to optimise conduction of heat away from the light source (110). The light source (110) is also positioned radially inwardly of a speaker diaphragm (130) also centred around the central longitudinal axis of the housing (15). The housing (15) is generally cup shaped and has side walls (15a). The interior of the housing side walls (15a) is parallel with the central longitudinal axis of the housing (15) over the majority of the rearward depth thereof. This results in a large void behind the loudspeaker diaphragm (130), leading to improved sound.



**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/GB2016/050524

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. H04R1/02 F21V33/00 H04R9/02  
 ADD. H04R1/24 H04R7/20

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 F21V

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 practicable, search terms used)  
 EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/316247 A1 (DING FENG [CN]) 16 December 2010 (2010-12-16)	1,2, 9-17,19, 26-29, 31,32
Y	paragraphs [0001], [0006] - [0013], [0031] - [0037], [0040] - [0043]; figures	2-8,16, 17,30
A	1-4, 6, 8, 9	18,20-25
Y	----- JP S59 148499 A (MATSUSHITA ELECTRIC IND CO LTD) 25 August 1984 (1984-08-25) figure 3	2-6
Y	----- US 5 748 760 A (BUTTON DOUGLAS J [US]) 5 May 1998 (1998-05-05) column 3, line 27 - line 52; figure 1 column 5, line 53 - line 61 column 7, line 22 - line 41; figures 3, 4 ----- -/--	5-8

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
- "E" earlier application or patent 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  26 September 2016	Date of mailing of the international search report  19/10/2016
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Joder, Cyril

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2016/050524

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2011 077213 A (OKAYA ELECTRIC INDUSTRY CO) 14 April 2011 (2011-04-14) paragraph [0014] - paragraph [0016]; figure 1 -----	12-14
Y	US 2004/085773 A1 (SANTA CRUZ CATHY D [US] ET AL) 6 May 2004 (2004-05-06) paragraphs [0013], [0040]; figure 9 -----	16,17,30
A	EP 0 624 049 A2 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 9 November 1994 (1994-11-09) figure 1 -----	18
A	US 2008/298045 A1 (WRIGHT DOUG [US]) 4 December 2008 (2008-12-04) paragraph [0004]; figure 1 -----	20-25
A	EP 2 498 512 A2 (SONY CORP [JP]) 12 September 2012 (2012-09-12) paragraphs [0001], [0046] - [0082]; figures 1-4 -----	1-32

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2016/050524
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010316247	A1	16-12-2010	CA 2735832 A1 26-03-2009 CN 201114660 Y 10-09-2008 US 2010316247 A1 16-12-2010 WO 2009036648 A1 26-03-2009
-----			
JP S59148499	A	25-08-1984	NONE
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US 5748760	A	05-05-1998	AT 364979 T 15-07-2007 CA 2218471 A1 24-10-1996 DE 69535513 T2 04-10-2007 EP 0821861 A1 04-02-1998 ES 2286821 T3 01-12-2007 US 5748760 A 05-05-1998 WO 9633592 A1 24-10-1996
-----			
JP 2011077213	A	14-04-2011	NONE
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US 2004085773	A1	06-05-2004	NONE
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EP 0624049	A2	09-11-1994	DE 69430776 D1 18-07-2002 DE 69430776 T2 27-03-2003 EP 0624049 A2 09-11-1994
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US 2008298045	A1	04-12-2008	NONE
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EP 2498512	A2	12-09-2012	AU 2012200533 A1 27-09-2012 CA 2766660 A1 07-09-2012 CN 102685651 A 19-09-2012 EP 2498512 A2 12-09-2012 JP 5644593 B2 24-12-2014 JP 2012186700 A 27-09-2012 US 2012230499 A1 13-09-2012
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB2016/050524

## Box No. 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 No. 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 fees, this Authority did not invite payment of additional fees.
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 and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-11, 19, 32

Combined light and loudspeaker device, comprising a loudspeaker diaphragm with a central opening, a rear heat sink and a heat removal column extending forwardly from the central part of the heat sink and supporting a light source, wherein the device further comprises a void in the housing, behind the loudspeaker diaphragm, or wherein the heat sink comprises fins extending radially.  
The object is to evacuate the heat from the device.

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2. claims: 12-17, 26-31

Combined light and loudspeaker device, further comprising light-modifying elements (phosphorescent cover, lens, grille) in front of the light source.  
The object is to control the visual effect of the apparatus.

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3. claim: 18

Combined light and loudspeaker device, wherein the diaphragm is connected to the housing by a surround shaped as an annulus with a convex rearward surface and a concave frontward surface.  
The object is to reduce the "flutter" shadow resulting from the use of a classic frontward-protruding surround.

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4. claims: 20-25

Combined light and loudspeaker device, further comprising a tweeter inwardly of the diaphragm opening, in front of or around the light source.  
The object is to provide a compact device suitable for wide-band reproduction.

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