

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 (piezoelectric, electrostrictive or magnetostrictive elements per se [H10N 30/00](#), [H10N 35/00](#))

NOTES

1. This subclass does not cover:
 - purely electrical or electronic devices per se which are covered by section [H](#), e.g. class [H10](#);
 - purely optical devices per se which are covered by subclasses [G02B](#) or [G02F](#);
 - essentially two-dimensional [2D] 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](#)

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00	Devices without movable or flexible elements, e.g. microcapillary devices	3/0013	. . {Structures dimensioned for mechanical prevention of stiction, e.g. spring with increased stiffness}
1/002	. {Holes characterised by their shape, in either longitudinal or sectional plane}	3/0016	. . {Arrangements for avoiding sticking of the flexible or moving parts not provided for in groups B81B 3/0005 - B81B 3/0013 }
1/004	. . {Through-holes, i.e. extending from one face to the other face of the wafer}	3/0018	. {Structures acting upon the moving or flexible element for transforming energy into mechanical movement or <u>vice versa</u> , i.e. actuators, sensors, generators}
1/006	. {Microdevices formed as a single homogeneous piece, i.e. wherein the mechanical function is obtained by the use of the device, e.g. cutters}	3/0021	. . {Transducers for transforming electrical into mechanical energy or <u>vice versa</u> (dynamo-electric machines H02K 99/00 ; electrostatic machines H02N 1/00 ; piezoelectric devices H10N 30/00)}
1/008	. . {Microtips}	3/0024	. . {Transducers for transforming thermal into mechanical energy or <u>vice versa</u> , e.g. thermal or bimorph actuators (electric motors using thermal effects H02N 10/00)}
3/00	Devices comprising flexible or deformable elements, e.g. comprising elastic tongues or membranes (B81B 5/00 takes precedence)	3/0027	. . {Structures for transforming mechanical energy, e.g. potential energy of a spring into translation, sound into translation}
3/0002	. {Arrangements for avoiding sticking of the flexible or moving parts}		
3/0005	. . {Anti-stiction coatings}		
3/0008	. . {Structures for avoiding electrostatic attraction, e.g. avoiding charge accumulation}		
3/001	. . {Structures having a reduced contact area, e.g. with bumps or with a textured surface}		

- 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 3/0043](#) - [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 3/60](#))}
 - 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 3/007](#) - [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 (circuit arrangements for protecting electronic switching circuits used for pulse technique against overcurrent or overvoltage [H03K 17/08](#); electrostatic discharge protection for electronic semiconductor circuits [H10D 89/60](#))}
 - 7/0025 . . {Protection against chemical alteration}
 - 7/0029 . . {Protection against environmental influences not provided for in groups [B81B 7/0012](#) - [B81B 7/0025](#)}
 - 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 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 7/0074](#)}
 - 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. }

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(continued)

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}

7/02 . containing distinct electrical or optical devices of particular relevance for their function, e.g. microelectro-mechanical systems [MEMS] ([B81B 7/04 takes precedence](#))

7/04 . Networks or arrays of similar microstructural devices

2201/00 Specific applications of microelectromechanical systems

2201/01 . Switches

2201/012 . . characterised by the shape

2201/014 . . . having a cantilever fixed on one side connected to one or more dimples

2201/016 . . . having a bridge fixed on two ends and connected to one or more dimples

2201/018 . . . Switches not provided for in [B81B 2201/014](#) - [B81B 2201/016](#)

2201/02 . Sensors

2201/0207 . . Bolometers

2201/0214 . . Biosensors; Chemical sensors

2201/0221 . . Variable capacitors

2201/0228 . . Inertial sensors

2201/0235 . . . Accelerometers

2201/0242 . . . Gyroscopes

2201/025 . . . Inertial sensors not provided for in [B81B 2201/0235](#) - [B81B 2201/0242](#)

