

## SECTION H — ELECTRICITY

### H01 BASIC ELECTRIC ELEMENTS

**H01F MAGNETS; INDUCTANCES; TRANSFORMERS; SELECTION OF MATERIALS FOR THEIR MAGNETIC PROPERTIES** (ceramics based on ferrites C04B 35/26; alloys C22C; thermomagnetic devices H01L 37/00; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers H04R) [2]

#### Subclass index

#### MAGNETS, ELECTROMAGNETS

Characterised by the magnetic material.....	1/00
Cores, yokes, armatures.....	3/00
Coils.....	5/00
Superconducting coils or magnets.....	6/00
Magnets.....	7/00
Magnetising, demagnetising.....	13/00
Manufacture.....	41/00

THIN FILMS..... 10/00

#### FIXED INDUCTANCES OR TRANSFORMERS

Of the signal type.....	17/00, 19/00
Other than of the signal type.....	30/00, 37/00
Manufacture.....	41/00

#### VARIABLE INDUCTANCES OR TRANSFORMERS

Of the signal type.....	21/00
Other than of the signal type.....	29/00
Manufacture.....	41/00

DETAILS OF TRANSFORMERS OR INDUCTANCES, IN GENERAL..... 27/00

SUPERCONDUCTIVE OR CRYOGENIC TRANSFORMERS..... 36/00

ADAPTATIONS OF TRANSFORMERS OR INDUCTANCES FOR SPECIFIC APPLICATIONS OR FUNCTIONS..... 38/00

**1/00 Magnets or magnetic bodies characterised by the magnetic materials therefor; Selection of materials for their magnetic properties** (thin magnetic films characterised by their composition H01F 10/10)

#### Note(s) [2010.01]

Attention is drawn to Note (3) after the title of section C, which Note indicates to which version of the periodic table of chemical elements the IPC refers.

1/01 • of inorganic materials (H01F 1/44 takes precedence) [6]

1/03 • • characterised by their coercivity [6]

#### Note(s)

Group H01F 1/40 takes precedence over H01F 1/03

1/032 • • • of hard-magnetic materials [6]

1/04 • • • metals or alloys [6]

1/047 • • • • Alloys characterised by their composition [5, 6]

1/053 • • • • • containing rare earth metals [5, 6]

1/055 • • • • • and magnetic transition metals, e.g. SmCo<sub>5</sub> [6]

1/057 • • • • • and IIIa elements, e.g. Nd<sub>2</sub>Fe<sub>14</sub>B [6]

1/058 • • • • • and IVa elements, e.g. Gd<sub>2</sub>Fe<sub>14</sub>C [6]

1/059 • • • • • and Va elements, e.g. Sm<sub>2</sub>Fe<sub>17</sub>N<sub>2</sub> [6]

1/06 • • • • • in the form of particles, e.g. powder (H01F 1/047 takes precedence) [5, 6]

1/08 • • • • • pressed, sintered, or bound together [6]

1/09 • • • • • mixtures of metallic and non-metallic particles; metallic particles having oxide skin [6]

1/10 • • • • • non-metallic substances, e.g. ferrites [6]

1/11 • • • • • in the form of particles [6]

1/113 • • • • • in a bonding agent [6]

1/117 • • • • • Flexible bodies [6]

1/12 • • • of soft-magnetic materials [6]

1/14 • • • • metals or alloys [6]

1/147 • • • • • Alloys characterised by their composition [5, 6]

1/153 • • • • • Amorphous metallic alloys, e.g. glassy metals [5, 6]

1/16 • • • • • in the form of sheets (H01F 1/147 takes precedence) [5, 6]

1/18 • • • • • with insulating coating [6]

1/20 • • • • • in the form of particles, e.g. powder (H01F 1/147 takes precedence) [5, 6]

1/22 • • • • • pressed, sintered, or bound together [6]

1/24 • • • • • the particles being insulated [6]

