

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**

Definition statement

This place covers:

Supply of electric power to auxiliary equipment of electrically-propelled vehicles, e.g. electric heating or lighting circuits.

Current-collectors and arrangements thereof on electrically-propelled vehicles, e.g. rollers in contact with trolley wire, pantographs or third-rail current-collectors.

Electro-dynamic brake systems for vehicles in general, e.g. electric resistor braking, electric regenerative braking or eddy-current braking.

Electric propulsion of vehicles with power supply external to the vehicle or supplied within the vehicle.

Charging or exchange of Batteries for electric vehicles whilst the car is stopped and details of charging stations including communication between vehicle and the charging station.

Electric propulsion of vehicles with power supply from force of nature, e.g. sun or wind.

Electric propulsion for monorail vehicles, suspension vehicles or rack railways.

Magnetic suspension or levitation for vehicles.

Methods, circuits or devices for controlling the propulsion of electrically-propelled vehicles.

Monitoring operating variables, e.g. speed, deceleration or power consumption.

Electric devices on electrically-propelled vehicles for safety purposes, e.g. dead-man's devices, devices for limiting the current under mechanical overload conditions or for preventing excessive speed of the vehicle.

Adaptation of control equipment on electrically-propelled vehicles for remote actuation from a stationary place, from alternative parts of the vehicle or from alternative vehicles in the same vehicle train.

Relationships with other classification places

This subclass is the general place for subject-matter relating to the propulsion of electrically-propelled vehicles, for control of the propulsion and for collecting electrical power therefor.

Relationships with other classification places

However conjoint control of two or more vehicle subunits, one of which may be an electrical propulsion unit, and subject-matter relating to control of hybrid vehicles comprising an internal-combustion motor and an electric motor, are covered in subclass [B60W](#).

Further subject-matter relating to arrangements or mounting of electrical propulsion units, electric gearings or auxiliary drives in vehicles, are covered in subclass [B60K](#). That includes also the transmission of drive from electric motors to the ultimate propulsive elements in vehicles and the disposition of electric propulsion equipment, other than current collectors.

This subclass is also the application-oriented place for subject-matter relating to electro-dynamic or dynamo-electric braking systems for vehicles. The function-oriented places for such systems are subclasses [H02P](#) and [H02K](#).

Therefore, this subclass covers all vehicles except those restricted to one of the following types of vehicles: rail vehicles, waterborne vessels, aircraft, space vehicles, hand carts, cycles, animal-drawn vehicles, and sledges, which are covered by the relevant subclasses of [B61](#) - [B64](#).

Thus, this subclass covers also:

- vehicular characteristics which are common to more than one of the above listed types;
- certain characteristics restricted to automobiles, road or cross-country trailers.

The following exceptions to the above should be noted:

- Subclass [B60B](#) or [B60C](#) cover all vehicle wheels and tyres, except wheels for roller skates [A63C 17/22](#), wheels for model railway vehicles [A63H 19/22](#), and special adaptations of wheels or tyres for aircraft [B64C 25/36](#).
- Subclass [B60C](#) covers the connection of valves to inflatable elastic bodies in general, and in this respect it is not limited to vehicles.
- Subclass [B60L](#) covers certain electric equipment of all electrically-propelled vehicles.
- Subclass [B60M](#) covers certain power supply for, but external to, any kind of electrically-propelled vehicle.
- Subclass [B60R](#) covers safety belts or body harnesses used in all types of land vehicles.
- Subclass [B60S](#) relates to all kinds of vehicles, except the servicing of rail locomotives [B61K 11/00](#), ground equipment for aircraft [B64F](#), or cleaning apparatus peculiar to waterborne vessels [B63B 57/00](#), [B63B 59/00](#).
- Subclass [B60T](#) covers brake control systems of general applicability, and in this respect it is not limited to vehicles. It also covers rail-vehicle power-brake systems and some other features of rail-vehicle brake systems.

References

Limiting references

This place does not cover:

| | |
|---|---|
| Electric coupling devices combined with mechanical couplings of vehicles | B60D 1/64 |
| Electric heating for vehicles | B60H 1/00 |
| Arrangement or mounting of electrical propulsion units | B60K 1/00 |
| Arrangement or mounting of plural diverse prime movers for mutual or common propulsion, e.g. hybrid propulsion systems comprising electric motors and internal combustion engines | B60K 6/20 |
| Arrangements or mounting of electric 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 |

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|---|
| Motor driven wheel chairs | A61G 5/04 |
| Auxiliary drives on vehicles | B60K 25/00 |
| Power supply lines for supplying power to electrically-propelled vehicles | B60M |
| Arrangement of signalling or lighting devices, the mounting or supporting thereof or circuits therefor, for vehicles in general | B60Q |
| Power-driven ground-engaging fittings for manoeuvring the vehicle | B60S 9/205 |
| Vehicle brake control systems in general | B60T |
| Conjoint control of vehicle sub-units of different type or different function, including control of electrical propulsion units in case the vehicle is not purely electrically-propelled | B60W 10/00 |
| Control systems specially adapted for hybrid vehicles. i.e. vehicles having two or more prime movers of more than one type, e.g. electrical and internal combustion motors, all used for propulsion of the vehicle | B60W 20/00 |
| Electric locomotives or railcars | B61C 3/00 |
| Preventing wheel slip by reducing power in rail vehicles | B61C 15/08 |
| Railway track circuits in general | B61L |
| Construction of cycles | B62K |
| Rider propulsion of wheeled vehicles | B62M |
| Construction of electrically-powered cycles | B62M 6/40 |
| Lighting in general | F21 , H05B 31/00 – H05B 41/00 |
| Switches in general | H01H |
| Coupling devices for electric connections in general | H01R |
| Conversion of electric power | H02M |
| Electric heating in general | H05B 1/00 – H05B 11/00 |

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|-------------------------------|--|
| electrodynamic braking system | An electric machine that acts as a brake. Braking is accomplished by reversing the electric fields on the machine, effectively turning it into a generator. The usage of the generated power, either in useful applications or as dissipation of heat, restrains the motor-generator and provides a braking action. As such, this term is virtually coterminous with "dynamo-electric braking system" (see below). However the term "electrodynamic" on its own is broader and less clear than the term "dynamo-electric". It means "pertaining to electric current, electricity in motion and the effects of magnetism and induction", and could theoretically encompass electrical devices other than dynamo-electric devices. |
| battery | generic term covering primary and secondary electrical cells. |

| | |
|--------------------------------|--|
| dynamo-electric braking system | A dynamo-electric machine is a device for converting electrical energy into mechanical energy or mechanical energy into electrical energy or combinations thereof, which involve electromagnetic induction. In respect of brakes, a braking effect could be produced by converting the kinetic energy of a vehicle into electrical energy, for dissipation (e.g. by resistors or as eddy-currents) or for storage (e.g. by regenerative braking). Alternatively, electrical energy could be supplied to the device to drive it into reverse, thereby producing a braking effect. |
| electric vehicle | Vehicle propelled by electric motor(s), these motors being mechanically connected to the drive wheels. This definition embraces also vehicles with engine-driven generators, sometimes referred to as serial hybrid vehicles. |
| hybrid vehicle | Vehicles having two or more prime movers of more than one type connected with the driven wheels, e.g. electrical and internal combustion motors, and that are either singularly or in combination used for propulsion of the vehicle. |
| plug-in hybrid vehicle | Hybrid vehicle which uses rechargeable batteries that can be restored to full charge by connecting a plug or other connection means to an external electric power source. |
| primary cell | electrochemical generator in which the cell energy is present in chemical form and is not regenerated. |
| range extender | Devices to extend the range of an electric vehicles supplied by a traction battery. Most of the time the term refers to an engine driven generator. It can however also refer to fuel cells or additional energy storage for electrical energy. Range extenders have generally a lower power than the maximum output of the vehicle. |
| prime mover | A machine that transforms energy from thermal, electrical or pressure form to mechanical form, typically an engine or turbine |
| secondary cell | accumulator receiving and supplying electrical energy by means of reversible electrochemical reactions. |
| fuel cell | electrochemical generator wherein the reactants are supplied from outside. |

