

CPC COOPERATIVE PATENT CLASSIFICATION

B60L ELECTRIC EQUIPMENT OR PROPULSION OF ELECTRICALLY-PROPELLED VEHICLES; MAGNETIC SUSPENSION OR LEVITATION FOR VEHICLES; ELECTRODYNAMIC BRAKE SYSTEMS FOR VEHICLES, IN GENERAL (electric coupling devices combined with mechanical couplings of vehicles [B60D 1/62](#); electric heating for vehicles [B60H](#); transmitting drive from electric motors to ultimate propulsive elements in vehicles [B60K](#); disposition of electric propulsion equipment, other than current collectors, in vehicles [B60K](#); auxiliary generator drives on vehicles [B60K](#); lighting for vehicles [B60Q](#); vehicle brake control systems in general [B60T](#); preventing wheel slip by reducing power in rail vehicles [B61C](#); railway track circuits in general [B61L](#); lighting in general [F21](#); [H05B](#); switches in general [H01H](#); coupling devices for electric connections in general [H01R](#); dynamo-electric machines [H02K](#); electric converters [H02M](#); starting, controlling, braking of electric machines or converters in general [H02P](#); electric heating in general [H05B](#))

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.

1/00	Supplying electric power to auxiliary equipment of vehicles (circuit arrangements for charging batteries H02J 7/00)	3/0084	. . {relating to control modules}
1/003	. {to auxiliary motors, e.g. for pumps, compressors}	3/0092	. {with use of redundant elements for safety purposes}
1/006	. {to power outlets}	3/02	. Dead-man's devices
1/02	. to electric heating circuits	3/04	. Cutting off the power supply under fault conditions (protective devices and circuit arrangements in general H01H ; H02H)
1/04	. . fed by the power supply line	3/06	. Limiting the traction current under mechanical overload conditions
1/06	. . . using only one supply	3/08	. Means for preventing excessive speed of the vehicle
1/08 Methods and devices for control or regulation	3/10	. Indicating wheel slip; {Correction of wheel slip}
1/10	. . . with provision for using different supplies	3/102	. . {of individual wheels}
1/12 Methods and devices for control or regulation	3/104	. . {by indirect measurement of vehicle speed}
1/14	. to electric lighting circuits	3/106	. . {for maintaining or recovering the adhesion of the drive wheels}
1/16	. . fed by the power supply line	3/108	. . . {whilst braking, i.e. ABS}
1/20	. {Energy regeneration from auxiliary equipment}	3/12	. Recording operating variables; {Monitoring of operating variables}
3/00	Electric devices on electrically-propelled vehicles for safety purposes; Monitoring operating variables, e.g. speed, deceleration, power consumption (measuring in general G01)	5/00	Current collectors for power supply lines of electrically-propelled vehicles (current collectors in general H01R 41/00)
3/0007	. {Measures or means for preventing or attenuating collisions}	5/005	. {without mechanical contact between the collector and the power supply line}
3/0015	. . {Prevention of collisions}	5/02	. with ice-removing device
3/0023	. {Detecting, eliminating, remedying or compensating for drive train abnormalities, e.g. failures within the drive train}	5/04	. using rollers or sliding shoes in contact with trolley wire (B60L 5/40 takes precedence)
3/003	. . {relating to inverters}	5/045	. . {with trolley wire finders}
3/0038	. . {relating to sensors}	5/06	. . Structure of the rollers or their carrying means
3/0046	. . {relating to electric energy storage systems, e.g. batteries or capacitors}	5/08	. . Structure of the sliding shoes or their carrying means
3/0053	. . {relating to fuel cells}	5/085	. . . {with carbon contact members}
3/0061	. . {relating to electrical machines}	5/10	. . Devices preventing the collector from jumping off
3/0069	. . {relating to the isolation, e.g. ground fault or leak current}	5/12	. . Structural features of poles or their bases
3/0076	. . {relating to braking}		

