## CPC - COOPERATIVE PATENT CLASSIFICATION

### B PERFORMING OPERATIONS; TRANSPORTING

**(NOTES omitted)**

### MICROSTRUCTURAL TECHNOLOGY; NANOTECHNOLOGY

#### B81 MICROSTRUCTURAL TECHNOLOGY

**(NOTES omitted)**

#### B81B MICROSTRUCTURAL DEVICES OR SYSTEMS, e.g. MICROMECHANICAL DEVICES (piezo-electric, electrostrictive or magnetostrictive elements per se H01L 41/00)

**NOTES**

1. This subclass does not cover:
   - purely electrical or electronic devices per se which are covered by section H, e.g. subclass H01L;
   - purely optical devices per se which are covered by subclasses G02B or G02F;
   - essentially two-dimensional structures, e.g. layered products which are covered by subclass B32B;
   - chemical or biological structures per se which are covered by section C;
   - structures in atomic scale produced by manipulation of single atoms or molecules, which are covered by group B82B 1/00.

2. Devices or systems classified in this subclass are also classified in appropriate subclasses providing for their structural or functional features, if such features are of interest.

3. Attention is drawn to the following places:
   - A61K 9/50 Microcapsules for medicinal preparations
   - B25J 7/00 Micromanipulators
   - G02B 21/32 Micromanipulators combined with microscopes
   - G11B 5/127 Magnetic heads
   - H01P 3/08 Waveguide microstrips.

4. In this subclass, local "residual" subgroups, e.g. B81B 7/0077, are used with the following purpose:
   - When classifying a document which does not fit in any of a set of subgroups with the same dot-level, the document should be classified in the residual group, if present, and not in the group at the hierarchical level one dot above.
   - In the example, the document shall be classified in B81B 7/0077 and not in B81B 7/0032 as B81B 7/0077 is "residual" to B81B 7/0035-B81B 7/0074.

<table>
<thead>
<tr>
<th>1/00</th>
<th>Devices without movable or flexible elements, e.g. microcapillary devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/002</td>
<td>{ Holes characterised by their shape, in either longitudinal or sectional plane }</td>
</tr>
<tr>
<td>1/004</td>
<td>{ Through-holes, i.e. extending from one face to the other face of the wafer }</td>
</tr>
<tr>
<td>1/006</td>
<td>{ Microdevices formed as a single homogeneous piece, i.e. wherein the mechanical function is obtained by the use of the device, e.g. cutters }</td>
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<tr>
<td>1/008</td>
<td>{ Microtips }</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>3/00</th>
<th>Devices comprising flexible or deformable elements, e.g. comprising elastic tongues or membranes (B81B 5/00 takes precedence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/0002</td>
<td>{ Arrangements for avoiding sticking of the flexible or moving parts }</td>
</tr>
<tr>
<td>3/0005</td>
<td>{ Anti-stiction coatings }</td>
</tr>
<tr>
<td>3/0008</td>
<td>{ Structures for avoiding electrostatic attraction, e.g. avoiding charge accumulation }</td>
</tr>
<tr>
<td>3/001</td>
<td>{ Structures having a reduced contact area, e.g. with bumps or with a textured surface }</td>
</tr>
<tr>
<td>3/0013</td>
<td>{ Structures dimensioned for mechanical prevention of stiction, e.g. spring with increased stiffness }</td>
</tr>
<tr>
<td>3/0016</td>
<td>{ Arrangements for avoiding sticking of the flexible or moving parts not provided for in groups B81B 3/0005 - B81B 3/0013 }</td>
</tr>
</tbody>
</table>

