

# 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

1. 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
2. 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	3/003	• . {relating to inverters}
1/12	• . . . Methods and devices for control or regulation	3/0038	• . {relating to sensors}
1/14	• to electric lighting circuits	3/0046	• . {relating to electric energy storage systems, e.g. batteries or capacitors}
1/16	• . fed by the power supply line	3/0053	• . {relating to fuel cells}
1/20	• {Energy regeneration from auxiliary equipment}	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, programme 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.

### **WARNING**

Group [B60L 50/64](#) is incomplete pending reclassification of documents from group [H01M 50/20](#).

Groups [H01M 50/20](#) and [B60L 50/64](#) should be considered in order to perform a complete search.

- 50/66 . . . {Arrangements of batteries}
- 50/70 . . using power supplied by fuel cells (in combination with batteries [B60L 50/75](#))
- 50/71 . . . Arrangement of fuel cells within vehicles specially adapted for electric vehicles
- 50/72 . . . Constructional details of fuel cells specially adapted for electric vehicles
- NOTE**  
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.
- 50/75 . . using propulsion power supplied by both fuel cells and batteries
- 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
- 53/00 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**
- 53/10 . characterised by the energy transfer between the charging station and the vehicle
- 53/11 . . {DC charging controlled by the charging station, e.g. mode 4}
- 53/12 . . Inductive energy transfer
- 53/122 . . . Circuits or methods for driving the primary coil, e.g. supplying electric power to the coil
- 53/124 . . . Detection or removal of foreign bodies
- 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
- 53/14 . . Conductive energy transfer
- 53/16 . . . Connectors, e.g. plugs or sockets, specially adapted for charging electric vehicles
- 53/18 . . . Cables specially adapted for charging electric vehicles
- 53/20 . characterised by converters located in the vehicle
- 53/22 . . Constructional details or arrangements of charging converters specially adapted for charging electric vehicles
- 53/24 . . Using the vehicle's propulsion converter for charging
- 53/30 . Constructional details of charging stations
- 53/302 . . Cooling of charging equipment
- 53/305 . . {Communication interfaces}
- 53/31 . . Charging columns specially adapted for electric vehicles

- 53/32 . . {by charging in short intervals along the itinerary, e.g. during short stops}
- 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](#))
- 53/35 . . Means for automatic or assisted adjustment of the relative position of charging devices and vehicles
- 53/36 . . . by positioning the vehicle
- 53/37 . . . using optical position determination, e.g. using cameras
- 53/38 . . . specially adapted for charging by inductive energy transfer
- 53/39 . . . . with position-responsive activation of primary coils
- 53/50 . Charging stations characterised by energy-storage or power-generation means
- 53/51 . . Photovoltaic means
- 53/52 . . Wind-driven generators
- 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
- 53/60 . Monitoring or controlling charging stations
- 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
- 53/65 . . involving identification of vehicles or their battery types
- 53/66 . . Data transfer between charging stations and vehicles
- 53/665 . . . {Methods related to measuring, billing or payment}
- 53/67 . . Controlling two or more charging stations
- 53/68 . . Off-site monitoring or control, e.g. remote control
- 53/80 . Exchanging energy storage elements, e.g. removable batteries
- 55/00 Arrangements for supplying energy stored within a vehicle to a power network, i.e. vehicle-to-grid [V2G] arrangements**
- 58/00 Methods or circuit arrangements for monitoring or controlling batteries or fuel cells, specially adapted for electric vehicles**
- NOTE**  
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.
- 58/10 . for monitoring or controlling batteries
- 58/12 . . responding to state of charge [SoC]
- 58/13 . . . Maintaining the SoC within a determined range
- 58/14 . . . Preventing excessive discharging
- 58/15 . . . Preventing overcharging
- 58/16 . . responding to battery ageing, e.g. to the number of charging cycles or the state of health [SoH]
- 58/18 . . of two or more battery modules