- 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 force of nature, e.g. sun, 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 vehicle** ([B60L 8/00](#), [B60L 13/00](#) take precedence)
- 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
- 11/00 Electric propulsion with power supplied within the vehicle** ([B60L 8/00](#), [B60L 13/00](#) take precedence; arrangements or mounting of plural diverse prime-movers for mutual or common propulsion [B60K 6/20](#); control systems specially adapted for hybrid vehicles [B60W 20/00](#))
- 11/002 . {using electric power supply other than engine driven generators, electrical or fuel-cells}
- 11/005 . . {using capacitors}
- 11/007 . . {using auxiliary power supplied by humans}
- 11/02 . using engine-driven generators
- 11/04 . . using dc generators and motors
- 11/06 . . using ac generators and dc motors
- 11/08 . . using ac generators and motors
- 11/10 . . using dc generators and ac motors
- 11/12 . . with additional electric power supply, e.g. accumulator
- 11/123 . . . {using range extenders, e.g. series hybrid vehicles}
- 11/126 {the range extender having low power output with respect to maximum power output of the vehicle}
- 11/14 . . with provision for direct mechanical propulsion
- 11/16 . using power stored mechanically, e.g. in fly-wheel
- 11/18 . using power supply from primary cells, secondary cells, or fuel cells
- 11/1801 . . {combined with an external power supply}
- 11/1803 . . {for vehicles propelled by ac-motors}
- 11/1805 . . {for vehicles propelled by dc-motors}
- 11/1807 . . {for vehicles propelled by position controlled motors}
- 11/1809 . . {Charging electric vehicles}
- 11/1811 . . . {using converters}
- 11/1812 {Physical arrangements or structures of charging converters specially adapted for charging electric vehicles}
- 11/1814 {the vehicle's propulsion converter is used for charging}
- 11/1816 . . . {by conductive energy transfer, e.g. connectors}

