

# CPC COOPERATIVE PATENT CLASSIFICATION

## B PERFORMING OPERATIONS; TRANSPORTING (NOTES omitted)

### TRANSPORTING

#### B60 VEHICLES IN GENERAL (NOTE omitted)

**B60L PROPULSION OF ELECTRICALLY-PROPELLED VEHICLES** (arrangements or mounting of electrical propulsion units or of plural diverse prime-movers for mutual or common propulsion in vehicles [B60K 1/00](#), [B60K 6/20](#); arrangements or mounting of electrical gearing in vehicles [B60K 17/12](#), [B60K 17/14](#); preventing wheel slip by reducing power in rail vehicles [B61C 15/08](#); dynamo-electric machines [H02K](#); control or regulation of electric motors [H02P](#)); **SUPPLYING ELECTRIC POWER FOR AUXILIARY EQUIPMENT OF ELECTRICALLY-PROPELLED VEHICLES** (electric coupling devices combined with mechanical couplings of vehicles [B60D 1/64](#); electric heating for vehicles [B60H 1/00](#)); **ELECTRODYNAMIC BRAKE SYSTEMS FOR VEHICLES IN GENERAL** (control or regulation of electric motors [H02P](#)); **MAGNETIC SUSPENSION OR LEVITATION FOR VEHICLES; MONITORING OPERATING VARIABLES OF ELECTRICALLY-PROPELLED VEHICLES; ELECTRIC SAFETY DEVICES FOR ELECTRICALLY-PROPELLED VEHICLES**

#### NOTES

- {This subclass, subject to the above references, covers:
  - feeding of power to auxiliary circuits;
  - current collectors; arrangements thereof on rail or road vehicles or on vehicles in general;
  - electrodynamic brake systems;
  - electric propulsion of vehicles control and regulation therefor.}
- {In this subclass it is desirable to classify any "additional information" which is of interest for search.}

#### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

<b>1/00</b>	<b>Supplying electric power to auxiliary equipment of vehicles</b> ( <a href="#">circuit arrangements for charging batteries H02J 7/00</a> )	<b>3/00</b>	<b>Electric devices on electrically-propelled vehicles for safety purposes; Monitoring operating variables, e.g. speed, deceleration or energy consumption</b> ( <a href="#">methods or circuit arrangements for monitoring or controlling batteries or fuel cells B60L 58/00</a> )
1/003	. {to auxiliary motors, e.g. for pumps, compressors}		
1/006	. {to power outlets}		
1/02	. to electric heating circuits		
1/04	. . fed by the power supply line	3/0007	. {Measures or means for preventing or attenuating collisions}
1/06	. . . using only one supply	3/0015	. . {Prevention of collisions}
1/08	. . . . Methods and devices for control or regulation	3/0023	. {Detecting, eliminating, remedying or compensating for drive train abnormalities, e.g. failures within the drive train}
1/10	. . . with provision for using different supplies		
1/12	. . . . Methods and devices for control or regulation	3/003	. . {relating to inverters}
1/14	. to electric lighting circuits	3/0038	. . {relating to sensors}
1/16	. . fed by the power supply line	3/0046	. . {relating to electric energy storage systems, e.g. batteries or capacitors}
1/20	. {Energy regeneration from auxiliary equipment}	3/0053	. . {relating to fuel cells}
		3/0061	. . {relating to electrical machines}
		3/0069	. . {relating to the isolation, e.g. ground fault or leak current}
		3/0076	. . {relating to braking}

