CPC COOPERATIVE PATENT CLASSIFICATION

B PERFORMING OPERATIONS; TRANSPORTING
(NOTES omitted)

TRANSPORTING

B60 VEHICLES IN GENERAL
(NOTE omitted)

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)

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
1/06 . . . using only one supply
1/08 . . . . Methods and devices for control or regulation
1/10 . . . with provision for using different supplies
1/12 . . . . Methods and devices for control or regulation
1/14 . to electric lighting circuits
1/16 . . fed by the power supply line
1/20 . {Energy regeneration from auxiliary equipment}

3/00 **Electric devices on electrically-propelled vehicles for safety purposes; Monitoring operating variables, e.g. speed, deceleration, power consumption** (measuring in general G01)

3/0007 . {Measures or means for preventing or attenuating collisions}
3/0015 . . {Prevention of collisions}
3/0023 . {Detecting, eliminating, remedying or compensating for drive train abnormalities, e.g. failures within the drive train}
3/003 . . {relating to inverters}
3/0038 . . {relating to sensors}
3/0046 . . {relating to electric energy storage systems, e.g. batteries or capacitors}
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 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 flywheel
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 transductor
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 transductor
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 . 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

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
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
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