- 11/1818 {Adaptations of plugs or sockets for charging electric vehicles}
- 11/182 . . . {by inductive energy transfer}
- 11/1822 . . . {by exchange of energy storage elements, e.g. removable batteries}
- 11/1824 . . . {Details of charging stations, e.g. vehicle recognition or billing ([B60L 11/1811](#), [B60L 11/182](#), [B60L 11/1822](#) take precedence)}
- 11/1825 {Charging columns for electric vehicles}
- 11/1827 {Automatic adjustment of relative position between charging device and vehicle}
- 11/1829 {for inductive energy transfer}
- 11/1831 {with position related activation of primary coils}
- 11/1833 {the vehicle being positioned}
- 11/1835 {with optical position determination, e.g. by a camera}
- 11/1837 {by charging in short intervals along the itinerary, e.g. during short stops}
- 11/1838 {Methods for the transfer of electrical energy or data between charging station and vehicle}
- 11/184 {Optimising energy costs, e.g. by charging depending on electricity rates}
- 11/1842 {Energy stored in the vehicle is provided to the network, i.e. vehicle to grid (V2G) arrangements}
- 11/1844 {the charging being dependent on network capabilities}
- 11/1846 {Identification of the vehicle}
- 11/1848 {Methods related to measuring, billing or payment}
- 11/185 {Fast charging}
- 11/1851 . . {Battery monitoring or controlling; Arrangements of batteries, structures or switching circuits therefore}
- 11/1853 . . . {by battery splitting}
- 11/1855 {by series/parallel switching}
- 11/1857 . . . {Battery age determination}
- 11/1859 . . . {Preventing deep discharging}
- 11/1861 . . . {Monitoring or controlling state of charge [SOC]}
- 11/1862 {Target range for state of charge [SOC]}
- 11/1864 . . . {Control of a battery packs, i.e. of a set of batteries with the same voltage}
- 11/1866 {Balancing the charge of multiple batteries or cells}
- 11/1868 . . . {Controlling two or more batteries with different voltages}
- 11/187 . . . {Battery temperature regulation}
- 11/1872 {by control of electric loads}
- 11/1874 {by cooling}
- 11/1875 {by heating}
- 11/1877 . . . {Arrangements of batteries}
- 11/1879 . . . {Adaptation of battery structures for electric vehicles}
- 11/1881 . . {Fuel cells monitoring or controlling; Arrangements of fuel cells, structures or switching circuits therefore}
- 11/1883 . . . {Details of fuel cells}
- 11/1885 . . . {Starting of fuel cells}
- 11/1887 . . . {combined with battery control}
- 11/1888 . . . {Fuel cell temperature regulation}
- 11/189 {by control of electric loads}
- 11/1892 {by cooling}
- 11/1894 {by heating}
- 11/1896 . . . {Arrangements of the fuel cells}
- 11/1898 . . . {Adaptation of fuel cell structures for electric vehicles}
- 13/00 Electric propulsion for monorail vehicles, suspension vehicles or rack railways; Magnetic suspension or levitation for vehicles** ([\(tracks for Maglev-type trains E01B 25/30;\)](#) [electromagnets per se H01F 7/06;](#) [linear motors per se H02K 41/00](#))
- 13/003 . {Crossings; Points}
- 13/006 . {Electric propulsion adapted for monorail vehicles, suspension vehicles or rack railways ([B60L 13/03](#) takes precedence)}
- 13/03 . Electric propulsion by linear motors
- 13/035 . . {Suspension of the vehicle-borne motorparts}
- 13/04 . Magnetic suspension or levitation for vehicles
- 13/06 . . Means to sense or control vehicle position or attitude with respect to railway
- 13/08 . . . for the lateral position
- 13/10 . Combination of electric propulsion and magnetic suspension or levitation
- 15/00 Methods, circuits, or devices for controlling the traction-motor speed of electrically-propelled vehicles**
- 15/002 . {for control of propulsion for monorail vehicles, suspension vehicles or rack railways; for control of magnetic suspension or levitation for vehicles for propulsion purposes}
- 15/005 . . {for control of propulsion for vehicles propelled by linear motors}
- 15/007 . {Physical arrangements or structures of drive train converters specially adapted for the propulsion motors of electric vehicles}
- 15/02 . characterised by the form of the current used in the control circuit
- 15/025 . . {using field orientation; Vector control; Direct Torque Control [DTC]}
- 15/04 . . using dc
- 15/06 . . using substantially sinusoidal ac
- 15/08 . . using pulses
- 15/10 . for automatic control superimposed on human control to limit the acceleration of the vehicle, e.g. to prevent excessive motor current ([electric devices for safety purposes B60L 3/00](#))
- 15/12 . . with circuits controlled by relays or contactors
- 15/14 . . with main controller driven by a servomotor ([B60L 15/18](#) takes precedence)
- 15/16 . . with main controller driven through a ratchet mechanism ([B60L 15/18](#) takes precedence)
- 15/18 . . without contact making and breaking, e.g. using a transducer
- 15/20 . for control of the vehicle or its driving motor to achieve a desired performance, e.g. speed, torque, programmed variation of speed
- 15/2009 . . {for braking}
- 15/2018 . . . {for braking on a slope}
- 15/2027 {whilst maintaining constant speed}
- 15/2036 . . {Electric differentials, e.g. for supporting steering of vehicles ([arrangement of control devices for differential gearing B60K 23/02](#))}
- 15/2045 . . {for optimising the use of energy}