- 3/0084 . . {relating to control modules}
- 3/0092 . {with use of redundant elements for safety purposes}
- 3/02 . Dead-man's devices
- 3/04 . Cutting off the power supply under fault conditions (protective devices and circuit arrangements in general [H01H](#); [H02H](#))
- 3/06 . Limiting the traction current under mechanical overload conditions
- 3/08 . Means for preventing excessive speed of the vehicle
- 3/10 . Indicating wheel slip {; [Correction of wheel slip](#)}
- 3/102 . . {of individual wheels}
- 3/104 . . {by indirect measurement of vehicle speed}
- 3/106 . . {for maintaining or recovering the adhesion of the drive wheels}
- 3/108 . . . {whilst braking, i.e. ABS}
- 3/12 . Recording operating variables {; [Monitoring of operating variables](#)}
- 5/00 Current collectors for power supply lines of electrically-propelled vehicles (current collectors in general [H01R 41/00](#))**
- 5/005 . {without mechanical contact between the collector and the power supply line}
- 5/02 . with ice-removing device
- 5/04 . using rollers or sliding shoes in contact with trolley wire ([B60L 5/40](#) takes precedence)
- 5/045 . . {with trolley wire finders}
- 5/06 . . Structure of the rollers or their carrying means
- 5/08 . . Structure of the sliding shoes or their carrying means
- 5/085 . . . {with carbon contact members}
- 5/10 . . Devices preventing the collector from jumping off
- 5/12 . . Structural features of poles or their bases
- 5/14 . . . Devices for automatic lowering of a jumped-off collector
- 5/16 . . . Devices for lifting and resetting the collector ([B60L 5/34](#) takes precedence)
- 5/18 . using bow-type collectors in contact with trolley wire
- 5/19 . . using arrangements for effecting collector movement transverse to the direction of vehicle motion
- 5/20 . . Details of contact bow
- 5/205 . . . {with carbon contact members}
- 5/22 . . Supporting means for the contact bow
- 5/24 . . . Pantographs
- 5/26 . . . Half pantographs, e.g. using counter rocking beams
- 5/28 . . . Devices for lifting and resetting the collector
- 5/30 . . . . using springs
- 5/32 . . . . using fluid pressure
- 5/34 . with devices to enable one vehicle to pass another one using the same power supply line
- 5/36 . with means for collecting current simultaneously from more than one conductor, e.g. from more than one phase
- 5/38 . for collecting current from conductor rails ([B60L 5/40](#) takes precedence)
- 5/39 . . from third rail
- 5/40 . for collecting current from lines in slotted conduits
- 5/42 . for collecting current from individual contact pieces connected to the power supply line
- 7/00 Electrodynamic brake systems for vehicles in general**
- 7/003 . {Dynamic electric braking by short circuiting the motor}
- 7/006 . {Dynamic electric braking by reversing current, i.e. plugging}
- 7/02 . Dynamic electric resistor braking ([B60L 7/22](#) takes precedence)
- 7/04 . . for vehicles propelled by DC motors
- 7/06 . . for vehicles propelled by AC motors
- 7/08 . . Controlling the braking effect ([B60L 7/04](#), [B60L 7/06](#) take precedence)
- 7/10 . Dynamic electric regenerative braking ([B60L 7/22](#) takes precedence)
- 7/12 . . for vehicles propelled by DC motors
- 7/14 . . for vehicles propelled by AC motors
- 7/16 . . for vehicles comprising converters between the power source and the motor
- 7/18 . . Controlling the braking effect ([B60L 7/12](#), [B60L 7/14](#), [B60L 7/16](#) take precedence)
- 7/20 . Braking by supplying regenerated power to the prime mover of vehicles comprising engine-driven generators
- 7/22 . Dynamic electric resistor braking, combined with dynamic electric regenerative braking
- 7/24 . with additional mechanical or electromagnetic braking
- 7/26 . . Controlling the braking effect
- 7/28 . Eddy-current braking
- 8/00 Electric propulsion with power supply from forces of nature, e.g. sun or wind**
- 8/003 . {Converting light into electric energy, e.g. by using photo-voltaic systems}
- 8/006 . {Converting flow of air into electric energy, e.g. by using wind turbines}
- 9/00 Electric propulsion with power supply external to the vehicle (electric propulsion for monorail vehicles, suspension vehicles or rack railways [B60L 13/00](#); in combination with batteries or fuel cells within the vehicle [B60L 50/53](#))**
- 9/005 . {Interference suppression}
- 9/02 . using DC motors
- 9/04 . . fed from DC supply lines
- 9/06 . . . with conversion by metadyne
- 9/08 . . fed from AC supply lines
- 9/10 . . . with rotary converters
- 9/12 . . . with static converters
- 9/14 . . fed from different kinds of power-supply lines
- 9/16 . using AC induction motors
- 9/18 . . fed from DC supply lines
- 9/20 . . . single-phase motors
- 9/22 . . . polyphase motors
- 9/24 . . fed from AC supply lines
- 9/26 . . . single-phase motors
- 9/28 . . . polyphase motors
- 9/30 . . fed from different kinds of power-supply lines
- 9/32 . using AC brush displacement motors

