

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 MACHINES OR ENGINES OTHER THAN NON-POSITIVE-DISPLACEMENT MACHINES OR ENGINES, TO WIND MOTORS, TO NON-POSITIVE DISPLACEMENT PUMPS, AND TO GENERATING COMBUSTION PRODUCTS OF HIGH PRESSURE OR HIGH VELOCITY

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
- 2220/3021 . . . for a special turbine stage
- 2220/3022 the first stage of a turbine
- 2220/3023 an intermediate stage of the turbine
- 2220/3025 the last stage of the turbine
- 2220/303 . . . for aircraft propulsion, e.g. jet engines
- 2220/304 . . . to drive unshrouded, low solidity propeller
- 2220/305 . . . to drive unshrouded, high solidity propeller
- 2220/306 . . . to drive shrouded, low solidity propeller
- 2220/307 . . . to drive shrouded, high solidity propeller
- 2220/308 . . . providing direct vertical lift
- 2220/309 . . . in a helicopter
- 2220/31 . . in ram-air turbines ("RATS")
- 2220/32 . . in water turbines

2220/33	. . specially adapted for the fan of turbofan engines	2230/311	. . . by torch or flame spray
2220/40	. in turbochargers	2230/312	. . . by plasma spray
2220/50	. for auxiliary power units (APU's)	2230/313	. . . by physical vapour deposition
2220/60	. making use of surplus or waste energy	2230/314	. . . by chemical vapour deposition
2220/602	. . with energy recovery turbines	2230/40	. Heat treatment
2220/604	. . for domestic central heating or production of electricity	2230/41	. . Hardening; Annealing
2220/61	. for hydrogen and/or oxygen production	2230/50	. Building or constructing in particular ways
2220/62	. for desalination	2230/502	. . using existing or "off the shelf" parts, e.g. using standardised turbocharger elements
2220/64	. for aeration	2230/60	. Assembly methods
2220/70	. in combination with	2230/601	. . using limited numbers of standard modules which can be adapted by machining
2220/702	. . a steam turbine	2230/604	. . using positioning or alignment devices for aligning or centering, e.g. pins
2220/704	. . a gas turbine	2230/606	. . . using maintaining alignment while permitting differential dilatation
2220/706	. . an electrical generator	2230/608	. . . for adjusting the position or the alignment, e.g. wedges or excenters
2220/7062	. . . of the direct current (D.C.) type	2230/61	. . using auxiliary equipment for lifting or holding (hoisting on to a stationary structure with provisions on the structure itself F05B 2240/916)
2220/7064	. . . of the alternating current (A.C.) type	2230/6102	. . . carried on a floating platform
2220/70642	. . . . of the synchronous type	2230/70	. Disassembly methods
2220/70644	. . . . of the asynchronous type, i.e. induction type	2230/80	. Repairing, retrofitting or upgrading methods
2220/70646	. . . . . Double fed induction generators (DFIGs)	2230/90	. Coating; Surface treatment (manufacture with deposition of material F05B 2220/30)
2220/7066	. . . via a direct connection, i.e. a gearless transmission	2240/00	Components
2220/7068	. . . equipped with permanent magnets		NOTE
2220/707	. . . of the linear type		Components are the basic elements of construction.
