**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 H01L; 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.

**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.

| 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 |
| 1/08 | . . . 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) |
| 3/007 | . [Measures or means for preventing or attenuating collisions] |
| 3/015 | . . [Prevention of collisions] |
| 3/023 | . . (Detecting, eliminating, remedying or compensating for drive train abnormalities, e.g. failures within the drive train) |
| 3/03 | . . [relating to inverters] |
| 3/038 | . . [relating to sensors] |
| 3/046 | . . [relating to electric energy storage systems, e.g. batteries or capacitors] |
| 3/053 | . . [relating to fuel cells] |
| 3/061 | . . [relating to electrical machines] |
| 3/069 | . . [relating to the isolation, e.g. ground fault or leak current] |
| 3/076 | . . [relating to braking] |
| 3/084 | . . [relating to control modules] |
| 3/092 | . . [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 |
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)

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

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
cells, or fuel cells

using power supply from primary cells, secondary cells, or fuel cells

with provision for direct mechanical propulsion

using power stored mechanically, e.g. in flywheel

using power supply from primary cells, secondary cells, or fuel cells

[combined with an external power supply]

[for vehicles propelled by ac-motors]

[for vehicles propelled by dc-motors]

[for vehicles propelled by position controlled motors]

[Charging electric vehicles]

[using converters]

[Physical arrangements or structures of charging converters specially adapted for charging electric vehicles]

(the vehicle's propulsion converter is used for charging]

(by conductive energy transfer, e.g. connectors]

[Adaptations of plugs or sockets for charging electric vehicles]

(by inductive energy transfer]

(by exchange of energy storage elements, e.g. removable batteries]

[Details of charging stations, e.g. vehicle recognition or billing (B60L 11/1811, B60L 11/1812, B60L 11/1822 take precedence)]

[Charging columns for electric vehicles]

[Automatic adjustment of relative position between charging device and vehicle]

[for inductive energy transfer]

[with position related activation of primary coils]

(the vehicle being positioned]

(with optical position determination, e.g. by a camera]

(by charging in short intervals along the itinerary, e.g. during short stops]

[Methods for the transfer of electrical energy or data between charging station and vehicle]

[Optimising energy costs, e.g. by charging depending on electricity rates]

[Energy stored in the vehicle is provided to the network, i.e. vehicle to grid (V2G) arrangements]

(the charging being dependent on network capabilities]

[Identification of the vehicle]

[Methods related to measuring, billing or payment]

[Fast charging]

[Battery monitoring or controlling: Arrangements of batteries, structures or switching circuits therefore]

(by battery splitting]

[by series/parallel switching]

[Battery age determination]

[Preventing deep discharging]

[Monitoring or controlling state of charge [SOC]]

[Target range for state of charge [SOC]]

[Control of a battery packs, i.e. of a set of batteries with the same voltage]

[Balancing the charge of multiple batteries or cells]

[Controlling two or more batteries with different voltages]

[Battery temperature regulation]

(by control of electric loads]

(by cooling]

(by heating]

[Arrangements of batteries]

[Adaptation of battery structures for electric vehicles]

[Fuel cells monitoring or controlling: Arrangements of fuel cells, structures or switching circuits therefore]

[Details of fuel cells]

[Starting of fuel cells]

[combined with battery control]

[Fuel cell temperature regulation]

[by control of electric loads]

[by cooling]

(by heating]

[Arrangements of the fuel cells]

[Adaptation of fuel cell structures for electric vehicles]

Electric propulsion for monorail vehicles, suspension vehicles or rack railways; Magnetic suspension or levitation for vehicles (tracks for Maglev-type trains H01B 25/30; magnets per se H01F 7/06; linear motors per se H02K 41/00)

(Crossings; Points]

[Electric propulsion adapted for monorail vehicles, suspension vehicles or rack railways (B60L 13/03 takes precedence)]

Electric propulsion by linear motors

[Suspension of the vehicle-borne motorparts]

Magnetic suspension or levitation for vehicles

Means to sense or control vehicle position or attitude with respect to railway

for the lateral position

Combination of electric propulsion and magnetic suspension or levitation

Methods, circuits, or devices for controlling the traction-motor speed of electrically-propelled vehicles

(for control of propulsion for monorail vehicles, suspension vehicles or rack railways; for control of magnetic suspension or levitation for vehicles for propulsion purposes]