<b>13/00</b>	<b>Electric propulsion for monorail vehicles, suspension vehicles or rack railways; Magnetic suspension or levitation for vehicles</b> ( <a href="#">{tracks for Maglev-type trains E01B 25/30;}</a> <a href="#">electromagnets per se H01F 7/06; linear motors per se H02K 41/00</a> )	15/24	<ul style="list-style-type: none"> <li>with main controller driven by a servomotor (<a href="#">B60L 15/28 takes precedence</a>)</li> </ul>
13/003	<ul style="list-style-type: none"> <li><a href="#">{Crossings; Points}</a></li> </ul>	15/26	<ul style="list-style-type: none"> <li>with main controller driven through a ratchet mechanism (<a href="#">B60L 15/28 takes precedence</a>)</li> </ul>
13/006	<ul style="list-style-type: none"> <li><a href="#">{Electric propulsion adapted for monorail vehicles, suspension vehicles or rack railways (B60L 13/03 takes precedence)}</a></li> </ul>	15/28	<ul style="list-style-type: none"> <li>without contact making and breaking, e.g. using a transductor</li> </ul>
13/03	<ul style="list-style-type: none"> <li>Electric propulsion by linear motors</li> </ul>	15/30	<ul style="list-style-type: none"> <li>with means to change over to human control</li> </ul>
13/035	<ul style="list-style-type: none"> <li><a href="#">{Suspension of the vehicle-borne motorparts}</a></li> </ul>	15/32	Control or regulation of multiple-unit electrically-propelled vehicles
13/04	<ul style="list-style-type: none"> <li>Magnetic suspension or levitation for vehicles</li> </ul>	15/34	<ul style="list-style-type: none"> <li>with human control of a setting device</li> </ul>
13/06	<ul style="list-style-type: none"> <li>Means to sense or control vehicle position or attitude with respect to railway</li> </ul>	15/36	<ul style="list-style-type: none"> <li>with automatic control superimposed, e.g. to prevent excessive motor current</li> </ul>
13/08	<ul style="list-style-type: none"> <li>for the lateral position</li> </ul>	15/38	<ul style="list-style-type: none"> <li>with automatic control</li> </ul>
13/10	<ul style="list-style-type: none"> <li>Combination of electric propulsion and magnetic suspension or levitation</li> </ul>	15/40	Adaptation of control equipment on vehicle for remote actuation from a stationary place ( <a href="#">devices along the route for controlling devices on rail vehicles B61L 3/00; central rail-traffic control systems B61L 27/00</a> )
<b>15/00</b>	<b>Methods, circuits, or devices for controlling the traction-motor speed of electrically-propelled vehicles</b>	15/42	Adaptation of control equipment on vehicle for actuation from alternative parts of the vehicle or from alternative vehicles of the same vehicle train ( <a href="#">B60L 15/32 takes precedence</a> )
15/002	<ul style="list-style-type: none"> <li><a href="#">{for control of propulsion for monorail vehicles, suspension vehicles or rack railways; for control of magnetic suspension or levitation for vehicles for propulsion purposes}</a></li> </ul>	<b>50/00</b>	<b>Electric propulsion with power supplied within the vehicle</b> ( <a href="#">with power supply from force of nature, e.g. sun or wind, B60L 8/00; for monorail vehicles, suspension vehicles or rack railways B60L 13/00</a> )
15/005	<ul style="list-style-type: none"> <li><a href="#">{for control of propulsion for vehicles propelled by linear motors}</a></li> </ul>	50/10	<ul style="list-style-type: none"> <li>using propulsion power supplied by engine-driven generators, e.g. generators driven by combustion engines</li> </ul>
15/007	<ul style="list-style-type: none"> <li><a href="#">{Physical arrangements or structures of drive train converters specially adapted for the propulsion motors of electric vehicles}</a></li> </ul>	50/11	<ul style="list-style-type: none"> <li>using DC generators and DC motors</li> </ul>
15/02	<ul style="list-style-type: none"> <li>characterised by the form of the current used in the control circuit</li> </ul>	50/12	<ul style="list-style-type: none"> <li>using AC generators and DC motors</li> </ul>
15/025	<ul style="list-style-type: none"> <li><a href="#">{using field orientation; Vector control; Direct Torque Control [DTC]}</a></li> </ul>	50/13	<ul style="list-style-type: none"> <li>using AC generators and AC motors</li> </ul>
