ECLA EUROPEAN CLASSIFICATION

H01F MAGNETS; INDUCTANCES; TRANSFORMERS; SELECTION OF MATERIALS FOR THEIR MAGNETIC PROPERTIES (ceramics based on ferrites C04B35/26; alloys C22C; [N: construction of loading coils H01B]; thermomagnetic devices H01L37/00; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers H04R)

Note
In this subclass, inductances and transformers are regarded as being "for power supply" if they are intended for this purpose even in systems operating at frequencies above 60 cycles/sec.

H01F1/00 Magnets or magnetic bodies characterised by the magnetic materials therefor; Selection of materials for their magnetic properties

H01F1/00A . [N: Antiferromagnetic materials, i.e. materials exhibiting a Néel transition temperature (H01F1/00E takes precedence)] [N1112]

[N: **WARNING**
[N1112] This groups is not complete pending the completion of reclassification; see provisionally also H01F1/00-H01F1/44R
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H01F1/00B . [N: Diamagnetic or paramagnetic materials, i.e. materials with low susceptibility and no hysteresis (H01F1/00E takes precedence)] [N9603]

H01F1/00D . [N: Thick magnetic films (forming thick magnetic films H01F41/16; magnetic record carriers G11B5/70)] [C0606]

[N: **Note**
Group H01F1/00E takes precedence over groups H01F1/09, H01F1/11, H01F1/20, H01F1/33 and H01F1/36
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H01F1/00E . [N: showing low dimensional magnetism, i.e. spin rearrangements due to a restriction of dimensions, e.g. showing giant magnetoresistivity, (H01F1/153, H01F1/42 and H01F10/00 take precedence; magnetoresistive sensors G01D5/16, G01R33/06; magnetoresistive recording G11B5/39; magnetic-field-controlled resistors H01L43/08)] [C9601]

H01F1/00E10 . . [N: Zero dimensional, e.g. nanoparticles, soft nanoparticles for medical/biological use (preparation of fullerenes in general C01B31/02B)] [N9601] [C1112]

H01F1/00E10B . . . [N: Coated nanoparticles, e.g. nanoparticles coated with organic surfactant] [N1112]

H01F1/00E10M . . . [N: in a non-magnetic matrix, e.g. granular solids (granular films H01F10/00E)] [N9601]

H01F1/00E11 . . [N: one dimensional, i.e. linear or dendritic nanostructures] [N9601]

H01F1/00E11M . . . [N: in a non-magnetic matrix, e.g. Fe-nanowires in a nanoporous membrane] [N0103]

H01F1/00E12 . . [N: bidimensional, e.g. nanoscale period nanomagnet arrays (H01F10/00E takes precedence)] [N9601] [C0006]

H01F1/01 . of inorganic materials (H01F1/44 takes precedence)

H01F1/01B . . [N: adapted for magnetic entropy change by magnetocaloric effect, e.g. used as magnetic refrigerating material (refrigeration systems using magnetic effects F25B21/00)] [C9610]

H01F1/01B2 . . . [N: Metals or alloys]

H01F1/01B4 . . . [N: Compounds]

H01F1/03 . . characterised by their coercivity [N: (H01F1/40 takes precedence)]

H01F1/03B . . . [N: characterised by unspecified or heterogeneous hardness or specially adapted for magnetic hardness transitions]

H01F1/03B1 . . . . [N: adapted for large Barkhausen jumps or domain wall rotations, e.g. WIEGAND or MATTEUCCI effect (H01F1/14A and H01F1/153T take precedence)] [N9508]

H01F1/03B2 . . . . [N: Metals or alloys, e.g. LAVES phase alloys of the MgCu2-type (H01F1/03B1 takes precedence)] [C9508]

H01F1/03B2B . . . . . [N: with magnetic shape memory (MSM), i.e. with lattice transformations driven by a magnetic field, e.g. Heusler alloys] [N0306]

H01F1/03B4 . . . . [N: Compounds (H01F1/03B1 takes precedence)] [C9508]

H01F1/03B4C . . . . . [N: Oxidic compounds]

H01F1/03B4C2 . . . . . [N: Ferrites]

H01F1/03B4C4 . . . . . [N: Manganites]

H01F1/032 . . . of hard-magnetic materials

H01F1/04 . . . . Metals or alloys

H01F1/047 . . . . . Alloys characterised by their composition

[N: **Note**
In groups H01F1/053 to H01F1/059, an alloy is classified in the last appropriate place
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H01F1/053 . . . . . containing rare earth metals

H01F1/053B . . . . . {7 dots} [N: in a bonding agent]

H01F1/053C . . . . . {7 dots} [N: sintered]

H01F1/055 . . . . . {7 dots} and magnetic transition metals, e.g. SmCo5

H01F1/055B . . . . . {8 dots} [N: in the form of particles, e.g. rapid quenched powders or ribbon flakes]

H01F1/055B2 . . . . . {9 dots} [N: with a protective layer]

H01F1/055C . . . . . {8 dots} [N: obtained by reduction or by hydrogen decrepitation or embrittlement]

H01F1/055D . . . . . {8 dots} [N: pressed, sintered or bonded together]

H01F1/055D2 . . . . . {9 dots} [N: pressed]

H01F1/055D4 . . . . . {9 dots} [N: sintered]

H01F1/055D6 . . . . . {9 dots} [N: bonded together]

H01F1/057 . . . . . {8 dots} and IIIa elements, e.g. Nd2Fe14B

H01F1/057B . . . . . {9 dots} [N: in the form of particles, e.g. rapid quenched powders or ribbon flakes]

H01F1/057B2 . . . . . {10 dots} [N: with a protective layer]

H01F1/057B4 . . . . . {10 dots} [N: obtained by reduction or by hydrogen

decrepitation or embrittlement]

H01F1/057B6 . . . . . {10 dots} [N: obtained by liquid dynamic compaction]

H01F1/057B8 . . . . . {10 dots} [N: pressed, sintered or bonded together]

H01F1/057B8B . . . . . {11 dots} [N: pressed, e.g. hot working]

H01F1/057B8C . . . . . {11 dots} [N: sintered]

H01F1/057B8D . . . . . {11 dots} [N: bonded together]

H01F1/057C . . . . . {9 dots} [N: with exchange spin coupling between hard and soft nanophases, e.g. nanocomposite spring magnets] [N9801]

H01F1/058 . . . . . {8 dots} and IVa elements, e.g. Gd2Fe14C

H01F1/059 . . . . . {8 dots} and Va elements, e.g. Sm2Fe17N2

H01F1/059M . . . . . {9 dots} [N: of tetragonal ThMn12-structure] [N9510]

