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

(54) Title: DIELECTRIC COMB FOR MEMS DEVICE

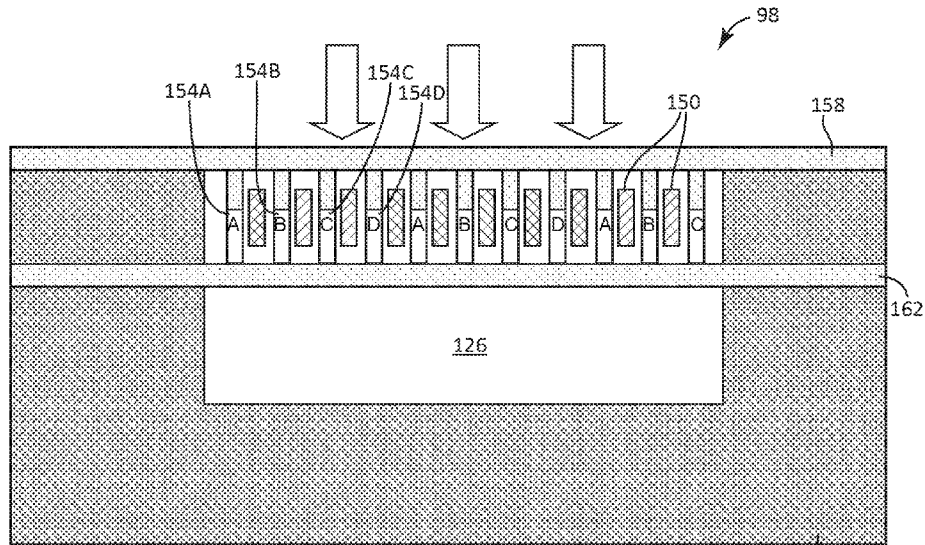


Figure 4

(57) Abstract: Microphones including a housing defining a cavity, a plurality of conductors positioned within the cavity, at least one dielectric bar positioned within the cavity, and a transducer diaphragm. The conductors are structured to move in response to pressure changes while the housing remains fixed. A first conductor generates first electrical signals responsive to the pressure changes resulting from changes in an atmospheric pressure. A second conductor generates second electrical signals responsive to the pressure changes resulting from acoustic activity. The dielectric bar is fixed with respect to the cavity and remains fixed under the pressure changes. The dielectric bar is adjacent to at least one of the conductors. In response to an applied pressure that is an atmospheric pressure and/or an acoustic pressure, the transducer diaphragm exerts a force on the housing and displaces at least a portion of conductors with respect to the dielectric bar.



AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, 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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INTERNATIONAL SEARCH REPORT

International application No PCT/US2019/023260
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A. CLASSIFICATION OF SUBJECT MATTER INV. H04R19/04 ADD. B81B3/00 H04R19/00 G01L9/00 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) H04R B82B B81B G01L

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
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015/256913 A1 (DEHE ALFONS [DE]) 10 September 2015 (2015-09-10) paragraphs [0024] - [0033], [0051], [0070], [0097] - [0105]; figures 2, 3C, 6 -----	1,2,6,9, 23,28
X	BAY J ET AL: "Design of a silicon microphone with differential read-out of a sealed double parallel-plate capacitor", SENSORS AND ACTUATORS A: PHYSICAL, ELSEVIER BV, NL, vol. 53, no. 1, 1 May 1996 (1996-05-01), pages 232-236, XP004018151, ISSN: 0924-4247, DOI: 10.1016/0924-4247(96)01129-6	1,2,23, 26-28
Y	the whole document ----- -/--	3-5,24, 25

<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> See patent family annex.
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* 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 application or patent 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 15 July 2019	Date of mailing of the international search report 25/09/2019
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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 Lörch, Dominik
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INTERNATIONAL SEARCH REPORT

International application No PCT/US2019/023260

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/279717 A1 (REIMANN KLAUS [NL] ET AL) 24 October 2013 (2013-10-24) paragraphs [0067] - [0078], [0107], [0124]; figures 4, 8 -----	3-5, 24, 25

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, 9, 23-28

microphone responsive to both atmospheric and acoustic pressure changes, and corresponding control circuit; active compensation of atmospheric pressure

2. claims: 7, 10-18, 29

MEMS transducer with bellow diaphragm

3. claims: 8, 19-22, 30

MEMS transducer with first and second layers of different module of elasticity for stress distribution

4. claims: 31-35

method for manufacturing MEMS transducer comprising doped and undoped oxide layers

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/023260

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.:

1-6, 9, 23-28

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/023260

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015256913 A1	10-09-2015	CN 104902400 A	09-09-2015
		DE 102015103236 A1	10-09-2015
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