15/04	<ul style="list-style-type: none"> <li>using DC</li> </ul>	50/14	<ul style="list-style-type: none"> <li>using DC generators and AC motors</li> </ul>
15/06	<ul style="list-style-type: none"> <li>using substantially sinusoidal AC</li> </ul>	50/15	<ul style="list-style-type: none"> <li>with additional electric power supply (<a href="#">with capacitors charged by engine-driven generators B60L 50/40; with batteries charged by engine-driven generators B60L 50/61</a>)</li> </ul>
15/08	<ul style="list-style-type: none"> <li>using pulses</li> </ul>	50/16	<ul style="list-style-type: none"> <li>with provision for separate direct mechanical propulsion</li> </ul>
15/10	<ul style="list-style-type: none"> <li>for automatic control superimposed on human control to limit the acceleration of the vehicle, e.g. to prevent excessive motor current (<a href="#">electric devices for safety purposes B60L 3/00</a>)</li> </ul>	50/20	<ul style="list-style-type: none"> <li>using propulsion power generated by humans or animals</li> </ul>
15/12	<ul style="list-style-type: none"> <li>with circuits controlled by relays or contactors</li> </ul>	50/30	<ul style="list-style-type: none"> <li>using propulsion power stored mechanically, e.g. in fly-wheels</li> </ul>
15/14	<ul style="list-style-type: none"> <li>with main controller driven by a servomotor (<a href="#">B60L 15/18 takes precedence</a>)</li> </ul>	50/40	<ul style="list-style-type: none"> <li>using propulsion power supplied by capacitors</li> </ul>
15/16	<ul style="list-style-type: none"> <li>with main controller driven through a ratchet mechanism (<a href="#">B60L 15/18 takes precedence</a>)</li> </ul>	50/50	<ul style="list-style-type: none"> <li>using propulsion power supplied by batteries or fuel cells</li> </ul>
15/18	<ul style="list-style-type: none"> <li>without contact making and breaking, e.g. using a transductor</li> </ul>	50/51	<ul style="list-style-type: none"> <li>characterised by AC-motors</li> </ul>
15/20	<ul style="list-style-type: none"> <li>for control of the vehicle or its driving motor to achieve a desired performance, e.g. speed, torque, programmed variation of speed</li> </ul>	50/52	<ul style="list-style-type: none"> <li>characterised by DC-motors</li> </ul>
15/2009	<ul style="list-style-type: none"> <li><a href="#">{for braking}</a></li> </ul>	50/53	<ul style="list-style-type: none"> <li>in combination with an external power supply, e.g. from overhead contact lines</li> </ul>
15/2018	<ul style="list-style-type: none"> <li><a href="#">{for braking on a slope}</a></li> </ul>	50/60	<ul style="list-style-type: none"> <li>using power supplied by batteries (<a href="#">in combination with fuel cells B60L 50/75</a>)</li> </ul>
15/2027	<ul style="list-style-type: none"> <li><a href="#">{whilst maintaining constant speed}</a></li> </ul>	50/61	<ul style="list-style-type: none"> <li>by batteries charged by engine-driven generators, e.g. series hybrid electric vehicles</li> </ul>
15/2036	<ul style="list-style-type: none"> <li><a href="#">{Electric differentials, e.g. for supporting steering vehicles}</a></li> </ul>	50/62	<ul style="list-style-type: none"> <li>charged by low-power generators primarily intended to support the batteries, e.g. range extenders</li> </ul>
15/2045	<ul style="list-style-type: none"> <li><a href="#">{for optimising the use of energy}</a></li> </ul>	50/64	<ul style="list-style-type: none"> <li>Constructional details of batteries specially adapted for electric vehicles</li> </ul>
15/2054	<ul style="list-style-type: none"> <li><a href="#">{by controlling transmissions or clutches}</a></li> </ul>		
15/2063	<ul style="list-style-type: none"> <li><a href="#">{for creeping}</a></li> </ul>		
15/2072	<ul style="list-style-type: none"> <li><a href="#">{for drive off}</a></li> </ul>		
15/2081	<ul style="list-style-type: none"> <li><a href="#">{for drive off on a slope}</a></li> </ul>		
15/209	<ul style="list-style-type: none"> <li><a href="#">{for overtaking}</a></li> </ul>		
15/22	<ul style="list-style-type: none"> <li>with sequential operation of interdependent switches, e.g. relays, contactors or program drum</li> </ul>		

