

CPC COOPERATIVE PATENT CLASSIFICATION

H01F **MAGNETS; INDUCTANCES; TRANSFORMERS; SELECTION OF MATERIALS FOR THEIR MAGNETIC PROPERTIES** (ceramics based on ferrites [C04B 35/26](#); alloys [C22C](#); {construction of loading coils [H01B](#)} ; thermomagnetic devices [H01L 37/00](#); 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.

1/00	Magnets or magnetic bodies characterised by the magnetic materials therefor; Selection of materials for their magnetic properties	1/017	. . . {Compounds}
		1/03	. . characterised by their coercivity { (H01F 1/40 takes precedence) }
1/0009	. {Antiferromagnetic materials, i.e. materials exhibiting a Néel transition temperature (H01F 1/0036 takes precedence)}	1/0302	. . . {characterised by unspecified or heterogeneous hardness or specially adapted for magnetic hardness transitions}
	WARNING	1/0304	. . . . {adapted for large Barkhausen jumps or domain wall rotations, e.g. WIEGAND or MATTEUCCI effect (H01F 1/143 and H01F 1/15391 take precedence)}
	This groups is not complete pending the completion of reclassification; see provisionally also H01F 1/00 - H01F 1/447	1/0306	. . . . {Metals or alloys, e.g. LAVES phase alloys of the MgCu ₂ -type (H01F 1/0304 takes precedence)}
1/0018	. {Diamagnetic or paramagnetic materials, i.e. materials with low susceptibility and no hysteresis (H01F 1/0036 takes precedence)}	1/0308	. . . . . {with magnetic shape memory [MSM], i.e. with lattice transformations driven by a magnetic field, e.g. Heusler alloys}
1/0027	. {Thick magnetic films (forming thick magnetic films H01F 41/16 ; magnetic record carriers G11B 5/70)}	1/0311	. . . . . {Compounds (H01F 1/0304 takes precedence)}
	NOTE	1/0313	. . . . . {Oxidic compounds}
	Group H01F 1/0036 takes precedence over groups H01F 1/09 , H01F 1/11 , H01F 1/20 , H01F 1/33 and H01F 1/36	1/0315	. . . . . {Ferrites}
		1/0317	. . . . . {Manganites}
1/0036	. {showing low dimensional magnetism, i.e. spin rearrangements due to a restriction of dimensions, e.g. showing giant magnetoresistivity, (H01F 1/153 , H01F 1/42 and H01F 10/00 take precedence; magnetoresistive sensors G01D 5/16 , G01R 33/06 ; magnetoresistive recording G11B 5/39 ; magnetic-field-controlled resistors H01L 43/08)}	1/032	. . . of hard-magnetic materials
		1/04	. . . . Metals or alloys
1/0045	. . {Zero dimensional, e.g. nanoparticles, soft nanoparticles for medical/biological use (preparation of fullerenes in general C01B 31/0206)}	1/047	. . . . . Alloys characterised by their composition
1/0054	. . . {Coated nanoparticles, e.g. nanoparticles coated with organic surfactant}		NOTE
1/0063	. . . {in a non-magnetic matrix, e.g. granular solids (granular films H01F 10/007)}		In groups H01F 1/053 - H01F 1/059 , an alloy is classified in the last appropriate place
1/0072	. . {one dimensional, i.e. linear or dendritic nanostructures}	1/053	. . . . . containing rare earth metals
1/0081	. . . {in a non-magnetic matrix, e.g. Fe-nanowires in a nanoporous membrane}	1/0533	. . . . . {in a bonding agent}
1/009	. . {bidimensional, e.g. nanoscale period nanomagnet arrays (H01F 10/007 takes precedence)}	1/0536	. . . . . {sintered}
1/01	. of inorganic materials (H01F 1/44 takes precedence)	1/055	. . . . . and magnetic transition metals, e.g. SmCo ₅
1/012	. . {adapted for magnetic entropy change by magnetocaloric effect, e.g. used as magnetic refrigerating material (refrigeration systems using magnetic effects F25B 21/00)}	1/0551	. . . . . {in the form of particles, e.g. rapid quenched powders or ribbon flakes}
1/015	. . . {Metals or alloys}	1/0552	. . . . . {with a protective layer}
		1/0553	. . . . . {obtained by reduction or by hydrogen decrepitation or embrittlement}
		1/0555	. . . . . {pressed, sintered or bonded together}
		1/0556	. . . . . {pressed}
		1/0557	. . . . . {sintered}
		1/0558	. . . . . {bonded together}
		1/057	. . . . . and IIIa elements, e.g. Nd ₂ Fe ₁₄ B

1/0571	. . . . .	{in the form of particles, e.g. rapid quenched powders or ribbon flakes}
1/0572	. . . . .	{with a protective layer}
1/0573	. . . . .	{obtained by reduction or by hydrogen decrepitation or embrittlement}
1/0574	. . . . .	{obtained by liquid dynamic compaction}
1/0575	. . . . .	{pressed, sintered or bonded together}
1/0576	. . . . .	{pressed, e.g. hot working}
1/0577	. . . . .	{sintered}
1/0578	. . . . .	{bonded together}
1/0579	. . . . .	{with exchange spin coupling between hard and soft nanophases, e.g. nanocomposite spring magnets}
1/058	. . . . .	and IVa elements, e.g. $\text{Gd}_2\text{Fe}_{14}\text{C}$
1/059	. . . . .	and Va elements, e.g. $\text{Sm}_2\text{Fe}_{17}\text{N}_2$
1/0593	. . . . .	{of tetragonal ThMn_{12} -structure}
1/0596	. . . . .	{of rhombic or rhombohedral $\text{Th}_2\text{Zn}_{17}$ structure or hexagonal $\text{Th}_2\text{Ni}_{17}$ structure}
1/06	. . . . .	in the form of particles, e.g. powder (H01F 1/047 takes precedence; {record carriers G11B 5/70605 })
1/061	. . . . .	{with a protective layer}
1/063	. . . . .	{with a non magnetic core}
1/065	. . . . .	{obtained by a reduction}
1/066	. . . . .	{obtained by liquid dynamic compaction}
1/068	. . . . .	{having a L10 crystallographic structure, e.g. $[\text{Co},\text{Fe}][\text{Pt},\text{Pd}]$ (nano)particles}
<u>WARNING</u>		
This groups is not complete pending the completion of reclassification; see provisionally also H01F 1/06 - H01F 1/066		
1/08	. . . . .	pressed, sintered, or bound together
1/083	. . . . .	{in a bonding agent}
1/086	. . . . .	{sintered}
1/09	. . . . .	Mixtures of metallic and non-metallic particles; Metallic particles having oxide skin
1/10	. . . . .	Non-metallic substances, e.g. ferrites {, e.g. $[(\text{Ba},\text{Sr})\text{O}(\text{Fe}_2\text{O}_3)_6]$ ferrites with hexagonal structure}
1/11	. . . . .	in the form of particles {(for magnetic record carriers G11B 5/70626)}
1/111	. . . . .	{with a non-magnetic core}