2220/708	. . Photoelectric means, i.e. photovoltaic or solar cells	2240/10	. Stators
2220/709	. . Piezoelectric means	2240/11	. . Shroud seal segments
2220/80	. in supersonic vehicles excluding hypersonic vehicles or ram, scram or rocket propulsion	2240/12	. . Fluid guiding means, e.g. vanes
2220/90	. in vehicles adapted for vertical or short take off and landing (v/stol vehicles), (gas turbines providing direct vertical lift F05B 2220/308)	2240/121	. . . Baffles or ribs
2230/00	Manufacture	2240/122	. . . Vortex generators, turbulators, or the like, for mixing (by creating turbulence F05B 2260/222)
	NOTE	2240/123	. . . Nozzles
	Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like.	2240/1231	. . . . Plug nozzles
2230/10	. by removing material	2240/124	. . . Cascades, i.e. assemblies of similar profiles acting in parallel
2230/101	. . by electrochemical methods	2240/13	. . to collect or cause flow towards or away from turbines
2230/102	. . by spark erosion methods	2240/131	. . . by means of vertical structures, i.e. chimneys
2230/103	. . using lasers	2240/132	. . . creating a vortex or tornado effect
2230/104	. Micromachining	2240/133	. . . with a convergent-divergent guiding structure, e.g. a Venturi conduit
2230/20	. essentially without removing material	2240/14	. . Casings, housings, nacelles, gondels or the like, protecting or supporting assemblies within
2230/21	. . by casting	2240/142	. . . in the form of a standard ISO container
2230/211	. . . by precision casting, e.g. microfusing or investment casting	2240/20	. Rotors
2230/22	. . by sintering	2240/201	. . using the Magnus-effect
2230/23	. . by permanently joining parts together	2240/202	. . with adjustable area of intercepted fluid
2230/232	. . . by welding	2240/2021	. . . by means of telescoping blades
2230/233	. . . . Electron beam welding	2240/2022	. . . by means of tethering or coning blades
2230/234	. . . . Laser welding	2240/2023	. . . by means of radially reefing blades
2230/235	. . . . Tig/Mig welding	2240/21	. . for wind turbines
2230/236	. . . . Diffusion bonding	2240/211	. . . with vertical axis
2230/237	. . . . Brazing	2240/212	. . . . of the Darrieus type
2230/238	. . . . Soldering	2240/213	. . . . of the Savonius type
2230/239	. . . . Inertia or friction welding	2240/214	. . . . of the Musgrove or "H"-type
2230/24	. . by extrusion	2240/215	. . . . of the panemone or "vehicle ventilator" type
2230/25	. . by forging		
2230/26	. . by rolling		
2230/30	. with deposition of material		
2230/31	. . Layer deposition		

2240/216	. . . . of the anemometer type	2240/9113	. . . . which is a roadway, rail track, or the like for recovering energy from moving vehicles
2240/217	. . . . of the crossflow- or "Banki"- or "double action" type	2240/912	. . . . on a tower
2240/218	. . . . with horizontally hinged vanes	2240/9121	. . . . on a lattice tower
2240/221	. . . . with horizontal axis	2240/913	. . . . on a mast
2240/2211	. . . . of the multibladed, low speed, e.g. "American farm" type	2240/914	. . . . on an inflatable structure
2240/2212	. . . . perpendicular to wind direction	2240/915	. . . . which is vertically adjustable
2240/2213	. . . . and with the rotor downwind from the yaw pivot axis	2240/9151	. . . . telescopically
2240/231	. . . . driven by aerodynamic lift effects	2240/9152	. . . . by being hinged
2240/232	. . . . driven by drag	2240/91521	. . . . . at ground level
2240/24	. . for turbines	2240/916	. . . . with provision for hoisting onto the structure
2240/241	. . . . of impulse type	2240/917	. . . . attached to cables
2240/2411	. . . . Pelton type	2240/92	. . . on an airborne structure
2240/242	. . . . of reaction type	2240/921	. . . . kept aloft due to aerodynamic effects
2240/243	. . . . of the Archimedes screw type	2240/922	. . . . kept aloft due to buoyancy effects
2240/244	. . . . of the cross-flow, e.g. Banki, Ossberger type	2240/923	. . . . which is a vehicle
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	2240/93	. . . on a structure floating on a liquid surface
2240/301	. . . . Cross-section characteristics	2240/931	. . . . which is a vehicle
2240/302	. . . . Segmented or sectional blades	2240/932	. . . . which is a catamaran-like structure
2240/31	. . . . of changeable form or shape	2240/94	. . . on a movable wheeled structure
2240/311	. . . . flexible or elastic	2240/941	. . . . which is a land vehicle
2240/312	. . . . capable of being reefed	2240/95	. . . offshore
2240/3121	. . . . . around an axis orthogonal to rotor rotational axis	2240/96	. . . as part of a wind farm
2240/313	. . . . with adjustable flow intercepting area (F05B 2240/312 takes precedence)	2240/97	. . . on a submerged structure
2240/32	. . . . with roughened surfaces	2240/98	. . . which is inflatable
2240/33	. . Shrouds which are part of or which are rotating with the rotor	2240/99	. . characterised by colour or colour patterns
2240/34	. . . with auxiliary or secondary rotors attached to blades of main rotor	2250/00	Geometry
2240/35	. . Combustors or associated equipment		NOTE
2240/36	. . Fuel vaporizer		Geometry indicates the shape or form of a component or the configuration or arrangement of components in a machine or in a plant.
