

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 B60D1/62 ; electric heating for vehicles B60H; transmitting drive from electric motors to ultimate propulsive elements in vehicles B60K; disposition of electric propulsion equipment, other than current collectors, in vehicles B60K; auxiliary generator drives on vehicles B60K; lighting for vehicles B60Q; vehicle brake control systems in general B60T; preventing wheel slip by reducing power in rail vehicles B61C; railway track circuits in general B61L; lighting in general F21; H05B; switches in general H01H; coupling devices for electric connections in general H01R; dynamo-electric machines H02K; electric converters H02M; starting, controlling, braking of electric machines or converters in general H02P; electric heating in general H05B)

Definition statement

This subclass/group 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.

Relationship between large subject matter areas

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 therefore;

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;

Rider propulsion of wheeled vehicles is covered in subclass [B62M](#).
Construction of Cycles per se [B62K](#);

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](#);

Starting, controlling, braking of electric machines per se are covered in [H02P](#), converters in general are covered in [H02M](#) and the construction of dynamo-electric machines is covered in [H02K](#);

Electric heating for vehicles is covered in [B60H](#) and electric heating per se is covered in [H05B](#);

Lighting for vehicles is covered in [B60Q](#) and lighting in general in F21 and [H05B](#);

Vehicle brake control systems in general [B60T](#)

As for rail bound systems railway track circuits in general are covered in [B61L](#), overhead power lines in [B60M](#) and preventing wheel slip by reducing power in rail vehicles is covered in [B61C](#);

Coupling devices for electric connections in general are covered in [H01R](#), switches in [H01H](#) and electric converters in [H02M](#).

References relevant to classification in this group

This subclass/group does not cover:

Motor driven wheel chairs	A61G 5/04
Electric coupling devices combined with mechanical couplings of vehicles	B60D 1/62
Construction of electrically-powered cycles	B62M 6/40
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 6/00
Arrangements or mounting of electric gearing in vehicles	B60K 17/12 , B60K 17/14
Arrangement of signalling or lighting devices, the mounting or supporting thereof or circuits therefore, for vehicles in general	B60Q
Power-driven ground-engaging fittings for manoeuvring the vehicle	B60S 9/205
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	B60W 20/00

internal combustion motors, all used for propulsion of the vehicle	
Construction of electrically-powered cycles	B62M 6/40
Construction of dynamo-electric brakes	H02K 49/00
Starting, controlling, braking of electric machines or converters in general	H02P

Informative references

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

Auxiliary drives on vehicles	B60K 25/00
Power supply lines for supplying power to electrically-propelled vehicles	B60M
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
Lighting in general	F21, H05B
Switches in general	H01H
Coupling devices for electric connections in general	H01R
Conversion of electric power	H02M
Electric heating in general	H05B

Special rules of classification within this group

- "vehicle" means 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 to B64.

Thus, the term "vehicle" includes:

- 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](#) embrace 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](#) embraces the connection of valves to inflatable elastic bodies in general, and in this respect it is not limited to vehicles
- Subclass [B60L](#) embraces certain electric equipment of all electrically-propelled vehicles
- Subclass [B60M](#) embraces certain power supply for, but external to, any kind of electrically-propelled vehicle
- Subclass [B60R](#) embraces 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](#) includes brake control systems of general applicability, and in this respect it is not limited to vehicles. It also includes rail-vehicle power-brake systems and some other features of rail-vehicle brake systems

Glossary of terms

In this subclass/group, 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
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	<p>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.</p>
Dynamo-electric braking system	<p>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.</p>
Electric vehicle	<p>Vehicles propelled by electric motors, these motors being mechanically connected to the drive wheels. This includes also vehicles with engine driven generators sometimes referred to as serial hybrid vehicles</p>
Hybrid vehicle	<p>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.</p>
Plug in Hybrid	<p>Hybrid vehicle which utilizes</p>

	rechargeable batteries that can be restored to full charge by connecting a plug or other connection means to an external electric power source
Range extender	Devices to extend the range of an electric vehicles supplied by a traction battery. Most of the time the term refers to a engine driven generator. It can however also refer to fuel cells or additional energy storage for electrical energy. Range extender 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
AC motor	Motor driven by ac
AC generator	Generator providing ac
DC motor	Motor driven by dc
DC generator	Generator providing dc