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|--------|-----------------------------|
| Maglev | Magnetic levitation vehicle |
|--------|-----------------------------|

B60L 1/00

Supplying electric power to auxiliary equipment of vehicles (circuit arrangements for charging batteries [H02J 7/00](#))

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---------------------------------------|-----------------|
| Electric circuits for cars in general | B60R1/16 |
|---------------------------------------|-----------------|

| | |
|---|--|
| Lighting in general | F21 , H05B |
| Installations of electric cables or lines in vehicles | H02G 3/00 |
| Circuit arrangements for charging batteries | H02J 7/00 |

Special rules of classification

This sub-group is only applicable to electrically propelled vehicles.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|---------------------------------|--|
| auxiliary equipment of vehicles | aggregates not directly used for propulsion, e.g. pumps, compressors, light, heating, air-conditioning, powered steering |
|---------------------------------|--|

B60L 1/003

{to auxiliary motors, e.g. for pumps, compressors}

Definition statement

This place covers:

The supply of electric energy to auxiliary motors. These auxiliary motors can be in form of actuators or used to drive all kind of equipment like pumps, compressors.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|-------------------------|------------------------------|
| Control of vans in cars | B60H 1/00828 |
|-------------------------|------------------------------|

B60L 1/006

{to power outlets}

Definition statement

This place covers:

Supply of electric energy to power outlets or sockets in or at the vehicle. Power may be provided in form of 12 V DC supply or high volt AC. Providing power to charging ports for auxiliary vehicles is also covered.

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Sockets for charging electrical vehicles | B60L 53/16 |
| Providing electrical energy to the grid (V4G) | B60L 55/00 |

B60L 1/02

to electric heating circuits

Definition statement

This place covers:

The provision of electric energy for the climatisation for electric cars. Climatisation covers heating, cooling and ventilation, e.g. cabin climate control.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|------------------------------|
| Control of heating, cooling or ventilation in cars in general | B60H 1/00828 |
| Electric heating in cars in general | B60H 1/2215 |
| Heating or cooling of trains | B61D 27/00 |
| Heating or cooling of batteries per se | H01M 10/60 |

Special rules of classification

Heating in this group is to be understood in the broader meaning of changing temperature including cooling and ventilating

B60L 1/04

fed by the power supply line

Definition statement

This place covers:

Vehicles supplied by overhead contact lines.

Provision of heating during charging of battery driven electrically propelled vehicles

B60L 1/06

using only one supply

Definition statement

This place covers:

The provision of electrical energy to heating devices that use only one kind of supply. The origin of this group are heating devices that run on electricity, steam or hot air e.g. in trains.

B60L 1/10

with provision for using different supplies

Definition statement

This place covers:

The provision of electrical energy to heating devices that use different supplies. This group covers not only heating devices that run on different forms of electric energy but also heating devices in trains that run additionally on steam, hot water or hot air.

B60L 1/14**to electric lighting circuits****Definition statement**

This place covers:

Provision of electric energy to electric lighting circuits for electric cars.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|--|
| Electric lighting systems for toy vehicles | A63H 17/28 |
| Lighting in general | F21 , H05B |

B60L 1/16**fed by the power supply line****Definition statement**

This place covers:

Vehicles supplied by overhead contact lines.

B60L 1/20**{Energy regeneration from auxiliary equipment}****Definition statement**

This place covers:

Energy recovering from auxiliary equipment e.g. downward movement of fork lift fork is used to regenerate energy. This procedure can also be frequently found in working vehicles.

B60L 3/00

**Electric devices on electrically-propelled vehicles for safety purposes;
Monitoring operating variables, e.g. speed, deceleration or energy
consumption (methods or circuit arrangements for monitoring or controlling
batteries or fuel cells [B60L 58/00](#))**

Definition statement

This place covers:

Methods and devices for crash or collision prevention;

Methods and devices for detection of failure in the drive train;

Dead-man's devices;

Methods and devices for cutting of power under fault conditions;

Methods and devices for limiting traction current under mechanical overload conditions;

Methods and devices for preventing excessive speed of the vehicle;

Methods and devices for indicating wheel slip;

Methods and devices for monitoring and recording operating variables.

Relationships with other classification places

Measuring in general [G01](#)

Emergency protective circuit arrangements [H02H](#)

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Methods or circuit arrangements for monitoring or controlling batteries or fuel cells, specially adapted for electric vehicles | B60L 58/00 |
|--|----------------------------|

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Testing of electric installations on transport means | G01R 31/005 |
| Testing dynamo electric machines | G01R 31/34 |
| Testing dynamo electric machines in operation | G01R 31/343 |
| Safety arrangements with redundant control systems | G05B 9/03 |
| Sound generating devices | G10K 15/02 |

B60L 3/0007

{Measures or means for preventing or attenuating collisions}

Definition statement

This place covers:

Methods and devices dealing with the impact or the results of a crash or a collision. This includes the disconnection of the battery or the discharge of the smoothing capacitor.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Safety devices responsive to accident or emergency per se | B60K 28/14 |
|---|----------------------------|

B60L 3/0015

{Prevention of collisions}

Definition statement

This place covers:

Methods and devices for preventing crashes or collisions.

B60L 3/0023

{Detecting, eliminating, remedying or compensating for drive train abnormalities, e.g. failures within the drive train}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities in the drive train whilst the vehicle is in operation

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Avoiding failure by redundant parts | B60W 50/023 |
| Testing dynamo electric machines in operation | G01R 31/343 |
| Arrangements for testing of electric apparatus, lines or components for short-circuits, leakage or ground faults | G01R 31/52 |

B60L 3/003

{relating to inverters}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with the inverter systems e.g. semiconductor switch failure

B60L 3/0038

{relating to sensors}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with sensors e.g. motor position sensor, voltage sensors or wheel speed sensors

B60L 3/0046

{relating to electric energy storage systems, e.g. batteries or capacitors}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with the electric energy storage e.g. battery or capacitor.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Monitoring or controlling batteries in electric vehicles | B60L 58/10 |
| Safety and protective circuits for charging batteries | H02J 7/0029 |

B60L 3/0053

{relating to fuel cells}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with fuel cells

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Monitoring or controlling fuel cells in electric vehicles | B60L 58/30 |
|---|----------------------------|

B60L 3/0061

{relating to electrical machines}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with the electrical machines of the vehicle e.g. drive motors or generators

