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.

1/00 Devices without movable or flexible elements, e.g. microcapillary devices

1/002 .  (Holes characterised by their shape, in either longitudinal or sectional plane)
1/004 . . (Through-holes, i.e. extending from one face to the other face of the wafer)
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)
1/008 . . (Micropits)

3/00 Devices comprising flexible or deformable elements, e.g. comprising elastic tongues or membranes (B81B 5/00 takes precedence)

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)
3/0013 . . (Structures dimensioned for mechanical prevention of stiction, e.g. spring with increased stiffness)
3/0016 . . (Arrangements for avoiding sticking of the flexible or moving parts not provided for in groups B81B 3/0005 - B81B 3/0013)

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 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 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 vice versa)
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)
Microstructural systems; {Auxiliary parts of microstructural devices or systems}

- MEMS mechanisms for assembling automatically hinged components, self-assembly devices (self-assembly processes B81C 1/00007)
- [Interconnects]
- [Structural features, others than packages, for protecting a device against environmental influences (B81C 1/00077 takes precedence)]
- Protection against reverse engineering, unauthorised use, use in unintended manner, wrong insertion or pin assignment
- Protection against shocks or vibrations, e.g. vibration damping
- Protection against thermal alteration or destruction (B81B 7/0083 takes precedence)

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 H03K 17/008)

Protection against chemical alteration

Protection against environmental influences not provided for in groups B81B 7/0012 - B81B 7/0023

Packages or encapsulation (processes for packaging MEMS B81C 1/00261; packaging of smart-MEMS B81C 1/0023)

for maintaining a controlled atmosphere inside of the chamber containing the MEMS

[using materials for controlling the level of pressure, contaminants or moisture inside of the package, e.g. getters]

[maintaining a controlled atmosphere with techniques not provided for in B81B 7/0038]

[for reducing stress inside of the package structure]

[between the MEMS die and the package substrate]

[between the package lid and the substrate]

[between other parts not provided for in B81B 7/0048 - B81B 7/0051]

[for protecting against damages due to external chemical or mechanical influences, e.g. shocks or vibrations]

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[suitable for fluid transfer from the MEMS out of the package or vice versa, e.g. transfer of liquid, gas, sound]

[for protecting against electromagnetic or electrostatic interferences]

[for maintaining a controlled atmosphere with techniques not provided for in B81B 7/0038]

[for reducing stress inside of the package structure]

[for protecting against damages due to external chemical or mechanical influences, e.g. shocks or vibrations]

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Specific applications of microelectromechanical systems

Switches

characterised by the shape

having a cantilever fixed on one side connected to one or more dimples

having a bridge fixed on two ends and connected to one or more dimples

Switches not provided for in

Sensors

Bolometers

Biosensors; Chemical sensors

Variable capacitors

Inertial sensors

Accelerometers

Gyrosopes

Inertial sensors not provided for in

Microphones or microspeakers

Pressure sensors

Resonators; ultrasonic resonators

Temperature sensors

Vibration sensors

Sensors not provided for in

Microengines and actuators

Thermal actuators

Bimorph and unimorph actuators, e.g. piezo and thermo

Comb drives

Electrical rotating micromachines

Microgears

Micropumps

Microtransmissions

Microengines and actuators not provided for in

Optical MEMS

Optical MEMS not provided for in

Microfluidics

Micromixers, microreactors

Ink-jet print cartridges

Microvalves

Microneedles

Micropipets, dropformers

Microfluidics not provided for in

Bio-MEMS

Data storage devices, static or dynamic memories

Microfilters, e.g. for gas or fluids

Read heads, write heads or micropositioners for hard- or optical disks

STM or AFM microtips

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

Basic microelectromechanical structures

Suspended structures, i.e. structures allowing a movement

Bridges

Cantilevers

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

Comb structures

Flexible holders

Torsion bars

Spring holders

Flexible holders not provided for in

See-saws

characterized by their profile

Static structures

Anchors

Cavities

Grooves

Trenches

Channels

Grooves not provided for in

Holes

Tips, pillars

characterized by their profile

rounded profile

sloped profile

profiles not provided for in

Electrodes

Type of movement

Translation according to an axis parallel to the substrate

Translation according to an axis perpendicular to the substrate

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

Rotation in a plane parallel to the substrate

Rotation out of a plane parallel to the substrate

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

Microstructural systems or auxiliary parts thereof

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

the micromechanical device and the control or processing electronics being separate parts in the same package

the micromechanical device and the control or processing electronics being integrated on the same substrate

Smart-MEMS not provided for in

Electronic circuits for micromechanical devices which are not application specific, e.g. for controlling, power supplying, testing, protecting

Arrays
B81B

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