| 3/0018               | { Structures acting upon the moving or flexible element for transforming energy into mechanical movement or vice versa, i.e. actuators, sensors, generators } |
| 3/0021               | { Transducers for transforming electrical input into mechanical energy or vice versa (dynamo-electric machines H02K 99/00; electrostatic machines H02N 1/00; piezo-electric devices H01L 41/00) } |
| 3/0024               | { Transducers for transforming thermal input into mechanical energy or vice versa, e.g. thermal or bimorph actuators (electric motors using thermal effects H02N 10/00) } |
| 3/0027               | { Structures for transforming mechanical energy, e.g. potential energy of a spring into translation, sound into translation } |
| 3/0029               | { Transducers for transforming light into mechanical energy or viceversa } |
| 3/0032               | { Structures for transforming energy not provided for in groups B81B 3/0021 - B81B 3/0029 } |
| 3/0035               | { Constitution or structural means for controlling the movement of the flexible or deformable elements } |
| 3/0037               | { For increasing stroke, i.e. achieve large displacement of actuated parts } |
| 3/004                | { Angular deflection } |
| 3/0043               | { Increasing angular deflection } |
| 3/0045               | { Improve properties related to angular swinging, e.g. control resonance frequency } |
3/0048 . . . {Constitution or structural means for controlling angular deflection not provided for in groups B81B 3/0004 - B81B 3/0045}

3/0051 . . . {For defining the movement, i.e. structures that guide or limit the movement of an element (mechanical arrangements for preventing or damping vibration or shock H01H 3/90)}

3/0054 . . . {For holding or placing an element in a given position}

3/0056 . . . {Adjusting the distance between two elements, at least one of them being movable, e.g. air-gap tuning}

3/0059 . . . {Constitution or structural means for controlling the movement not provided for in groups B81B 3/0037 - B81B 3/0056}

3/0062 . . . {Devices moving in two or more dimensions, i.e. having special features which allow movement in more than one dimension}

3/0064 . . . {Constitution or structural means for improving or controlling the physical properties of a device}

3/0067 . . . {Mechanical properties}

3/007 . . . . . . {For controlling stiffness, e.g. ribs}

3/0072 . . . . . . {For controlling internal stress or strain in moving or flexible elements, e.g. stress compensating layers}

3/0075 . . . . . . {For improving wear resistance}

3/0078 . . . . . . {Constitution or structural means for improving mechanical properties not provided for in B81B 3/0007 - B81B 3/0075}

3/0081 . . . . . . {Thermal properties}

3/0083 . . . . . . {Optical properties}

3/0086 . . . . . . {Electrical characteristics, e.g. reducing driving voltage, improving resistance to peak voltage}

3/0089 . . . . . . {Chemical or biological characteristics, e.g. layer which makes a surface chemically active}

3/0091 . . . . . . {Magnetic properties, e.g. guiding magnetic flux}

3/0094 . . . . . . {Constitution or structural means for improving or controlling physical properties not provided for in B81B 3/0067 - B81B 3/0091}

3/0097 . . . . . . {Devices comprising flexible or deformable elements not provided for in groups B81B 3/0002 - B81B 3/0094}

5/00 Devices comprising elements which are movable in relation to each other, e.g. comprising slidable or rotatable elements

7/00 Microstructural systems; Auxiliary parts of microstructural devices or systems

7/0003 . . . . {MEMS mechanisms for assembling automatically hinged components, self-assembly devices (self-assembly processes B81C 1/00007)}

7/0006 . . . . {Interconnects}

7/0009 . . . . {Structural features, others than packages, for protecting a device against environmental influences (B81C 1/00777 takes precedence)}

7/0012 . . . . {Protection against reverse engineering, unauthorised use, use in unintended manner, wrong insertion or pin assignment}

7/0016 . . . . {Protection against shocks or vibrations, e.g. vibration damping}

7/0019 . . . . {Protection against thermal alteration or destruction (B81B 7/0083 takes precedence)}

7/0022 . . . . {Protection against electrostatic discharge (electrostatic discharge protection for electronic semiconductor circuits H01L 27/0248; circuit arrangements for protecting electronic switching circuits used for pulse technique against overcurrent or overvoltage H02K 17/008)}