1/112	. . . . .	{with a skin (H01F 1/113 takes precedence)}
1/113	. . . . .	in a bonding agent
1/117	. . . . .	Flexible bodies
1/12	. . . . .	of soft-magnetic materials
1/14	. . . . .	Metals or alloys
1/143	. . . . .	{in the form of wires (H01F 1/147 takes precedence)}

1/147	. . . . .	Alloys characterised by their composition {(treatment thereof for enhancing their electromagnetic properties C21D 8/12)}
<u>NOTE</u>		
In groups H01F 1/14708 - H01F 1/15391 , an alloy is classified in the last appropriate place		
1/14708	. . . . .	{Fe-Ni based alloys (pure Fe or Ni H01F 1/14 , H01F 1/16 or H01F 1/20)}
1/14716	. . . . .	{in the form of sheets}
1/14725	. . . . .	{with insulating coating}
1/14733	. . . . .	{in the form of particles}
1/14741	. . . . .	{pressed, sintered or bonded together}
1/1475	. . . . .	{the particles being insulated}
1/14758	. . . . .	{by macromolecular organic substances}
1/14766	. . . . .	{Fe-Si based alloys}
1/14775	. . . . .	{in the form of sheets}
1/14783	. . . . .	{with insulating coating}
1/14791	. . . . .	{Fe-Si-Al based alloys, e.g. Sendust}
1/153	. . . . .	Amorphous metallic alloys, e.g. glassy metals {(making ferrous amorphous alloys C22C 33/003)}
1/15308	. . . . .	{based on Fe/Ni (H01F 1/15325 takes precedence)}
1/15316	. . . . .	{based on Co (H01F 1/15325 takes precedence)}
1/15325	. . . . .	{containing rare earths}
1/15333	. . . . .	{containing nanocrystallites, e.g. obtained by annealing}
1/15341	. . . . .	{Preparation processes therefor}
1/1535	. . . . .	{by powder metallurgy, e.g. spark erosion}
1/15358	. . . . .	{Making agglomerates therefrom, e.g. by pressing}
1/15366	. . . . .	{using a binder}
1/15375	. . . . .	{using polymers}
1/15383	. . . . .	{Applying coatings thereon (H01F 1/15366 takes precedence)}
1/15391	. . . . .	{Elongated structures, e.g. wires}
1/16	. . . . .	in the form of sheets (H01F 1/147 takes precedence)
1/18	. . . . .	with insulating coating
1/20	. . . . .	in the form of particles, e.g. powder (H01F 1/147 takes precedence)
1/22	. . . . .	pressed, sintered, or bound together
1/24	. . . . .	the particles being insulated
1/26	. . . . .	by macromolecular organic substances
1/28	. . . . .	dispersed or suspended in a bonding agent
1/33	. . . . .	Mixtures of metallic and non-metallic particles; Metallic particles having oxide skin
1/34	. . . . .	Non-metallic substances, e.g. ferrites
1/342	. . . . .	{Oxides (H01F 1/36 and H01F 1/38 take precedence)}
1/344	. . . . .	{Ferrites, e.g. having a cubic spinel structure $(\text{X}_2+\text{O})(\text{Y}_{23}+\text{O}_3)$, e.g. magnetite Fe_3O_4 }

1/346	. . . . .	{[(TO4) 3] with T= Si, Al, Fe, Ga (H01F 10/24 takes precedence; Faraday rotators G02F 1/09)}	3/14	. .	Constrictions; Gaps, e.g. air-gaps (in magnetic shunt paths H01F 3/12)
1/348	. . . . .	{Hexaferrites with decreased hardness or anisotropy, i.e. with increased permeability in the microwave (GHz) range, e.g. having a hexagonal crystallographic structure}	5/00		Coils (superconducting coils H01F 6/06 ; fixed inductances of the signal type H01F 17/00)
1/36	. . . . .	in the form of particles {(H01F 1/346 , H01F 1/348 and H01F 1/38 take precedence)}	5/003	. .	{Printed circuit coils}
1/37	. . . . .	in a bonding agent	2005/006	. .	{with conical spiral form}
1/375	. . . . .	Flexible bodies	5/02	. .	wound on non-magnetic supports, e.g. formers
1/38	. . . . .	amorphous, e.g. amorphous oxides	2005/022	. .	{wound on formers with several winding chambers separated by flanges, e.g. for high voltage applications}
1/40	. .	of magnetic semiconductor materials, e.g. CdCr ₂ S ₄ (devices using galvano-magnetic or similar effects H01L 43/00)	2005/025	. .	{wound on coaxial arrangement of two or more formers}
1/401	. . .	{diluted}	2005/027	. .	{wound on formers for receiving several coils with perpendicular winding axes, e.g. for antennae or inductive power transfer}
		NOTE In group H01F 1/401 , a diluted magnetic semiconductor (DMS) is classified in the last appropriate place	5/04	. .	Arrangements of electric connections to coils, e.g. leads
1/402	. . . . .	{of II-VI type, e.g. Zn1-x Crx Se}	2005/043	. .	{having multiple pin terminals, e.g. arranged in two parallel lines at both sides of the coil}
1/404	. . . . .	{of III-V type, e.g. In1-x Mn _x As}	2005/046	. .	{Details of formers and pin terminals related to mounting on printed circuits}
1/405	. . . . .	{of IV type, e.g. Ge1-x Mn _x }	5/06	. .	Insulation of windings
1/407	. . . . .	{Diluted non-magnetic ions in a magnetic cation-sublattice, e.g. perovskites, La1- x(Ba,Sr)xMnO ₃ }	6/00		Superconducting magnets; Superconducting coils {(magnetic resonance assemblies using superconducting coil systems G01R 33/3815)}
1/408	. . .	{half-metallic, i.e. having only one electronic spin direction at the Fermi level, e.g. CrO ₂ , Heusler alloys (H01F 10/1936 takes precedence)}	2006/001	. .	{Constructive details of inductive current limiters}
1/42	. .	of organic or organo-metallic materials {, e.g. graphene} (H01F 1/44 takes precedence)	6/003	. .	{Methods and means for discharging superconductive storage (superconducting alloys C22C ; static memories with superconducting elements G11C 11/44 ; superconducting circuit breakers with contacts H01H 33/004 ; superconducting material H01L 39/00 ; power cryotons H01L 39/20 ; superconducting switches for low power H03K 17/92)}
1/44	. .	of magnetic liquids, e.g. ferrofluids (particles in a bonding agent H01F 1/28 , H01F 1/36 , { H01F 1/37 })	6/005	. .	{Methods and means for increasing the stored energy in superconductive coils by increments (flux pumps)}
1/442	. .	{the magnetic component being a metal or alloy, e.g. Fe (H01F 1/447 takes precedence)}	6/006	. .	{Supplying energising or de-energising current; Flux pumps}
1/445	. .	{the magnetic component being a compound, e.g. Fe ₃ O ₄ (H01F 1/447 takes precedence)}	6/008	. .	{Electric circuit arrangements for energising superconductive electromagnets}
1/447	. .	{characterised by magnetoviscosity, e.g. magnetorheological, magnetorheotropic, magnetodilatant liquids (electrorheological fluids C10M 171/001)}	6/02	. .	Quenching; Protection arrangements during quenching {(protection circuits H02H 7/001)}
		3/00 Cores, Yokes, or armatures (magnetic materials H01F 1/00 ; permanent magnets H01F 7/02)	6/04	. .	Cooling
2003/005	. .	{Magnetic cores for receiving several windings with perpendicular axes, e.g. for antennae or inductive power transfer}	6/06	. .	Coils, e.g. winding, insulating, terminating or casing arrangements therefor
3/02	. .	made from sheets	6/065	. .	{Feed-through bushings, terminals and joints (leading of conductors or axles through casings of transformers H01F 27/04)}
3/04	. .	made from strips or ribbons	7/00		Magnets (superconducting magnets H01F 6/00 ; for separation of 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 ; {operating or controlling locks using permanent magnets E05B 47/0038 ; devices for holding a wing, e.g. door or window, by magnetic or electromagnetic attraction E05C 19/16 ; relieving load or bearings using magnetic means F16C 39/06 } ; for electric meters G01R ; for relays H01H ; {for electric discharge tubes H01J , e.g. H01J 3/24 , H01J 23/10 , H01J 29/68 } ; for dynamo-electric machines H02K)
3/06	. .	made from wires	7/02	. .	Permanent magnets {[PM]}
3/08	. .	made from powder (powder coatings on sheets H01F 3/02 ; on strips or ribbons H01F 3/04 ; on wires H01F 3/06)	7/0205	. .	{Magnetic circuits with PM in general}
3/10	. .	Composite arrangements of magnetic circuits			
2003/103	. .	{Magnetic circuits with permanent magnets}			
2003/106	. .	{Magnetic circuits using combinations of different magnetic materials}			
3/12	. .	Magnetic shunt paths			

- 7/021 . . . {Construction of PM ([H01F 7/0278](#) takes precedence; PM compositions [H01F 1/032](#))}
- 7/0215 {Flexible forms, sheets}
- 7/0221 . . . {Mounting means for PM, supporting, coating, encapsulating PM}
- 7/0226 . . . {PM with variable field strength ([H01F 7/0284](#) takes precedence)}
- 7/0231 . . {Magnetic circuits with PM for power or force generation}
- 7/0236 . . . {Magnetic suspension or levitation (for vehicles [B60L 13/04](#); magnetic bearings [F16C 39/063](#))}
- 7/0242 . . . {Magnetic drives, magnetic coupling devices}
- 7/0247 . . . {Orientating, locating, transporting arrangements}
- 7/0252 . . . {PM holding devices ([H01F 7/021](#), [H01F 7/0215](#), [H01F 7/0226](#) take precedence)}
- 7/0257 {Lifting, pick-up magnetic objects}
- 7/0263 {Closures, bags, bands, engagement devices with male and female parts}
- 7/0268 {Magnetic cylinders}
- 7/0273 . . {Magnetic circuits with PM for magnetic field generation}
- 7/0278 . . . {for generating uniform fields, focusing, deflecting electrically charged particles (for magnetic separation by Lorentz force [B03C 1/023](#); specially adapted for NMR applications [G01R 33/383](#))}
- 7/0284 {using a trimmable or adjustable magnetic circuit, e.g. for a symmetric dipole or quadrupole magnetic field}
- 7/0289 . . . {Transducers, loudspeakers, moving coil arrangements}
- 7/0294 . . . {Detection, inspection, magnetic treatment}
- 7/04 . . Means for releasing the attractive force
- 7/06 . Electromagnets; Actuators including electromagnets {(electric coils [H01F 5/00](#); devices for holding workpieces using electric force [B23Q 3/15](#); load-engaging elements for lifting articles electromagnetically [B66C 1/06](#); electromagnetic couplings [F16D 27/00](#); magnetic brakes [F16D 63/002](#); electromagnetically operated valves [F16K 11/24](#), [F16K 31/00](#); analysing materials by magnetic means [G01N 27/72](#), [G01N 27/80](#); electromagnets for winding mechanical clocks [G04C 1/02](#); electromagnetic relays [H01H 51/00](#); windings for salient poles of dynamo-electric machines [H02K 3/18](#); electromagnets for telegraphic communication [H04L](#); for arc lamps [H05B 31/28](#))}
- 2007/062 . . {Details of terminals or connectors for electromagnets}
- 7/064 . . {Circuit arrangements for actuating electromagnets (circuit arrangements for obtaining special operating characteristics [H01F 7/18](#); driving circuits for electromagnets making use of a switching regulator [H01H 47/325](#))}
- 7/066 . . {Electromagnets with movable winding}
- 2007/068 . . {using printed circuit coils}
- 7/08 . . with armatures
- 7/081 . . . {Magnetic constructions}
- 2007/083 {External yoke surrounding the coil bobbin, e.g. made of bent magnetic sheet}
- 2007/085 {Yoke or polar piece between coil bobbin and armature having a gap, e.g. filled with nonmagnetic material}
- 2007/086 {Structural details of the armature}
- 7/088 . . . {provided with means for absorbing shocks}
- 7/10 . . . specially adapted for alternating current
- 7/11 reducing or eliminating the effects of eddy currents
- 7/12 having anti-chattering arrangements
- 7/1205 {having short-circuited conductors (electromagnetic relays provided with short-circuited conducting sleeves [H01H 47/00](#))}
- 7/121 . . . Guiding or setting position of armatures, e.g. retaining armatures in their end position
- 7/122 by permanent magnets {([H01F 7/1615](#), [H01F 7/1646](#) take precedence)}
- 7/123 by ancillary coil
- 7/124 by mechanical latch, e.g. detent
- 7/126 . . . Supporting or mounting
- 7/127 . . . Assembling
- 7/128 . . . Encapsulating, encasing or sealing
- 7/129 of armatures
- 7/13 . . . characterised by pulling-force characteristics
- 7/14 . . . Pivoting armatures ([H01F 7/17](#) takes precedence)
- 7/145 {Rotary electromagnets with variable gap (with fixed gap or torque motors [H02K 26/00](#))}
- 7/16 . . . Rectilinearly-movable armatures ([H01F 7/17](#) takes precedence)
- 7/1607 {Armatures entering the winding}
- 7/1615 {Armatures or stationary parts of magnetic circuit having permanent magnet}
- 7/1623 {Armatures having T-form}
- 2007/163 {with axial bearing}
- 7/1638 {Armatures not entering the winding}
- 7/1646 {Armatures or stationary parts of magnetic circuit having permanent magnet}
- 7/1653 {Magnetic circuit having axially spaced pole-pieces}
- 2007/1661 {Electromagnets or actuators with anti-stick disc}
- 2007/1669 {Armatures actuated by current pulse, e.g. bistable actuators}
- 2007/1676 {Means for avoiding or reducing eddy currents in the magnetic circuit, e.g. radial slots}
- 2007/1684 {Armature position measurement using coils}
- 2007/1692 {Electromagnets or actuators with two coils}
- 7/17 . . . Pivoting and rectilinearly-movable armatures
- 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

7/1805	. . . . {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 H01H 47/04 ; quick energising of electro-dynamic machines H02P 9/08 ; for quickly de-energising of dynamo-electric generators H02P 9/123)}	10/005	. {organic or organo-metallic films, e.g. monomolecular films obtained by Langmuir-Blodgett technique, graphene}
7/1811	. . . . {demagnetising upon switching off, removing residual magnetism}	10/007	. {ultrathin or granular films (H01F 10/005 and H01F 10/3227 take precedence; applying ultrathin or granular layers to substrates H01F 41/301)}
7/1816	. . . . {making use of an energy accumulator (for relays H01H 47/043)}	10/06	. characterised by the coupling or physical contact with connecting or interacting conductors
2007/1822	. . . . {using a capacitor to produce a boost voltage}	10/08	. characterised by magnetic layers ({ H01F 10/32 takes precedence } ; applying thin magnetic films to substrates H01F 41/14)
7/1827	. . . . {by changing number of serially-connected turns or windings (for relays H01H 47/06)}	10/10	. . characterised by the composition
7/1833	. . . . {by changing number of parallel-connected turns or windings (for relays H01H 47/08)}	10/12	. . . being metal or alloys (intermetallic compounds H01F 10/18)
7/1838	. . . . {by switching-in or -out impedance (for relays H01H 47/10)}	10/123	. . . . {having a L10 crystallographic structure, e.g. [Co,Fe][Pt,Pd] thin films}
7/1844	. . . . {Monitoring or fail-safe circuits (for relays H01H 47/002)}	WARNING This groups is not complete pending the completion of reclassification; see provisionally also H01F 10/16	
2007/185	. . . . {with armature position measurement}	10/126	. . . . {containing rare earth metals (H01F 10/133 takes precedence)}
2007/1855	. . . . {using a stored table to deduce one variable from another}	10/13	. . . . Amorphous metallic alloys, e.g. glassy metals ({ H01F 10/3204 takes precedence})
2007/1861	. . . . {using derivative of measured variable}	NOTE In this group, amorphous metallic alloys are classified in the last appropriate place	
2007/1866	. . . . {with regulation loop}	10/131	. . . . {containing iron or nickel}
7/1872	. . . . {Bistable or bidirectional current devices (relays H01H 47/226)}	10/132	. . . . {containing cobalt}
7/1877	. . . . {controlling a plurality of loads}	10/133	. . . . {containing rare earth metals}
7/1883	. . . . {by steepening leading and trailing edges of magnetisation pulse, e.g. printer drivers}	10/135	. . . . {containing transition metals}
2007/1888	. . . . {using pulse width modulation}	10/136	. . . . {containing iron}
2007/1894	. . . . {minimizing impact energy on closure of magnetic circuit}	10/137	. . . . {containing cobalt}
7/20	. . without armatures (cores H01F 3/00 ; coils H01F 5/00 ; {shaping metal by applying magnetic forces B21D 26/14 ; electromagnets specially adapted for NMR applications G01R 33/381)}	10/138	. . . . {containing nanocrystallites, e.g. obtained by annealing}
7/202	. . . {Electromagnets for high magnetic field strength (for superconducting electromagnets H01F 6/00 ; for transformers or inductances without a magnetic core H01F 30/08)}	10/14	. . . . containing iron or nickel ({ H01F 10/126 , H01F 10/13 , H01F 10/16 take precedence})
7/204	. . . . {Circuits for energising or de-energising}	NOTE In this group, alloys containing iron or nickel are classified in the last appropriate place	
7/206	. . . {Electromagnets for lifting, handling or transporting of magnetic pieces or material (electromagnets for guidance of vehicles, workpieces B65G 21/2009 ; for magnetic suspension or levitation H02N 15/00)}	10/142	. . . . {containing Si}
2007/208	. . . . {combined with permanent magnets}	10/145	. . . . {containing Al, e.g. SENDUST}
10/00	Thin magnetic films, e.g. of one-domain structure (magnetic record carriers G11B 5/00; thin-film magnetic stores G11C)	10/147	. . . . {with lattice under strain, e.g. expanded by interstitial nitrogen (H01F 10/26 - H01F 10/30 take precedence)}
10/002	. {Antiferromagnetic thin films, i.e. films exhibiting a Néel transition temperature (H01F 10/3218 and H01F 10/3268 take precedence)}	10/16	. . . . containing cobalt ({ H01F 10/126 , H01F 10/13 take precedence})
WARNING This groups is not complete pending the completion of reclassification; see provisionally also H01F 10/00 - H01F 10/30		10/18	. . . being compounds
		10/187	. . . . Amorphous compounds ({ H01F 10/3204 takes precedence})
		10/193	. . . . Magnetic semiconductor compounds {in general H01F 1/40 ; multilayers, e.g. superlattices H01F 10/3213 }

- 10/1933 {Perovskites}
- WARNING**
- This groups is not complete pending the completion of reclassification; see provisionally also [H01F 10/193](#)
- 10/1936 {Half-metallic, e.g. epitaxial CrO₂ or NiMnSb films}
- 10/20 Ferrites
- 10/205 {Hexagonal ferrites}
- 10/22 Orthoferrites {, e.g. RFeO₃ (R= rare earth element) with orthorhombic structure}
- 10/24 Garnets {(in general [H01F 1/346](#); multilayers, e.g. superlattices [H01F 10/3209](#); applying magnetic garnet films to substrates by sputtering [H01F 41/186](#))}
- 10/245 {Modifications for enhancing interaction with electromagnetic wave energy}
- 10/26 . . . characterised by the substrate or intermediate layers ([H01F 10/06](#) and [H01F 10/32](#) take precedence)}
- 10/265 . . . {Magnetic multilayers non exchange-coupled ([H01F 10/32](#) takes precedence)}
- WARNING**
- This groups is not complete pending the completion of reclassification; see provisionally also [H01F 10/00](#) - [H01F 10/30](#)
- 10/28 . . . characterised by the composition of the substrate
- 10/30 . . . characterised by the composition of the intermediate layers {, e.g. seed, buffer, template, diffusion preventing, cap layers ([H01F 10/06](#) and [H01F 10/32](#) take precedence)}
- 10/32 . . . Spin-exchange-coupled multilayers, e.g. nanostructured superlattices {(applying spin-exchange-coupled multilayers to substrates [H01F 41/302](#))}
- 10/3204 . . . {Exchange coupling of amorphous multilayers}
- 10/3209 . . . {Exchange coupling of garnet multilayers}
- 10/3213 . . . {Exchange coupling of magnetic semiconductor multilayers, e.g. MnSe/ZnSe superlattices (semiconductor materials for use in semiconductor devices [H01L 29/12](#))}
- 10/3218 . . . {Exchange coupling of magnetic films via an antiferromagnetic interface ([H01F 10/3268](#) takes precedence)}
- 10/3222 . . . {Exchange coupled hard/soft multilayers, e.g. CoPt/Co or NiFe/CoSm (nanocomposite spring magnets [H01F 1/0579](#))}
- 10/3227 . . . {Exchange coupling via one or more magnetisable ultrathin or granular films}
- 10/3231 . . . {via a non-magnetic spacer}
- 10/3236 {made of a noble metal, e.g.(Co/Pt) n multilayers having perpendicular anisotropy ([H01F 10/3286](#) takes precedence)}
- 10/324 . . . {Exchange coupling of magnetic film pairs via a very thin non-magnetic spacer, e.g. by exchange with conduction electrons of the spacer}
- 10/3245 {the spacer being superconductive}
- 10/325 {the spacer being noble metal}
- 10/3254 {the spacer being semiconducting or insulating, e.g. for spin tunnel junction [STJ]}
- 10/3259 {Spin-exchange-coupled multilayers comprising at least a nano-oxide layer [NOL], e.g. with a NOL spacer}
- 10/3263 {the exchange coupling being symmetric, e.g. for dual spin valve, e.g. NiO/Co/Cu/Co/Cu/Co/NiO}
- 10/3268 {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}
- 10/3272 {by use of anti-parallel coupled [APC] ferromagnetic layers, e.g. artificial ferrimagnets [AFI], artificial [AAF] or synthetic [SAF] anti-ferromagnets}
- 10/3277 {by use of artificial ferrimagnets [AFI] only}
- 10/3281 {only by use of asymmetry of the magnetic film pair itself, i.e. so-called pseudospin valve [PSV] structure, e.g. NiFe/Cu/Co}
- 10/3286 {Spin-exchange coupled multilayers having at least one layer with perpendicular magnetic anisotropy}
- 10/329 {Spin-exchange coupled multilayers wherein the magnetisation of the free layer is switched by a spin-polarised current, e.g. spin torque effect}
- 10/3295 {Spin-exchange coupled multilayers wherein the magnetic pinned or free layers are laminated without anti-parallel coupling within the pinned and free layers}
- 13/00 Apparatus or processes for magnetising or demagnetising** ({devices for holding workpieces using magnetic or electric force acting directly on the workpieces [B23Q 3/15](#)}; for degaussing ships [B63G 9/06](#); for clocks or watches [G04D 9/00](#); {recording or erasing of information on magnetic record carriers [G11B 5/00](#)}; demagnetising arrangements for colour television [H04N 9/29](#))
- 13/003 . . . {Methods and devices for magnetising permanent magnets (permanent magnets [H01F 7/02](#))}
- 13/006 . . . {Methods and devices for demagnetising of magnetic bodies, e.g. workpieces, sheet material (for erasing of information on magnetic record carriers [G11B 5/00](#))}
- 17/00 Fixed inductances of the signal type** (coils in general [H01F 5/00](#) {inductors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof and multistep manufacturing processes therefor [H01L 28/10](#)})
- 17/0006 . . . {Printed inductances (printed coils for dynamo-electric machines [H02K 3/26](#); printed circuits [H05K](#))}
- 17/0013 . . . {with stacked layers ([H01F 27/2804](#) takes precedence)}
- 2017/002 {Details of via holes for interconnecting the layers}
- 2017/0026 {Multilayer LC-filter}
- 17/0033 . . . {with the coil helically wound around a magnetic core}
- 2017/004 . . . {with the coil helically wound around an axis without a core}
- 2017/0046 . . . {with a conductive path having a bridge}
- 2017/0053 . . . {with means to reduce eddy currents}

2017/006	. . {flexible printed inductors}	27/002	. {Arrangements provided on the transformer facilitating its transport}
2017/0066	. . {with a magnetic layer}	27/004	. {Arrangements for interchanging inductances, transformers or coils thereof}
2017/0073	. . {with a special conductive pattern, e.g. flat spiral}	27/006	. {with special arrangement or spacing of turns of the winding(s), e.g. to produce desired self-resonance}
2017/008	. . {Electric or magnetic shielding of printed inductances}	27/008	. {with temperature compensation}
2017/0086	. . {on semiconductor substrate (inductors for integrated circuits H01L 28/10)}	27/02	. Casings
2017/0093	. {Common mode choke coil}	27/022	. . {Encapsulation}
17/02	. without magnetic core	27/025	. . {Constructional details relating to cooling}
17/03	. . with ceramic former	27/027	. . {specially adapted for combination of signal type inductors or transformers with electronic circuits, e.g. mounting on printed circuit boards}
17/04	. with magnetic core	27/04	. . Leading of conductors or axes through casings, e.g. for tap-changing arrangements
17/041	. . {Means for preventing rotation or displacement of the core}	27/06	. Mounting, supporting or suspending transformers, reactors or choke coils {not being of the signal type}
17/043	. . {with two, usually identical or nearly identical parts enclosing completely the coil (pot cores)}	2027/065	. . {Mounting on printed circuit boards}
17/045	. . {with core of cylindric geometry and coil wound along its longitudinal axis, i.e. rod or drum core}	27/08	. Cooling (heat-transfer elements F28F); Ventilating (structural details of casings H01F 27/02)
2017/046	. . . {helical coil made of flat wire, e.g. with smaller extension of wire cross section in the direction of the longitudinal axis}	27/085	. . {Cooling by ambient air}
2017/048	. . {with encapsulating core, e.g. made of resin and magnetic powder}	27/10	. . Liquid cooling
17/06	. . with core substantially closed in itself, e.g. toroid	27/105	. . . {Cooling by special liquid or by liquid of particular composition}
17/062	. . . {Toroidal core with turns of coil around it}	27/12	. . . Oil cooling
2017/065	. . . {Core mounted around conductor to absorb noise, e.g. EMI filter}	27/125	. . . . {Cooling by synthetic insulating and incombustible liquid}
2017/067	. . . {Core with two or more holes to lead through conductor}	27/14	. . . . Expansion chambers; Oil conservators; Gas cushions; Arrangements for purifying, drying, or filling
17/08	. . . Loading coils for telecommunication circuits	27/16	. . . Water cooling
19/00	Fixed transformers or mutual inductances of the signal type (H01F 36/00 takes precedence)	27/18	. . . by evaporating liquids
19/02	. Audio-frequency transformers or mutual inductances, i.e. not suitable for handling frequencies considerably beyond the audio range	27/20	. . Cooling by special gases or non-ambient air
19/04	. Transformers or mutual inductances suitable for handling frequencies considerably beyond the audio range (resonant circuits H03H)	27/22	. . Cooling by heat conduction through solid or powdered fillings
19/06	. . Broad-band transformers, e.g. suitable for handling frequencies well down into the audio range	27/23	. Corrosion protection
19/08	. . Transformers having magnetic bias, e.g. for handling pulses	27/24	. Magnetic cores
2019/085	. . . {Transformer for galvanic isolation}	27/245	. . made from sheets, e.g. grain-oriented (H01F 27/26 takes precedence)
21/00	Variable inductances or transformers of the signal type (H01F 36/00 takes precedence)	27/2455	. . . {using bent laminations}
21/005	. {Inductances without magnetic core}	27/25	. . made from strips or ribbons (H01F 27/26 takes precedence)
21/02	. continuously variable, e.g. variometers	27/255	. . made from particles (H01F 27/26 takes precedence)
21/04	. . by relative movement of turns or parts of windings	27/26	. . Fastening parts of the core together; Fastening or mounting the core on casing or support (on coil H01F 27/30)
21/06	. . by movement of core or part of core relative to the windings as a whole	27/263	. . . {Fastening parts of the core together}
21/065	. . . {Measures for obtaining a desired relation between the position of the core and the inductance}	27/266	. . . {Fastening or mounting the core on casing or support (on coil H01F 27/30)}
21/08	. . by varying the permeability of the core, e.g. by varying magnetic bias	27/28	. Coils; Windings; Conductive connections
21/10	. . by means of a movable shield	27/2804	. . {Printed windings}
21/12	. discontinuously variable, e.g. tapped	2027/2809	. . . {on stacked layers}
2021/125	. . {Printed variable inductor with taps, e.g. for VCO}	2027/2814	. . . {with only part of the coil or of the winding in the printed circuit board, e.g. the remaining coil or winding sections can be made of wires or sheets}
27/00	Details of transformers or inductances, in general	2027/2819	. . . {Planar transformers with printed windings, e.g. surrounded by two cores and to be mounted on printed circuit}
		27/2823	. . {Wires (H01F 27/2866 takes precedence)}

- 27/2828 . . . {Construction of conductive connections, of leads}
- 2027/2833 . . . {using coaxial cable as wire}
- 2027/2838 . . . {using transposed wires}
- 2027/2842 . . . {Wire coils wound in conical zigzag to reduce voltage between winding turns}
- 27/2847 . . {Sheets; Strips ([H01F 27/2866](#) takes precedence)}
- 27/2852 . . . {Construction of conductive connections, of leads}
- 2027/2857 . . . {Coil formed from wound foil conductor}
- 2027/2861 . . . {Coil formed by folding a blank}
- 27/2866 . . {Combination of wires and sheets}
- 27/2871 . . {Pancake coils}
- 27/2876 . . {Cooling (cooling transformers and inductances in general [H01F 27/08](#))}
- 27/288 . . {Shielding}
- 27/2885 . . . {with shields or electrodes (shields or electrodes for pancake coils [H01F 27/2871](#); construction of electric or magnetic shields or screens [H01F 27/36](#))}
- 27/289 . . . {with auxiliary windings (for pancake coils [H01F 27/2871](#))}
- 27/2895 . . {Windings disposed upon ring cores}
- 27/29 . . Terminals; Tapping arrangements {for signal inductances}
- 27/292 . . . {Surface mounted devices}
- 2027/295 {with flexible terminals}
- 2027/297 . . . {with pin-like terminal to be inserted in hole of printed path}
- 27/30 . . Fastening or clamping coils, windings, or parts thereof together; Fastening or mounting coils or windings on core, casing, or other support
- 27/303 . . . {Clamping coils, windings or parts thereof together}
- 27/306 . . . {Fastening or mounting coils or windings on core, casing or other support}
- 27/32 . . Insulating of coils, windings, or parts thereof
- 27/321 . . . {using a fluid for insulating purposes only}
- 27/322 . . . {the insulation forming channels for circulation of the fluid}
- 27/323 . . . {Insulation between winding turns, between winding layers}
- 27/324 . . . {Insulation between coil and core, between different winding sections, around the coil; Other insulation structures}
- 27/325 {Coil bobbins (formers for coils in general [H01F 5/02](#))}
- 27/326 {specifically adapted for discharge lamp ballasts}
- 27/327 . . . {Encapsulating or impregnating (encapsulating coil and core [H01F 27/022](#))}
- 2027/328 {Dry-type transformer with encapsulated foil winding, e.g. windings coaxially arranged on core legs with spacers for cooling and with three phases}
- 2027/329 . . . {Insulation with semiconducting layer, e.g. to reduce corona effect}
- 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
- 27/341 . . {Preventing or reducing no-load losses or reactive currents}
- 27/343 . . {Preventing or reducing surge voltages; oscillations}
- 27/345 . . . {using auxiliary conductors}
- 27/346 . . {Preventing or reducing leakage fields (using magnetic shields [H01F 27/365](#); using auxiliary windings [H01F 27/38](#))}
- 2027/348 . . {Preventing eddy currents}
- 27/36 . . Electric or magnetic shields or screens (movable for varying inductance [H01F 21/10](#))
- 27/362 . . . {Electric shields or screens}
- 27/365 . . . {Magnetic shields or screens}
- 27/367 {using non-magnetic screens}
- 27/38 . . Auxiliary core members; Auxiliary coils or windings
- 27/385 . . . {for reducing harmonics}
- 27/40 . . Structural association with built-in electric component, e.g. fuse
- 27/402 . . {Association of measuring or protective means}
- 2027/404 . . . {Protective devices specially adapted for fluid filled transformers}
- 2027/406 . . . {Temperature sensor or protection}
- 2027/408 . . {Association with diode or rectifier}
- 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](#))
- 27/422 . . {for instrument transformers}
- 27/425 . . . {for voltage transformers}
- 27/427 . . . {for current transformers}
- 29/00** **Variable transformers or inductances not covered by group [H01F 21/00](#) {(tap change devices [H01H 9/0005](#))}**
- 29/02 . . with tapplings on coil or winding; with provision for rearrangement or interconnection of windings
- 29/025 . . {Constructional details of transformers or reactors with tapping on coil or 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 {(high leakage transformers [H01F 38/08](#); dynamo-electric machines with movable part of magnetic circuit [H02K 23/44](#), [H02K 23/48](#))}
- 29/12 . . having movable coil, winding, or part thereof; having movable shield
- 29/14 . . with variable magnetic bias ({amplitude modulation by means of variable impedance element [H03C 1/08](#) } ; magnetic amplifiers [H03F](#); {circuits for automatic telephonic communication [H04M 3/00](#)})
- 2029/143 . . {with control winding for generating magnetic bias}
- 29/146 . . {Constructional details}

30/00	Fixed transformers not covered by group H01F 19/00	2038/423	. . {with adjusting potentiometers}
30/02	. Auto-transformers	2038/426	. . {with gap in transformer core}
30/04	. having two or more secondary windings, each supplying a separate load, e.g. for radio set power supplies	41/00	Apparatus or processes specially adapted for manufacturing or assembling magnets, inductances or transformers; Apparatus or processes specially adapted for manufacturing materials characterised by their magnetic properties
30/06	. characterised by the structure	41/005	. {Impregnating or encapsulating (insulating of windings H01F 41/12)}
30/08	. . without magnetic core	41/02	. for manufacturing cores, coils, or magnets (H01F 41/14 takes precedence; for dynamo-electric machines H02K 15/00)
30/10	. . Single-phase transformers (H01F 30/16 takes precedence)	41/0206	. . {Manufacturing of magnetic cores by mechanical means (magnetic cores per se H01F 27/24)}
30/12	. . Two-phase, three-phase or polyphase transformers	41/0213	. . . {Manufacturing of magnetic circuits made from strip(s) or ribbon(s) (magnetic cores made by winding a ribbon H01F 27/25)}
30/14	. . . for changing the number of phases	41/022	. . . . {by winding the strips or ribbons around a coil}
30/16	. . Toroidal transformers	41/0226	. . . . {from amorphous ribbons}
36/00	Transformers with superconductive windings or with windings operating at cryogenic temperature (superconducting magnets or superconducting coils H01F 6/00)	41/0233	. . . {Manufacturing of magnetic circuits made from sheets (magnetic cores made from sheets H01F 27/245; soft magnetic alloys in the form of sheets H01F 1/16)}
37/00	Fixed inductances not covered by group H01F 17/00	41/024	. . . . {Manufacturing of magnetic circuits made from deformed sheets (magnetic cores made from deformed sheets H01F 27/2455)}
37/005	. {without magnetic core}	41/0246	. . . {Manufacturing of magnetic circuits by moulding or by pressing powder (magnetic cores made by moulding or by pressing powder H01F 27/255; soft magnetic particles H01F 1/20, H01F 1/36)}
38/00	Adaptations of transformers or inductances for specific applications or functions	41/0253	. . {for manufacturing permanent magnets}
2038/003	. {High frequency transformer for microwave oven}	41/026	. . . {protecting methods against environmental influences, e.g. oxygen, by surface treatment (magnetic particles with skin H01F 1/061, H01F 1/09, H01F 1/24, H01F 1/33 and G11B 5/706)}
2038/006	. {matrix transformer consisting of several interconnected individual transformers working as a whole}	41/0266	. . . {Moulding; Pressing (H01F 41/0273 takes precedence; hard magnetic particles H01F 1/06, H01F 1/11)}
38/02	. for non-linear operation	41/0273	. . . {Imparting anisotropy (methods and devices for magnetising permanent magnets H01F 13/003)}
38/023	. . {of inductances}	41/028	. . . . {Radial anisotropy (for rotor or stator bodies H02K 15/02)}
2038/026	. . . {non-linear inductive arrangements for converters, e.g. with additional windings}	41/0286	. . . {Trimming}
38/04	. . for frequency changing	41/0293	. . . {diffusion of rare earth elements, e.g. Tb, Dy or Ho, into permanent magnets}
38/06	. . for changing the wave shape	41/04	. . for manufacturing coils {(coils for transformer or inductances H01F 27/28)}
38/08	. High-leakage transformers or inductances	41/041	. . . {Printed circuit coils (apparatus or processes for manufacturing printed circuits in general H05K 3/00)}
38/085	. . {Welding transformers}	41/042	. . . . {by thin film techniques}
38/10	. . Ballasts, e.g. for discharge lamps	41/043	. . . . {by thick film techniques}
38/12	. Ignition, e.g. for IC engines	41/045	. . . . {Trimming}
2038/122	. . {with rod-shaped core}	41/046	. . . . {structurally combined with ferromagnetic material}
2038/125	. . {with oil insulation}	41/047	. . . . {structurally combined with superconductive material}
2038/127	. . {with magnetic circuit including permanent magnet}	41/048	. . . {Superconductive coils}
38/14	. Inductive couplings {(for charging batteries from ac mains by converters H02J 7/025)}	41/06	. . . Coil winding
2038/143	. . {for signals}		
2038/146	. . {in combination with capacitive coupling}		
38/16	. Cascade transformers, e.g. for use with extra high tension		
38/18	. Rotary transformers		
38/20	. Instruments transformers		
38/22	. . for single phase ac		
38/24	. . . Voltage transformers		
38/26	. . . . Constructions		
38/28	. . . Current transformers		
38/30	. . . . Constructions		
2038/305	. . . . . {with toroidal magnetic core}		
38/32	. . . . Circuit arrangements		
38/34	. . . Combined voltage and current transformers		
38/36	. . . . Constructions		
38/38	. . for polyphase ac		
38/40	. . for dc		
38/42	. Flyback transformers		

- 41/061 Winding flat conductive wires or sheets
- 41/063 with insulation
- 41/064 Winding non-flat conductive wires, e.g. rods, cables or cords
- 41/066 with insulation
- 41/068 in the form of strip material
- 41/069 Winding two or more wires, e.g. bifilar winding
- 41/07 Twisting
- 41/071 Winding coils of special form ([winding conductors onto closed formers or cores H01F 41/08](#))
- 2041/0711 {[Winding saddle or deflection coils](#)}
- 41/073 Winding onto elongate formers
- 41/074 Winding flat coils
- 41/076 Forming taps or terminals while winding, e.g. by wrapping or soldering the wire onto pins, or by directly forming terminals from the wire
- 41/077 Deforming the cross section or shape of the winding material while winding
- 41/079 Measuring electrical characteristics while winding
- 41/08 Winding conductors onto closed formers or cores, e.g. threading conductors through toroidal cores
- 41/082 Devices for guiding or positioning the winding material on the former
- 41/084 for forming pancake coils
- 41/086 in a special configuration on the former, e.g. orthocyclic coils or open mesh coils
- 41/088 using revolving flyers
- 41/09 Winding machines having two or more work holders or formers
- 41/092 Turrets; Turntables
- 41/094 Tensioning or braking devices
- 41/096 Dispensing or feeding devices
- 41/098 Mandrels; Formers
- 41/10 Connecting leads to windings ([making electric connections in general H01R 43/00](#))
- 41/12 Insulating of windings ({[impregnating or encapsulating of transformers H01F 41/005](#)}; [of conductors in general H01B 13/06](#))
- 41/122 {[Insulating between turns or between winding layers](#)}
- 41/125 {[Other insulating structures; Insulating between coil and core, between different winding sections, around the coil](#)}
- 41/127 {[Encapsulating or impregnating \(encapsulating coil and core H01F 41/005\)](#)}
- 41/14 for applying magnetic films to substrates ([covering metals, or materials with metals, in general C23C; manufacturing record carriers G11B 5/84](#))
- NOTE**
Group [H01F 41/30](#) takes precedence over groups [H01F 41/16](#) - [H01F 41/24](#), and over group [H01F 41/32](#)
- 41/16 the magnetic material being applied in the form of particles, e.g. by serigraphy {, i.e. [forming thick magnetic films and precursors therefor, e.g. magnetisable pastes, inks, glass frits \(H01F 41/18 - H01F 41/24 take precedence; thick magnetic films H01F 1/0027\)](#)}
- 41/18 by cathode sputtering
- 41/183 {[Sputtering targets therefor](#)}
- 41/186 {[for applying a magnetic garnet film \(magnetic garnet materials H01F 1/346; magnetic garnet films H01F 10/24\)](#)}
- 41/20 by evaporation
- 41/205 {[by laser ablation, e.g. pulsed laser deposition \[PLD\]](#)}
- 41/22 Heat treatment; Thermal decomposition; Chemical vapour deposition
- 41/24 from liquids
- 41/26 using electric currents {, e.g. [electroplating](#)}
- 41/28 by liquid phase epitaxy
- 41/30 for applying nanostructures, e.g. by molecular beam epitaxy [MBE]
- 41/301 {[for applying ultrathin or granular layers \(ultrathin or granular layers H01F 10/007\)](#)}
- 41/302 {[for applying spin-exchange-coupled multilayers, e.g. nanostructured superlattices \(spin-exchange-coupled multilayers H01F 10/32\)](#)}
- 41/303 {[with exchange coupling adjustment of magnetic film pairs, e.g. interface modifications by reduction, oxidation](#)}
- 41/304 {[using temporary decoupling, e.g. involving blocking, Néel or Curie temperature transitions by heat treatment in presence/absence of a magnetic field](#)}
- 41/305 {[applying the spacer or adjusting its interface, e.g. in order to enable particular effect different from exchange coupling](#)}
- 41/306 {[conductive spacer](#)}
- 41/307 {[insulating or semiconductive spacer](#)}
- 41/308 {[lift-off processes, e.g. ion milling, for trimming or patterning](#)}
- 41/309 {[electroless or electrodeposition processes from plating solution](#)}
- 41/32 for applying conductive, insulating or magnetic material on a magnetic film {, specially adapted for [a thin magnetic film](#)}
- 41/325 {[applying a noble metal capping on a spin-exchange-coupled multilayer, e.g. spin filter deposition](#)}
- WARNING**
This groups is not complete pending the completion of reclassification; see provisionally also [H01F 41/32](#)
- 41/34 in patterns, e.g. by lithography