2240/40	. . Use of a multiplicity of similar components	2250/02	. . variable
2240/50	. . Bearings	2250/10	. . two-dimensional
2240/51	. . magnetic	2250/11	. . . triangular
2240/511	. . . with permanent magnets	2250/12	. . . rectangular
2240/515	. . . electromagnetic	2250/121	. . . . square
2240/52	. . Axial thrust bearings	2250/13	. . . trapezoidal
2240/53	. . Hydrodynamic or hydrostatic bearings	2250/131	. . . . polygonal
2240/54	. . Radial bearings	2250/132	. . . . hexagonal
2240/57	. . Seals	2250/14	. . . elliptical
2240/571	. . Brush seals	2250/141	. . . . circular
2240/572	. . Leaf seals	2250/15	. . . spiral
2240/60	. . Shafts	2250/16	. . . parabolic
2240/61	. . hollow	2250/17	. . . hyperbolic
2240/62	. . flexible	2250/18	. . . patterned
2240/63	. . Glands for admission or removal of fluids from shafts	2250/181	. . . . ridged
2240/70	. . Slinger plates or washers	2250/182	. . . . crenellated, notched
2240/80	. . Platforms for stationary or moving blades	2250/183	. . . . zigzag
2240/801	. . . cooled platforms	2250/184	. . . . sinusoidal
2240/90	. . Mounting on supporting structures or systems	2250/19	. . . machined; miscellaneous
2240/91	. . . on a stationary structure	2250/191	. . . . perforated
2240/911	. . . . already existing for a prior purpose	2250/192	. . . . beveled
2240/9111	. . . . . which is a chimney	2250/193	. . . . milled
2240/9112	. . . . . which is a building	2250/20	. . . three-dimensional
		2250/21	. . . pyramidal
		2250/22	. . . parallelepipedic
		2250/221	. . . . cubic
		2250/23	. . . prismatic
		2250/231	. . . . cylindrical
		2250/232	. . . . conical

2250/24	. . ellipsoidal	2250/86	. . Megamachines
2250/241	. . . spherical	2260/00	Function
2250/25	. . helical	2260/02	. Transport, e.g. specific adaptations or devices for conveyance (transport of wind turbines or equipments therefore F03D 13/40)
2250/26	. . paraboloidal	2260/10	. Particular cycles
2250/27	. . hyperboloidal	2260/20	. Heat transfer, e.g. cooling
2250/28	. . patterned	2260/201	. . by impingement of a fluid
2250/281	. . . threaded	2260/202	. . by film cooling
2250/282	. . . Cubic pattern	2260/203	. . by transpiration cooling
2250/283	. . . Honeycomb	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
2250/29	. . machined; miscellaneous	2260/207	. . using a phase changing mass, (e.g. heat absorbing by melting or boiling)
2250/291	. . . hollowed	2260/208	. . using heat pipes
2250/292	. . . tapered	2260/209	. . using vortex tubes
2250/293	. . . lathed, e.g. rotation symmetrical	2260/211	. . by intercooling, e.g. during a compression cycle
2250/30	. Arrangement of components	2260/212	. . . by water injection
2250/31	. . according to the direction of their main axis or their axis of rotation	2260/221	. . Improvement of heat transfer
2250/311	. . . the axes being in line	2260/222	. . . by creating turbulence (vortex generators, turbulators or the like for mixing F05B 2240/122)
2250/312	. . . the axes being parallel to each other	2260/224	. . . by increasing the heat transfer surface
2250/313	. . . the axes being perpendicular to each other	2260/2241	. . . . using fins or ribs
2250/314	. . . the axes being inclined in relation to each other	2260/231	. . Preventing heat transfer
2250/315	. . . the main axis being substantially vertical	2260/232	. . characterised by the cooling medium
2250/32	. . according to their shape	2260/233	. . . the medium being steam
2250/321	. . . asymptotic	2260/24	. . for draft enhancement in chimneys, using solar or other heat sources
2250/322	. . . tangential	2260/30	. Retaining components in desired mutual position
2250/323	. . . convergent	2260/301	. . Retaining bolts or nuts
2250/324	. . . divergent	2260/3011	. . . of the frangible or shear type
2250/33	. . symmetrical	2260/302	. . by means of magnetic or electromagnetic forces