7/0025 . . . . {Protection against chemical alteration}

7/0029 . . . . {Protection against environmental influences not provided for in groups B81B 7/0012 - B81B 7/0023}

7/0032 . . . . {Packages or encapsulation (processes for packaging MEMS B81C 1/00261; packaging of smart-MEMS B81C 1/0023)}

7/0035 . . . . {for maintaining a controlled atmosphere inside of the chamber containing the MEMS}

7/0038 . . . . {using materials for controlling the level of pressure, contaminants or moisture inside of the package, e.g. getters}

7/0041 . . . . {maintaining a controlled atmosphere with techniques not provided for in B81B 7/0038}

7/0045 . . . . {for reducing stress inside of the package structure}

7/0048 . . . . {between the MEMS die and the package substrate}

7/0051 . . . . {between the package lid and the substrate}

7/0054 . . . . {between other parts not provided for in B81B 7/0048 - B81B 7/0051}

7/0058 . . . . {for protecting against damages due to external chemical or mechanical influences, e.g. shocks or vibrations}

7/0061 . . . . {(suitable for fluid transfer from the MEMS out of the package or vice versa, e.g. transfer of liquid, gas, sound)}

7/0064 . . . . {for protecting against electromagnetic or electrostatic interferences}

7/0067 . . . . {for controlling the passage of optical signals through the package}

7/007 . . . . {Interconnections between the MEMS and external electrical signals}

7/0074 . . . . {3D packaging, i.e. encapsulation containing one or several MEMS devices arranged in planes non-parallel to the mounting board}

7/0077 . . . . {Other packages not provided for in groups B81B 7/0035 - B81B 7/0047}

7/008 . . . . {MEMS characterised by an electronic circuit specially adapted for controlling or driving the same (B81B 7/0087 takes precedence; arrangements for starting, regulating, braking, or otherwise controlling an actuator H02N; control arrangements or circuits for visual indicators G09G 3/00)}

NOTES

1. This group covers: only MEMS with an electronic circuit which is not specific to a particular application.

2. This group does not cover: electronic circuits per se, e.g. for controlling or driving application specific MEMS

7/0083 . . . . {Temperature control}

7/0087 . . . . {On-device systems and sensors for controlling, regulating or monitoring}

7/009 . . . . {Maintaining a constant temperature by heating or cooling}

7/0093 . . . . {by cooling}

7/0096 . . . . {by heating}
Microstructural systems or auxiliary parts thereof

2201/00 Specific applications of microelectromechanical systems

2201/01 Switches

2201/02 Sensors

2201/03 Microengines and actuators

2201/04 Optical MEMS

2201/05 Microfluidics

2201/06 Bio-MEMS

2201/07 Data storage devices, static or dynamic memories

2201/08 Microfilters, e.g. for gas or fluids

2201/09 Read heads, write heads or micropositioners for hard- or optical disks

2201/10 STM or AFM microtips

2201/11 Mechanical connectors, i.e. not functioning as an electrical connector

2201/12 Networks or arrays of similar microstructural devices

2201/13 Mechanical connectors, i.e. not functioning as an electrical connector
2207/053 . . of movable structures
2207/056 . . of static structures
2207/07 . Interconnects
2207/09 . Packages
2207/091 . . Arrangements for connecting external electrical signals to mechanical structures inside the package
2207/092 . . . Buried interconnects in the substrate or in the lid
2207/093 . . . Conductive package seal
2207/094 . . . Feed-through, via
2207/095 . . . through the lid
2207/096 . . . through the substrate
2207/097 . . . Interconnects arranged on the substrate or the lid, and covered by the package seal
2207/098 . . . Arrangements not provided for in groups B81B 2207/092 - B81B 2207/097
2207/11 . Structural features, others than packages, for protecting a device against environmental influences
2207/115 . . Protective layers applied directly to the device before packaging
2207/99 . Microstructural systems or auxiliary parts thereof not provided for in B81B 2207/01 - B81B 2207/115