

## H02N

### ELECTRIC MACHINES NOT OTHERWISE PROVIDED FOR

#### Definition statement

*This place covers:*

Electrostatic generators, motors, clutches, or holding devices;

Other non-dynamo-electric generators or motors;

Holding or levitation devices using magnetic attraction or repulsion;

Arrangements for starting, regulating, braking, or otherwise controlling such machines unless in conjoint operation with a second machine.

#### References

##### Limiting references

*This place does not cover:*

Pumps	<a href="#">F04D</a>
Dynamo-electric machines	<a href="#">H02K</a>
Loudspeakers and microphones	<a href="#">H04R</a>

## H02N 1/002

### {Electrostatic motors}

#### References

##### Limiting references

*This place does not cover:*

Switches making use of micromechanics	<a href="#">H01H 1/0036</a>
Electrostatic relays; Electro-adhesion relays	<a href="#">H01H 59/00</a>
Making use of micromechanics	<a href="#">H01H 59/0009</a>

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Reflecting element being a micromechanical device and being moved or deformed by electrostatic means	<a href="#">G02B 26/0841</a>
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#### Special rules of classification

Electroactive polymers: see rules of classification in [H02N 1/006](#)

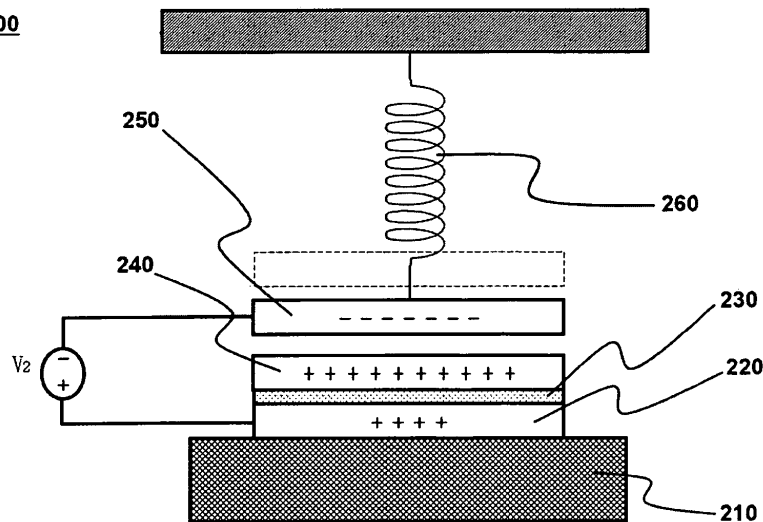
**H02N 1/006**

{of the gap-closing type ([H02N 1/004](#) takes precedence)}

**Definition statement**

*This place covers:*

electrostatic actuators:

**References****Limiting references**

*This place does not cover:*

Electrostatic motors, in which a body is moved along a path due to interaction with an electric field travelling along the path	<a href="#">H02N 1/004</a>
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**Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Electro-chemical actuators	<a href="#">F03G 7/012</a>
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**Special rules of classification**

The electroactive polymers (EAPs) are of three types:

1) The EAPs based on some electrochemical effect inside the polymer (e.g. or i.e. ionic EAPs). Electric machines with the same are classified in [F03G 7/00](#).

2/3) The EAPs based on electrostrictive, or electrostatic (or a combination of electrostrictive and electrostatic) effects. Electric machines based on electrostrictive / electrostatic EAPs are classified in [H02N 2/00](#).

## H02N 1/008

{Laterally driven motors, e.g. of the comb-drive type}

### Definition statement

*This place covers:*

Comb shaped motors the direction of movement is parallel to the extension direction of the comb teeth, among others

### References

#### Limiting references

*This place does not cover:*

Details of microelectro-mechanical resonators	<a href="#">H03H 9/02244</a>
Constructional features of microelectro-mechanical resonators of material which is not piezo-electric, electrostrictive, or magnetostrictive	<a href="#">H03H 9/2405</a>

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Details of microelectro-mechanical resonators	<a href="#">H03H 9/02244</a>
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### Special rules of classification

Comb shaped motors with oscillating movement are classified in [H02N 1/006](#)

## H02N 1/08

with conductive charge carrier, i.e. capacitor machines

### Definition statement

*This place covers:*

Including conveyor belt carrying conductive charge carriers charged by induction, i.e. like capacitors.