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Testing dynamo electric machines in operation | G01R 31/343 |
|---|-----------------------------|

B60L 3/0069

{relating to the isolation, e.g. ground fault or leak current}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with the electric isolation e.g. ground fault or leaking current

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Arrangements for testing of electric apparatus, lines or components for short-circuits, leakage or ground faults | G01R 31/52 |
|--|----------------------------|

B60L 3/0076

{relating to braking}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with brakes

B60L 3/0084

{relating to control modules}

Definition statement

This place covers:

Methods and devices for detecting or overcoming abnormalities associated with control modules

B60L 3/0092

{with use of redundant elements for safety purposes}

Definition statement

This place covers:

Same or similar elements are used to replace a failed component of the drive train. This can be either a supernumerary part only foreseen for this purpose or an other devices that serves originally a different propose.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|-------------------------------------|-----------------------------|
| Avoiding failure by redundant parts | B60W 50/023 |
|-------------------------------------|-----------------------------|

B60L 3/02

Dead-man's devices

Definition statement

This place covers:

Failsafe devices initiating appropriate safety measures in case that the human operator becomes incapacitated.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|--------------------|---|
| dead-man's devices | Failsafe devices that are initiated by a type of human incapacitation |
|--------------------|---|

B60L 3/04

Cutting off the power supply under fault conditions (protective devices and circuit arrangements in general [H01H](#); [H02H](#))

Definition statement

This place covers:

This subclass also covers the discharge or isolation of elements with high energy content e.g. batteries under fault conditions in so far as specially adapted for electric vehicles

Relationships with other classification places

Emergency protective circuit arrangements for automatic disconnection directly responsive to an undesired change from normal electric working condition are covered in [H02H](#) and [H01H](#)

B60L 3/10

Indicating wheel slip {; Correction of wheel slip}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Preventing wheel slip by reducing power in rail vehicles | B61C 15/08 |
|--|----------------------------|

B60L 3/104

{by indirect measurement of vehicle speed}

Definition statement

This place covers:

When all wheels are driving wheels, none of them can be relied on to give the true vehicle speed because all wheels could be spinning. Thus the vehicle speed can not be measured directly and has to be calculated, estimated or simulated. This established vehicle speed is then compared to the measured wheel speed to determine if the wheel is blocked or if it spins.

B60L 3/106

{for maintaining or recovering the adhesion of the drive wheels}

Definition statement

This place covers:

Traction control systems

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Safety devices responsive to or preventing skidding of wheels per se | B60K 28/16 |
|--|----------------------------|

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|-----|--|
| TCS | Traction control system |
| ASR | Anti slip regulation/ German: Anti- Schlupf-Regelung |

B60L 3/108

{whilst braking, i.e. ABS}

Definition statement

This place covers:

Anti-lock braking system (ABS = Antiblokiersystem) The braking torque is controlled to prevent the wheels from locking up (that is, ceasing rotation) and therefore avoiding slipping or skidding.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|------------|---------------------------|
| ABS per se | B60T 8/00 |
|------------|---------------------------|

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|-------------|--|
| Gleitschutz | German synonym for ABS used only in connection with trains |
|-------------|--|

B60L 3/12

Recording operating variables {; Monitoring of operating variables}

Definition statement

This place covers:

Recording, measuring and detecting operating variables of an electric vehicle

B60L 5/00

Current collectors for power supply lines of electrically-propelled vehicles (current collectors in general [H01R 41/00](#))

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Supply of electric current to toy vehicles through a track | A63H 18/12 |
| Toy vehicles with overhead trolley-wire | A63H 19/26 |
| Power supply lines for electrically propelled vehicles | B60M |
| Current collectors in general, e.g. non-rotary current collectors | H01R 41/00 |

B60L 5/04

using rollers or sliding shoes in contact with trolley wire ([B60L 5/40](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|--|---------------------------|
| Current collectors for collecting current from lines in slotted conduits | B60L 5/40 |
|--|---------------------------|

B60L 5/16

Devices for lifting and resetting the collector ([B60L 5/34](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|--|---------------------------|
| Current collectors with devices to enable one vehicle to pass another one using the same power supply line | B60L 5/34 |
|--|---------------------------|

B60L 5/38

for collecting current from conductor rails ([B60L 5/40](#) takes precedence)

References**Limiting references**

This place does not cover:

| | |
|--|---------------------------|
| Current collectors for collecting current from lines in slotted conduits | B60L 5/40 |
|--|---------------------------|

B60L 5/39**from third rail****Definition statement**

This place covers:

Current collectors for vehicles on a railway track comprising two rails. The third rail is the power supply rail.

B60L 5/42**for collecting current from individual contact pieces connected to the power supply line****Definition statement**

This place covers:

Intermittent electrical power transfer to vehicle in motion.

References**Limiting references**

This place does not cover:

| | |
|---|----------------------------|
| Charging stations for electric vehicles when not moving | B60L 53/00 |
|---|----------------------------|

B60L 7/00**Electrodynamic brake systems for vehicles in general****Definition statement**

This place covers:

The electric traction motor is used as a generator and in this way slowing the vehicle. The energy produced can either be fed back into the supply, stored in a battery, dissipated in a braking resistors or used to power the engine driven generator that is used as a motor and dragging the combustion engine.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-------------------------------|
| Vehicle brake control systems | B60T |
| ABS-systems | B60T 8/00 |
| Retarders, i.e. regenerative electric braking | B60T 13/586 |
| Regenerative Braking | B60W 30/18127 |
| Rail brakes | B61H 7/00 |
| Actuating mechanisms for brakes | F16D 65/14 |
| Stopping or slowing electric motors per se | H02P 3/00 |

B60L 7/003

{Dynamic electric braking by short circuiting the motor}

Definition statement

This place covers:

The electric traction motor is short circuited and produces a braking force. The energy is dissipated in the motor itself.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|---------------------------|
| Braking electric DC-motors by short-circuit per se | H02P 3/12 |
| Braking electric AC-motors by short-circuit per se | H02P 3/22 |

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|--------------------|----------------|
| Kurzschlussbremsen | German synonym |
|--------------------|----------------|

B60L 7/006

{Dynamic electric braking by reversing current, i.e. plugging}

Definition statement

This place covers:

Electric currents are applied to the motor in a way that induces a magnetic field that turns in an opposite direction to the one of the motor. The magnetic field serves to brake the motor. This method can still be applied if battery is fully charged. The main part of the energy is dissipated in the motor itself.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|-------------------|--------|
| Gegenstrombremsen | German |
|-------------------|--------|

B60L 7/02

Dynamic electric resistor braking ([B60L 7/22](#) takes precedence)

Definition statement

This place covers:

Braking resistors are used to dissipate the energy regenerated by electrodynamic braking.