(for control of propulsion for vehicles propelled by linear motors]

(Physical arrangements or structures of drive train converters specially adapted for the propulsion motors of electric vehicles]

characterised by the form of the current used in the control circuit
Type of vehicles

- Air crafts
- Bikes
- Vehicles with one wheel only
- Single-axle vehicles
- Buses
- Vehicles specially adapted for children, e.g. toy vehicles

- Microcars, e.g. golf cars
- Personal mobility vehicles
- Rail vehicles
- Trailers
- Trolleys
- Waterborne vessels
- Wheel chairs
- Vehicles designed to transport cargo, e.g. trucks
- Working vehicles
- Fork lift trucks
- Industrial trucks or floor conveyors
- Vehicles with auxiliary ad-on propulsions, e.g. add-on electric motor kits for bicycles

- DC to DC converters
- Buck converters
- Boost converters
- AC to AC converters
- without intermediate conversion to DC
- AC to DC converters
- DC to AC converters
- Voltage source inverters
- Current source inverters
- with more than three phases

- Electrical machine types; Structures or applications thereof

- Electrical machine types
- Induction machines
- Synchronous machines
- DC brushless machines
- Reluctance machines
- DC electrical machines
- Universal machines
- Electrical machine applications
- with use of more than one motor
- Wheel Hub motors, i.e. integrated in the wheel hub
- Wheel motors, i.e. motor connected to only one wheel
- Structural details of electrical machines
- Clutch motors
- Windings for different functions
- with switched windings
- with more than three phases

- Charging station details

- Parts thereof
- Connection cables
- Contact less plugs
- Communication interfaces
- Power generation within charging stations
- by solar panels
- by wind generators
- by power stored mechanically, e.g. by fly wheel
- by fuel cells
- by batteries
- by capacitors
- Charging station being an island
- Remote controls for charging stations

Control parameters of input or output; Target parameters
coordinates

Interactions with external data bases, e.g. traffic

Navigation input

Drive Train control parameters

related to electric machines

Speed

Torque

Temperature

Voltage

Current

related to combustion engines

Speed

Torque

Temperature

related to wheels

Speed

Torque

Slip

related to transmissions

Temperature

Operating parameters

related to clutches

Operating parameters

related to converters

Temperature of converter or components thereof

Operating parameters

Voltage

Current

related to batteries

Temperature

Voltage

Current

Navigation input

Vehicle position

by satellite navigation

by GSM

by WLAN

Road conditions

Slope of road

Type of road

Surface situation of road, e.g. type of paving

Ambient conditions

Temperature

Light intensity

Precipitation

Traffic data

Interactions with external data bases, e.g. traffic centres

Charging station selection relying on external data

Time limits

Driver interactions

by alarm

by confirmation, e.g. of the input

by input of vehicle departure time

by display

by enquiring driving style

by driver identification

by presence detection

by lever actuation

by pedal actuation

Accelerator pedal thresholds

by voice

Operating Modes

Temporary overload

of combustion engines

of transmissions

of electrical drive trains

of electrical cells or capacitors

of converters

of motors or generators

Drive modes; Transition between modes

Standstill, e.g. zero speed

Coasting mode

Transition between different drive modes

Four wheel or all wheel drive

Engine braking emulation

Auto pilot mode

Stabilising upright position of vehicles, e.g. of single axle vehicles

Control modes

by adaptive correction

by parameter estimation

by self learning

by fuzzy logic

by future state prediction

drive range estimation, e.g. of estimation of available travel distance

Energy consumption estimation

Temperature prediction, e.g. for pre-cooling

Departure time prediction

Problem solutions or means not otherwise provided for

Emission reduction

of exhaust

of noise

acoustic

Structure borne vibrations

electro magnetic [EMI]

Inrush current reduction, i.e. avoiding high currents when connecting the battery

Preventing theft during charging

of electricity

of parts

of vehicles

of data

related to technical updates when adding new parts or software
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<th>Description</th>
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<td>Means to improve acoustic vehicle detection by humans</td>
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<td>2270/44</td>
<td>Heat storages, e.g. for cabin heating</td>
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<tr>
<td>2270/46</td>
<td>Heat pumps, e.g. for cabin heating</td>
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