

## SEARCH HISTORY

<b>Application Number</b>	PCT/US 15/63242
<b>Search Conducted By</b>	AD
<b>Search Approved By</b>	AD

<b>US/IPC Classifications Searched</b>	IPC(8) - B06B 1/06 (2016.01) CPC - H01L 41/053, H01L 41/081, B06B 1/0292, B06B 1/06, B06B 1/0651, B06B 2201/55, B06B 2201/51
<b>Date Conducted</b>	17 March 2016 (17.03.2016) 18 March 2016 (18.03.2016)

<b>Documentation Searched</b>	UPC-310/334; 600/459 CPC-H01L 41/04*, 41/08*; G01N 29/2406; B06B*, B06B 1/06, 1/06*; G01H 11/*, G01H 11/06, G01H 11/08; G10K 11/*, G10K 11/002 (Search term limited; see below)
<b>Search Terms Used</b>	Micro*, micromachin*, microfabric*, microelectr*, machin*, fabricat*, electr*, MEMS, MEM, ultraso*, sonic*, acoustic*, transducer, transmitter, emitter, MUT, capacitive, piezoelectric, cMUT, pMUT, size, circular*, circle%, ovoid, oval*, cylinder%, cylindrical*, curv*, arcuate, spher*, semispher*, hemispher*, enclosure%, enclosed, cavity, cavities, housing%, backing%, gap*, chamber%, space, back, air, resonan*,
<b>Date Conducted</b>	17 March 2016 (17.03.2016) 18 March 2016 (18.03.2016)

<b>Electronic Database Searched</b>	PubWEST
<b>Files Searched</b>	PGPB, USPT, EPAB, JPAB
<b>Date Conducted</b>	17 March 2016 (17.03.2016) 18 March 2016 (18.03.2016)
<b>Search Logic:</b>	

## SEARCH HISTORY

DATE: Thursday, March 17, 2016						
<a href="#">Purge Queries</a>						
<a href="#">Printable Copy</a>						
<a href="#">Create Case</a>						
<u>Order</u>	<u>Set</u>	<u>Query</u>	<u>Hit</u>	<u>Set</u>	<u>Set</u>	<u>Set</u>
<u>By</u>	<u>Name</u>		<u>Count</u>	<u>Name</u>	<u>Name</u>	<u>Name</u>
	<u>Side by</u>			<u>Result</u>	<u>Grid</u>	<u>Classification</u>
	<u>Side</u>			<u>Set</u>		
<i>DB=PGPB,USPT,USOC,EPAB,JPAB; PLUR=YES; OP=ADJ</i>						
Date	<u>L20</u>	L19 and I17	33	<u>L20</u>	<u>L20</u>	<u>L20</u>
Date	<u>L19</u>	(aperture or hole or opening or channel) near5 (transducer or MUT or pMUT or cMUT)	27609	<u>L19</u>	<u>L19</u>	<u>L19</u>
Date	<u>L18</u>	(aperture or hole or opening) near5 (transducer or MUT or pMUT or cMUT)	17795	<u>L18</u>	<u>L18</u>	<u>L18</u>
Date	<u>L17</u>	L16 and I14	88	<u>L17</u>	<u>L17</u>	<u>L17</u>
Date	<u>L16</u>	B06B*.cpc,ipc.	17459	<u>L16</u>	<u>L16</u>	<u>L16</u>
Date	<u>L15</u>	L14 and I2	2	<u>L15</u>	<u>L15</u>	<u>L15</u>
Date	<u>L14</u>	L13 and I5	1911	<u>L14</u>	<u>L14</u>	<u>L14</u>
Date	<u>L13</u>	(transducer or MUT or pMUT or cMUT) with ((inside or within) near5 (enclosure or enclosed or cavity or gap or chamber))	9745	<u>L13</u>	<u>L13</u>	<u>L13</u>
Date	<u>L12</u>	L11 not I6	16	<u>L12</u>	<u>L12</u>	<u>L12</u>
Date	<u>L11</u>	I10.ti,ab. and I9	40	<u>L11</u>	<u>L11</u>	<u>L11</u>
Date	<u>L10</u>	(micro or MEM or microelectr* or micromachin* or microfabricat*5 or micro (electr*5 or electromechanical or machin*5)) with ((ultraso*5 or acoustic) near3 (transducer or transmitter or emit*5))	4407	<u>L10</u>	<u>L10</u>	<u>L10</u>
Date	<u>L9</u>	(cylinder or cylindrical*5 or curv*5 or arcuate or sphere*3 or spherical*5 or semispher* or hemisphere*) near5 (enclosure or enclosed or cavity or housing or backing or gap or chamber)	784946	<u>L9</u>	<u>L9</u>	<u>L9</u>
Date	<u>L8</u>	L7 and I1	39	<u>L8</u>	<u>L8</u>	<u>L8</u>
Date	<u>L7</u>	(enclosure or enclosed or cavity or housing or backing or gap or chamber or space) with (shap*3) with (resonan*5)	6391	<u>L7</u>	<u>L7</u>	<u>L7</u>
Date	<u>L6</u>	L5 and I2	24	<u>L6</u>	<u>L6</u>	<u>L6</u>