2250/34	. . translated	2260/303	. . with a bayonet coupling
2250/35	. . rotated	2260/304	. . Balancing of radial or axial forces on regenerative rotors
2250/36	. . in inner-outer relationship, e.g. shaft-bearing arrangements	2260/305	. . Reducing friction between regenerative impeller discs and casing walls
2250/40	. Movement of component	2260/40	. Transmission of power
2250/41	. . with one degree of freedom	2260/402	. . through friction drives
2250/411	. . . in rotation	2260/4021	. . . through belt drives
2250/42	. . with two degrees of freedom	2260/4022	. . . through endless chains
2250/43	. . with three degrees of freedom	2260/4023	. . . through a friction clutch
2250/50	. Inlet or outlet	2260/403	. . through the shape of the drive components
2250/501	. . Inlet	2260/4031	. . . as in toothed gearing
2250/5011	. . . augmenting, i.e. with intercepting fluid flow cross sectional area greater than the rest of the machine behind the inlet	2260/40311	. . . . of the epicyclic, planetary or differential type
2250/5012	. . . concentrating only, i.e. with intercepting fluid flow cross sectional area not greater than the rest of the machine behind the inlet	2260/404	. . through magnetic drive coupling
2250/502	. . Outlet	2260/4041	. . . the driven magnets encircling the driver magnets
2250/503	. . of regenerative pumps	2260/406	. . through hydraulic systems
2250/60	. Structure; Surface texture	2260/407	. . through piezoelectric conversion
2250/61	. . corrugated	2260/408	. . through magnetohydrodynamic conversion
2250/611	. . . undulated	2260/42	. Storage of energy
2250/62	. . smooth	2260/421	. . in the form of rotational kinetic energy, e.g. in flywheels
2250/621	. . . polished	2260/50	. Kinematic linkage, i.e. transmission of position
2250/70	. Shape	2260/502	. . involving springs
2250/71	. . curved	2260/503	. . using gears
2250/711	. . . convex	2260/5032	. . . of the bevel or angled type
2250/712	. . . concave	2260/504	. . using flat or V-belts and pulleys
2250/713	. . . inflexed		
2250/72	. . symmetric		
2250/73	. . asymmetric		
2250/80	. Size or power range of the machines		
2250/82	. . Micromachines		
2250/84	. . Nanomachines (Nanotechnology for interacting, sensing or actuating B82Y 15/00)		

2260/505	. . using chains and sprockets; using toothed belts	2270/1016	. . in variable speed operation
2260/506	. . using cams or eccentrics	2270/102	. . to control acceleration (u)
2260/507	. . using servos, independent actuators, etc.	2270/1021	. . . by keeping it below damagingly high values
2260/60	. Fluid transfer	2270/1022	. . . by making it as high as possible
2260/601	. . using an ejector or a jet pump	2270/103	. . to affect the output of the engine
2260/602	. . Drainage	2270/1031	. . . Thrust
2260/603	. . . of leakage having past a seal (seals F05B 2240/57 ; glands F05B 2240/63)	2270/1032	. . . Torque
2260/604	. . Vortex non-clogging type pumps	2270/1033	. . . Power (if explicitly mentioned)
2260/63	. . Preventing clogging or obstruction of flow paths by dirt, dust, or foreign particles	2270/104	. . to match engine to driven device
2260/64	. . Aeration, ventilation, dehumidification or moisture removal of closed spaces	2270/1041	. . . in particular the electrical frequency of driven generator
2260/70	. Adjusting of angle of incidence or attack of rotating blades	2270/105	. . to improve fuel economy
2260/71	. . as a function of flow velocity	2270/1051	. . . in particular at idling speed
2260/72	. . by turning around an axis parallel to the rotor centre line	2270/106	. . to produce clean exhaust gases
2260/74	. . by turning around an axis perpendicular the rotor centre line	2270/1061	. . . with as little smoke as possible
2260/75	. . the adjusting mechanism not using auxiliary power sources ("servos")	2270/1062	. . . with as little NOx's as possible