2201/0257 . . Microphones or microspeakers

2201/0264 . . Pressure sensors

2201/0271 . . Resonators; ultrasonic resonators

2201/0278 . . Temperature sensors

2201/0285 . . Vibration sensors

2201/0292 . . Sensors not provided for in [B81B 2201/0207](#) - [B81B 2201/0285](#)

2201/03 . Microengines and actuators

2201/031 . . Thermal actuators

2201/032 . . Bimorph and unimorph actuators, e.g. piezo and thermo

2201/033 . . Comb drives

2201/034 . . Electrical rotating micromachines

2201/035 . . Microgears

2201/036 . . Micropumps

2201/037 . . Microtransmissions

2201/038 . . Microengines and actuators not provided for in [B81B 2201/031](#) - [B81B 2201/037](#)

2201/04 . Optical MEMS

2201/042 . . Micromirrors, not used as optical switches

2201/045 . . Optical switches

2201/047 . . Optical MEMS not provided for in [B81B 2201/042](#) - [B81B 2201/045](#)

2201/05 . Microfluidics

2201/051 . . Micromixers, microreactors

2201/052 . . Ink-jet print cartridges

2201/054 . . Microvalves

2201/055 . . Microneedles

2201/057 . . Micropipets, dropformers

2201/058 . . Microfluidics not provided for in [B81B 2201/051](#) - [B81B 2201/054](#)

2201/06 . Bio-MEMS

2201/07 . Data storage devices, static or dynamic memories

2201/10 . Microfilters, e.g. for gas or fluids

2201/11 . Read heads, write heads or micropositioners for hard- or optical disks

2201/12 . STM or AFM microtips

2201/13 . Mechanical connectors, i.e. not functioning as an electrical connector

2203/00 Basic microelectromechanical structures

2203/01 . Suspended structures, i.e. structures allowing a movement

2203/0109 . . Bridges

2203/0118 . . Cantilevers

2203/0127 . . Diaphragms, i.e. structures separating two media that can control the passage from one medium to another; Membranes, i.e. diaphragms with filtering function

2203/0136 . . Comb structures

2203/0145 . . Flexible holders

2203/0154 . . . Torsion bars

2203/0163 . . . Spring holders

2203/0172 . . . Flexible holders not provided for in [B81B 2203/0154](#) - [B81B 2203/0163](#)

2203/0181 . . See-saws

2203/019 . . characterized by their profile

2203/03 . Static structures

2203/0307 . . Anchors

2203/0315 . . Cavities

2203/0323 . . Grooves

2203/033 . . . Trenches

2203/0338 . . . Channels

2203/0346 . . . Grooves not provided for in [B81B 2203/033](#) - [B81B 2203/0338](#)

2203/0353 . . Holes

2203/0361 . . Tips, pillars

2203/0369 . . characterized by their profile

2203/0376 . . . rounded profile

2203/0384 . . . sloped profile

2203/0392 . . . profiles not provided for in [B81B 2203/0376](#) - [B81B 2203/0384](#)

2203/04 . Electrodes

2203/05 . Type of movement

2203/051 . . Translation according to an axis parallel to the substrate

2203/053 . . Translation according to an axis perpendicular to the substrate

2203/055 . . Translation in a plane parallel to the substrate, i.e. enabling movement along any direction in the plane

2203/056 . . Rotation in a plane parallel to the substrate

2203/058 . . Rotation out of a plane parallel to the substrate

2203/06 . Devices comprising elements which are movable in relation to each other, e.g. slidable or rotatable

2207/00 Microstructural systems or auxiliary parts thereof

2207/01 . comprising a micromechanical device connected to control or processing electronics, i.e. Smart-MEMS

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- 2207/012 . . the micromechanical device and the control or processing electronics being separate parts in the same package
- 2207/015 . . the micromechanical device and the control or processing electronics being integrated on the same substrate
- 2207/017 . . Smart-MEMS not provided for in [B81B 2207/012](#) - [B81B 2207/015](#)
- 2207/03 . . Electronic circuits for micromechanical devices which are not application specific, e.g. for controlling, power supplying, testing, protecting
- 2207/05 . . Arrays
- 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](#)