**NOTE**

This group covers adaptation of battery structures of electric vehicles, e.g. integration into control or safety systems,

## B60L

B60L 50/64  
(continued)

	crash-resistant casings or vibration-damping means.	53/37	. . . using optical position determination, e.g. using cameras
50/66	. . . {Arrangements of batteries}	53/38	. . . specially adapted for charging by inductive energy transfer
50/70	. . using power supplied by fuel cells (in combination with batteries B60L 50/75)	53/39	. . . . with position-responsive activation of primary coils
50/71	. . . Arrangement of fuel cells within vehicles specially adapted for electric vehicles	53/50	. Charging stations characterised by energy-storage or power-generation means
50/72	. . . Constructional details of fuel cells specially adapted for electric vehicles	53/51	. . Photovoltaic means
	<b>NOTE</b>	53/52	. . Wind-driven generators
	This group covers adaptation of fuel cell structures of electric vehicles, e.g. integration into control or safety systems, crash-resistant casings or vibration-damping means.	53/53	. . Batteries
		53/54	. . Fuel cells
		53/55	. . Capacitors
		53/56	. . Mechanical storage means, e.g. fly wheels
		53/57	. . Charging stations without connection to power networks
50/75	. . using propulsion power supplied by both fuel cells and batteries	53/60	. Monitoring or controlling charging stations
50/90	. using propulsion power supplied by specific means not covered by groups B60L 50/10 - B60L 50/50, e.g. by direct conversion of thermal nuclear energy into electricity	53/62	. . in response to charging parameters, e.g. current, voltage or electrical charge
		53/63	. . in response to network capacity
		53/64	. . Optimising energy costs, e.g. responding to electricity rates
<b>53/00</b>	<b>Methods of charging batteries, specially adapted for electric vehicles; Charging stations or on-board charging equipment therefor; Exchange of energy storage elements in electric vehicles</b>	53/65	. . involving identification of vehicles or their battery types
53/10	. characterised by the energy transfer between the charging station and the vehicle	53/66	. . Data transfer between charging stations and vehicles
53/11	. . {DC charging controlled by the charging station, e.g. mode 4}	53/665	. . . {Methods related to measuring, billing or payment}
53/12	. . Inductive energy transfer	53/67	. . Controlling two or more charging stations
53/122	. . . Circuits or methods for driving the primary coil, e.g. supplying electric power to the coil	53/68	. . Off-site monitoring or control, e.g. remote control
53/124	. . . Detection or removal of foreign bodies	53/80	. Exchanging energy storage elements, e.g. removable batteries
53/126	. . . Methods for pairing a vehicle and a charging station, e.g. establishing a one-to-one relation between a wireless power transmitter and a wireless power receiver	<b>55/00</b>	<b>Arrangements for supplying energy stored within a vehicle to a power network, i.e. vehicle-to-grid [V2G] arrangements</b>
53/14	. . Conductive energy transfer	<b>58/00</b>	<b>Methods or circuit arrangements for monitoring or controlling batteries or fuel cells, specially adapted for electric vehicles</b>
53/16	. . . Connectors, e.g. plugs or sockets, specially adapted for charging electric vehicles		<b>NOTE</b>
53/18	. . . Cables specially adapted for charging electric vehicles		This group covers the monitoring of the operating state of batteries or fuel cells in combination with controlling the propulsion in response to the detected variables of the state.
53/20	. characterised by converters located in the vehicle		
53/22	. . Constructional details or arrangements of charging converters specially adapted for charging electric vehicles	58/10	. for monitoring or controlling batteries
53/24	. . Using the vehicle's propulsion converter for charging	58/12	. . responding to state of charge [SoC]
53/30	. Constructional details of charging stations	58/13	. . . Maintaining the SoC within a determined range
53/302	. . Cooling of charging equipment	58/14	. . . Preventing excessive discharging
53/305	. . {Communication interfaces}	58/15	. . . Preventing overcharging
53/31	. . Charging columns specially adapted for electric vehicles	58/16	. . responding to battery ageing, e.g. to the number of charging cycles or the state of health [SoH]
53/32	. . {by charging in short intervals along the itinerary, e.g. during short stops}	58/18	. . of two or more battery modules
53/34	. . Plug-like or socket-like devices specially adapted for contactless inductive charging of electric vehicles (positioning means for charging devices using inductive energy transfer B60L 53/38)	58/19	. . . Switching between serial connection and parallel connection of battery modules
53/35	. . Means for automatic or assisted adjustment of the relative position of charging devices and vehicles	58/20	. . . having different nominal voltages
53/36	. . . by positioning the vehicle	58/21	. . . having the same nominal voltage
		58/22	. . . Balancing the charge of battery modules
		58/24	. . for controlling the temperature of batteries
		58/25	. . . by controlling the electric load
		58/26	. . . by cooling
		58/27	. . . by heating
		58/30	. for monitoring or controlling fuel cells