SEARCH HISTORY

Date	<u>L5</u>	(cylinder or cylindrical*5 or curv*5 or arcuate or sphere*3 or spherical*5 or semispher* or hemisphere*) near5 (enclosure or enclosed or cavity or housing or backing)	481913	<u>L5</u>	<u>L5</u>	<u>L5</u>
Date	<u>L4</u>	pMUT.ti.ab. and l3	11	<u>L4</u>	<u>L4</u>	<u>L4</u>
Date	<u>L3</u>	l1.ti.	281	<u>L3</u>	<u>L3</u>	<u>L3</u>
Date	<u>L2</u>	l1.ti.ab.	542	<u>L2</u>	<u>L2</u>	<u>L2</u>
Date	<u>L1</u>	(micro or MEM or microelectr* or micro electro* or micromachin*) with ((ultraso*5 or acoustic) near3 transducer)	3937	<u>L1</u>	<u>L1</u>	<u>L1</u>

DATE: Friday, March 18, 2016 [Purge Queries](#) [Printable Copy](#) [Create Case](#)

Order By	<u>Set Name</u> Side by Side	<u>Query</u>	<u>Hit Count</u>	<u>Set Name</u> Result Set	<u>Set Name</u> Grid	<u>Set Name</u> Classification
<i>DB=PGPB,USPT,USOC,EPAB,JPAB; PLUR=YES; OP=ADJ</i>						
Date	<u>L13</u>	L12 and l3	0	<u>L13</u>	<u>L13</u>	<u>L13</u>
Date	<u>L12</u>	(sphere*3 or spherical*5 or semispher* or hemisphere*) near4 ((back or air or resonan*3) (chamber or cavity))	332	<u>L12</u>	<u>L12</u>	<u>L12</u>
Date	<u>L11</u>	l3 and l9.ti.ab,clm.	23	<u>L11</u>	<u>L11</u>	<u>L11</u>
Date	<u>L10</u>	l3.ti.ab. and l9.ti.ab.	0	<u>L10</u>	<u>L10</u>	<u>L10</u>
Date	<u>L9</u>	(cylinder or cylindrical*5 or curv*5 or arcuate or sphere*3 or spherical*5 or semispher* or hemisphere*) near4 (chamber or cavity)	394886	<u>L9</u>	<u>L9</u>	<u>L9</u>
Date	<u>L8</u>	l2 and l3	136	<u>L8</u>	<u>L8</u>	<u>L8</u>
Date	<u>L7</u>	l2 and l3.ti.ab.	1	<u>L7</u>	<u>L7</u>	<u>L7</u>
Date	<u>L6</u>	l2 and l3 and (l4 or l5)	2	<u>L6</u>	<u>L6</u>	<u>L6</u>
Date	<u>L5</u>	(membrane or film) near5 (hole or aperture or opening or channel) near5 (substrate)	39486	<u>L5</u>	<u>L5</u>	<u>L5</u>
Date	<u>L4</u>	(transducer or MUT or pMUT or cMUT or membrane or film) near5 ((inside or within) near3 (cavity or chamber))	25740	<u>L4</u>	<u>L4</u>	<u>L4</u>
Date	<u>L3</u>	(micro or MEM or MEMS or microelectr* or micromachin* or microfabricat*5 or micro (electr*5 or electromechanical or machin*5 or	4407	<u>L3</u>	<u>L3</u>	<u>L3</u>

SEARCH HISTORY

Date	<u>L2</u>	fabricat*5)) with ((ultraso*5 or acoustic) near3 (transducer or transmitter or emit*5)) (shap*3 or cylinder or cylindrical*5 or curv*5 or arcuate or sphere*3 or spherical*5 or semispher* or hemisphere*) with l1	13335	<u>L2</u>	<u>L2</u>	<u>L2</u>
Date	<u>L1</u>	(back or resonan*4) near2 (chamber or cavity)	115406	<u>L1</u>	<u>L1</u>	<u>L1</u>

END OF SEARCH HISTORY

<b>Electronic Database Searched</b>	Google
<b>Files Searched</b>	Google
<b>Date Conducted</b>	17 March 2016 (17.03.2016) 18 March 2016 (18.03.2016)
<b>Search Logic:</b>	
(cMUT pMUT) AND (spherical resonant cavity) About 1,120 results	
(cMUT pMUT) AND (spherical air cavity) About 1,490 results	
(cMUT pMUT) AND (cylindrical air cavity) About 1,430 results	

<b>Electronic Database Searched</b>	PatBase
<b>Files Searched</b>	Full-text: AU BE BR CA CH CN DE DK EP ES FI FR GB IN JP KR SE TH TW US WO Bibliographic: (Europe) AT BA BE BG CH CS CY CZ DD DK EE ES FI GE GR HR HU IE IS IT LT LU LV MC MD MT NL NO PL PT RO RS SE SI SK SM TR UA YU (Asia) EA GC HK ID IL IN KZ MN MY PH RU SG SU TH TJ TW UZ VN (North America) CA CR CU DO GT HN MX NI PA SV TT (South America) AR BR CL CO EC PE UY (Australasia) AU NZ (Africa) AP DZ EG KE MA MW OA ZA ZM ZW
<b>Date Conducted</b>	17 March 2016 (17.03.2016) 18 March 2016 (18.03.2016)