### References

#### Limiting references

*This place does not cover:*

Machines of the corona charging type in which an (usually) insulating belt is charged by charges generated by corona effect	<a href="#">H02N 1/12</a>
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### Special rules of classification

Influence type generators built as a conveyor belt can be of two types (according to the way the belt is charged): induction charging type and corona charging type.

The corona charging type usually comprises an insulating belt charged by charges generated by corona effect. This type of machine is classified in [H02N 1/12](#) (even if the belt comprises some conductive element)

The induction charging type are a conveyor belt version (i.e. a linear version) of capacitor machines in which conductive charge carriers are charged by induction ( i.e. like capacitors). This type of machine is classified in [H02N 1/08](#).

## H02N 1/12

**in the form of a conveyor belt, e.g. van de Graaff machine**

### Definition statement

*This place covers:*

Machines of the corona charging type in which an (usually) insulating belt is charged by charges generated by corona effect. (if the belt contains some conductive element see Special Rules of Classification).

### References

#### Limiting references

*This place does not cover:*

Machines of the induction charging type i.e. in which the belt carries conductive charge carriers charged by induction	<a href="#">H02N 1/08</a>
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### Special rules of classification

Influence type generators built as a conveyor belt can be of two types (according to the way the belt is charged): induction charging type and corona charging type.

The corona charging type usually comprises an insulating belt charged by charges generated by corona effect. This type of machine is classified in [H02N 1/12](#) (even if the belt comprise some conductive element)

The induction charging type are a conveyor belt version (i.e. a linear version) of capacitor machines in which conductive charge carriers are charged by induction ( i.e. like capacitors). This type of machine is classified in [H02N 1/08](#).

## H02N 2/00

**Electric machines in general using piezo-electric effect, electrostriction or magnetostriction (generating mechanical vibrations in general [B06B](#); piezo-electric, electrostrictive or magnetostrictive devices in general [H01L 41/00](#))**

### Definition statement

*This place covers:*

Electric motors or generators using piezo-electric (PE) or magnetostriction (MS) devices described under [H01L 41/00](#) as primary motion producing or electricity generating parts. In particular:

Linear or rotary motors, including positioners or actuators, based on at least one PE or MS device in cooperation with at least one driven element as mechanical output, e.g. a rotor or translating shaft. The motors can operate based on standing or travelling waves or quasi-static deformation generated by said PE or MS devices;

Generators based on at least one PE or MS device in cooperation with at least one driving element as mechanical input;

Aspects such as the operating principle, mechanical construction built around said PE or MS devices, driving or control circuits or methods, and methods relating to manufacturing of the engines.

## Definition statement

Further information:

In this group the PE or MS devices are seen as black boxes which could in principle be replaced by any device of equal electromechanical conversion functionality.

If no relevant details of the PE or MS devices themselves are given classification is done only in this group. If particular details of the PE or MS devices are concerned, e.g. these devices appear to be relevant to other technical fields as well, classification in [H01L 41/00](#) is required. If no details other than the PE or MS devices themselves are described, e.g. PE stacks or benders are just called actuators or generators, classification is done only in [H01L 41/00](#).