References**Limiting references**

This place does not cover:

| | |
|---|---------------------------|
| Dynamic electric resistor braking combined with dynamic electric regenerative braking | B60L 7/22 |
|---|---------------------------|

B60L 7/04**for vehicles propelled by DC motors****Definition statement**

This place covers:

Vehicles propelled by motors driven by a dc current

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---------------------------------------|---------------------------|
| Resistor braking for DC-motors per se | H02P 3/12 |
|---------------------------------------|---------------------------|

B60L 7/06**for vehicles propelled by AC motors****Definition statement**

This place covers:

Vehicles propelled by motors driven by an AC current

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---------------------------------------|---------------------------|
| Resistor braking for AC-motors per se | H02P 3/22 |
|---------------------------------------|---------------------------|

B60L 7/08**Controlling the braking effect ([B60L 7/04](#), [B60L 7/06](#) take precedence)****References****Limiting references**

This place does not cover:

| | |
|-----------------------------------|---------------------------|
| Vehicles propelled with DC motors | B60L 7/04 |
| Vehicles propelled with AC motors | B60L 7/06 |

B60L 7/10

Dynamic electric regenerative braking ([B60L 7/22](#) takes precedence)

Definition statement

This place covers:

The traction battery is used to store the energy regenerated by electrodynamic braking.

References

Limiting references

This place does not cover:

| | |
|---|---------------------------|
| Dynamic electric resistor braking combined with dynamic electric regenerative braking | B60L 7/22 |
|---|---------------------------|

B60L 7/12

for vehicles propelled by DC motors

Definition statement

This place covers:

Vehicles propelled by motors driven by a DC current

B60L 7/14

for vehicles propelled by AC motors

Definition statement

This place covers:

Vehicles propelled by motors driven by an AC current

B60L 7/18

Controlling the braking effect ([B60L 7/12](#), [B60L 7/14](#), [B60L 7/16](#) take precedence)

References

Limiting references

This place does not cover:

| | |
|---|---------------------------|
| Regenerative braking for vehicles with DC motors | B60L 7/12 |
| Regenerative braking for vehicles with AC motors | B60L 7/14 |
| Regenerative braking for vehicles comprising converters | B60L 7/16 |

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|----------------------|-------------------------------|
| Regenerative Braking | B60W 30/18127 |
|----------------------|-------------------------------|

B60L 7/20

Braking by supplying regenerated power to the prime mover of vehicles comprising engine-driven generators

Definition statement

This place covers:

The mechanical resistance of the vehicle combustion engine is used to dissipate the energy regenerated by electrodynamic braking.

B60L 7/22

Dynamic electric resistor braking, combined with dynamic electric regenerative braking

Definition statement

This place covers:

The traction battery is used to store the energy regenerated by electrodynamic braking. If its storage capacity is not sufficient (e.g. during peaks), braking resistors are used to dissipate the energy regenerated by electrodynamic braking.

B60L 7/26

Controlling the braking effect

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--------------------------------------|-------------------------------|
| Retarders being of the electric type | B60T 13/586 |
| Regenerative Braking | B60W 30/18127 |

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|-----------|--|
| Retarders | regenerating braking in electric vehicles seem to be interpreted as retarders in B60T 13/586 |
|-----------|--|

B60L 7/28

Eddy-current braking

Definition statement

This place covers:

Wear-free systems for slowing a vehicle creating eddy currents in a metal by means of induction.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|----------------------|---|
| Eddy-current braking | Wear free systems for slowing a vehicle creating eddy currents by in a metal by means of induction. The eddy currents produces a magnetic field opposing the first magnetic field. Opposing magnetic fields create force that reduces the vehicle velocity. |
|----------------------|---|

B60L 8/00

Electric propulsion with power supply from forces of nature, e.g. sun or wind

Definition statement

This place covers:

The propulsion energy of the vehicle is provided by forces of nature in or at the vehicle itself. This can be achieved e.g. by solar panels and wind mills.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Supplying electric power to auxiliary equipment of electric vehicles | B60L 1/00 |
| Arrangements in connection with power supply from force of nature | B60K 16/00 |

B60L 8/003

{Converting light into electric energy, e.g. by using photo-voltaic systems}

Definition statement

This place covers:

The electric energy used for propulsion is generated using light e.g. sun light in or at the vehicle.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Components or accessories specially adapted for PV modules | H02S 40/00 |
| Solar cells per se | H10F |

B60L 8/006

{Converting flow of air into electric energy, e.g. by using wind turbines}

Definition statement

This place covers:

The electric energy used for propulsion of the vehicle is generated in or at the vehicle using wind energy.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--------------------|----------------------|
| Wind motors per se | F03D |
|--------------------|----------------------|

B60L 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](#))

Definition statement

This place covers:

Trains, streetcars, buses or similar vehicles using overhead power lines. The vehicle is supplied with electric energy meanwhile it is in motion and as well during stops in stations. The major part of the traction energy is delivered externally to the vehicle a relative small amount of energy may be stored within the vehicle.

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Electric propulsion for monorail vehicles, suspension vehicles or rack railways | B60L 13/00 |
| In combination with an external power supply, e.g. from overhead contact lines | B60L 50/53 |

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Supply of electric current to toy vehicles through a track | A63H 18/12 |
| Control of toy vehicles by vehicle-track interaction | A63H 18/16 |
| Electrically-driven model locomotives | A63H 19/10 |
| Electric toy railways | A63H 19/24 |
| Toy vehicles with overhead trolley-wire | A63H 19/26 |
| Electric drive mechanisms for toys | A63H 29/22 |

B60L 9/06

with conversion by metadyne

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|----------|---|
| Metadyne | Special form of a rotary converter with three or more brushes |
|----------|---|

B60L 9/16

using AC induction motors

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|--------------------|-----------------|
| Asynchronous motor | Induction motor |
|--------------------|-----------------|

B60L 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](#))

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Tracks for magnetic suspension or levitation vehicles | E01B 25/30 |
|---|----------------------------|

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|------------------------------------|----------------------------|
| Electromagnets per se | H01F 7/06 |
| Propulsion by linear motors per se | H02K 41/02 |

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

| | |
|--------------------|--|
| Suspension railway | Railway in a form of elevated monorail where the vehicle is suspended from a fixed track |
| Rack railway | Railway with a toothed rack rail, usually between the running rails |

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "rack railway", "rack-and-pinion railway" and "cog railway"

B60L 13/006

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

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Electric propulsion for MagLev vehicles | B60L 13/10 |
|---|----------------------------|

B60L 15/00

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

Definition statement

This place covers:

Controlling the speed of the traction motor implies the control of the vehicle speed itself.

References

Limiting references

This place does not cover:

| | |
|--|----------------------|
| Starting, controlling, braking of electric machines per se | H02P |
|--|----------------------|

B60L 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}

Definition statement

This place covers:

Control for monorail vehicles, suspension vehicles, rack railways or vehicles propelled by linear motors as covered by [B60L 13/00](#)

Control for magnetic suspension or levitation for propulsion purposes as covered by [B60L 13/00](#)

[B60L 13/00](#) covers the devices, this group covers the control (method) aspects.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Electric propulsion for monorail vehicles, suspension vehicles or rack railways; Magnetic suspension or levitation for vehicles | B60L 13/00 |
|---|----------------------------|

B60L 15/005**{for control of propulsion for vehicles propelled by linear motors}****Definition statement***This place covers:*

Control for vehicles propelled by linear motors.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

| | |
|--------------------------------------|----------------------------|
| Electric propulsion by linear motors | B60L 13/03 |
|--------------------------------------|----------------------------|

B60L 15/007**{Physical arrangements or structures of drive train converters specially adapted for the propulsion motors of electric vehicles}****Definition statement***This place covers:*