## SEARCH HISTORY

**Search Logic:**

- Search 1: TA=(((ultraso\* or acoustic\*) near (transducer\* or emitt\* or speak\*)) near (micro or MEM or MEMS)) (Results 196)
- Search 2: TA=(((ultraso\* or acoustic\*) near (transducer\* or transmitter% or emitt\* or speak\*)) near (micro\* or MEM or MEMS)) (Results 822)
- Search 3: TA=(MUT or cMUT or pMUT) (Results 1017)
- Search 4: FT=((cylinder% or cylindrical\* or curv\* or arcuate or spher\* or semispher\* or hemispher\*) near (enclosure% or enclosed or cavity or cavities or housing% or backing% or gap\* or chamber% or space)) (Results 100000)
- Search 5: FT=((circular\* or circle% or ovoid or oval\* or cylinder% or cylindrical\* or curv\* or arcuate or spher\* or semispher\* or hemispher\*) near (enclosure% or enclosed or cavity or cavities or housing% or backing% or gap\* or chamber% or space)) (Results 100000)
- Search 6: (2 or 3) and 5 (Results 83)
- Search 7: cpc=(H01L41/053) (Results 682)
- Search 8: 5 and 7 (Results 100)
- Search 9: 8 and (2 or 3) (Results 0)
- Search 10: 8 and FT=(micro\*) (Results 42)
- Search 11: FT=(((ultraso\* or acoustic\*) near (transducer\* or emitt\* or speak\*)) near (micro\* or MEM or MEMS)) (Results 5067)
- Search 12: 8 and 11 (Results 0)
- Search 13: cpc=(H01L41/04\* or H01L41/04 or H01L41/08 or H01L41/08\*) (Results 8045)
- Search 14: FT=(((ultraso\* or acoustic\*) near (transducer\* or transmit\* or emitt\* or speak\*)) near (micro\* or MEM or MEMS)) (Results 5827)
- Search 15: 14 and 8 (Results 0)
- Search 16: 13 and 14 (Results 104)
- Search 17: 16 and 5 (Results 6)
- Search 18: cpc=(B06B1/0292 or B06B1/06 or B06B1/0651 or B06B2201/55 or B06B2201/51) (Results 1291)
- Search 19: upc=(600/459) (Results 2053)
- Search FT=(MUT or cMUT or pMUT) (Results 17770)

SEARCH HISTORY

---

20:

Search (18 or 19) and (14 or 20) (Results 576)

21:

Search 21 and 5 (Results 85)

22:

Search cpc=(B06B1/06 or B06B1/06\*) or ipc=(B06B1/06) or upc=(310/334) (Results 10478)

Search 23 and (14 or 20) and 5 not 22 (Results 31)

24:

Search FT=(((back or air or resonan\*) WF1 (chamber% or cavity or cavities)) near (spher\* or semispher\* or hemispher\*)) (Results 283)

Search 25 and (14 or 2) (Results 0)

26:

Search 25 and (14 or 20) (Results 0)

27:

Search 25 and (7 or 13 or 18 or 23) (Results 2)

28:

Search TA=(ultraso\* or acoust\*) and 25 (Results 26)

29:

Search FT((((micro WF1 (electr\* or machin\* or fabricat\* or membran\*)) or micromach\* or microelectr\* or MEMS or MEM) near (ultraso\* or sonic\* or acoustic\*)) near (transduc\* or emit\* or transmit\*)) (Results 1532)

Search FT(((circular\* or circle% or ovoid or oval\* or cylinder% or cylindrical\* or curv\* or arcuate or spher\* or semispher\* or hemispher\*) near (enclosure% or enclosed or cavity or cavities or housing% or backing% or gap\* or chamber% or space)) (Results 100000)

Search 1 and 2 (Results 168)

3:

Search FT(((circular\* or circle% or ovoid or oval\* or cylinder% or cylindrical\* or curv\* or arcuate or spher\* or semispher\* or hemispher\* or shap\*) near resonan\*)) (Results 21824)

Search FT(((circular\* or circle% or ovoid or oval\* or cylinder% or cylindrical\* or curv\* or arcuate or spher\* or semispher\* or hemispher\* or shap\*) w/10 resonan\*)) (Results 39599)

Search FT=((micro\* near (ultraso\* or sonic\* or acoustic\*)) near (transduc\* or emit\* or transmit\*)) (Results 5292)

Search 5 and 6 and 2 (Results 32)

7:

Search FT(((spher\* or semispher\* or hemispher\*) near (enclosure% or enclosed or cavity or cavities or housing% or backing% or gap\* or chamber% or space)) (Results 63981)

Search 1 and 8 (Results 20)

9: