

# CPC COOPERATIVE PATENT CLASSIFICATION

## F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

### ENGINES OR PUMPS

#### F05 INDEXING SCHEMES RELATING TO ENGINES OR PUMPS IN VARIOUS SUBCLASSES OF CLASSES [F01-F04](#)

#### F05B INDEXING SCHEME RELATING TO WIND, SPRING, WEIGHT, INERTIA OR LIKE MOTORS, TO MACHINES OR ENGINES FOR LIQUIDS COVERED BY SUBCLASSES [F03B](#), [F03D](#) AND [F03G](#)

##### NOTE

This subclass constitutes an internal scheme for indexing only.

#### 2200/00 Mathematical features

- 2200/10 . Basic functions
- 2200/11 . . Sum
- 2200/12 . . Subtraction
- 2200/13 . . Product
- 2200/14 . . Division
- 2200/15 . . Inverse
- 2200/20 . Special functions
- 2200/21 . . Root
- 2200/211 . . . Square root
- 2200/212 . . . Cubic root
- 2200/22 . . Power
- 2200/221 . . . Square power
- 2200/222 . . . Cubic power
- 2200/23 . . Logarithm
- 2200/24 . . exponential
- 2200/25 . . Hyperbolic trigonometric, e.g. sinh, cosh, tanh
- 2200/26 . . trigonometric
- 2200/261 . . . Sine
- 2200/262 . . . Cosine
- 2200/263 . . . Tangent
- 2200/264 . . . Cotangent
- 2200/30 . miscellaneous
- 2200/31 . . odd
- 2200/32 . . even
- 2200/33 . . bigger/smaller
- 2200/34 . . biggest/smallest
- 2200/35 . . first
- 2200/36 . . last

#### 2210/00 Working fluid

##### NOTE

Indexing codes of group [F05B 2210/00](#) can be followed by a name for a specific working fluid preceded by the "+" sign, e.g. [F05B 2210/11](#) +water.

- 2210/10 . Kind or type
- 2210/11 . . liquid, i.e. incompressible
- 2210/12 . . gaseous, i.e. compressible
- 2210/13 . . mixed, e.g. two-phase fluid

- 2210/132 . . . Pumps with means for separating and evacuating the gaseous phase
- 2210/14 . . Refrigerants with particular properties, e.g. HFC-134a
- 2210/16 . Air or water being indistinctly used as working fluid, i.e. the machine can work equally with air or water without any modification
- 2210/18 . Air and water being simultaneously used as working fluid
- 2210/20 . Properties
- 2210/30 . Flow characteristics
- 2210/301 . . with Mach-number kept constant along the flow
- 2210/302 . . Pressure kept constant along the flow
- 2210/40 . Flow geometry or direction
- 2210/401 . . upwards due to the buoyancy of compressed air
- 2210/402 . . Axial inlet and radial outlet
- 2210/403 . . Radial inlet and axial outlet
- 2210/404 . . bidirectional, i.e. in opposite, alternating directions

#### 2220/00 Application

- 2220/10 . in ram-jet engines or ram-jet driven vehicles
- 2220/20 . within closed fluid conduits, e.g. pipes
- 2220/25 . as advertisement
- 2220/30 . in turbines
- 2220/301 . . in steam turbines
- 2220/302 . . in gas turbines
- 2220/31 . . in ram-air turbines ("RATS")
- 2220/32 . . in water turbines
- 2220/40 . in turbochargers
- 2220/50 . for auxiliary power units (APU's)
- 2220/60 . making use of surplus or waste energy
- 2220/602 . . with energy recovery turbines
- 2220/604 . . for domestic central heating or production of electricity
- 2220/61 . for hydrogen and/or oxygen production
- 2220/62 . for desalination
- 2220/64 . for aeration
- 2220/70 . in combination with
- 2220/702 . . the other apparatus being a steam turbine
- 2220/703 . . the other apparatus being a water turbine
- 2220/704 . . the other apparatus being a gas turbine

2220/705	. . the other apparatus being a wind turbine	2230/608	. . . for adjusting the position or the alignment, e.g. wedges or excenters
2220/706	. . an electrical generator	2230/61	. . using auxiliary equipment for lifting or holding ( <a href="#">hoisting on to a stationary structure with provisions on the structure itself F05B 2240/916</a> )
2220/7062	. . . of the direct current (D.C.) type	2230/6102	. . . carried on a floating platform
2220/7064	. . . of the alternating current (A.C.) type	2230/70	. Disassembly methods
2220/70642	. . . . of the synchronous type	2230/80	. Repairing, retrofitting or upgrading methods
2220/70644	. . . . of the asynchronous type, i.e. induction type	2230/90	. Coating; Surface treatment ( <a href="#">manufacture with deposition of material F05B 2220/30</a> )
2220/70646	. . . . . Double fed induction generators (DFIGs)		
2220/7066	. . . via a direct connection, i.e. a gearless transmission		
2220/7068	. . . equipped with permanent magnets		
2220/707	. . . of the linear type		
2220/708	. . Photoelectric means, i.e. photovoltaic or solar cells		
2220/709	. . Piezoelectric means		
<b>2230/00</b>	<b>Manufacture</b>	<b>2240/00</b>	<b>Components</b>
	<b>NOTE</b>		<b>NOTE</b>
	Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like.		Components are the basic elements of construction.
2230/10	. by removing material	2240/10	. Stators
2230/101	. . by electrochemical methods	2240/11	. . Shroud seal segments
2230/102	. . by spark erosion methods	2240/12	. . Fluid guiding means, e.g. vanes
2230/103	. . using lasers	2240/121	. . . Baffles or ribs
2230/104	. Micromachining	2240/122	. . . Vortex generators, turbulators, or the like, for mixing ( <a href="#">by creating turbulence F05B 2260/222</a> )
2230/20	. essentially without removing material	2240/123	. . . Nozzles
2230/21	. . by casting	2240/1231	. . . . Plug nozzles
2230/211	. . . by precision casting, e.g. microfusing or investment casting	2240/124	. . . Cascades, i.e. assemblies of similar profiles acting in parallel
2230/22	. . by sintering	2240/13	. . to collect or cause flow towards or away from turbines
2230/23	. . by permanently joining parts together	2240/131	. . . by means of vertical structures, i.e. chimneys
2230/232	. . . by welding	2240/132	. . . creating a vortex or tornado effect
2230/233	. . . . Electron beam welding	2240/133	. . . with a convergent-divergent guiding structure, e.g. a Venturi conduit
2230/234	. . . . Laser welding	2240/14	. . Casings, housings, nacelles, gondels or the like, protecting or supporting assemblies within
2230/235	. . . . Tig/Mig welding	2240/142	. . . in the form of a standard ISO container
2230/236	. . . . Diffusion bonding	2240/20	. Rotors
2230/237	. . . . Brazing	2240/201	. . using the Magnus-effect
2230/238	. . . . Soldering	2240/202	. . with adjustable area of intercepted fluid
2230/239	. . . . Inertia or friction welding	2240/2021	. . . by means of telescoping blades
2230/24	. . by extrusion	2240/2022	. . . by means of tethering or coning blades
2230/25	. . by forging	2240/2023	. . . by means of radially reefing blades
2230/26	. . by rolling	2240/21	. . for wind turbines
2230/30	. with deposition of material	2240/211	. . . with vertical axis
2230/31	. . Layer deposition	2240/212	. . . . of the Darrieus type
2230/311	. . . by torch or flame spray	2240/213	. . . . of the Savonius type
2230/312	. . . by plasma spray	2240/214	. . . . of the Musgrove or "H"-type
2230/313	. . . by physical vapour deposition	2240/215	. . . . of the panemone or "vehicle ventilator" type
2230/314	. . . by chemical vapour deposition	2240/216	. . . . of the anemometer type
2230/40	. Heat treatment	2240/217	. . . . of the crossflow- or "Banki"- or "double action" type
2230/41	. . Hardening; Annealing	2240/218	. . . . with horizontally hinged vanes
2230/50	. Building or constructing in particular ways	2240/221	. . . with horizontal axis
2230/502	. . using existing or "off the shelf" parts, e.g. using standardised turbocharger elements	2240/2211	. . . . of the multibladed, low speed, e.g. "American farm" type
2230/60	. Assembly methods	2240/2212	. . . . perpendicular to wind direction
2230/601	. . using limited numbers of standard modules which can be adapted by machining	2240/2213	. . . . and with the rotor downwind from the yaw pivot axis
2230/604	. . using positioning or alignment devices for aligning or centering, e.g. pins	2240/231	. . . driven by aerodynamic lift effects
2230/606	. . . using maintaining alignment while permitting differential dilatation	2240/232	. . . . driven by drag
		2240/24	. . for turbines
		2240/241	. . . of impulse type
		2240/2411	. . . . Pelton type
		2240/242	. . . of reaction type

2240/243	. . . of the Archimedes screw type	2240/9152	. . . . by being hinged
2240/244	. . . of the cross-flow, e.g. Banki, Ossberger type	2240/91521	. . . . . at ground level
2240/30	. . Characteristics of rotor blades, i.e. of any element transforming dynamic fluid energy to or from rotational energy and being attached to a rotor	2240/916	. . . with provision for hoisting onto the structure
2240/301	. . . Cross-section characteristics	2240/917	. . . attached to cables
2240/302	. . . Segmented or sectional blades	2240/9172	. . . . of kite type with traction and retraction
2240/303	. . . Details of the leading edge	2240/9174	. . . . of kite type with a turbine and a flying pattern
2240/304	. . . Details of the trailing edge	2240/9176	. . . . Wing, kites or buoyant bodies with a turbine attached without flying pattern
2240/3042	. . . . Serrated trailing edge	2240/92	. . on an airborne structure
2240/305	. . . Flaps, slats or spoilers	2240/921	. . . kept aloft due to aerodynamic effects
2240/3052	. . . . adjustable	2240/922	. . . kept aloft due to buoyancy effects
2240/306	. . . Surface measures	2240/923	. . . which is a vehicle
2240/3062	. . . . Vortex generators	2240/93	. . on a structure floating on a liquid surface
2240/307	. . . Blade tip, e.g. winglets	2240/931	. . . which is a vehicle
2240/31	. . . of changeable form or shape	2240/932	. . . which is a catamaran-like structure
2240/311	. . . . flexible or elastic	2240/94	. . on a movable wheeled structure
2240/312	. . . . capable of being reefed	2240/941	. . . which is a land vehicle
2240/3121	. . . . . around an axis orthogonal to rotor rotational axis	2240/95	. . offshore
2240/313	. . . . with adjustable flow intercepting area (F05B 2240/312 takes precedence)	2240/96	. . as part of a wind turbine farm
2240/32	. . . with roughened surfaces	2240/965	. . as part of a water turbine farm
2240/33	. . Shrouds which are part of or which are rotating with the rotor	2240/97	. . on a submerged structure
2240/37	. . Multiple rotors	2240/98	. . which is inflatable
2240/372	. . . coaxially arranged	2240/99	. characterised by colour or colour patterns
2240/374	. . . Auxiliary rotors attached to blades of main rotor		
2240/40	. Use of a multiplicity of similar components	<b>2250/00</b>	<b>Geometry</b>
2240/50	. Bearings		<b>NOTE</b>
2240/51	. . magnetic		Geometry indicates the shape or form of a component or the configuration or arrangement of components in a machine or in a plant.
2240/511	. . . with permanent magnets	2250/02	. variable
2240/515	. . . electromagnetic	2250/10	. two-dimensional
2240/52	. . Axial thrust bearings	2250/11	. . triangular
2240/53	. . Hydrodynamic or hydrostatic bearings	2250/12	. . rectangular
2240/54	. . Radial bearings	2250/121	. . . square
2240/57	. Seals	2250/13	. . trapezoidal
2240/571	. . Brush seals	2250/131	. . . polygonal
2240/572	. . Leaf seals	2250/132	. . . hexagonal
2240/60	. Shafts	2250/14	. . elliptical
2240/61	. . hollow	2250/141	. . . circular
2240/62	. . flexible	2250/15	. . spiral
2240/63	. . Glands for admission or removal of fluids from shafts	2250/16	. . parabolic
2240/70	. Slinger plates or washers	2250/17	. . hyperbolic
2240/80	. Platforms for stationary or moving blades	2250/18	. . patterned
2240/801	. . cooled platforms	2250/181	. . . ridged
2240/85	. Electrical connection arrangements	2250/182	. . . crenellated, notched
2240/90	. Mounting on supporting structures or systems	2250/183	. . . zigzag
2240/91	. . on a stationary structure	2250/184	. . . sinusoidal
2240/911	. . . already existing for a prior purpose	2250/19	. . machined; miscellaneous
2240/9111	. . . . which is a chimney	2250/191	. . . perforated
2240/9112	. . . . which is a building	2250/192	. . . beveled
2240/9113	. . . . which is a roadway, rail track, or the like for recovering energy from moving vehicles	2250/193	. . . milled
2240/912	. . . on a tower	2250/20	. three-dimensional
2240/9121	. . . . on a lattice tower	2250/21	. . pyramidal
2240/913	. . . on a mast	2250/22	. . parallelepipedic
2240/914	. . . on an inflatable structure	2250/221	. . . cubic
2240/915	. . . which is vertically adjustable	2250/23	. . prismatic
2240/9151	. . . . telescopically	2250/231	. . . cylindrical
		2250/232	. . . conical
		2250/24	. . ellipsoidal
		2250/241	. . . spherical

2250/25	. . helical	2250/84	. . Nanomachines ( <a href="#">Nanotechnology for interacting, sensing or actuating B82Y 15/00</a> )
2250/26	. . paraboloidal	2250/86	. . Megamachines
2250/27	. . hyperboloidal	<b>2260/00</b>	<b>Function</b>
2250/28	. . patterned	2260/02	. Transport, e.g. specific adaptations or devices for conveyance ( <a href="#">transport of wind turbines or equipments therefore F03D 13/40</a> )
2250/281	. . . threaded	2260/04	. Deployment, e.g. installing underwater structures
2250/282	. . . Cubic pattern	2260/10	. Particular cycles
2250/283	. . . Honeycomb	2260/20	. Heat transfer, e.g. cooling
2250/29	. . machined; miscellaneous	2260/201	. . by impingement of a fluid
2250/291	. . . hollowed	2260/202	. . by film cooling
2250/292	. . . tapered	2260/203	. . by transpiration cooling
2250/293	. . . lathed, e.g. rotation symmetrical	2260/205	. . Cooling fluid recirculation, i.e. after having cooled one or more components the cooling fluid is recovered and used elsewhere for other purposes
2250/30	. Arrangement of components	2260/207	. . using a phase changing mass, (e.g. heat absorbing by melting or boiling)
2250/31	. . according to the direction of their main axis or their axis of rotation	2260/208	. . using heat pipes
2250/311	. . . the axes being in line	2260/209	. . using vortex tubes
2250/312	. . . the axes being parallel to each other	2260/211	. . by intercooling, e.g. during a compression cycle
2250/313	. . . the axes being perpendicular to each other	2260/212	. . . by water injection
2250/314	. . . the axes being inclined in relation to each other	2260/221	. . Improvement of heat transfer
2250/315	. . . the main axis being substantially vertical	2260/222	. . . by creating turbulence ( <a href="#">vortex generators, turbulators or the like for mixing F05B 2240/122</a> )
2250/32	. . according to their shape	2260/224	. . . by increasing the heat transfer surface
2250/321	. . . asymptotic	2260/2241	. . . . using fins or ribs
2250/322	. . . tangential	2260/231	. . Preventing heat transfer
2250/323	. . . convergent	2260/232	. . characterised by the cooling medium
2250/324	. . . divergent	2260/233	. . . the medium being steam
2250/33	. . symmetrical	2260/24	. . for draft enhancement in chimneys, using solar or other heat sources
2250/34	. . translated	2260/30	. Retaining components in desired mutual position
2250/35	. . rotated	2260/301	. . Retaining bolts or nuts
2250/36	. . in inner-outer relationship, e.g. shaft-bearing arrangements	2260/3011	. . . of the frangible or shear type
2250/40	. Movement of component	2260/302	. . by means of magnetic or electromagnetic forces
2250/41	. . with one degree of freedom	2260/303	. . with a bayonet coupling
2250/411	. . . in rotation	2260/304	. . Balancing of radial or axial forces on regenerative rotors
2250/42	. . with two degrees of freedom	2260/305	. . Reducing friction between regenerative impeller discs and casing walls
2250/43	. . with three degrees of freedom	2260/31	. . Locking rotor in position
2250/44	. . one element moving inside another one, e.g. wave-operated member (wom) moving inside another member (rem)	2260/40	. Transmission of power
2250/50	. Inlet or outlet	2260/402	. . through friction drives
2250/501	. . Inlet	2260/4021	. . . through belt drives
2250/5011	. . . augmenting, i.e. with intercepting fluid flow cross sectional area greater than the rest of the machine behind the inlet	2260/4022	. . . through endless chains
2250/5012	. . . concentrating only, i.e. with intercepting fluid flow cross sectional area not greater than the rest of the machine behind the inlet	2260/4023	. . . through a friction clutch
2250/502	. . Outlet	2260/403	. . through the shape of the drive components
2250/503	. . of regenerative pumps	2260/4031	. . . as in toothed gearing
2250/60	. Structure; Surface texture	2260/40311	. . . . of the epicyclic, planetary or differential type
2250/61	. . corrugated	2260/40312	. . . . Ratchet wheels
2250/611	. . . undulated	2260/404	. . through magnetic drive coupling
2250/62	. . smooth	2260/4041	. . . the driven magnets encircling the driver magnets
2250/621	. . . polished	2260/406	. . through hydraulic systems
2250/70	. Shape	2260/407	. . through piezoelectric conversion
2250/71	. . curved	2260/408	. . through magnetohydrodynamic conversion
2250/711	. . . convex	2260/42	. Storage of energy
2250/712	. . . concave	2260/421	. . in the form of rotational kinetic energy, e.g. in flywheels
2250/713	. . . inflexed		
2250/72	. . symmetric		
2250/73	. . asymmetric		
2250/80	. Size or power range of the machines		
2250/82	. . Micromachines		

2260/422	. . in the form of potential energy, e.g. pressurized or pumped fluid	2260/99	. Radar absorption
2260/50	. Kinematic linkage, i.e. transmission of position	<b>2270/00</b>	<b>Control</b>
2260/502	. . involving springs	2270/10	. Purpose of the control system
2260/503	. . using gears	2270/101	. . to control rotational speed (n)
2260/5032	. . . of the bevel or angled type	2270/1011	. . . to prevent overspeed
2260/504	. . using flat or V-belts and pulleys	2270/1012	. . . to prevent underspeed
2260/505	. . using chains and sprockets; using toothed belts	2270/1013	. . . of different spools or shafts
2260/506	. . using cams or eccentrics	2270/1014	. . . to keep rotational speed constant
2260/507	. . using servos, independent actuators, etc.	2270/1016	. . in variable speed operation
2260/60	. Fluid transfer	2270/102	. . to control acceleration (u)
2260/601	. . using an ejector or a jet pump	2270/1021	. . . by keeping it below damagingly high values
2260/602	. . Drainage	2270/1022	. . . by making it as high as possible
2260/603	. . . of leakage having past a seal ( <a href="#">seals F05B 2240/57</a> ; <a href="#">glands F05B 2240/63</a> )	2270/103	. . to affect the output of the engine
2260/604	. . Vortex non-clogging type pumps	2270/1031	. . . Thrust
2260/63	. . Preventing clogging or obstruction of flow paths by dirt, dust, or foreign particles	2270/1032	. . . Torque
2260/64	. . Aeration, ventilation, dehumidification or moisture removal of closed spaces	2270/1033	. . . Power (if explicitly mentioned)
2260/70	. Adjusting of angle of incidence or attack of rotating blades	2270/104	. . to match engine to driven device
2260/71	. . as a function of flow velocity	2270/1041	. . . in particular the electrical frequency of driven generator
2260/72	. . by turning around an axis parallel to the rotor centre line	2270/107	. . to cope with emergencies
2260/74	. . by turning around an axis perpendicular the rotor centre line	2270/1071	. . . in particular sudden load loss
2260/75	. . the adjusting mechanism not using auxiliary power sources ("servos")	2270/10711	. . . . applying a low voltage ride through method
2260/76	. . the adjusting mechanism using auxiliary power sources	2270/1072	. . . in particular blow-out and relight
2260/77	. . the adjusting mechanism driven or triggered by centrifugal forces	2270/1073	. . . of one engine in a multi-engine system
2260/78	. . the adjusting mechanism driven or triggered by aerodynamic forces	2270/1074	. . . by using back-up controls
2260/79	. . Bearing, support or actuation arrangements therefor	2270/1075	. . . by temporary overriding set control limits
2260/80	. Diagnostics	2270/1076	. . . caused by water or hail ingestion
2260/82	. Forecasts	2270/1077	. . . Storm protection
2260/821	. . Parameter estimation or prediction	2270/109	. . to prolong engine life
2260/8211	. . . of the weather	2270/1091	. . . by limiting temperatures
2260/83	. Testing, e.g. methods, components or tools therefor	2270/1095	. . . by limiting mechanical stresses
2260/84	. Modelling or simulation	2270/1097	. . . by preventing reverse rotation
2260/845	. Redundancy	2270/11	. . to maintain desired vehicle trajectory parameters
2260/85	. Starting	2270/111	. . to control two or more engines simultaneously
2260/87	. Using a generator as a motor	2270/17	. . to avoid excessive deflection of the blades
2260/90	. Braking	2270/18	. . to control buoyancy
2260/901	. . using aerodynamic forces, i.e. lift or drag	2270/19	. . to avoid stroboscopic flicker shadow on surroundings
2260/9011	. . . of the tips of rotor blades	2270/20	. . to optimise the performance of a machine
2260/902	. . using frictional mechanical forces	2270/202	. . . Tuning to wave conditions
2260/903	. . using electrical or magnetic forces	2270/204	. . . taking into account the wake effect
2260/904	. . using hydrodynamic forces	2270/30	. Control parameters, e.g. input parameters
2260/95	. Preventing corrosion ( <a href="#">coating or surface treatment F05B 2230/90</a> )	2270/301	. . Pressure
2260/96	. Preventing, counteracting or reducing vibration or noise	2270/3011	. . . Inlet
2260/962	. . my means creating "anti-noise"	2270/3013	. . . Outlet
2260/964	. . by damping means	2270/3015	. . . differential
2260/966	. . by correcting static or dynamic imbalance	2270/303	. . Temperature
2260/97	. Reducing windage losses	2270/3032	. . . excessive temperatures, e.g. caused by overheating
2260/972	. . in radial flow machines	2270/304	. . Spool rotational speed
2260/98	. Lubrication	2270/305	. . Tolerances
		2270/309	. . Rate of change of parameters
		2270/32	. . Wind speeds
		2270/3201	. . . "cut-off" or "shut-down" wind speed
		2270/3202	. . . "cut-in" or starting wind speed
		2270/321	. . Wind directions
		2270/322	. . the detection or prediction of a wind gust
		2270/323	. . Air humidity
		2270/324	. . Air pressure
		2270/325	. . Air temperature
		2270/326	. . Rotor angle



2270/327	. . Rotor or generator speeds	2280/1021	. . . Aluminium
2270/328	. . Blade pitch angle	2280/1022	. . . Beryllium
2270/329	. . Azimuth or yaw angle	2280/1023	. . . Boron
2270/33	. . Proximity of blade to tower	2280/1024	. . . Lithium
2270/331	. . Mechanical loads	2280/1025	. . . Magnesium
2270/332	. . Maximum loads or fatigue criteria	2280/103	. . Heavy metals
2270/333	. . Noise or sound levels	2280/10301	. . . Refractory metals, e.g. V, W
2270/334	. . Vibration measurements	2280/10302	. . . Chromium
2270/335	. . Output power or torque	2280/10303	. . . Molybdenum
2270/336	. . Blade lift measurements	2280/10304	. . . Titanium
2270/337	. . Electrical grid status parameters, e.g. voltage, frequency or power demand	2280/10305	. . . Zirconium
2270/34	. . Water level	2280/10306	. . . Hafnium
2270/341	. . Liquid flow velocity or direction	2280/10307	. . . Manganese
2270/342	. . Wave conditions, e.g. amplitude, frequency or direction	2280/10308	. . . Lead
2270/40	. Type of control system	2280/10309	. . . Tin
2270/402	. . passive or reactive, e.g. using large wind vanes	2280/1031	. . . Zinc
2270/404	. . active, predictive, or anticipative	2280/10311	. . . Mercury
2270/50	. Control logic embodiment by	2280/104	. . Noble metals
2270/502	. . electrical means, e.g. relays or switches	2280/1041	. . . Silver
2270/504	. . electronic means, e.g. electronic tubes, transistors or IC's within an electronic circuit	2280/1042	. . . Gold
2270/506	. . hydraulic means, e.g. hydraulic valves within a hydraulic circuit	2280/1043	. . . Platinum group, e.g. Pt, Ir
2270/508	. . mechanical means, e.g. levers, gears or cams	2280/1044	. . . Palladium
2270/60	. Control system actuates through	2280/1045	. . . Ruthenium
2270/602	. . electrical actuators	2280/1046	. . . Osmium
2270/604	. . hydraulic actuators	2280/1047	. . . Iridium
2270/605	. . Pneumatic actuators	2280/1048	. . . Rhodium
2270/606	. . mechanical actuators ( <a href="#">F05B 2270/602 takes precedence</a> )	2280/105	. . Copper
2270/70	. Type of control algorithm	2280/106	. . Rare earth metals, e.g. Sc, Y
2270/701	. . proportional	2280/107	. . Alloys
2270/702	. . differential	2280/1071	. . . Steel alloys
2270/703	. . integral	2280/1072	. . Copper alloys
2270/704	. . proportional-differential	2280/10721	. . . Bronze
2270/705	. . proportional-integral	2280/10722	. . . Phosphor-bronze alloy
2270/706	. . proportional-integral-differential	2280/10723	. . . Nickel-Copper alloy, e.g. monel
2270/707	. . fuzzy logic	2280/1073	. . Aluminium alloy, e.g. AlCuMgPb
2270/708	. . with comparison tables	2280/1074	. . Alloys not otherwise provided for
2270/709	. . with neural networks	2280/10741	. . . Superalloys
2270/80	. Devices generating input signals, e.g. transducers, sensors, cameras or strain gauges	2280/10742	. . . Heat stable alloys
2270/802	. . Calibration thereof	2280/10743	. . . Ni - Si alloys
2270/803	. . Sampling thereof	2280/10744	. . . Metal-aluminide intermetallic compounds
2270/804	. . Optical devices	2280/20	. Inorganic materials, e.g. non-metallic materials
2270/8041	. . . Cameras	2280/2001	. . Glass
2270/8042	. . . Lidar systems	2280/20011	. . . MIBA
2270/805	. . Radars	2280/20012	. . . Quartz
2270/806	. . Sonars	2280/2002	. . Phosphor
2270/807	. . Accelerometers	2280/2003	. . Silicon
2270/808	. . Strain gauges; Load cells	2280/2004	. . Ceramics; Oxides
2270/809	. . Encoders	2280/20041	. . . Aluminium oxides
2270/81	. . Microphones	2280/20042	. . . Zinc oxides
2270/821	. . Displacement measuring means, e.g. inductive	2280/20043	. . . Zirconium oxides
<b>2280/00</b>	<b>Materials; Properties thereof</b>	2280/2005	. . Non-oxide ceramics
2280/10	. Inorganic materials, e.g. metals	2280/2006	. . Carbon, e.g. graphite
2280/101	. . Iron	2280/2007	. . Carbides
2280/1011	. . Cast iron	2280/20071	. . . of silicon
2280/102	. . Light metals	2280/20072	. . . of titanium, e.g. TiB
		2280/20073	. . . of wolfram, e.g. tungsten carbide
		2280/2008	. . Nitrides
		2280/20081	. . . of aluminium
		2280/20082	. . . of boron
		2280/20083	. . . of silicon
		2280/20084	. . . of titanium

2280/20085	. . . of zirconium
2280/2009	. . Sulfides
2280/20091	. . . of molybdenum
2280/201	. . Sapphire
2280/2011	. . Aluminium titanate
2280/2013	. . Silica
2280/2014	. . Arsenic
2280/2015	. . Antimony
2280/2016	. . Bismuth
2280/2017	. . Barium
2280/30	. Inorganic materials not otherwise provided for
2280/40	. Organic materials
2280/4001	. . Leather
2280/4002	. . Cellulosic materials, e.g. wood
2280/4003	. . Synthetic polymers, e.g. plastics
2280/4004	. . Rubber
2280/4005	. . PTFE [PolyTetraFluorEthylene]
2280/4006	. . Polyamides, e.g. NYLON
2280/4007	. . Thermoplastics
2280/4009	. . Polyetherketones, e.g. PEEK
2280/401	. . Silicon polymers
2280/4011	. . Organic materials not otherwise provided for
2280/50	. Intrinsic material properties or characteristics
2280/5001	. . Elasticity
2280/5002	. . Thermal properties
2280/5003	. . Expansivity
2280/50031	. . . similar
2280/50032	. . . dissimilar
2280/5004	. . Heat transfer
2280/5005	. . Reflective properties
2280/5006	. . Shape memory
2280/5007	. . Hardness
2280/5008	. . Magnetic properties
2280/5009	. . non-magnetic
2280/501	. . Self lubricating materials; Solid lubricants
2280/5011	. . Surface roughness
2280/60	. Properties or characteristics given to material by treatment or manufacturing
2280/6001	. . Fabrics
2280/6002	. . . Woven fabrics
2280/6003	. . Composites; e.g. fibre-reinforced
2280/6004	. . amorphous
2280/6005	. . crystalline
2280/6006	. . Directionally-solidified crystalline structures
2280/6007	. . monocrystalline
2280/6008	. . Structures
2280/6009	. . Grain size
2280/601	. . Syntactic
2280/6011	. . Coating
2280/6012	. . Foam
2280/6013	. . Fibres
2280/6014	. . Filler
2280/6015	. . Resin
2280/70	. Treatments or modification of materials
2280/701	. . Heat treatments
2280/702	. . Reinforcements