Synonyms and Keywords

In patent documents the following abbreviates are often used :

Maglev	Magnetic levitation vehicle
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B60L 1/00

Supplying electric power to auxiliary equipment of vehicles (circuit arrangements for charging batteries H02J7/00))

Informative references

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

Electric circuits for cars in general	B60R 1/16
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Lighting in general	F21, H05B
Circuit arrangements for charging batteries	H02J 7/00
Installations of electric cables or lines in vehicles	H02G 3/00

Special rules of classification within this group

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

B60L 1/003

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

Definition statement

This subclass/group 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.

Informative references

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

Control of vans in cars	B60H 1/00828
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B60L 1/00E

to power outlets

Definition statement

This subclass/group 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 relevant to classification in this group

This subclass/group does not cover:

Sockets for charging electrical vehicles	B60L 11/1818
Providing electrical energy to the grid (V4G)	B60L 11/1842

B60L 1/02

to electric heating circuits

Definition statement

This subclass/group covers:

The provision electric energy for the climatisation for electric cars. Climatisation covers heating, cooling and ventilation.

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 batteries per se	H01M 10/50
Heating or cooling of trains	B61D 27/00

Special rules of classification within this group

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 subclass/group 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 subclass/group 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 subclass/group 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 subclass/group covers:

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

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 subclass/group covers:
Vehicles supplied by overhead contact lines.

B60L 1/20

[N: Energy regeneration from auxiliary equipment]

Definition statement

This subclass/group 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, power consumption (measuring in general G01)

Definition statement

This subclass/group 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.

Relationship between large subject matter areas

Measuring in general G01

Emergency protective circuit arrangements [H02H](#)

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
Safety arrangements with redundant control systems	G05B 9/03
Testing dynamo electric machines in operation	G01R 31/343
Sound generating devices	G10K 15/02

B60L 3/0007

[N: Measures or means for preventing or attenuating collisions]

Definition statement

This subclass/group 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.

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
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B60L 3/0015

[N: Prevention of collisions]

Definition statement

This subclass/group covers:

Methods and devices for preventing crashes or collisions.

B60L 3/0023

[N: Detecting, eliminating, remedying or compensating for drive train abnormalities, e.g. failures within the drive train]

Definition statement

This subclass/group covers:

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

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 31/025
Testing dynamo electric machines in operation	G01R 31/343
Avoiding failure by redundant parts	B60W 50/02C1

B60L 3/003

[N: relating to inverters]

Definition statement

This subclass/group covers:

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

B60L 3/0038

[N: relating to sensors]

Definition statement

This subclass/group 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

[N: relating to electric energy storage systems, e.g. batteries or capacitors]

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Monitoring the Battery	B60L 11/1851
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Informative references

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

Safety and protective circuits for charging batteries	H02J 7/0026
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B60L 3/0053

[N: relating to fuel cells]

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Monitoring or controlling fuel cells in electric vehicles	B60L 11/1881
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B60L 3/0061

[N: relating to electrical machines]

Definition statement

This subclass/group covers:

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

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
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B60L 3/0069

[N: relating to the isolation, e.g. ground fault or leak current]

Definition statement

This subclass/group covers:

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

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 31/025
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B60L 3/0076

[N: relating to braking]

Definition statement

This subclass/group covers:

Methods and devices for detecting or overcoming abnormalities associated with brakes

B60L 3/0084

relating to control modules

Definition statement

This subclass/group covers:

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

B60L 3/0092

[N: with use of redundant elements for safety purposes]

Definition statement

This subclass/group 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.

Informative references

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

Avoiding failure by redundant parts	B60W 50/02C1
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B60L 3/02

Dead-man`s devices

Definition statement

This subclass/group covers:

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

B60L 3/04

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

Definition statement

This subclass/group 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

Relationship between large subject matter areas

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; [N: Correction of wheel slip]

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
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B60L 3/104

[N: by indirect measurement of vehicle speed]

Definition statement

This subclass/group 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

[N: for maintaining or recovering the adhesion of the drive wheels]

Definition statement

This subclass/group covers:

Traction control systems

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
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Synonyms and Keywords

In patent documents the following abbreviates are often used :

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

B60L 3/108

[N: whilst braking , i.e. ABS]

Definition statement

This subclass/group 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.