## H01F

- 1/26 • • • • • by macromolecular organic substances [6]
- 1/28 • • • • • dispersed or suspended in a bonding agent [6]
- 1/33 • • • • mixtures of metallic and non-metallic particles; metallic particles having oxide skin [6]
- 1/34 • • • • non-metallic substances, e.g. ferrites [6]
- 1/36 • • • • • in the form of particles [6]
- 1/37 • • • • • in a bonding agent [6]
- 1/375 • • • • • Flexible bodies [6]
- 1/38 • • • • • amorphous, e.g. amorphous oxides [6]
- 1/40 • • of magnetic semiconductor materials, e.g.  $\text{CdCr}_2\text{S}_4$  (devices using galvano-magnetic or similar effects H01L 43/00) [6]
- 1/42 • of organic or organo-metallic materials (H01F 1/44 takes precedence) [6]
- 1/44 • of magnetic liquids, e.g. ferrofluids (particles in a bonding agent H01F 1/28, H01F 1/36) [6]
- 3/00 Cores, yokes, or armatures** (magnetic materials H01F 1/00; permanent magnets H01F 7/02)
  - 3/02 • made from sheets
  - 3/04 • made from strips or ribbons
  - 3/06 • made from wires
  - 3/08 • made from powder (powder coatings on sheets H01F 3/02, on strips or ribbons H01F 3/04, on wires H01F 3/06)
  - 3/10 • Composite arrangements of magnetic circuits
  - 3/12 • • Magnetic shunt paths
  - 3/14 • • Constrictions; Gaps, e.g. air-gaps (in magnetic shunt paths H01F 3/12)
- 5/00 Coils** (superconducting coils H01F 6/06; fixed inductances of the signal type H01F 17/00)
  - 5/02 • wound on non-magnetic supports, e.g. formers
  - 5/04 • Arrangements of electric connections to coils, e.g. leads
  - 5/06 • Insulation of windings
- 6/00 Superconducting magnets; Superconducting coils** [6]
  - 6/02 • Quenching; Protection arrangements during quenching [6]
  - 6/04 • Cooling [6]
  - 6/06 • Coils, e.g. winding, insulating, terminating or casing arrangements therefor [6]
- 7/00 Magnets** (superconducting magnets H01F 6/00; for separation of solid materials from solid materials or fluids B03C 1/00; for bench or like work-holders B23B 31/28, B23Q 3/00; work-holding devices B25B 11/00; lifting magnets B66C 1/00; for electric meters G01R; for relays H01H; for dynamo-electric machines H02K)
  - 7/02 • Permanent magnets
  - 7/04 • • Means for releasing the attractive force
  - 7/06 • Electromagnets; Actuators including electromagnets [6]
  - 7/08 • • with armatures
  - 7/10 • • • specially adapted for ac
  - 7/11 • • • • reducing or eliminating the effects of eddy currents [6]
  - 7/12 • • • • having anti-chattering arrangements
  - 7/121 • • • Guiding or setting position of armatures, e.g. retaining armatures in their end position [6]
  - 7/122 • • • • by permanent magnet [6]
  - 7/123 • • • • by ancillary coil [6]

- 7/124 • • • • by mechanical latch, e.g. detent [6]
- 7/126 • • • Supporting or mounting [6]
- 7/127 • • • Assembling [6]
- 7/128 • • • Encapsulating, encasing or sealing [6]
- 7/129 • • • • of armatures [6]
- 7/13 • • • characterised by pulling-force characteristic
- 7/14 • • • Pivoting armatures (H01F 7/17 takes precedence) [6]
- 7/16 • • • Rectilinearly-movable armatures (H01F 7/17 takes precedence) [6]
- 7/17 • • • Pivoting and rectilinearly-movable armatures [6]
- 7/18 • • • Circuit arrangements for obtaining desired operating characteristics, e.g. for slow operation, for sequential energisation of windings, for high-speed energisation of windings
- 7/20 • • without armatures (cores H01F 3/00; coils H01F 5/00)
- 10/00 Thin magnetic films, e.g. of one-domain structure** (magnetic record carriers G11B 5/00; thin-film magnetic stores G11C)
  - 10/06 • characterised by the coupling or physical contact with connecting or interacting conductors
  - 10/08 • characterised by magnetic layers (applying magnetic films to substrates H01F 41/14) [3]
  - 10/10 • • characterised by the composition [3]
  - 10/12 • • • being metals or alloys (intermetallic compounds H01F 10/18) [3]
  - 10/13 • • • • Amorphous metallic alloys, e.g. glassy metals [7]
  - 10/14 • • • • containing iron or nickel (H01F 10/13, H01F 10/16 take precedence) [3, 7]
  - 10/16 • • • • containing cobalt (H01F 10/13 takes precedence) [3, 7]
  - 10/18 • • • being compounds [3]
  - 10/187 • • • • Amorphous compounds [7]
  - 10/193 • • • • Magnetic semiconductor compounds [7]
  - 10/20 • • • • Ferrites [3]
  - 10/22 • • • • • Orthoferrites [3]
  - 10/24 • • • • • Garnets [3]
  - 10/26 • characterised by the substrate or intermediate layers (H01F 10/32 takes precedence) [3, 7]
  - 10/28 • • characterised by the composition of the substrate [3]
  - 10/30 • • characterised by the composition of intermediate layers [3]
  - 10/32 • Spin-exchange-coupled multilayers, e.g. nanostructured superlattices [7]

**13/00 Apparatus or processes for magnetising or demagnetising** (for degaussing ships B63G 9/06; for clocks or watches G04D 9/00; demagnetising arrangements for colour television H04N 9/29)

### Note(s)

Groups H01F 17/00-H01F 38/00, with the exception of groups H01F 27/42 and H01F 38/32, cover only structural or constructional aspects of transformers, inductive reactors, chokes or the like. These groups do not cover circuit arrangement of such devices, which are covered by the appropriate functional places.

- 17/00 Fixed inductances of the signal type** (coils in general H01F 5/00)
- 17/02 • without magnetic core

- 17/03 • • with ceramic former
- 17/04 • with magnetic core
- 17/06 • • with core substantially closed in itself, e.g. toroid
- 17/08 • • • Loading coils for telecommunication circuits
- 19/00 Fixed transformers or mutual inductances of the signal type (H01F 36/00 takes precedence) [3]**
- 19/02 • Audio-frequency transformers or mutual inductances, i.e. not suitable for handling frequencies considerably beyond the audio range
- 19/04 • Transformers or mutual inductances suitable for handling frequencies considerably beyond the audio range (resonant circuits H03H)
- 19/06 • • Broad-band transformers, e.g. suitable for handling frequencies well down into the audio range
- 19/08 • • Transformers having magnetic bias, e.g. for handling pulses
- 21/00 Variable inductances or transformers of the signal type (H01F 36/00 takes precedence) [3]**
- 21/02 • continuously variable, e.g. variometers
- 21/04 • • by relative movement of turns or parts of windings
- 21/06 • • by movement of core or part of core relative to the windings as a whole
- 21/08 • • by varying the permeability of the core, e.g. by varying magnetic bias
- 21/10 • • by means of a movable shield
- 21/12 • discontinuously variable, e.g. tapped
- 27/00 Details of transformers or inductances, in general [6]**
- 27/02 • Casings
- 27/04 • • Leading of conductors or axles through casings, e.g. for tap-changing arrangements
- 27/06 • Mounting, supporting, or suspending transformers, reactors, or choke coils
- 27/08 • Cooling (heat-transfer elements F28F); Ventilating (structural details of casings H01F 27/02)
- 27/10 • • Liquid cooling
- 27/12 • • • Oil cooling
- 27/14 • • • • Expansion chambers; Oil conservators; Gas cushions; Arrangements for purifying, drying, or filling
- 27/16 • • • Water cooling
- 27/18 • • • by evaporating liquids
- 27/20 • • Cooling by special gases or non-ambient air
- 27/22 • • Cooling by heat conduction through solid or powdered fillings
- 27/23 • Corrosion protection [6]
- 27/24 • Magnetic cores
- 27/245 • • made from sheets, e.g. grain-oriented (H01F 27/26 takes precedence) [5]
- 27/25 • • made from strips or ribbons (H01F 27/26 takes precedence) [5]
- 27/255 • • made from particles (H01F 27/26 takes precedence) [5]
- 27/26 • • Fastening parts of the core together; Fastening or mounting the core on casing or support (on coil H01F 27/30)
- 27/28 • Coils; Windings; Conductive connections
- 27/29 • • Terminals; Tapping arrangements [6]
- 27/30 • • Fastening or clamping coils, windings, or parts thereof together; Fastening or mounting coils or windings on core, casing, or other support
- 27/32 • • Insulating of coils, windings, or parts thereof
- 27/33 • Arrangements for noise damping
- 27/34 • Special means for preventing or reducing unwanted electric or magnetic effects, e.g. no-load losses, reactive currents, harmonics, oscillations, leakage fields
- 27/36 • • Electric or magnetic shields or screens (movable for varying inductance H01F 21/10) [6]
- 27/38 • • Auxiliary core members; Auxiliary coils or windings
- 27/40 • Structural association with built-in electric component, e.g. fuse
- 27/42 • Circuits specially adapted for the purpose of modifying, or compensating for, electric characteristics of transformers, reactors, or choke coils (circuits for controlling transformers, reactors or choke coils, for the purpose of obtaining a desired output H02P 13/00; impedance networks H03H) [6]
- 29/00 Variable transformers or inductances not covered by group H01F 21/00**
- 29/02 • with tapplings on coil or winding; with provision for rearrangement or interconnection of windings
- 29/04 • • having provision for tap-changing without interrupting the load current
- 29/06 • with current collector gliding or rolling on or along winding
- 29/08 • with core, coil, winding, or shield movable to offset variation of voltage or phase shift, e.g. induction regulators
- 29/10 • • having movable part of magnetic circuit
- 29/12 • • having movable coil, winding, or part thereof; having movable shield
- 29/14 • with variable magnetic bias (magnetic amplifiers H03F)
- 30/00 Fixed transformers not covered by group H01F 19/00 [6]**
- 30/02 • Auto-transformers [6]
- 30/04 • having two or more secondary windings, each supplying a separate load, e.g. for radio set power supplies [6]
- 30/06 • characterised by the structure [6]
- 30/08 • • without magnetic core [6]
- 30/10 • • Single-phase transformers (H01F 30/16 takes precedence) [6]
- 30/12 • • Two-phase, three-phase or polyphase transformers [6]
- 30/14 • • • for changing the number of phases [6]
- 30/16 • • Toroidal transformers [6]
- 36/00 Transformers with superconductive windings or with windings operating at cryogenic temperatures (superconducting magnets or superconducting coils H01F 6/00) [3]**
- 37/00 Fixed inductances not covered by group H01F 17/00 [6]**
- 38/00 Adaptations of transformers or inductances for specific applications or functions [6]**
- 38/02 • for non-linear operation [6]
- 38/04 • • for frequency changing [6]
- 38/06 • • for changing the wave shape [6]
- 38/08 • High-leakage transformers or inductances [6]
- 38/10 • • Ballasts, e.g. for discharge lamps [6]
- 38/12 • Ignition, e.g. for IC engines [6]
- 38/14 • Inductive couplings [6]
- 38/16 • Cascade transformers, e.g. for use with extra high tension [6]

## H01F

- 38/18 • Rotary transformers [6]
- 38/20 • Instrument transformers [6]
- 38/22 • • for single phase ac [6]
- 38/24 • • • Voltage transformers [6]
- 38/26 • • • • Constructions [6]
- 38/28 • • • • Current transformers [6]
- 38/30 • • • • Constructions [6]
- 38/32 • • • • Circuit arrangements [6]
- 38/34 • • • • Combined voltage and current transformers [6]
- 38/36 • • • • Constructions [6]
- 38/38 • • for polyphase ac [6]
- 38/40 • • for dc [6]
- 38/42 • Flyback transformers [6]

### 41/00 Apparatus or processes specially adapted for manufacturing or assembling the devices covered by this subclass

- 41/02 • for manufacturing cores, coils, or magnets (H01F 41/14 takes precedence; for dynamo-electric machines H02K 15/00) [3]
- 41/04 • • for manufacturing coils
- 41/06 • • • Winding
- 41/08 • • • • Winding conductors on to or threading conductors through cores or formers which are closed in themselves, e.g. toroids (for interconnecting digital storage elements G11C 5/12)

- 41/10 • • • Connecting leads to windings (making electric connections in general H01R 43/00)
- 41/12 • • • Insulating of windings (of conductors in general H01B 13/06)
- 41/14 • for applying magnetic films to substrates (covering metals, or materials with metals, in general C23C; manufacturing record carriers G11B 5/84) [3]

### **Note(s)**

Group H01F 41/30 takes precedence over groups H01F 41/16-H01F 41/24.

- 41/16 • • the magnetic material being applied in the form of particles, e.g. by serigraphy (H01F 41/18 takes precedence) [3, 7]
- 41/18 • • by cathode sputtering [3]
- 41/20 • • by evaporation [3]
- 41/22 • • Heat treatment; Thermal decomposition; Chemical vapour deposition [3]
- 41/24 • • from liquids [3]
- 41/26 • • • using electric currents [3]
- 41/28 • • • by liquid phase epitaxy [3]
- 41/30 • • for applying nanostructures, e.g. by molecular beam epitaxy (MBE) [7]
- 41/32 • for applying conductive, insulating or magnetic material on a magnetic film [7]
- 41/34 • • in patterns, e.g. by lithography [7]