15/2054	. . {by controlling transmissions or clutches}
15/2063	. . {for creeping}
15/2072	. . {for drive off}
15/2081	. . . {for drive off on a slope}
15/209	. . {for overtaking}
15/22	. . with sequential operation of interdependent switches, e.g. relays, contactors, programme drum
15/24	. . with main controller driven by a servomotor (B60L 15/28 takes precedence)
15/26	. . with main controller driven through a ratchet mechanism (B60L 15/28 takes precedence)
15/28	. . without contact making and breaking, e.g. using a transducer
15/30	. . with means to change over to human control
15/32	. Control or regulation of multiple-unit electrically-propelled vehicles
15/34	. . with human control of a setting device
15/36	. . . with automatic control superimposed, e.g. to prevent excessive motor current
15/38	. . with automatic control
15/40	. Adaptation of control equipment on vehicle for remote actuation from a stationary place (devices along the route for controlling devices on rail vehicles B61L 3/00; central rail-traffic control systems B61L 27/00)
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 (B60L 15/32 takes precedence)
2200/00	Type of vehicles
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	. Micro-cars, 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
2210/00	Converter types
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
2220/00	Electrical machine types; Structures or applications thereof
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
2230/00	Charging station details
2230/10	. Parts thereof
2230/12	. . Connection cables
2230/14	. . Contact less plugs
2230/16	. . Communication interfaces
2230/20	. Power generation within charging stations
2230/22	. . by solar panels
2230/24	. . by wind generators
2230/26	. . by power stored mechanically, e.g. by fly wheel
2230/28	. . by fuel cells
2230/30	. . by batteries
2230/32	. . by capacitors
2230/34	. . Charging station being an island
2230/40	. Remote controls for charging stations
2240/00	Control parameters of input or output; Target parameters
2240/10	. Vehicle control parameters
2240/12	. . Speed
2240/14	. . Acceleration
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	2260/24	. . Coasting mode
2240/461	. . . Speed	2260/26	. . Transition between different drive modes
2240/463	. . . Torque	2260/28	. . Four wheel or all wheel drive
2240/465	. . . Slip	2260/30	. . Engine braking emulation
2240/48	. . related to transmissions	2260/32	. . Auto pilot mode
2240/485	. . . Temperature	2260/34	. . Stabilising upright position of vehicles, e.g. of single axle vehicles
2240/486	. . . Operating parameters	2260/40	. Control modes
2240/50	. . related to clutches	2260/42	. . by adaptive correction
2240/507	. . . Operating parameters	2260/44	. . by parameter estimation
2240/52	. . related to converters	2260/46	. . by self learning
2240/525	. . . Temperature of converter or components thereof	2260/48	. . by fuzzy logic
2240/526	. . . Operating parameters	2260/50	. . by future state prediction
2240/527	. . . Voltage	2260/52	. . . drive range estimation, e.g. of estimation of available travel distance
2240/529	. . . Current	2260/54	. . . Energy consumption estimation
2240/54	. . related to batteries	2260/56	. . . Temperature prediction, e.g. for pre-cooling
2240/545	. . . Temperature	2260/58	. . . Departure time prediction
2240/547	. . . Voltage		
2240/549	. . . Current	2270/00	Problem solutions or means not otherwise provided for
2240/60	. Navigation input	2270/10	. Emission reduction
2240/62	. . Vehicle position	2270/12	. . of exhaust
2240/622	. . . by satellite navigation	2270/14	. . of noise
2240/625	. . . by GSM	2270/142	. . . acoustic
2240/627	. . . by WLAN	2270/145	. . . Structure borne vibrations
2240/64	. . Road conditions	2270/147	. . . electro magnetic [EMI]
2240/642	. . . Slope of road	2270/20	. Inrush current reduction, i.e. avoiding high currents when connecting the battery
2240/645	. . . Type of road	2270/30	. Preventing theft during charging
2240/647	. . . Surface situation of road, e.g. type of paving	2270/32	. . of electricity
2240/66	. . Ambient conditions	2270/34	. . of parts
2240/662	. . . Temperature	2270/36	. . of vehicles
2240/665	. . . Light intensity	2270/38	. . of data
2240/667	. . . Precipitation	2270/40	. related to technical updates when adding new parts or software
2240/68	. . Traffic data	2270/42	. Means to improve acoustic vehicle detection by humans
2240/70	. Interactions with external data bases, e.g. traffic centres	2270/44	. Heat storages, e.g. for cabin heating
2240/72	. . Charging station selection relying on external data	2270/46	. Heat pumps, e.g. for cabin heating
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		