Details of converters and inverters only in so far specially adapted for the drive train of electric vehicles

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

| | |
|--|----------------------------|
| Converters and inverters for charging vehicles | B60L 53/22 |
| Converters and inverters per se | H02M/00 |

B60L 15/025**{using field orientation; Vector control; Direct Torque Control [DTC]}****Definition statement***This place covers:*

Control for vehicles using control methods based on coordinate transfer to a coordinate system rotating with the rotor of the electric machine. By doing so the stator current of an electrical motor can be broken down into the torque and field component allowing to independently control the torque and field of an electric motor.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|----------------------------|
| Arrangements or methods for the control of electric machines by vector control per se, e.g. by control of field orientation | H02P 21/00 |
|---|----------------------------|

B60L 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](#))

References

Limiting references

This place does not cover:

| | |
|--------------------------------------|---------------------------|
| Electric devices for safety purposes | B60L 3/00 |
|--------------------------------------|---------------------------|

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Control system corrects or modifies a request from the driver | B60W 50/087 |
|---|-----------------------------|

B60L 15/14

with main controller driven by a servomotor ([B60L 15/18](#) takes precedence)

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Automatic control without contact making or breaking | B60L 15/18 |
|--|----------------------------|

B60L 15/16

with main controller driven through a ratchet mechanism ([B60L 15/18](#) takes precedence)

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Automatic control without contact making or breaking | B60L 15/18 |
|--|----------------------------|

B60L 15/2009

{for braking}

Relationships with other classification places

Electrodynamic braking breaking [B60L 7/00](#)

B60L 15/2018**{for braking on a slope}****Definition statement***This place covers:*

Braking on a slope (ascendant and descendant);

Stopping on a slope;

Anti rollback systems on a slope;

Limiting current through motor on Lock State

Stalled state or at zero or low speed (on a slope);

Regenerative braking during low descent on a slope.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

| | |
|---------------------|-------------------------------|
| Hill holding per se | B60W 30/18118 |
|---------------------|-------------------------------|

B60L 15/2036**{Electric differentials, e.g. for supporting steering vehicles}****Definition statement***This place covers:*

Different speed of wheels on opposite sides of the vehicles whilst turning, e.g. electrical differential and systems of the like. Of particular importance for wheel motors.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|----------------------------|
| Arrangement of control devices for differential gearing | B60K 23/04 |
| Electrical power steering | B62D 5/04 |

B60L 15/2045**{for optimising the use of energy}****Definition statement***This place covers:*

The efficient use of energy in electric cars and strategies to achieve this.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--------------------------------|------------------------------|
| Navigation based on energy use | G01C 21/3469 |
|--------------------------------|------------------------------|

B60L 15/2054

{by controlling transmissions or clutches}

Definition statement

This place covers:

Control is affected upon the transmission or the clutch

B60L 15/2063

{for creeping}

Definition statement

This place covers:

Methods emulating the creeping state of an automatic transmission.

B60L 15/2072

{for drive off}

Definition statement

This place covers:

Methods for accelerating the vehicle from stand still.

B60L 15/209

{for overtaking}

Definition statement

This place covers:

Methods facilitating the process of overtaking.

B60L 15/26

with main controller driven through a ratchet mechanism ([B60L 15/28](#) takes precedence)

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Control without contact making or breaking | B60L 15/28 |
|--|----------------------------|

B60L 15/32

Control or regulation of multiple-unit electrically-propelled vehicles

Definition statement

This place covers:

The joint control of multiple units. Historically this concerns mainly trains with multiple individual propelled units. However this group also covers a collective of electric vehicles that is controlled together.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--------------------|---------------------------|
| Traction couplings | B60D 1/00 |
|--------------------|---------------------------|

B60L 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](#))

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Devices along the route for controlling devices on rail vehicles | B61L 3/00 |
| Central rail-traffic control systems | B61L 27/00 |

B60L 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)

References

Limiting references

This place does not cover:

| | |
|--|----------------------------|
| Control or regulation of multiple-unit electrically-propelled vehicles | B60L 15/32 |
|--|----------------------------|

B60L 50/00

Electric propulsion with power supplied within the vehicle (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](#))

Definition statement

This place covers:

Electric vehicles using electric energy stored or provided in various forms within the vehicle. The electric energy can be provided by engine-driven generators or fuel cells, stored in electrical cells like batteries or in capacitors, or converted from mechanically stored energy.

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Electric propulsion with power supply from forces of nature, e.g. sun or wind | B60L 8/00 |
| Electric propulsion for monorail vehicles, suspension vehicles or rack railways | B60L 13/00 |

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

| | |
|---------------------------------------|----------------------------|
| Electrically-driven model locomotives | A63H 19/10 |
|---------------------------------------|----------------------------|

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Arrangements or mounting of plural diverse prime-movers for mutual or common propulsion consisting of electric motors and internal combustion engines, e.g. HEVs. | B60K 6/20 |
| Control systems specially adapted for hybrid vehicles if propulsion other than electric is used to drive the wheels | B60W 20/00 |

B60L 50/10

using propulsion power supplied by engine-driven generators, e.g. generators driven by combustion engines

Definition statement

This place covers:

Electric vehicles using an engine-driven generator as only power supply, e.g. diesel electric locomotives.

Motors and generators are being considered as being of type AC or DC according to the form of the current used in the motor or generator.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Electric vehicles with batteries charged by engine-driven generators | B60L 50/61 |
| Control of combustion engines | F02D |
| Control of engine driven generators | F02D 29/06 |
| Starting engines by motor/generator | F02N 11/04 |
| Charging batteries by a generator driven by a prime mover other than motor of the vehicle | H02J 7/1415 |

B60L 50/15

with additional electric power supply (with capacitors charged by engine-driven generators [B60L 50/40](#); with batteries charged by engine-driven generators [B60L 50/61](#))

Definition statement

This place covers:

Additional electric power supply independent of the power supplied by the engine-driven generators.

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Electric vehicles with capacitors charged by engine-driven generators | B60L 50/40 |
| Electric vehicles with batteries charged by engine-driven generators | B60L 50/61 |

B60L 50/16

with provision for separate direct mechanical propulsion

Definition statement

This place covers:

Vehicles, where, under certain conditions, power is directly delivered from the engine to the wheels. This includes also electric equipment for hybrid vehicles unless they are conjointly controlled with the combustion engine.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Architecture of hybrid vehicles | B60K 6/42 |
| Conjoint control of vehicle sub-units of different type or different function, including control of electrical propulsion units in case the vehicle is not purely electrically-propelled. | B60W 10/00 |

| | |
|--|----------------------------|
| Control systems specially adapted for hybrid vehicles. i.e. vehicles having two or more prime movers of more than one type, e.g. electrical and internal combustion motors, all used for propulsion of the vehicle | B60W 20/00 |
|--|----------------------------|

Special rules of classification

Classification should additionally be made:

- in group [B60L 53/00](#) if aspects of charging are relevant (e.g. plug-in hybrid),
- in group [B60L 50/60](#) if battery related problems are relevant, and
- in group [B60L 50/70](#) if fuel cell related aspects are relevant.

B60L 50/20

using propulsion power generated by humans or animals

Definition statement

This place covers:

Electric vehicles using human power in addition to other sources of electrical energy

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|---------------------------|
| Rider propelled cycles with auxiliary electric motor | B62M 6/40 |
|--|---------------------------|

B60L 50/30

using propulsion power stored mechanically, e.g. in fly-wheels

Definition statement

This place covers:

Electrical energy is converted into mechanical energy and stored mechanically. For later use it is reconverted into electrical energy.

B60L 50/40

using propulsion power supplied by capacitors

Definition statement

This place covers:

Electric vehicles using capacitors in addition to other sources of electrical energy, e.g. to accommodate short-term power fluctuations. The capacitors should explicitly be meant to provide propulsion energy.

B60L 50/50

using propulsion power supplied by batteries or fuel cells

Definition statement

This place covers:

General features that are not specific for either batteries or fuel cells.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|-----------------|----------------------------|
| Primary cells | H01M 6/00 |
| Fuel cells | H01M 8/00 |
| Secondary cells | H01M 10/00 |

B60L 50/51

characterised by AC-motors

Definition statement

This place covers:

Vehicles supplied with electric energy from an electrical cell and propelled by AC motors.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Electric vehicles with power supplied by batteries in combination with an external power supply | B60L 50/53 |
| Electric vehicles powered by fuel cells | B60L 50/70 |

B60L 50/52

characterised by DC-motors

Definition statement

This place covers:

Vehicles supplied with electric energy from an electrical cell and propelled by motors driven by a DC current

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Electric vehicles with power supplied by batteries in combination with an external power supply | B60L 50/53 |
| Electric vehicles powered by fuel cells | B60L 50/70 |

B60L 50/53

in combination with an external power supply, e.g. from overhead contact lines

Definition statement

This place covers:

Vehicle supplied with electric energy from an electrical cell and additionally from the outside mostly in the form of an overhead power line.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Electric vehicles powered exclusively by external power supply | B60L 9/00 |
| Charging electric vehicles | B60L 53/00 |

B60L 50/60

using power supplied by batteries (in combination with fuel cells [B60L 50/75](#))

Definition statement

This place covers:

- Monitoring the operating state of the batteries
- Controlling the drive in dependence of detected batteries variables.

The term "batteries" is used as well for accumulators.

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Electric vehicles powered by batteries in combination with fuel cells | B60L 50/75 |
|---|----------------------------|

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|------------------------------------|---------------------------|
| Charging or depolarising batteries | H02J 7/00 |
|------------------------------------|---------------------------|

B60L 50/61

by batteries charged by engine-driven generators, e.g. series hybrid electric vehicles

Definition statement

This place covers:

- Electric vehicles using a range extender to increase the operating range of the battery, e.g. series hybrid vehicles.
- Aspects related to the electrical equipment and propulsion of series hybrid vehicles, i.e. the electric drivetrain of series hybrid vehicles.

Definition statement

- Control of series hybrid vehicles when the control is restricted to the electrical drivetrain only.

Relationships with other classification places

Arrangements of the plural prime-movers in series hybrid vehicles or aspects related to the architecture of series hybrid vehicles are covered by [B60K 6/20](#), especially [B60K 6/46](#).

Control of series hybrid vehicles involving plural prime-movers, i.e. when the control is not restricted to the electrical drivetrain, is covered by [B60W 20/00](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Electric vehicles using propulsion power supplied by engine-driven generators, e.g. generators driven by combustion engines | B60L 50/10 |
| Architecture of series-type hybrid vehicles | B60K 6/46 |
| Control systems specially adapted for hybrid vehicles | B60W 20/00 |

B60L 50/62

charged by low-power generators primarily intended to support the batteries, e.g. range extenders

Definition statement

This place covers:

Vehicles with propulsion power supplied by batteries charged by engine-driven generators that are not providing enough power to supply the maximum output power of the vehicles, e.g. range extenders. This kind of vehicle has a reduced power output if it is only powered by low-power generators.

B60L 50/64

Constructional details of batteries specially adapted for electric vehicles

Relationships with other classification places

This group does not cover constructional details of batteries per se which are covered by [H01M](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Secondary cells, i.e. accumulators, in general | H01M 10/00 |
|--|----------------------------|

B60L 50/66

{Arrangements of batteries}

Definition statement

This place covers:

Arrangements or location of batteries only in so far as specially adapted for the drive train of electric vehicles.

B60L 50/70

using power supplied by fuel cells (in combination with batteries [B60L 50/75](#))

Definition statement

This place covers:

Electric vehicles powered by fuel cells.

References

Limiting references

This place does not cover:

| | |
|---|----------------------------|
| Electric vehicles powered by fuel cells in combination with batteries | B60L 50/75 |
|---|----------------------------|

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|--|
| Control of fuel cells | H01M 8/04298 |
| Control of failure or abnormal functionality of fuel cells | H01M 8/04664 |
| Indirect fuel cell; Redox flow type battery | H01M 8/20 , H01M 8/188 |
| Grouping of fuel cells into batteries | H01M 8/24 |

B60L 50/71

Arrangement of fuel cells within vehicles specially adapted for electric vehicles

Definition statement

This place covers:

Arrangements or locations of fuel cells only in so far as specially adapted for the drive train of electric vehicles.

B60L 50/72

Constructional details of fuel cells specially adapted for electric vehicles

Definition statement

This place covers:

Details of fuel cells only in so far as specially adapted for the drive train of electric vehicles.

Relationships with other classification places

This group does not cover constructional details of fuel cells per se, which are covered by [H01M 8/00](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|------------|---------------------------|
| Fuel cells | H01M 8/00 |
|------------|---------------------------|

B60L 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

Definition statement

This place covers:

Electric vehicles using electrical energy provided by sources not covered by groups [B60L 50/10](#) - [B60L 50/50](#), e.g. gas turbine driven generators, radioisotope thermoelectric generators (RTG) or energy converted from energy stored pneumatically or hydraulically.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Detecting, eliminating, remedying or compensating for drive train abnormalities relating to electric energy storage systems | B60L 3/0046 |
| Arrangement or mounting of plural diverse prime-movers for HEV characterised by the electric energy storing means | B60K 6/28 |

B60L 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

Definition statement

This place covers:

Charging and discharging of electric vehicles.

Aspects of:

- charging converter;
- connection means;
- automatic connection;
- exchange of energy storage elements;
- charging stations;
- Methods for;
- identification of vehicles;
- determination of the supplied energy;
- measuring, billing and payment;
- availability of energy.

The vehicles are normally not moving during the charging process. Exceptionally an inductive energy transfer may occur during the ride.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|------------------------------|
| Electric propulsion of vehicles with power supply external to the vehicle | B60L 9/00 |
| Methods, circuits, or devices for controlling the traction-motor speed of electrically propelled vehicles | B60L 15/20 |
| Optimisation of energy with GPS or similar systems | B60L 15/2045 |
| Electric propulsion of vehicles using power supplied by vehicle batteries in combination with an external power supply | B60L 50/53 |
| Power supply (e.g. charging) of vehicles whilst in motion | B60M |
| Power supply of vehicles whilst in motion using intermitting contact points along the line | B60M 1/36 |
| Power supply for vehicles of special types using stored power | B60M 7/003 |
| Ground or aircraft-carrier-deck installations for supplying electrical power to stationary aircraft | B64F 1/35 |
| Inductive coupling | H01F 38/14 |
| Methods for charging or discharging batteries in general | H01M 10/44 |
| Connectors per se | H01R |
| Circuit arrangements for charging batteries or for supplying loads from batteries in general | H02J 7/00 |
| Power conversion systems per se | H02M |
| Arrangements for secret or secure communication | H04L 9/00 |

B60L 53/10

characterised by the energy transfer between the charging station and the vehicle

Definition statement

This place covers:

Charging of batteries, specially adapted for propulsion of electric vehicles, characterised by the type of energy transfer between the charging station and the vehicle.