2260/76	. . the adjusting mechanism using auxiliary power sources	2270/1063	. . . by monitoring combustion conditions
2260/77	. . the adjusting mechanism driven or triggered by centrifugal forces	2270/1064	. . . . indirectly, at the exhaust
2260/78	. . the adjusting mechanism driven or triggered by aerodynamic forces	2270/107	. . to cope with emergencies
2260/79	. . Bearing, support or actuation arrangements therefor	2270/1071	. . . in particular sudden load loss
2260/80	. Diagnostics	2270/10711	. . . . applying a low voltage ride through method
2260/82	. Forecasts	2270/1072	. . . in particular blow-out and relight
2260/821	. . Parameter estimation or prediction	2270/1073	. . . of one engine in a multi-engine system
2260/8211	. . . of the weather	2270/1074	. . . by using back-up controls
2260/83	. Testing, e.g. methods, components or tools therefor	2270/1075	. . . by temporary overriding set control limits
2260/84	. Modelling or simulation	2270/1076	. . . caused by water or hail ingestion
2260/845	. Redundancy	2270/108	. . to cope with, or avoid, compressor flow instabilities
2260/85	. Starting	2270/1081	. . . Compressor surge or stall
2260/90	. Braking	2270/10812	. . . . caused by working fluid flow velocity profile distortion
2260/901	. . using aerodynamic forces, i.e. lift or drag	2270/10815	. . . . . due to high angle of attack of aircraft
2260/9011	. . . of the tips of rotor blades	2270/10817	. . . . . due to compressor degradation
2260/902	. . using frictional mechanical forces	2270/109	. . to prolong engine life
2260/903	. . using electrical or magnetic forces	2270/1091	. . . by limiting temperatures
2260/904	. . using hydrodynamic forces	2270/1095	. . . by limiting mechanical stresses
2260/95	. Preventing corrosion (coating or surface treatment F05B 2230/90)	2270/1097	. . . by preventing reverse rotation
2260/96	. Preventing, counteracting or reducing vibration or noise	2270/11	. . to maintain desired vehicle trajectory parameters
2260/962	. . my means creating "anti-noise"	2270/1101	. . . Altitude
2260/964	. . by damping means	2270/1102	. . . Speed or Mach number
2260/966	. . by correcting static or dynamic imbalance	2270/111	. . to control two or more engines simultaneously
2260/97	. Reducing windage losses	2270/15	. . to control thermoacoustic behaviour in the combustion chambers (counteracting noise or vibration F05B 2260/96)
2260/972	. . in radial flow machines	2270/16	. . to control water or steam injection
2260/98	. Lubrication	2270/17	. . to avoid excessive deflection of the blades
2260/99	. Radar absorption	2270/18	. . to control buoyancy
2270/00	Control	2270/19	. . to avoid stroboscopic flicker shadow on surroundings
2270/10	. Purpose of the control system	2270/20	. . to optimise the performance of a machine
2270/101	. . to control rotational speed (n)	2270/30	. Control parameters, e.g. input parameters
2270/1011	. . . to prevent overspeed	2270/301	. . Pressure
2270/1012	. . . to prevent underspeed	2270/3011	. . . Inlet
2270/1013	. . . of different spools or shafts	2270/3013	. . . Outlet
2270/1014	. . . to keep rotational speed constant	2270/3015	. . . differential
		2270/303	. . Temperature
		2270/3032	. . . excessive temperatures, e.g. caused by overheating
		2270/304	. . Spool rotational speed
		2270/305	. . Tolerances
		2270/309	. . Rate of change of parameters
		2270/31	. . Fuel schedule for stage combustors

2270/32	. . Wind speeds	2280/10	. Inorganic materials, e.g. metals
2270/3201	. . . "cut-off" or "shut-down" wind speed	2280/101	. . Iron
2270/321	. . Wind directions	2280/1011	. . Cast iron
2270/322	. . the detection or prediction of a wind gust	2280/102	. . Light metals
2270/323	. . Air humidity	2280/1021	. . . Aluminium
2270/324	. . Air pressure	2280/1022	. . . Beryllium
2270/325	. . Air temperature	2280/1023	. . . Boron