58/31	. . for starting of fuel cells	2240/00	<b>Control parameters of input or output; Target parameters</b>
58/32	. . for controlling the temperature of fuel cells, e.g. by controlling the electric load	2240/10	. Vehicle control parameters
58/33	. . . by cooling	2240/12	. . Speed
58/34	. . . by heating	2240/14	. . Acceleration
58/40	. for controlling a combination of batteries and fuel cells	2240/16	. . . longitudinal
		2240/18	. . . lateral
		2240/20	. . . angular
		2240/22	. . Yaw angle
		2240/24	. . Steering angle
		2240/26	. . Vehicle weight
		2240/28	. . Door position
		2240/30	. . Parking brake position
		2240/32	. . Driving direction
		2240/34	. . Cabin temperature
		2240/36	. . Temperature of vehicle components or parts
		2240/40	. Drive Train control parameters
		2240/42	. . related to electric machines
		2240/421	. . . Speed
		2240/423	. . . Torque
		2240/425	. . . Temperature
		2240/427	. . . Voltage
		2240/429	. . . Current
		2240/44	. . related to combustion engines
		2240/441	. . . Speed
		2240/443	. . . Torque
		2240/445	. . . Temperature
		2240/46	. . related to wheels
		2240/461	. . . Speed
		2240/463	. . . Torque
		2240/465	. . . Slip
		2240/48	. . related to transmissions
		2240/485	. . . Temperature
		2240/486	. . . Operating parameters
		2240/50	. . related to clutches
		2240/507	. . . Operating parameters
		2240/52	. . related to converters
		2240/525	. . . Temperature of converter or components thereof
		2240/526	. . . Operating parameters
		2240/527	. . . Voltage
		2240/529	. . . Current
		2240/54	. . related to batteries
		2240/545	. . . Temperature
		2240/547	. . . Voltage
		2240/549	. . . Current
		2240/60	. Navigation input
		2240/62	. . Vehicle position
		2240/622	. . . by satellite navigation
		2240/625	. . . by GSM
		2240/627	. . . by WLAN
		2240/64	. . Road conditions
		2240/642	. . . Slope of road
		2240/645	. . . Type of road
		2240/647	. . . Surface situation of road, e.g. type of paving
		2240/66	. . Ambient conditions
		2240/662	. . . Temperature
		2240/665	. . . Light intensity
		2240/667	. . . Precipitation
		2240/68	. . Traffic data
<b>2200/00</b>	<b>Type of vehicles</b>		
2200/10	. Air crafts		
2200/12	. Bikes		
2200/14	. Vehicles with one wheel only		
2200/16	. Single-axle vehicles		
2200/18	. Buses		
2200/20	. Vehicles specially adapted for children, e.g. toy vehicles		
2200/22	. Microcars, e.g. golf cars		
2200/24	. Personal mobility vehicles		
2200/26	. Rail vehicles		
2200/28	. Trailers		
2200/30	. Trolleys		
2200/32	. Waterborne vessels		
2200/34	. Wheel chairs		
2200/36	. Vehicles designed to transport cargo, e.g. trucks		
2200/40	. Working vehicles		
2200/42	. . Fork lift trucks		
2200/44	. . Industrial trucks or floor conveyors		
2200/46	. Vehicles with auxiliary ad-on propulsions, e.g. add-on electric motor kits for bicycles		
<b>2210/00</b>	<b>Converter types</b>		
2210/10	. DC to DC converters		
2210/12	. . Buck converters		
2210/14	. . Boost converters		
2210/20	. AC to AC converters		
2210/22	. . without intermediate conversion to DC		
2210/30	. AC to DC converters		
2210/40	. DC to AC converters		
2210/42	. . Voltage source inverters		
2210/44	. . Current source inverters		
2210/46	. . with more than three phases		
<b>2220/00</b>	<b>Electrical machine types; Structures or applications thereof</b>		
2220/10	. Electrical machine types		
2220/12	. . Induction machines		
2220/14	. . Synchronous machines		
2220/16	. . DC brushless machines		
2220/18	. . Reluctance machines		
2220/20	. . DC electrical machines		
2220/30	. . Universal machines		
2220/40	. Electrical machine applications		
2220/42	. . with use of more than one motor		
2220/44	. . Wheel Hub motors, i.e. integrated in the wheel hub		
2220/46	. . Wheel motors, i.e. motor connected to only one wheel		
2220/50	. Structural details of electrical machines		
2220/52	. . Clutch motors		
2220/54	. . Windings for different functions		
2220/56	. . with switched windings		
2220/58	. . with more than three phases		