H01F1/059R . . . . . {9 dots} [N: of rhombic or rhombohedral Th2Zn17 structure or hexagonal Th2Ni17 structure] [N9510]

H01F1/06 . . . . . in the form of particles, e.g. powder (H01F1/047 takes precedence; [N: record carriers G11B5/706B])

H01F1/06B . . . . . [N: with a protective layer]

H01F1/06C . . . . . [N: with a non magnetic core]

H01F1/06D . . . . . [N: obtained by a reduction]

H01F1/06E . . . . . [N: obtained by liquid dynamic compaction]

H01F1/06F . . . . . [N: having a L10 crystallographic structure, e.g. [Co,Fe][Pt,Pd] (nano)particles] [N1112]

[N: **WARNING**
[N1112] This groups is not complete pending the completion of reclassification; see provisionally also H01F1/06-H01F1/06E
]

H01F1/08 . . . . . pressed, sintered, or bound together

H01F1/08B . . . . . {7 dots} [N: in a bonding agent]

H01F1/08C . . . . . {7 dots} [N: sintered]

H01F1/09 . . . . Mixtures of metallic and non-metallic particles; Metallic particles having oxide skin [C0606]

H01F1/10 . . . . Non-metallic substances, e.g. ferrites [N: e.g. [(Ba,Sr)O(Fe2O3)6] ferrites with hexagonal structure] [C1112]

H01F1/11 . . . . . in the form of particles [N: (for magnetic record carriers G11B5/706C)]

H01F1/11A . . . . . [N: with a non-magnetic core]

H01F1/11C . . . . . [N: with a skin (H01F1/113 takes precedence)]

H01F1/113 . . . . . in a bonding agent

H01F1/117 . . . . . {7 dots} Flexible bodies

H01F1/12 . . . of soft-magnetic materials

H01F1/14 . . . . Metals or alloys

H01F1/14A . . . . . [N: in the form of wires (H01F1/147 takes precedence)]

H01F1/147 . . . . . Alloys characterised by their composition [N: (treatment thereof for enhancing their electromagnetic properties C21D8/12)]

[N: **Note**

In groups H01F1/147N to H01F1/153T, an alloy is classified in the last appropriate place
]

H01F1/147N . . . . . [N: Fe-Ni based alloys (pure Fe or Ni H01F1/14, H01F1/16 or H01F1/20)] [C0606]

H01F1/147N2 . . . . . {7 dots} [N: in the form of sheets]

H01F1/147N2B . . . . . {8 dots} [N: with insulating coating]

H01F1/147N4 . . . . . {7 dots} [N: in the form of particles]

H01F1/147N4B . . . . . {8 dots} [N: pressed, sintered or bonded together]

H01F1/147N4B2 . . . . . {9 dots} [N: the particles being insulated]

H01F1/147N4B2B . . . . . {10 dots} [N: by macromolecular organic substances]

H01F1/147S . . . . . [N: Fe-Si based alloys]

H01F1/147S1 . . . . . {7 dots} [N: in the form of sheets]

H01F1/147S1B . . . . . {8 dots} [N: with insulating coating]

H01F1/147S2 . . . . . {7 dots} [N: Fe-Si-Al based alloys, e.g. Sendust]

H01F1/153 . . . . . Amorphous metallic alloys, e.g. glassy metals [N: (making ferrous amorphous alloys C22C33/00B)]

H01F1/153F . . . . . {7 dots} [N: based on Fe/Ni (H01F1/153H takes precedence)]

H01F1/153G . . . . . {7 dots} [N: based on Co (H01F1/153H takes precedence)]

H01F1/153H . . . . . {7 dots} [N: containing rare earths]

H01F1/153I . . . . . {7 dots} [N: containing nanocrystallites, e.g. obtained by annealing] [N1204]

H01F1/153P . . . . . {7 dots} [N: Preparation processes therefor]

H01F1/153P2 . . . . . {8 dots} [N: by powder metallurgy, e.g. spark erosion]

H01F1/153R . . . . . {7 dots} [N: Making agglomerates therefrom, e.g. by pressing]

H01F1/153R2 . . . . . {8 dots} [N: using a binder]

H01F1/153R2B . . . . . {9 dots} [N: using polymers]

H01F1/153S . . . . . {7 dots} [N: Applying coatings thereon (H01F1/153R2 takes precedence)]

H01F1/153T . . . . . {7 dots} [N: Elongated structures, e.g. wires]

H01F1/16 . . . . . in the form of sheets (H01F1/147 takes precedence)

H01F1/18 . . . . . with insulating coating

H01F1/20 . . . . . in the form of particles, e.g. powder (H01F1/147 takes precedence)

H01F1/22 . . . . . pressed, sintered, or bound together

H01F1/24 . . . . . {7 dots} the particles being insulated

H01F1/26 . . . . . {8 dots} by macromolecular organic substances

H01F1/28 . . . . . dispersed or suspended in a bonding agent

H01F1/33 . . . . Mixtures of metallic and non-metallic particles; Metallic particles having oxide skin [C0606]

H01F1/34 . . . . Non-metallic substances, e.g. ferrites

H01F1/34B . . . . . [N: Oxides (H01F1/36 and H01F1/38 take precedence)]

H01F1/34B2 . . . . . [N: Ferrites, e.g. having a cubic spinel structure (X2+O)(Y23+O3); e.g. magnetite Fe3O4] [C1112]

H01F1/34B2B . . . . . {7 dots} [N: Garnets, e.g. having a cubic nesosilicates-based

structure [X2+3Y3+2][(TO4)3] with T= Si, Al, Fe, Ga (H01F10/24 takes precedence; Faraday rotators G02F1/09)] [C1112]

H01F1/34B2H . . . . . {7 dots} [N: Hexaferrites with decreased hardness or anisotropy, i.e. with increased permeability in the microwave (GHz) range, e.g. having a hexagonal crystallographic structure] [N0308] [C1112]

H01F1/36 . . . . . in the form of particles [N: (H01F1/34B2B, H01F1/34B2H and H01F1/38 take precedence)] [C0308]

H01F1/37 . . . . . in a bonding agent

H01F1/375 . . . . . {7 dots} Flexible bodies [C0606]

H01F1/38 . . . . . amorphous, e.g. amorphous oxides

H01F1/40 . . of magnetic semiconductor materials, e.g. CdCr2S4 (devices using galvano-magnetic or similar effects H01L43/00)

H01F1/40D . . . [N: diluted] [N9612]

[N: **Note**
In group H01F1/40D, a diluted magnetic semiconductor (DMS) is classified in the last appropriate place
]

H01F1/40D2 . . . . [N: of II-VI type, e.g. Zn1-x Crx Se] [N9612]

H01F1/40D3 . . . . [N: of III-V type, e.g. In1-x Mnx As] [N9612]

H01F1/40D4 . . . . [N: of IV type, e.g. Ge1-xMnx] [N1204]

H01F1/40D5 . . . . [N: Diluted non-magnetic ions in a magnetic cation-sublattice, e.g. perovskites, La1-x(Ba,Sr)xMnO3] [N9612] [C1112]

H01F1/40H . . . [N: half-metallic, i.e. having only one electronic spin direction at the Fermi level, e.g. CrO2, Heusler alloys (H01F10/193H takes precedence)] [N0306] [C0503]

H01F1/42 . of organic or organo-metallic materials, [N: e.g. graphene] (H01F1/44takes precedence) [C1112]

H01F1/44 . of magnetic liquids, e.g. ferrofluids (particles in a bonding agent H01F1/28, H01F1/36, [N: H01F1/37]) [C0606]

H01F1/44M . . [N: the magnetic component being a metal or alloy, e.g. Fe (H01F1/44R takes precedence)] [C9601]

H01F1/44P . . [N: the magnetic component being a compound, e.g. Fe3O4 (H01F1/44R takes precedence)] [C9601]

H01F1/44R . . [N: characterised by magnetoviscosity, e.g. magnetorheological, magnetothixotropic, magnetodilatant liquids (electrorheological fluids C10M171/00B)] [N9601]

H01F3/00 **Cores, Yokes, or armatures** (magnetic materials H01F1/00; permanent magnets H01F7/02)

H01F3/02 . made from sheets

H01F3/04 . made from strips or ribbons

H01F3/06 . made from wires

H01F3/08 . made from powder (powder coatings on sheets H01F3/02; on strips or ribbons H01F3/04; on wires H01F3/06)

H01F3/10 . Composite arrangements of magnetic circuits

H01F3/12 . . Magnetic shunt paths

H01F3/14 . . Constrictions; Gaps, e.g. air-gaps (in magnetic shunt paths H01F3/12)

H01F5/00 **Coils** (superconducting coils H01F6/06; fixed inductances of the signal type H01F17/00)

H01F5/00A . [N: Printed circuit coils]

H01F5/02 . wound on non-magnetic supports, e.g. formers

H01F5/04 . Arrangements of electric connections to coils, e.g. leads

H01F5/06 . Insulation of windings

H01F6/00 **Superconducting magnets; Superconducting coils** [N: (magnetic resonance assemblies using superconducting coil systems G01R33/3815)] [C1108]

H01F6/00B . [N: Methods and means for discharging superconductive storage (superconducting alloys C22C; static memories with superconducting elements G11C11/44; superconducting circuit breakers with contacts H01H33/00B1; superconducting material H01L39/00; power cryotons H01L39/20; superconducting switches for low power H03K17/00B)]

H01F6/00C . [N: Methods and means for increasing the stored energy in superconductive coils by increments (flux pumps)]

H01F6/00D . [N: Supplying energising or de-energising current; Flux pumps]

H01F6/00D2 . . [N: Electric circuit arrangements for energising superconductive electromagnets]

H01F6/02 . Quenching; Protection arrangements during quenching [N: (protection circuits H02H7/00C)]

H01F6/04 . Cooling

H01F6/06 . Coils, e.g. winding, insulating, terminating or casing arrangements therefor

H01F6/06B . . [N: Feed-through bushings, terminals and joints (leading of conductors or axles through casings of transformers H01F27/04)]

H01F7/00 **Magnets** (superconducting magnets H01F6/00; for separation of solid materials or fluids B03C1/00; for bench or like work-holders B23B31/28, B23Q3/00; work-holding devices B25B11/00; lifting magnets B66C1/00; [N: operating or controlling locks using permanent magnets E05B47/00B; devices for holding a wing, e.g. door or window, by magnetic or electromagnetic attraction E05C19/16; relieving load or bearings using magnetic means F16C39/06]; for electric meters G01R; for relays H01H; [N: for electric discharge tubes H01J, e.g. H01J3/24, H01J23/10, H01J29/68]; for dynamo-electric machines H02K)

H01F7/02 . Permanent magnets [N: (PM)]

H01F7/02A . . [N: Magnetic circuits with PM in general]

H01F7/02A1 . . . [N: Construction of PM (H01F7/02C1 takes precedence; PM compositions H01F1/032)] [C9411]

H01F7/02A1A . . . . [N: Flexible forms, sheets]
H01F7/02A2 . . . [N: Mounting means for PM, supporting, coating, encapsulating PM]
H01F7/02A3 . . . [N: PM with variable field strength (H01F7/02C1B takes precedence)] [C0101]
H01F7/02B . . [N: Magnetic circuits with PM for power or force generation]
H01F7/02B1 . . . [N: Magnetic suspension or levitation (for vehicles B60L13/04; magnetic bearings F16C39/06A)]
H01F7/02B2 . . . [N: Magnetic drives, magnetic coupling devices]
H01F7/02B3 . . . [N: Orientating, locating, transporting arrangements]
H01F7/02B4 . . . [N: PM holding devices (H01F7/02A1, H01F7/02A1A, H01F7/02A3 take precedence)]
H01F7/02B4A . . . . [N: Lifting, pick-up magnetic objects]
H01F7/02B4B . . . . [N: Closures, bags, bands, engagement devices with male and female parts]
H01F7/02B4C . . . . [N: Magnetic cylinders]
H01F7/02C . . [N: Magnetic circuits with PM for magnetic field generation]
H01F7/02C1 . . . [N: for generating uniform fields, focusing, deflecting electrically charged particles (for magnetic separation by Lorentz force B03C1/023; specially adapted for NMR applications G01R33/383)] [C1108]
H01F7/02C1B . . . . [N: using a trimmable or adjustable magnetic circuit, e.g. for a symmetric dipole or quadrupole magnetic field] [N0101]
H01F7/02C2 . . . [N: Transducers, loudspeakers, moving coil arrangements]
H01F7/02C3 . . . [N: Detection, inspection, magnetic treatment]
H01F7/04 . . Means for releasing the attractive force

H01F7/06 . Electromagnets; Actuators including electromagnets [N: (electric coils H01F5/00; devices for holding workpieces using electric force B23Q3/15; load-engaging elements for lifting articles electromagnetically B66C1/06; electromagnetic couplings F16D27/00; magnetic brakes F16D63/00B; electromagnetically operated valves F16K11/24, F16K31/00; magnetically locked mine lamps F21L11/00; analysing materials by magnetic means G01N27/72, G01N27/80 to G01N27/88; electromagnets for winding mechanical clocks G04C1/02; electromagnetic relays H01H51/00; windings for salient poles of dynamo-electric machines H02K3/18; electromagnets for telegraphic communication H04L; for arc lamps H05B31/28)]
H01F7/06B . . [N: Circuit arrangements for actuating electromagnets (circuit arrangements for obtaining special operating characteristics H01F7/18; driving circuits for electromagnets making use of a switching regulator H01H47/32B)]
H01F7/06C . . [N: Electromagnets with movable winding]
H01F7/08 . . with armatures
H01F7/08A . . . [N: Magnetic constructions]
H01F7/08B . . . [N: provided with means for absorbing shocks]
H01F7/10 . . . specially adapted for alternating current
H01F7/11 . . . . reducing or eliminating the effects of eddy currents
H01F7/12 . . . . having anti-chattering arrangements
H01F7/12B . . . . . [N: having short-circuited conductors (electromagnetic relays provided with short-circuited conducting sleeves H01H47/00)]
H01F7/121 . . . Guiding or setting position of armatures, e.g. retaining armatures in their end position
H01F7/122 . . . . by permanent magnets [N: (H01F7/16A1, H01F7/16B1 take precedence)] [C1108]

H01F7/123 . . . . by ancillary coil

H01F7/124 . . . . by mechanical latch, e.g. detent

H01F7/126 . . . Supporting or mounting

H01F7/127 . . . Assembling

H01F7/128 . . . Encapsulating, encasing or sealing

H01F7/129 . . . . of armatures

H01F7/13 . . . characterised by pulling-force characteristics

H01F7/14 . . . Pivoting armatures (H01F7/17 takes precedence)

H01F7/14A . . . . [N: Rotary electromagnets with variable gap (with fixed gap or torque motors H02K26/00)] [N9709] [C0003]

H01F7/16 . . . Rectilinearly-movable armatures (H01F7/17 takes precedence)

H01F7/16A . . . . [N: Armatures entering the winding]

H01F7/16A1 . . . . . [N: Armatures or stationary parts of magnetic circuit having permanent magnet]

H01F7/16A2 . . . . . [N: Armatures having T-form]

H01F7/16B . . . . [N: Armatures not entering the winding]

H01F7/16B1 . . . . . [N: Armatures or stationary parts of magnetic circuit having permanent magnet]

H01F7/16C . . . . [N: Magnetic circuit having axially spaced pole-pieces]

H01F7/17 . . . Pivoting and rectilinearly-movable armatures

H01F7/18 . . . Circuit arrangements for obtaining desired operating characteristics, e.g. for slow operation, for sequential energisation of windings, for high-speed energisation of windings [C1112]

H01F7/18B . . . . [N: Circuit arrangements for holding the operation of electromagnets or for holding the armature in attracted position with reduced energising current (for holding relay armature in attracted position with reduced energising current H01H47/04; quick energising of electro-dynamic machines H02P9/08; for quickly de-energising of dynamo-electric generators H02P9/12B)] [C9411]

H01F7/18B1 . . . . . [N: demagnetising upon switching off, removing residual magnetism] [N9411]

H01F7/18B2 . . . . . [N: making use of an energy accumulator (for relays H01H47/04B)] [N9411]

H01F7/18B3 . . . . . [N: by changing number of serially-connected turns or windings (for relays H01H47/06)] [N9411]

H01F7/18B4 . . . . . [N: by changing number of parallel-connected turns or windings (for relays H01H47/08)] [N9411]

H01F7/18B5 . . . . . [N: by switching-in or -out impedance (for relays H01H47/10)] [N9411]

H01F7/18C . . . . [N: Monitoring or fail-safe circuits (for relays H01H47/00C)] [N9411]

H01F7/18D . . . . [N: Bistable or bidirectional current devices (relays H01H47/22C)] [N9411]

H01F7/18E . . . . [N: controlling a plurality of loads] [N9411]

H01F7/18F . . . . [N: by steepening leading and trailing edges of magnetisation pulse, e.g. printer drivers] [N9411]

H01F7/20 . . without armatures (cores H01F3/00; coils H01F5/00; [N: shaping metal by applying magnetic forces B21D26/14; analysing methods using magnetic fields G01N24/06; electromagnets specially adapted for NMR applications G01R33/381]) [C1108]

H01F7/20B . . . [N: Electromagnets for high magnetic field strength (for superconducting electromagnets H01F6/00; for transformers or inductances without a magnetic

core H01F30/08)]

H01F7/20B1 . . . . [N: Circuits for energising or de-energising]

H01F7/20C . . . [N: Electromagnets for lifting, handling or transporting of magnetic pieces or material (electromagnets for guidance of vehicles, workpieces B61B31/08, B65G21/20B; for magnetic suspension or levitation H02N15/00)]

H01F10/00 **Thin magnetic films, e.g. of one-domain structure** (magnetic record carriers G11B5/00; thin-film magnetic stores G11C)

H01F10/00A . [N: Antiferromagnetic thin films, i.e. films exhibiting a Néel transition temperature (H01F10/32H and H01F10/32N6 take precedence] [N1112]

[N: **WARNING**
[N1112]This groups is not complete pending the completion of reclassification; see provisionally also H01F10/00-H01F10/30
]

H01F10/00C . [N: organic or organo-metallic films, e.g. monomolecular films obtained by Langmuir-Blodgett technique, graphene] [N0311] [C1112]

H01F10/00E . [N: ultrathin or granular films (H01F10/00C and H01F10/32L take precedence; applying ultrathin or granular layers to substrates H01F41/30B)] [N9601] [C0606]

H01F10/06 . characterised by the coupling or physical contact with connecting or interacting conductors

H01F10/08 . characterised by magnetic layers ([N: H01F10/32 takes precedence]; applying thin magnetic films to substrates H01F41/14) [C0502]

H01F10/10 . . characterised by the composition [C0502]

H01F10/12 . . . being metal or alloys (intermetallic compounds H01F10/18)

H01F10/12B . . . . [N: having a L10 crystallographic structure, e.g. [Co,Fe][Pt,Pd] thin films] [N1112]

[N: **WARNING**
[N1112]This groups is not complete pending the completion of reclassification; see provisionally also H01F10/16
]

H01F10/12D . . . . [N: containing rare earth metals (H01F10/13D takes precedence)] [C0502]

H01F10/13 . . . . Amorphous metallic alloys, e.g. glassy metals [N: (H01F10/32B takes precedence)] [N0502]

[N: **Note**
In this group, amorphous metallic alloys are classified in the last appropriate place
]

H01F10/13B . . . . . [N: containing iron or nickel] [N0502]

H01F10/13C . . . . . [N: containing cobalt] [N0502]

H01F10/13D . . . . . [N: containing rare earth metals] [N0502]

H01F10/13D2 . . . . . [N: containing transition metals] [N0502]

H01F10/13D2B . . . . . {7 dots} [N: containing iron] [N0502]

H01F10/13D2C . . . . . {7 dots} [N: containing cobalt] [N0502]

H01F10/13E . . . . . [N: containing nanocrystallites, e.g. obtained by annealing] [N1204]

H01F10/14 . . . . containing iron or nickel ([N: H01F10/12D], H01F10/13, H01F10/16 take precedence) [C0502]

[N: **Note**
In this group, alloys containing iron or nickel are classified in the last appropriate place
]

H01F10/14S . . . . . [N: containing Si]

H01F10/14S2 . . . . . [N: containing Al, e.g. SENDUST]

H01F10/14T . . . . . [N: with lattice under strain, e.g. expanded by interstitial nitrogen (H01F10/26 to H01F10/30 take precedence)]

H01F10/16 . . . . containing cobalt ([N: H01F10/12D], H01F10/13 take precedence) [C0502]

H01F10/18 . . . being compounds

H01F10/187 . . . . Amorphous compounds [N: (H01F10/32B takes precedence)] [C0606]

H01F10/193 . . . . Magnetic semiconductor compounds [N: (in general H01F1/40; multilayers, e.g. superlattices H01F10/32F)] [N0502] [C0606]

H01F10/193D . . . . . [N: Perovskites] [N1112]

[N: **WARNING**
[N1112] This groups is not complete pending the completion of reclassification; see provisionally also H01F10/193
]

H01F10/193H . . . . . [N: Half-metallic, e.g. epitaxial CrO2 or NiMnSb films] [N0505]

H01F10/20 . . . . Ferrites

H01F10/20B . . . . . [N: Hexagonal ferrites]

H01F10/22 . . . . . Orthoferrites [N: e.g. RFeO3 (R= rare earth element) with orthorhombic structure] [C1112]

H01F10/24 . . . . . Garnets [N: (in general H01F1/34B2B; multilayers, e.g. superlattices H01F10/32C; applying magnetic garnet films to substrates by sputtering H01F41/18G)] [C0606]

H01F10/24E . . . . . [N: Modifications for enhancing interaction with electromagnetic wave energy] [N9501]

H01F10/26 . characterised by the substrate or intermediate layers [N: (H01F10/06 and H01F10/32 take precedence)]

H01F10/26B . . [N: Magnetic multilayers non exchange-coupled (H01F10/32 takes precedence)] [N1112]

[N: **WARNING**
[N1112] This groups is not complete pending the completion of reclassification; see provisionally also H01F10/00-H01F10/30
]

H01F10/28 . . characterised by the composition of the substrate

H01F10/30 . . characterised by the composition of the intermediate layers [N: e.g. seed, buffer, template, diffusion preventing, cap layers (H01F10/06 and H01F10/32 take precedence)] [C1112]

H01F10/32 . Spin-exchange-coupled multilayers, e.g. nanostructured superlattices [N: (applying spin-exchange-coupled multilayers to substrates H01F41/30D)] [N0001] [C0606]

H01F10/32B . . [N: Exchange coupling of amorphous multilayers] [N0001]

H01F10/32C . . [N: Exchange coupling of garnet multilayers] [N0001]

H01F10/32F . . [N: Exchange coupling of magnetic semiconductor multilayers, e.g. MnSe/ZnSe superlattices (semiconductor materials for use in semiconductor devices H01L29/12)] [N0001]

H01F10/32H . . [N: Exchange coupling of magnetic films via an antiferromagnetic interface (H01F10/32N6 takes precedence)] [N0001]

H01F10/32K . . [N: Exchange coupled hard/soft multilayers, e.g. CoPt/Co or NiFe/CoSm (nanocomposite spring magnets H01F1/057C)] [N0311]

H01F10/32L . . [N: Exchange coupling via one or more magnetisable ultrathin or granular films] [N0001]

H01F10/32L2 . . . [N: via a non-magnetic spacer] [N0001]

H01F10/32L2P . . . . [N: made of a noble metal, e.g. (Co/Pt)n multilayers having perpendicular anisotropy (H01F10/32N8 takes precedence)] [N0001] [C1112]

H01F10/32N . . [N: Exchange coupling of magnetic film pairs via a very thin non-magnetic spacer, e.g. by exchange with conduction electrons of the spacer] [N0001]

H01F10/32N1 . . . [N: the spacer being superconductive] [N0311]

H01F10/32N2 . . . [N: the spacer being noble metal] [N0001]

H01F10/32N4 . . . [N: the spacer being semiconducting or insulating, e.g. for spin tunnel junction (STJ)] [N0001] [C0101]

H01F10/32N4B . . . . [N: Spin-exchange-coupled multilayers comprising at least a nano-oxide layer (NOL), e.g. with a NOL spacer] [N1112]

H01F10/32N5 . . . [N: the exchange coupling being symmetric, e.g. for dual spin valve, e.g. NiO/Co/Cu/Co/Cu/Co/NiO] [N0101]

H01F10/32N6 . . . [N: the exchange coupling being asymmetric, e.g. by use of additional pinning, by using antiferromagnetic or ferromagnetic coupling interface, i.e. so-called spin-valve (SV) structure, e.g. NiFe/Cu/NiFe/FeMn] [N0001] [C0006]

H01F10/32N6A . . . . [N: by use of anti-parallel coupled (APC) ferromagnetic layers, e.g. artificial ferrimagnets (AFI), artificial (AAF) or synthetic (SAF) anti-ferromagnets] [N0101] [C0302]

H01F10/32N6A2 . . . . . [N: by use of artificial ferrimagnets (AFI) only] [N0302]

H01F10/32N6B . . . . [N: only by use of asymmetry of the magnetic film pair itself, i.e. so-called pseudospin valve (PSV) structure, e.g. NiFe/Cu/Co] [N0001] [C0006]

H01F10/32N8 . . . [N: Spin-exchange coupled multilayers having at least one layer with perpendicular magnetic anisotropy] [N1112]

H01F10/32N10 . . . [N: Spin-exchange coupled multilayers wherein the magnetisation of the free layer is switched by a spin-polarised current, e.g. spin torque effect] [N1112]

H01F10/32N12 . . . [N: Spin-exchange coupled multilayers wherein the magnetic pinned or free layers are laminated without anti-parallel coupling within the pinned and free layers] [N1112]

H01F13/00 **Apparatus or processes for magnetising or demagnetising** ([N: devices for holding workpieces using magnetic or electric force acting directly on the workpieces B23Q3/15]; for degaussing ships B63G9/06; for clocks or watches G04D9/00; [N: recording or erasing of information on magnetic record carriers G11B5/00]; demagnetising arrangements for colour television H04N9/29)

H01F13/00B . [N: Methods and devices for magnetising permanent magnets (permanent magnets H01F7/02)] [C0606]

H01F13/00C . [N: Methods and devices for demagnetising of magnetic bodies, e.g. workpieces, sheet material (for erasing of information on magnetic record carriersG11B5/00)]

H01F17/00	**Fixed inductances of the signal type** (coils in general H01F5/00 [N: inductors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof and multistep manufacturing processes therefor H01L28/10]) **[M1112]**
H01F17/00A	. [N: Printed inductances (printed coils for dynamo-electric machines H02K3/26; printed circuits H05K)]
H01F17/00A2	. . [N: with stacked layers (H01F27/28A takes precedence)] [N9905]
H01F17/00A4	. . [N: with the coil helically wound around a magnetic core] [N0001]
H01F17/02	. without magnetic core
H01F17/03	. . with ceramic former
H01F17/04	. with magnetic core
H01F17/04A	. . [N: Means for preventing rotation or displacement of the core]
H01F17/04B	. . [N: with two, usually identical or nearly identical parts enclosing completely the coil (pot cores)]
H01F17/04C	. . [N: with core of cylindric geometry and coil wound along its longitudinal axis, i.e. rod or drum core] [N9901]
H01F17/06	. . with core substantially closed in itself, e.g. toroid
H01F17/06A	. . . [N: Toroidal core with turns of coil around it] [N0101]
H01F17/08	. . . Loading coils for telecommunication circuits
H01F19/00	**Fixed transformers or mutual inductances of the signal type** (H01F36/00 takes precedence)
H01F19/02	. Audio-frequency transformers or mutual inductances, i.e. not suitable for handling frequencies considerably beyond the audio range
H01F19/04	. Transformers or mutual inductances suitable for handling frequencies considerably beyond the audio range (resonant circuits H03H)
H01F19/06	. . Broad-band transformers, e.g. suitable for handling frequencies well down into the audio range
H01F19/08	. . Transformers having magnetic bias, e.g. for handling pulses
H01F21/00	**Variable inductances or transformers of the signal type** (H01F36/00 takes precedence)
H01F21/00A	. [N: Inductances without magnetic core]
H01F21/02	. continuously variable, e.g. variometers
H01F21/04	. . by relative movement of turns or parts of windings
H01F21/06	. . by movement of core or part of core relative to the windings as a whole
H01F21/06A	. . . [N: Measures for obtaining a desired relation between the position of the core and the inductance]
H01F21/08	. . by varying the permeability of the core, e.g. by varying magnetic bias
H01F21/10	. . by means of a movable shield

H01F21/12 . discontinuously variable, e.g. tapped

H01F27/00 Details of transformers or inductances, in general

H01F27/00A . [N: Arrangements provided on the transformer facilitating its transport]

H01F27/00B . [N: Arrangements for interchanging inductances, transformers or coils thereof]

H01F27/00C . [N: with special arrangement or spacing of turns of the winding(s), e.g. to produce desired self-resonance]

H01F27/00D . [N: with temperature compensation]

H01F27/02 . Casings

H01F27/02A . . [N: Encapsulation]

H01F27/02B . . [N: Constructional details relating to cooling]

H01F27/02C . . [N: specially adapted for combination of signal type inductors or transformers with electronic circuits, e.g. mounting on printed circuit boards] [N9505] [C1112]

H01F27/04 . . Leading of conductors or axles through casings, e.g. for tap-changing arrangements

H01F27/06 . Mounting, supporting or suspending transformers, reactors or choke coils [N: not being of the signal type] [C1112]

H01F27/08 . Cooling (heat-transfer elements F28F); Ventilating (structural details of casings H01F27/02)

H01F27/08A . . [N: Cooling by ambient air]

H01F27/10 . . Liquid cooling

H01F27/10A . . . [N: Cooling by special liquid or by liquid of particular composition]

H01F27/12 . . . Oil cooling

H01F27/12A . . . . [N: Cooling by synthetic insulating and incombustible liquid]

H01F27/14 . . . . Expansion chambers; Oil conservators; Gas cushions; Arrangements for purifying, drying, or filling

H01F27/16 . . . Water cooling

H01F27/18 . . . by evaporating liquids

H01F27/20 . . Cooling by special gases or non-ambient air

H01F27/22 . . Cooling by heat conduction through solid or powdered fillings

H01F27/23 . Corrosion protection

H01F27/24 . Magnetic cores

H01F27/245 . . made from sheets, e.g. grain-oriented (H01F27/26 takes precedence)

H01F27/245A . . . [N: using bent laminations]

H01F27/25 . . made from strips or ribbons (H01F27/26 takes precedence)

H01F27/255 . . made from particles (H01F27/26 takes precedence)

H01F27/26 . . Fastening parts of the core together; Fastening or mounting the core on casing or support (on coil H01F27/30)

H01F27/26A . . . [N: Fastening parts of the core together]
H01F27/26B . . . [N: Fastening or mounting the core on casing or support (on coil H01F27/30)]

H01F27/28 . Coils; Windings; Conductive connections
H01F27/28A . . [N: Printed windings]
H01F27/28B . . [N: Wires (H01F27/28D takes precedence)]
H01F27/28B1 . . . [N: Construction of conductive connections, of leads]
H01F27/28C . . [N: Sheets; Strips (H01F27/28D takes precedence)]
H01F27/28C1 . . . [N: Construction of conductive connections, of leads]
H01F27/28D . . [N: Combination of wires and sheets]
H01F27/28E . . [N: Pancake coils]
H01F27/28F . . [N: Cooling (cooling transformers and inductances in general H01F27/08)]
H01F27/28G . . [N: Shielding]
H01F27/28G1 . . . [N: with shields or electrodes (shields or electrodes for pancake coils H01F27/28E; construction of electric or magnetic shields or screens H01F27/36)]
H01F27/28G2 . . . [N: with auxiliary windings (for pancake coils H01F27/28E)]
H01F27/28H . . [N: Windings disposed upon ring cores]
H01F27/29 . . Terminals; Tapping arrangements [N: for signal inductances] [C9712]
H01F27/29B . . . [N: Surface mounted devices] [N9712]
H01F27/30 . . Fastening or clamping coils, windings, or parts thereof together; Fastening or mounting coils or windings on core, casing, or other support
H01F27/30A . . . [N: Clamping coils, windings or parts thereof together]
H01F27/30B . . . [N: Fastening or mounting coils or windings on core, casing or other support]
H01F27/32 . . Insulating of coils, windings, or parts thereof
H01F27/32A . . . [N: using a fluid for insulating purposes only]
H01F27/32B . . . [N: the insulation forming channels for circulation of the fluid]
H01F27/32C . . . [N: Insulation between winding turns, between winding layers]
H01F27/32D . . . [N: Insulation between coil and core, between different winding sections, around the coil; Other insulation structures]
H01F27/32D1 . . . . [N: Coil bobbins (formers for coils in general H01F5/02)]
H01F27/32D2 . . . . [N: specifically adapted for discharge lamp ballasts]
H01F27/32E . . . [N: Encapsulating or impregnating (encapsulating coil and core H01F27/02A)]

H01F27/33 . Arrangements for noise damping

H01F27/34 . Special means for preventing or reducing unwanted electric or magnetic effects, e.g. no-load losses, reactive currents, harmonics, oscillations, leakage fields
H01F27/34A . . [N: Preventing or reducing no-load losses or reactive currents]
H01F27/34B . . [N: Preventing or reducing surge voltages; oscillations]
H01F27/34B1 . . . [N: using auxiliary conductors]
H01F27/34C . . [N: Preventing or reducing leakage fields (using magnetic shields H01F27/36B; using auxiliary windings H01F27/38)]
H01F27/36 . . Electric or magnetic shields or screens (movable for varying inductance H01F21/10)

H01F27/36A . . . [N: Electric shields or screens]
H01F27/36B . . . [N: Magnetic shields or screens]
H01F27/36B1 . . . . [N: using non-magnetic screens]
H01F27/38 . . Auxiliary core members; Auxiliary coils or windings
H01F27/38A . . . [N: for reducing harmonics]

H01F27/40 . Structural association with built-in electric component, e.g. fuse
H01F27/40A . . [N: Association of measuring or protective means]

H01F27/42 . 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 H02P13/00; impedance networks H03H)
H01F27/42B . . [N: for instrument transformers]
H01F27/42B2 . . . [N: for voltage transformers]
H01F27/42B4 . . . [N: for current transformers]

H01F29/00 **Variable transformers or inductances not covered by group H01F21/00** [N: (tap change devices H01H9/00B)]

H01F29/02 . with tappings on coil or winding; with provision for rearrangement or interconnection of windings
H01F29/02B . . [N: Constructional details of transformers or reactors with tapping on coil or windings]
H01F29/04 . . having provision for tap-changing without interrupting the load current

H01F29/06 . with current collector gliding or rolling on or along winding

H01F29/08 . with core, coil, winding, or shield movable to offset variation of voltage or phase shift, e.g. induction regulators
H01F29/10 . . having movable part of magnetic circuit [N: (high leakage transformers H01F38/08; dynamo-electric machines with movable part of magnetic circuit H02K23/44, H02K23/48)]
H01F29/12 . . having movable coil, winding, or part thereof; having movable shield

H01F29/14 . with variable magnetic bias ([N: amplitude modulation by means of variable impedance element H03C1/08]; magnetic amplifiers H03F; [N: circuits for automatic telephonic communication H04M3/00])
H01F29/14B . . [N: Constructional details]

H01F30/00 **Fixed transformers not covered by group H01F19/00**

H01F30/02 . Auto-transformers

H01F30/04 . having two or more secondary windings, each supplying a separate load, e.g. for radio set power supplies

H01F30/06 . characterised by the structure
H01F30/08 . . without magnetic core

H01F30/10 . . Single-phase transformers (H01F30/16 takes precedence)
H01F30/12 . . Two-phase, three-phase or polyphase transformers
H01F30/14 . . . for changing the number of phases
H01F30/16 . . Toroidal transformers

H01F36/00 **Transformers with superconductive windings or with windings operating at cryogenic temperature** (superconducting magnets or superconducting coils H01F6/00)

H01F37/00 **Fixed inductances not covered by group H01F17/00**

H01F37/00A . [N: without magnetic core] [N1112]

H01F38/00 **Adaptations of transformers or inductances for specific applications or functions**

H01F38/02 . for non-linear operation
H01F38/02B . . [N: of inductances] [N9505]
H01F38/04 . . for frequency changing
H01F38/06 . . for changing the wave shape

H01F38/08 . High-leakage transformers or inductances
H01F38/08B . . [N: Welding transformers] [N9505]
H01F38/10 . . Ballasts, e.g. for discharge lamps

H01F38/12 . Ignition, e.g. for IC engines

H01F38/14 . Inductive couplings [N: (for charging batteries from ac mains by converters H02J7/02B1)] [C9807]

H01F38/16 . Cascade transformers, e.g. for use with extra high tension

H01F38/18 . Rotary transformers

H01F38/20 . Instruments transformers
H01F38/22 . . for single phase ac
H01F38/24 . . . Voltage transformers
H01F38/26 . . . . Constructions
H01F38/28 . . . Current transformers
H01F38/30 . . . . Constructions
H01F38/32 . . . . Circuit arrangements
H01F38/34 . . . Combined voltage and current transformers
H01F38/36 . . . . Constructions
H01F38/38 . . for polyphase ac
H01F38/40 . . for dc

H01F38/42 . Flyback transformers

H01F41/00 **Apparatus or processes specially adapted for manufacturing or assembling the devices covered by this subclass** [C1108]

H01F41/00A . [N: Impregnating or encapsulating (insulating of windings H01F41/12)]

H01F41/02 . for manufacturing cores, coils, or magnets (H01F41/14 takes precedence; for dynamo-electric machines H02K15/00)

H01F41/02A . . [N: Manufacturing of magnetic cores by mechanical means (magnetic cores per se H01F27/24)]

H01F41/02A2 . . . [N: Manufacturing of magnetic circuits made from strip(s) or ribbon(s) (magnetic cores made by winding a ribbon H01F27/25)]

H01F41/02A2A . . . . [N: by winding the strips or ribbons around a coil] [N1112]

H01F41/02A2B . . . . [N: from amorphous ribbons] [N9706]

H01F41/02A3 . . . [N: Manufacturing of magnetic circuits made from sheets (magnetic cores made from sheets H01F27/245; soft magnetic alloys in the form of sheets H01F1/16)] [C0606]

H01F41/02A3B . . . . [N: Manufacturing of magnetic circuits made from deformed sheets (magnetic cores made from deformed sheets H01F27/245A)]

H01F41/02A4 . . . [N: Manufacturing of magnetic circuits by moulding or by pressing powder (magnetic cores made by moulding or by pressing powder H01F27/255; soft magnetic particles H01F1/20, H01F1/36)] [C0606]

H01F41/02B . . [N: for manufacturing permanent magnets]

H01F41/02B2 . . . [N: protecting methods against environmental influences, e.g. oxygen, by surface treatment (magnetic particles with skin H01F1/06B, H01F1/09, H01F1/24, H01F1/33 and G11B5/706)]

H01F41/02B4 . . . [N: Moulding; Pressing (H01F41/02B6 takes precedence; hard magnetic particles H01F1/06, H01F1/11)] [N9804] [C0606]

H01F41/02B6 . . . [N: Imparting anisotropy (methods and devices for magnetising permanent magnets H01F13/00B)] [N9804] [C0606]

H01F41/02B6B . . . . [N: Radial anisotropy (for rotor or stator bodies H02K15/02)] [N9804]

H01F41/02B8 . . . [N: Trimming] [N9804]

H01F41/02B10 . . . [N: diffusion of rare earth elements, e.g. Tb, Dy or Ho, into permanent magnets] [N1108]

H01F41/04 . . for manufacturing coils [N: (coils for transformer or inductances H01F27/28)]

H01F41/04A . . . [N: Printed circuit coils (apparatus or processes for manufacturing printed circuits in general H05K3/00)]

H01F41/04A2 . . . . [N: by thin film techniques] [N9705]

H01F41/04A4 . . . . [N: by thick film techniques] [N9705]

H01F41/04A6 . . . . [N: Trimming] [N9702]

H01F41/04A8 . . . . [N: structurally combined with ferromagnetic material] [N9702]

H01F41/04A10 . . . . [N: structurally combined with superconductive material] [N9702]

H01F41/04S . . . [N: Superconductive coils] [N9902]

H01F41/06 . . . Winding

H01F41/06A . . . . [N: Winding sheet material]

H01F41/06A1 . . . . . [N: with insulation]

H01F41/06B . . . . [N: Winding wire material]

H01F41/06B1 . . . . . [N: with insulation]

H01F41/06B1A . . . . . [N: the insulation being strip material]

H01F41/06B2 . . . . . [N: Winding more than one wire]

H01F41/06B2A . . . . . [N: Twisting]

H01F41/06C . . . . [N: Devices for guiding or positioning the winding material on the winding form]

H01F41/06C1 . . . . . [N: forming pancake coils]

H01F41/06C2 . . . . . [N: positioning the winding material in a special configuration on the winding form (orthocyclic coils, open mesh coils)]

H01F41/06C3 . . . . . [N: using revolving flyers]

H01F41/06D . . . . [N: Winding coils of special form]

H01F41/06D1 . . . . . [N: Winding on elongate winding forms]

H01F41/06D2 . . . . . [N: Winding flat coils]

H01F41/06E . . . . [N: Winding with terminal wrapping or soldering; Winding while forming taps or terminals]

H01F41/06F . . . . [N: Winding machines having a plurality of work holders or winding forms]

H01F41/06F1 . . . . . [N: Turrets, turntables]

H01F41/06G . . . . [N: Tensioning or braking devices]

H01F41/06H . . . . [N: Dispensing or feeding devices]

H01F41/06I . . . . [N: Winding mandrels, winding forms]

H01F41/06J . . . . [N: Winding with deformation of the winding material section]

H01F41/06K . . . . [N: Winding while measuring electrical characteristics]

H01F41/08 . . . . Winding conductors onto or threading conductors through cores or formers which are closed in themselves, e.g. toroids (for interconnecting digital storage elements G11C5/12)

H01F41/10 . . . Connecting leads to windings (making electric connections in general H01R43/00)

H01F41/12 . . . Insulating of windings ([N: impregnating or encapsulating of transformers H01F41/00A]; of conductors in general H01B13/06)

H01F41/12A . . . . [N: Insulating between turns or between winding layers]

H01F41/12B . . . . [N: Other insulating structures; Insulating between coil and core, between different winding sections, around the coil]

H01F41/12C . . . . [N: Encapsulating or impregnating (encapsulating coil and core H01F41/00A)]

H01F41/14 . for applying magnetic films to substrates (covering metals, or materials with metals, in general C23C; manufacturing record carriers G11B5/84)

Note

[N0001]Group H01F41/30 takes precedence over groups H01F41/16 to H01F41/24 [N:, and over group H01F41/32]

H01F41/16 . . the magnetic material being applied in the form of particles, e.g. by serigraphy [N: i.e. forming thick magnetic films and precursors therefor, e.g. magnetisable pastes, inks, glass frits (H01F41/18 to H01F41/24 take precedence; thick magnetic films H01F1/00D)] [C0606]

H01F41/18 . . by cathode sputtering [C0606]

H01F41/18B . . . [N: Sputtering targets therefor]

H01F41/18G . . . [N: for applying a magnetic garnet film (magnetic garnet materials H01F1/34B2B; magnetic garnet films H01F10/24)]

H01F41/20 . . by evaporation

H01F41/20L . . . [N: by laser ablation, e.g. pulsed laser deposition (PLD)] [N0202]

H01F41/22 . . Heat treatment; Thermal decomposition; Chemical vapour deposition

H01F41/24 . . from liquids

H01F41/26 . . . using electric currents [N: e.g. electroplating] [C0606]

H01F41/28 . . . by liquid phase epitaxy

H01F41/30 . . for applying nanostructures, e.g. by molecular beam epitaxy (MBE) [N0001]

H01F41/30B . . . [N: for applying ultrathin or granular layers (ultrathin or granular layers H01F10/00E)] [N0001] [C0606]

H01F41/30D . . . [N: for applying spin-exchange-coupled multilayers, e.g. nanostructured superlattices (spin-exchange-coupled multilayers H01F10/32)] [N0001] [C0606]

H01F41/30D2 . . . . [N: with exchange coupling adjustment of magnetic film pairs, e.g. interface modifications by reduction, oxidation] [N0311]

H01F41/30D2B . . . . . [N: using temporary decoupling, e.g. involving blocking, Néel or Curie temperature transitions by heat treatment in presence/absence of a magnetic field] [N0311] [C1112]

H01F41/30D4 . . . . [N: applying the spacer or adjusting its interface, e.g. in order to enable particular effect different from exchange coupling] [N0311] [C1112]

H01F41/30D4B . . . . . [N: conductive spacer] [N0311]

H01F41/30D4D . . . . . [N: insulating or semiconductive spacer] [N0311]

H01F41/30D6 . . . . [N: lift-off processes, e.g. ion milling, for trimming or patterning] [N0301]

H01F41/30D9 . . . . [N: electroless or electrodeposition processes from plating solution] [N0311] [C0606]

H01F41/32 . for applying conductive, insulating or magnetic material on a magnetic film [N:, specially adapted for a thin magnetic film] [N0001]

H01F41/32B . . [N: applying a noble metal capping on a spin-exchange-coupled multilayer e.g. spin filter deposition] [N1112]

[N: **WARNING**
[N1112]This groups is not complete pending the completion of reclassification; see provisionally also H01F41/32
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H01F41/34 . . in patterns, e.g. by lithography [N0001]