58/19	. . . Switching between serial connection and parallel connection of battery modules	2220/44	. . Wheel Hub motors, i.e. integrated in the wheel hub
58/20	. . . having different nominal voltages	2220/46	. . Wheel motors, i.e. motor connected to only one wheel
58/21	. . . having the same nominal voltage	2220/50	. Structural details of electrical machines
58/22	. . . Balancing the charge of battery modules	2220/52	. . Clutch motors
58/24	. . for controlling the temperature of batteries	2220/54	. . Windings for different functions
58/25	. . . by controlling the electric load	2220/56	. . with switched windings
58/26	. . . by cooling	2220/58	. . with more than three phases
58/27	. . . by heating		
58/30	. for monitoring or controlling fuel cells	<b>2240/00</b>	<b>Control parameters of input or output; Target parameters</b>
58/31	. . for starting of fuel cells	2240/10	. Vehicle control parameters
58/32	. . for controlling the temperature of fuel cells, e.g. by controlling the electric load	2240/12	. . Speed
58/33	. . . by cooling	2240/14	. . Acceleration
58/34	. . . by heating	2240/16	. . . longitudinal
58/40	. for controlling a combination of batteries and fuel cells	2240/18	. . . lateral
		2240/20	. . . angular
<b>2200/00</b>	<b>Type of vehicles</b>	2240/22	. . Yaw angle
2200/10	. Air crafts	2240/24	. . Steering angle
2200/12	. Bikes	2240/26	. . Vehicle weight
2200/14	. Vehicles with one wheel only	2240/28	. . Door position
2200/16	. Single-axle vehicles	2240/30	. . Parking brake position
2200/18	. Buses	2240/32	. . Driving direction
2200/20	. Vehicles specially adapted for children, e.g. toy vehicles	2240/34	. . Cabin temperature
2200/22	. Microcars, e.g. golf cars	2240/36	. . Temperature of vehicle components or parts
2200/24	. Personal mobility vehicles	2240/40	. Drive Train control parameters
2200/26	. Rail vehicles	2240/42	. . related to electric machines
2200/28	. Trailers	2240/421	. . . Speed
2200/30	. Trolleys	2240/423	. . . Torque
2200/32	. Waterborne vessels	2240/425	. . . Temperature
2200/34	. Wheel chairs	2240/427	. . . Voltage
2200/36	. Vehicles designed to transport cargo, e.g. trucks	2240/429	. . . Current
2200/40	. Working vehicles	2240/44	. . related to combustion engines
2200/42	. . Fork lift trucks	2240/441	. . . Speed
2200/44	. . Industrial trucks or floor conveyors	2240/443	. . . Torque
2200/46	. Vehicles with auxiliary ad-on propulsions, e.g. add-on electric motor kits for bicycles	2240/445	. . . Temperature
		2240/46	. . related to wheels
<b>2210/00</b>	<b>Converter types</b>	2240/461	. . . Speed
2210/10	. DC to DC converters	2240/463	. . . Torque
2210/12	. . Buck converters	2240/465	. . . Slip
2210/14	. . Boost converters	2240/48	. . related to transmissions
2210/20	. AC to AC converters	2240/485	. . . Temperature
2210/22	. . without intermediate conversion to DC	2240/486	. . . Operating parameters
2210/30	. AC to DC converters	2240/50	. . related to clutches
2210/40	. DC to AC converters	2240/507	. . . Operating parameters
2210/42	. . Voltage source inverters	2240/52	. . related to converters
2210/44	. . Current source inverters	2240/525	. . . Temperature of converter or components thereof
2210/46	. . with more than three phases	2240/526	. . . Operating parameters
<b>2220/00</b>	<b>Electrical machine types; Structures or applications thereof</b>	2240/527	. . . Voltage
2220/10	. Electrical machine types	2240/529	. . . Current
2220/12	. . Induction machines	2240/54	. . related to batteries
2220/14	. . Synchronous machines	2240/545	. . . Temperature
2220/16	. . DC brushless machines	2240/547	. . . Voltage
2220/18	. . Reluctance machines	2240/549	. . . Current
2220/20	. . DC electrical machines	2240/60	. Navigation input
2220/30	. . Universal machines	2240/62	. . Vehicle position
2220/40	. Electrical machine applications	2240/622	. . . by satellite navigation
2220/42	. . with use of more than one motor	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
- 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