- 2240/70 . Interactions with external data bases, e.g. traffic centres
- 2240/72 . . Charging station selection relying on external data
- 2240/80 . Time limits

#### **2250/00 Driver interactions**

- 2250/10 . by alarm
- 2250/12 . by confirmation, e.g. of the input
- 2250/14 . by input of vehicle departure time
- 2250/16 . by display
- 2250/18 . by enquiring driving style
- 2250/20 . by driver identification
- 2250/22 . by presence detection
- 2250/24 . by lever actuation
- 2250/26 . by pedal actuation
- 2250/28 . . Accelerator pedal thresholds
- 2250/30 . by voice

#### **2260/00 Operating Modes**

- 2260/10 . Temporary overload
- 2260/12 . . of combustion engines
- 2260/14 . . of transmissions
- 2260/16 . . of electrical drive trains
- 2260/162 . . . of electrical cells or capacitors
- 2260/165 . . . of converters
- 2260/167 . . . of motors or generators
- 2260/20 . Drive modes; Transition between modes
- 2260/22 . . Standstill, e.g. zero speed
- 2260/24 . . Coasting mode
- 2260/26 . . Transition between different drive modes
- 2260/28 . . Four wheel or all wheel drive
- 2260/30 . . Engine braking emulation
- 2260/32 . . Auto pilot mode
- 2260/34 . . Stabilising upright position of vehicles, e.g. of single axle vehicles
- 2260/40 . Control modes
- 2260/42 . . by adaptive correction
- 2260/44 . . by parameter estimation
- 2260/46 . . by self learning
- 2260/48 . . by fuzzy logic
- 2260/50 . . by future state prediction
- 2260/52 . . . drive range estimation, e.g. of estimation of available travel distance
- 2260/54 . . . Energy consumption estimation
- 2260/56 . . . Temperature prediction, e.g. for pre-cooling
- 2260/58 . . . Departure time prediction

#### **2270/00 Problem solutions or means not otherwise provided for**

- 2270/10 . Emission reduction
- 2270/12 . . of exhaust
- 2270/14 . . of noise
- 2270/142 . . . acoustic
- 2270/145 . . . Structure borne vibrations
- 2270/147 . . . electro magnetic [EMI]
- 2270/20 . Inrush current reduction, i.e. avoiding high currents when connecting the battery
- 2270/30 . Preventing theft during charging
- 2270/32 . . of electricity
- 2270/34 . . of parts
- 2270/36 . . of vehicles
- 2270/38 . . of data

- 2270/40 . related to technical updates when adding new parts or software
- 2270/42 . Means to improve acoustic vehicle detection by humans
- 2270/44 . Heat storages, e.g. for cabin heating
- 2270/46 . Heat pumps, e.g. for cabin heating