2270/326	. . Rotor angle	2280/1024	. . . Lithium
2270/327	. . Rotor or generator speeds	2280/1025	. . . Magnesium
2270/328	. . Blade pitch angle	2280/103	. . Heavy metals
2270/329	. . Azimuth or yaw angle	2280/10301	. . . Refractory metals, e.g. V, W
2270/33	. . Proximity of blade to tower	2280/10302	. . . Chromium
2270/331	. . Mechanical loads	2280/10303	. . . Molybdenum
2270/332	. . Maximum loads or fatigue criteria	2280/10304	. . . Titanium
2270/333	. . Noise or sound levels	2280/10305	. . . Zirconium
2270/334	. . Vibration measurements	2280/10306	. . . Hafnium
2270/335	. . Output power or torque	2280/10307	. . . Manganese
2270/336	. . Blade lift measurements	2280/10308	. . . Lead
2270/337	. . Electrical grid status parameters, e.g. voltage, frequency or power demand	2280/10309	. . . Tin
2270/40	. Type of control system	2280/1031	. . . Zinc
2270/402	. . passive or reactive, e.g. using large wind vanes	2280/10311	. . . Mercury
2270/404	. . active, predictive, or anticipative	2280/104	. . Noble metals
2270/50	. Control logic embodiment by	2280/1041	. . . Silver
2270/502	. . electrical means, e.g. relays or switches	2280/1042	. . . Gold
2270/504	. . electronic means, e.g. electronic tubes, transistors or IC's within an electronic circuit	2280/1043	. . . Platinum group, e.g. Pt, Ir
2270/506	. . hydraulic means, e.g. hydraulic valves within a hydraulic circuit	2280/1044	. . . Palladium
2270/508	. . mechanical means, e.g. levers, gears or cams	2280/1045	. . . Ruthenium
2270/60	. Control system actuates through	2280/1046	. . . Osmium
2270/602	. . electrical actuators	2280/1047	. . . Iridium
2270/604	. . hydraulic actuators	2280/1048	. . . Rhodium
2270/605	. . Pneumatic actuators	2280/105	. . Copper
2270/606	. . mechanical actuators (F05B 2270/602 takes precedence)	2280/106	. . Rare earth metals, e.g. Sc, Y
2270/70	. Type of control algorithm	2280/107	. . Alloys
2270/701	. . proportional	2280/1071	. . . Steel alloys
2270/702	. . differential	2280/1072	. . Copper alloys
2270/703	. . integral	2280/10721	. . . Bronze
2270/704	. . proportional-differential	2280/10722	. . . Phosphor-bronze alloy
2270/705	. . proportional-integral	2280/10723	. . . Nickel-Copper alloy, e.g. monel
2270/706	. . proportional-integral-differential	2280/1073	. . Aluminium alloy, e.g. AlCuMgPb
2270/707	. . fuzzy logic	2280/1074	. . Alloys not otherwise provided for
2270/708	. . with comparison tables	2280/10741	. . . Superalloys
2270/709	. . with neural networks	2280/10742	. . . Heat stable alloys
2270/80	. Devices generating input signals, e.g. transducers, sensors, cameras or strain gauges	2280/10743	. . . Ni - Si alloys
2270/802	. . Calibration thereof	2280/10744	. . . Metal-aluminide intermetallic compounds
2270/803	. . Sampling thereof	2280/20	. Inorganic materials, e.g. non-metallic materials
2270/804	. . Optical devices	2280/2001	. . Glass
2270/8041	. . . Cameras	2280/20011	. . . MIBA
2270/8042	. . . Lidar systems	2280/20012	. . . Quartz
2270/805	. . Radars	2280/2002	. . Phosphor
2270/806	. . Sonars	2280/2003	. . Silicon
2270/807	. . Accelerometers	2280/2004	. . Ceramics; Oxides
2270/808	. . Strain gauges; Load cells	2280/20041	. . . Aluminium oxides
2270/809	. . Encoders	2280/20042	. . . Zinc oxides
2270/81	. . Microphones	2280/20043	. . . Zirconium oxides
2270/821	. . Displacement measuring means, e.g. inductive	2280/2005	. . Non-oxide ceramics
2280/00	Materials; Properties thereof	2280/2006	. . Carbon, e.g. graphite
		2280/2007	. . Carbides
		2280/20071	. . . of silicon
		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; Rubber
2280/4004	. . Rubber
2280/4005	. . PTFE [PolyTetraFluorEthylene]
2280/4006	. . Polyamides, e.g. NYLON
2280/4007	. . Thermoplastics
2280/4008	. . Polyamides, e.g. Aurum
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