The energy transferred to or from the vehicle is used to adjust the SOC of the vehicle rather than for immediate propulsion. The vehicle is normally stationary, or at least stationary in relation to the charging station.

Relationships with other classification places

Electric propulsion of vehicles using power supplied by batteries in combination with an external power supply is covered by [B60L 50/53](#).

Electric propulsion of vehicles with power supply external of the vehicle is covered by [B60L 9/00](#).

B60L 53/11

{DC charging controlled by the charging station, e.g. mode 4}

Definition statement

This place covers:

Methods for charging vehicles considerably faster than normal charge, e.g. less than 30 minutes, or also called "fast charging" or "mode 4".

B60L 53/12

Inductive energy transfer

Definition statement

This place covers:

Arrangements where the charging energy is transmitted inductively from the charging station to the vehicle.

The energy needed to propel the vehicle is transmitted inductively from the station to the vehicle. Often, but not necessarily, the primary inductances are embedded in the floor. The vehicle normally is stopped during the charging process.

Relationships with other classification places

This group covers inductive energy transfer specially adapted for electric vehicles, e.g. for the power supply control in cooperation with control and operation of the vehicle or arrangements therefor.

Wireless charging in general is covered by the general technology group [H02J 50/00](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Magnetic suspension or levitation for vehicles | B60L 13/04 |
| Inductive couplings | H01F 38/14 |
| Circuit arrangements or systems for wireless supply or distribution of electric power in general | H02J 50/00 |
| For wireless supply or distribution of electric power using inductive coupling | H02J 50/10 |
| Near-field transmission systems for data transfer in combination with power transfer | H04B 5/79 |

B60L 53/122

Circuits or methods for driving the primary coil, e.g. supplying electric power to the coil

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Circuit arrangements for wireless supply of electric power in general using inductive coupling | H02J 50/10 |
|--|----------------------------|

B60L 53/124

Detection or removal of foreign bodies

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Circuit arrangements for wireless supply of electric power in general responsive to the presence of foreign objects | H02J 50/60 |
|---|----------------------------|

B60L 53/14

Conductive energy transfer

Definition statement

This place covers:

Arrangements where the charging energy is transmitted conductively from the charging station to the vehicle.

The connectors are fixed to a station or to the vehicle. The vehicle must be stopped in order to receive any charge. Communication between the station and the vehicle may be established.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Current collectors | B60L 5/00 |
| Charging stations | B60L 53/30 |
| Electric circuits specially adapted for vehicles not otherwise provided for | B60R 16/00 |
| Connectors per se | H01R |
| Installation of electric cables or line or protective tubings therefor in or on buildings, equivalent structures or vehicles | H02G 3/00 |

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|-------|-----------------------------|
| Pilot | Wire used for communication |
|-------|-----------------------------|

B60L 53/16

Connectors, e.g. plugs or sockets, specially adapted for charging electric vehicles

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|-----------------------|----------------------|
| Connectors in general | H01R |
|-----------------------|----------------------|

B60L 53/20

characterised by converters located in the vehicle

Definition statement

This place covers:

Measures and means for charging or discharging electric vehicles distinguished by the use of converters.

B60L 53/22

Constructional details or arrangements of charging converters specially adapted for charging electric vehicles

Definition statement

This place covers:

Details of converters and inverters only in so far as specially adapted for charging or discharging electric vehicles.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Converters and inverters for vehicle drive trains | B60L 15/007 |
| Converters and inverters, in general | H02M |

B60L 53/24

Using the vehicle's propulsion converter for charging

Definition statement

This place covers:

The propulsion converter is used as an onboard charger eliminating the need to provide a separate onboard charger.

B60L 53/30

Constructional details of charging stations

Definition statement

This place covers:

Charging stations for electric vehicles and their interaction/communication with the vehicle as well as with the grid supplying the station are classified here. Vehicle recognition, user recognition, theft of energy prevention, measurement of transferred energy, billing of the customer, availability of charging slots for the correspondent vehicle types, recognition of battery types.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|------------------------------|
| Methods, circuits, or devices for controlling the traction-motor speed of electrically propelled vehicles | B60L 15/20 |
| Optimisation of energy with GPS or similar systems | B60L 15/2045 |
| Inductive energy transfer | B60L 53/12 |
| Conductive energy transfer | B60L 53/20 |
| Exchange of energy storage elements for electric propulsion of vehicles | B60L 53/80 |
| Power lines of special types for vehicles using stored power | B60M 7/003 |
| Supplying batteries to, or removing batteries from, vehicles in general | B60S 5/06 |
| Building structures for parking | E04H 6/00 |
| Arrangements for road pricing | G07B 15/00 |
| Vending machines other than coins | G07F 7/00 |
| Coin-free apparatus with meter-controlled dispensing electricity | G07F 15/003 |
| Traffic control systems for road vehicles | G08G 1/00 |
| Automatic parking traffic control systems | G08G 1/065 |
| Fleet management | G08G 1/20 |
| Circuits for charging batteries per se, e.g. for batteries removed from the vehicle | H02J 7/00 |
| Using battery charging as network buffer | H02J 7/34 |
| Arrangements for secret or secure communication | H04L 9/00 |

B60L 53/31**Charging columns specially adapted for electric vehicles****Definition statement**

This place covers:

Charging installations for electric vehicles not integrated in a building. Typically they are designed for a public environment. They can be of a stand-alone type, e.g. columns or integrated into other street furniture. Means for energy theft prevention associated with charging columns.

B60L 53/35**Means for automatic or assisted adjustment of the relative position of charging devices and vehicles****Definition statement**

This place covers:

Automatic positioning of the plug, the inductive transfer device or the electric vehicle in order to automatically connect to an electric power supply to the vehicle.

B60L 53/36**by positioning the vehicle****Definition statement**

This place covers:

The vehicle is positioned in order to allow automatic connection of a plug or charging device. The positioning can be e.g. mechanical by forcing the car in the right position, optically by guiding the driver or by automatic repositioning of the car.

B60L 53/38**specially adapted for charging by inductive energy transfer****Definition statement**

This place covers:

Automatic positioning of the inductive charging device or the vehicle for inductively charging electric vehicles.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Inductive charging of electric vehicles in general | B60L 53/12 |
|--|----------------------------|

Special rules of classification

If the vehicle is positioned, the document should also be classified in [B60L 53/36](#).

B60L 53/39

with position-responsive activation of primary coils

Definition statement

This place covers:

The position of the vehicle to be charged is detected and primary coils are activated selectively to maximise energy transfer. The primary coils can be integrated in the floor surface or in a separate charging device. The primary coils can also be distributed along the road.