## References

### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Mechanical vibration generators	<a href="#">B06B 1/06</a>
Adjustable work or tool supports in machining tools, e.g. motorised platforms	<a href="#">B23Q 1/34</a>
Hair clippers; Shavers	<a href="#">B26B 19/28</a>
Typewriters	<a href="#">B41J 2/295</a>
PE generators - in tyre sensors- in spark lighters - in firing or trigger mechanisms of weapons - for measurement devices- in photographic flash ignition	<a href="#">B60C 23/0411</a> , <a href="#">F23Q 2/287</a> , <a href="#">F23Q 3/002</a> , <a href="#">F41A 19/62</a> , <a href="#">G01</a> , <a href="#">G03B 15/0463</a> ,
Fuel injection in combustion engines - Control circuits or methods for injectors - Injectors- Injection valves	<a href="#">F02D 41/2096</a> , <a href="#">F02M 51/0603</a> , <a href="#">F02M 59/468</a> , <a href="#">F02M 63/0026</a> ,
Pumps - Diaphragm type micropumps - Tube type- Oscillatory type, e.g. fans	<a href="#">F04B 17/003</a> , <a href="#">F04B 43/046</a> , <a href="#">F04B 43/095</a> , <a href="#">F04D 33/00</a> ,
Brakes	<a href="#">F16D 2121/28</a> , <a href="#">F16D 2129/12</a>
Adjustable optical elements, e.g. motorised lenses or objectives	<a href="#">G02B 7/02</a> - <a href="#">G02B 7/10</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Electrostatic motors or generators	<a href="#">H02N 1/00</a>
Motors using thermal drive effects	<a href="#">H02N 10/00</a>
Motors or generators not provided for elsewhere; Alleged electric or magnetic perpetua mobilia	<a href="#">H02N 11/00</a>
Liquid wave driven, e.g. ocean powered, generators	<a href="#">F03B 13/14</a>
Oscillatory wind driven generators	<a href="#">F03D 5/06</a>
PE or MS devices in general, e.g. PE stacks or benders; Structural details and fabrication thereof	<a href="#">H01L 41/00</a>
Oscillatory dynamo-electric generators	<a href="#">H02K 35/00</a>

## Special rules of classification

In this group, in the absence of an indication to the contrary, an invention is classified in the last appropriate place.

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Motor	Apparatus producing mechanical motion from electrical energy, the motion may be continuous or in separate strokes ;The term includes thus actuators or positioners, wherein the driven element is movable along a certain linear or angular stroke (limited stroke motors)
Ultrasonic motor	PE or MS motor operating in ultrasonic frequency range
perpetua mobilia	latin expression for devices having perpetual motion

## Synonyms and Keywords

BAW	Bulk acoustic wave
EAP	Electroactive polymer
MEMS	Microelectromechanical system
MS	Magnetostrictive
PE	Piezoelectric or electrostrictive
PEG	Piezoelectric generator
SAW	Surface acoustic wave
USM	Ultrasonic motor
Travelling wave motor Vibration wave motor	PE or MS motor

## H02N 2/0005

{producing non-specific motion; Details common to machines covered by [H02N 2/02](#) - [H02N 2/16](#)}

### Definition statement

*This place covers:*

Motors wherein the type of motion is irrelevant, e.g. driving devices which may be used to advance a driven body in arbitrary directions, and details thereof.

Details of linear or rotary motors covered by [H02N 2/02](#) - [H02N 2/16](#) wherein the type of motion is irrelevant, e.g. of mechanical, electrical or thermal nature, such as friction interfaces between driving and driven parts.

### References

#### Limiting references

*This place does not cover:*

Details of linear or rotary motors wherein the type of motion is relevant	<a href="#">H02N 2/02</a> - <a href="#">H02N 2/16</a>
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**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Friction linings	<a href="#">F16D 69/00</a>
Springs in general	<a href="#">F16F 1/00</a>
Casings for dynamo-electric machines	<a href="#">H02K 5/00</a>

**H02N 2/023**

**{Inchworm motors}**

**Definition statement**

*This place covers:*

Linear motors comprising at least two clamping devices and one intermediate driving device which are excited in sequence to grip and move a driven body.

**H02N 2/025**

**{Inertial sliding motors}**

**Definition statement**

*This place covers:*

Linear motors comprising a driving device which is excited asymmetrically during multiple phases such that in one phase the static friction between a driven body and its support is overcome, thereby effecting a sliding motion between them.

**H02N 2/026**

**{by pressing one or more vibrators against the driven body}**

**Definition statement**

*This place covers:*

Linear motors wherein a driven body, e.g. a translating rail, is moved by vibrations of one or more vibrators pressed against the driven body.

**References****Limiting references**

*This place does not cover:*

Details of the vibrator	<a href="#">H02N 2/0005</a>
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**H02N 2/08**

**using travelling waves {, i.e. Rayleigh surface waves}**

**Definition statement**

*This place covers:*

Linear motors wherein a driven body is moved by Rayleigh type surface acoustic waves only.

## H02N 2/103

**{by pressing one or more vibrators against the rotor}**

### Definition statement

*This place covers:*

Rotary motors wherein a rotor is moved by vibrations of one or more vibrators pressed against the rotor.

### References

#### Limiting references

*This place does not cover:*

Details of the vibrator	<a href="#">H02N 2/0005</a>
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## H02N 2/105

**{Cycloid or wobble motors; Harmonic traction motors}**

### Definition statement

*This place covers:*

Rotary motors wherein a cycloid type motion of a rotor is caused by radial or tangential driving devices excited in different phases.

## H02N 2/106

**{Langevin motors}**

### Definition statement

*This place covers:*

Rotary motors wherein a substantially rod-shaped vibrator excited to axial vibrations, e.g. a longitudinal mode, combined with lateral vibrations, e.g. a bending or torsion mode, creates a hula-hoop like progressive wave on its surface, thereby driving a rotor.

## H02N 2/16

**using travelling waves {, i.e. Rayleigh surface waves}**

### Definition statement

*This place covers:*

Rotary motors wherein a rotor is moved by Rayleigh type surface acoustic waves only.



## H02N 3/00

**Generators in which thermal or kinetic energy is converted into electrical energy by ionisation of a fluid and removal of the charge therefrom (discharge tubes functioning as thermionic generators [H01J 45/00](#))**

### Definition statement

*This place covers:*

Generators based on the collection of free electrical charges in the flow. e.g. ionized gas in a thermal engine exhaust.

### References

#### Limiting references

*This place does not cover:*

Discharge tubes functioning as thermionic generators	<a href="#">H01J 45/00</a>
Use of naturally-occurring electricity, e.g. lightning or static electricity	<a href="#">H05F 7/00</a>

## H02N 10/00

**Electric motors using thermal effects {(motors using expansion or contraction of bodies due to heating or cooling [F03G 7/06](#))}**

### Definition statement

*This place covers:*

Devices working around the Curie point.

### References

#### Limiting references

*This place does not cover:*

Radiation pyrometers	<a href="#">G01J 5/34</a>
Thermometers using thermo-electric or thermomagnetic elements	<a href="#">G01K 7/00</a>
Selection of materials for magnetography, e.g. for Curie-point writing	<a href="#">G03G 5/00</a>
Thermomagnetic generators, e.g. ;using Nernst-Ettinghausen effect (plurality of solid state components formed in or on a common substrate)	<a href="#">H01L 37/00</a>
Using thermal change of magnetic permeability, e.g. working above and below the Curie point	<a href="#">H01L 37/04</a>

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Mechanical-power-producing mechanisms using a shape memory alloy	<a href="#">F03G 7/0614</a>
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## H02N 11/00

Generators or motors not provided for elsewhere; Alleged perpetua mobilia obtained by electric or magnetic means (by hydrostatic pressure [F03B 17/04](#); {by mechanical means [F03G 7/10](#);} by dynamo-electric means, {including arrangements of permanent magnets interacting with other permanent magnets,} [H02K 53/00](#))

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Alleged perpetua mobilia obtained by hydrostatic pressure	<a href="#">F03B 17/04</a>
Alleged perpetua mobilia obtained by mechanical means	<a href="#">F03G 7/10</a>
Alleged perpetua mobilia obtained by dynamo-electric means, including arrangements of permanent magnets interacting with other permanent magnets	<a href="#">H02K 53/00</a>

### Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

perpetua mobilia	latin expression for devices having perpetual motion
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## H02N 11/002

### {Generators}

### References

#### Limiting references

This place does not cover:

Radiation pyrometers	<a href="#">G01J 5/34</a>
Thermometers using thermo-electric or thermomagnetic elements	<a href="#">G01K 7/00</a>
Selection of materials for magnetography, e.g. for Curie-point writing	<a href="#">G03G 5/00</a>
Thermoelectric generators comprising a junction of dissimilar materials, i.e. exhibiting Seebeck or Peltier effect with or without other thermo-electric effects or thermomagnetic effects	<a href="#">H01L 35/00</a>
Thermomagnetic generators, e.g. using Nernst-Ettinghausen effect (plurality of solid state components formed in or on a common substrate)	<a href="#">H01L 37/00</a>
Using thermal change of magnetic permeability, e.g. working above and below the Curie point	<a href="#">H01L 37/04</a>
Electrochemical current or voltage generators	<a href="#">H02M6/00</a> - <a href="#">H01M 14/00</a>

**H02N 11/006****{Motors}****References****Limiting references***This place does not cover:*

Actuators with elements stretchable when contacted with liquid rich in ions, with UV light, with a salt solution	<a href="#">F03G 7/009</a>
Actuators having a material for absorbing or desorbing gas, e.g. a metal hydride	<a href="#">F03G 7/011</a>
Electro-chemical actuators	<a href="#">F03G 7/012</a>
Actuators using the difference in osmotic pressure between fluids	<a href="#">F03G 7/015</a>

**Special rules of classification**Electroactive polymers: see rules of classification in [H02N 1/006](#)**H02N 11/008****{Alleged electric or magnetic perpetua mobilia}****References****Limiting references***This place does not cover:*

Perpetua mobilia obtained by the reciprocal attraction / repulsion of a system of magnets arranged as the coils and or the magnets of the normal electrodynamic machines, including systems comprising only permanent magnets	<a href="#">H02K 53/00</a>
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**H02N 13/00****Clutches or holding devices using electrostatic attraction, e.g. using Johnson-Rahbek effect****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Supporting structures for apparatus specially adapted for handling semiconductors using electrostatic chucks	<a href="#">H01L 21/6831</a>
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## H02N 15/00

Holding or levitation devices using magnetic attraction or repulsion, not otherwise provided for (electric or magnetic devices for holding work on machine tools [B23Q 3/15](#) {; monorail vehicle propulsion or suspension [B60L 13/00](#)}; sliding or levitation devices for railway systems [B61B 13/08](#); material handling devices associated with conveyors incorporating devices with electrostatic or magnetic grippers [B65G 47/92](#); separating thin or filamentary articles from piles using magnetic force [B65H 3/16](#); delivering thin or filamentary articles from magnetic holders by air blast or suction [B65H 29/24](#); bearings using magnetic or electric supporting means [F16C 32/04](#); relieving bearing loads using magnetic means [F16C 39/06](#); magnets [H01F 7/00](#); dynamo-electric clutches or brakes [H02K 49/00](#) {; electric furnaces with simultaneous levitation and heating [H05B 6/32](#)})

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Electric or magnetic devices for holding work on machine tools	<a href="#">B23Q 3/15</a>
Monorail vehicle propulsion or suspension	<a href="#">B60L 13/00</a>
Sliding or levitation devices for railway systems	<a href="#">B61B 13/08</a>
Material handling devices associated with conveyors incorporating devices with electrostatic or magnetic grippers	<a href="#">B65G 47/92</a>
Separating thin or filamentary articles from piles using magnetic force	<a href="#">B65H 3/16</a>
Delivering thin or filamentary articles from magnetic holders by air blast or suction	<a href="#">B65H 29/24</a>
Bearings using magnetic or electric supporting means	<a href="#">F16C 32/04</a>
Relieving bearing loads using magnetic means	<a href="#">F16C 39/06</a>
Magnets	<a href="#">H01F 7/00</a>
Apparatus specially adapted for handling semiconductor using electrostatic chucks	<a href="#">H01L 21/6831</a>
Details of electrostatic chucks	<a href="#">H01L 21/6833</a>
Dynamo-electric clutches or brakes	<a href="#">H02K 49/00</a>
Electric furnaces with simultaneous levitation and heating	<a href="#">H05B 6/32</a>

## H02N 15/04

Repulsion by the Meissner effect (superconductors or hyperconductors in general [H01L 39/00](#))

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Superconductors or hyperconductors in general	<a href="#">H01L 39/00</a>
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