Special rules of classification

If the primary coils are distributed along the road, documents should also be classified in group [B60L 53/32](#).

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|----------------|---|
| primary coil | the coil of an inductive transfer device that is stationary and part of the charging installation |
| secondary coil | the coil of an inductive transfer device that is integrated in an electric vehicle |

B60L 53/51

Photovoltaic means

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|----------------------------|
| Supporting structures for photovoltaic modules | H02S 20/00 |
|--|----------------------------|

B60L 53/52

Wind-driven generators

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|------------------------|----------------------|
| Wind motors in general | F03D |
|------------------------|----------------------|

B60L 53/60

Monitoring or controlling charging stations

Definition statement

This place covers:

Methods ruling the exchange of energy and the respective data for charging an electric vehicle. Interaction or communication between the vehicle and the charging station or the electricity grid, e.g. availability of charging slots for the correspondent vehicle types.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--------------------------------------|------------------------------|
| Charger exchanging data with battery | H02J 7/00036 |
|--------------------------------------|------------------------------|

B60L 53/63

in response to network capacity

Definition statement

This place covers:

Methods for adapting charging of electrical vehicles to the supply possibilities of the electricity grid, e.g. depending on network stability or limits of the network ability to provide power.

B60L 53/64

Optimising energy costs, e.g. responding to electricity rates

Definition statement

This place covers:

Methods for optimising the cost of charging an electric vehicle, e.g. by adapting time or location depending on available energy rates.

B60L 53/65

involving identification of vehicles or their battery types

Definition statement

This place covers:

Methods that allow the identification of an electric vehicle including recognition of vehicle or battery type.

B60L 53/665

{Methods related to measuring, billing or payment}

Definition statement

This place covers:

Methods for measuring energy transferred to and from the vehicle.

Registration, billing and payment associated with the transfer of energy.

B60L 53/80

Exchanging energy storage elements, e.g. removable batteries

Definition statement

This place covers:

Exchange of electric storage elements for electric propulsion of vehicles.

Empty or partially empty or faulty batteries, super-capacitors or similar energy carriers are physically removed from the vehicle and replaced with charged ones. An energy carrier may also be the electrolyte that is exchanged exclusively.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|----------------------------|
| Supplying batteries or removing batteries from vehicles | B60S 5/06 |
| Regenerative fuel cells | H01M 8/18 |
| Cells working by exchange of electrolyte, e.g. redox flow cells | H01M 8/188 |

B60L 55/00

Arrangements for supplying energy stored within a vehicle to a power network, i.e. vehicle-to-grid [V2G] arrangements

Definition statement

This place covers:

Methods for providing stored energy from the vehicle to the grid. The vehicles serve, e.g. as a net-buffer to stabilise the electricity net.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|---------------------------|
| Arrangements for balancing of the load in an AC network by storage of energy | H02J 3/28 |
| Arrangements for balancing of the load in a network by storage of energy using batteries with converting means in general | H02J 3/32 |

B60L 58/00

Methods or circuit arrangements for monitoring or controlling batteries or fuel cells, specially adapted for electric vehicles

Relationships with other classification places

This main group does not cover methods or circuit arrangements for monitoring or controlling batteries or fuel cells per se, which are covered by [G01R 31/36](#), [H01M 6/50](#), [H01M 8/04298](#) and [H01M 10/48](#).

B60L 58/10**for monitoring or controlling batteries****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|--|
| Testing electrical variables of batteries | G01R 31/36 , H01M 6/50 |
| Measuring, testing or indicating condition of accumulators in general | H01M 10/48 |

B60L 58/12**responding to state of charge [SoC]****Definition statement**

This place covers:

The state of charge [SoC/SOC] of the battery is determined and influences the control of the vehicle.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Indicating measured values, displays | G01D |
| Arrangements for monitoring battery variables, e.g. state-of-charge [SOC], in general | G01R 31/382 |
| Testing electrical conditions of batteries | G01R 31/387 |

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

| | |
|-----|-----------------|
| SOC | State of charge |
|-----|-----------------|

B60L 58/13**Maintaining the SoC within a determined range****Definition statement**

This place covers:

The control of the electric vehicle is required to keep the SOC within particular range or window (e.g. between 30% and 70%) so as, for example, increase the life span of the battery.

B60L 58/14

Preventing excessive discharging

Definition statement

This place covers:

Methods for prevention of a deep discharge of the battery to avoid damage to or destruction of the battery.

B60L 58/16

responding to battery ageing, e.g. to the number of charging cycles or the state of health [SoH]

Definition statement

This place covers:

Monitoring the aging of the battery and control methods depending on the established data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Apparatus for determining battery ageing, e.g. state-of-health, in general | G01R 31/392 |
|--|-----------------------------|

B60L 58/18

of two or more battery modules

Definition statement

This place covers:

The battery is split in different groups of cells to achieve a desired performance, e.g. using a part for traction purposes whilst another part is recharged.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|---|-----------------------------|
| Apparatus for monitoring individual cells or groups of cells within a battery | G01R 31/396 |
|---|-----------------------------|

B60L 58/19

Switching between serial connection and parallel connection of battery modules

Definition statement

This place covers:

The battery is switched between series and parallel connection in order to achieve a desired performance.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Parallel/serial switching for batteries per se | H02J 7/0024 |
|--|-----------------------------|

B60L 58/20

having different nominal voltages

Definition statement

This place covers:

The interaction of batteries with different voltages, e.g. traction battery and axillary battery.

B60L 58/21

having the same nominal voltage

Definition statement

This place covers:

Methods and means to control battery sets having the same nominal voltage.

B60L 58/22

Balancing the charge of battery modules

Definition statement

This place covers:

Methods or means to equalise the charge state or voltage of a group of battery cells to increase capacity and life span of the battery.

B60L 58/24

for controlling the temperature of batteries

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Controlling the temperature of accumulators in general | H01M 10/60 |
| Controlling the temperature of accumulators of vehicles in general | H01M 10/625 |

B60L 58/25**by controlling the electric load****Definition statement**

This place covers:

The control of the electric loads is influenced in order to control the battery temperature, e.g. by restricting the maximum drive power or by cutting of auxiliary drives.

B60L 58/30**for monitoring or controlling fuel cells****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--------------------------------------|------------------------------|
| Controlling of fuel cells in general | H01M 8/04298 |
|--------------------------------------|------------------------------|

B60L 58/31**for starting of fuel cells****Definition statement**

This place covers:

Powering up an electric vehicle using the start of the fuel cell including the fuel cell itself.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|------------------------------|
| Arrangements for starting of fuel cells in general | H01M 8/04225 |
| Starting of fuel cells in general | H01M 8/04302 |

B60L 58/32**for controlling the temperature of fuel cells, e.g. by controlling the electric load****Definition statement**

This place covers:

Control is affected upon the fuel cell temperature. For example, the control of the electric loads is influenced in order to control the fuel cell temperature, e.g. by restricting the maximum drive power or by cutting of auxiliary drives.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

| | |
|--|-----------------------------|
| Detection of temperature for controlling fuel cells in general | H01M 8/0432 |
|--|-----------------------------|

| | |
|--|------------------------------|
| Controlling the temperature of fuel cells in general | H01M 8/04701 |
|--|------------------------------|