Informative references

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

ABS per se	B60T 8/00
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Synonyms and Keywords

In patent documents the following abbreviates are often used :

Gleitschutz	German synonym for ABS used only in connection with trains
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B60L 3/12

Recording operating variables; [N: Monitoring of operating variables]

Definition statement

This subclass/group 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 H01R41/00)

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
Current collectors in general, e.g. non-rotary current collectors	H01R 41/00
Power supply lines for electrically propelled vehicles	B60M

B60L 5/04

using rollers or sliding shoes in contact with trolley wire (B60L5/40 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

Current collectors for collecting current from lines in slotted conduits	B60L 5/40
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B60L 5/16

Devices for lifting and resetting the collector (B60L5/34 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

Current collectors with devices to enable one vehicle to pass another one using the same power supply line	B60L 5/34
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B60L 5/38

for collecting current from conductor rails (B60L5/40 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

Current collectors for collecting current from lines in slotted conduits	B60L 5/40
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B60L 5/39

from third rail

Definition statement

This subclass/group 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 subclass/group covers:

Intermittent electrical power transfer to vehicle in motion.

References relevant to classification in this group

This subclass/group does not cover:

Charging stations for electric vehicles when not moving	B60L 11/1809
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B60L 7/00

Electrodynamic brake systems for vehicles in general

Definition statement

This subclass/group 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.

Informative references

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

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

B60L 7/003

[N: Dynamic electric braking by short circuiting the motor]

Definition statement

This subclass/group covers:

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

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 abbreviates are often used :

Kurzschlussbremsen	German synonym
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B60L 7/006

[N: Dynamic electric braking by reversing current, i.e. plugging]

Definition statement

This subclass/group 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 abbreviates are often used :

Gegenstrombremsen	German
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B60L 7/02

Dynamic electric resistor braking (takes B60L7/22 precedence)

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Dynamic electric resistor braking combined with dynamic electric regenerative braking	B60L 7/22
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B60L 7/04

for vehicles propelled by dc motors

Definition statement

This subclass/group covers:

Vehicles propelled by motors driven by a dc current

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
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B60L 7/06

for vehicles propelled by ac motors

Definition statement

This subclass/group covers:

Vehicles propelled by motors driven by a ac current

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
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B60L 7/08

Controlling the braking effect (B60L7/04, B60L7/06 take precedence)

References relevant to classification in this group

This subclass/group 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 (B60L7/22 takes precedence)

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Dynamic electric resistor braking combined with dynamic electric regenerative braking	B60L 7/22
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B60L 7/12

for vehicles propelled by dc motors

Definition statement

This subclass/group covers:

Vehicles propelled by motors driven by a dc current

B60L 7/14

for vehicles propelled by ac motors

Definition statement

This subclass/group covers:

Vehicles propelled by motors driven by a ac current

B60L 7/18

Controlling the braking effect

References relevant to classification in this group

This subclass/group 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
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B60L 7/20

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

Definition statement

This subclass/group 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 subclass/group 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 7/24

with additional mechanical or electromagnetic braking

Informative references

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

Electro-magnetic brakes	F16D 65/14D6D
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B60L 7/26

Controlling the braking effect

Informative references

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

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

Synonyms and Keywords

In patent documents the following abbreviates are often used :

Retarders	regenerating braking in electric vehicles seem to be interpreted as retarders in B60T 13/586
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B60L 7/28

Eddy-current braking

Definition statement

This subclass/group covers:

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

Glossary of terms

In this subclass/group, 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. Opposing magnetic fields create force that reduces the vehicle velocity. The heat created by the current due to the resistance of the metal causes dissipates energy in form of heat.
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B60L 8/00

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

Definition statement

This subclass/group 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 relevant to classification in this group

This subclass/group does not cover:

Supplying electric power to auxiliary equipment of electric vehicles	B60L 1/00
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Informative references

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

Arrangements in connection with power supply from force of nature	B60K 16/00
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B60L 8/003

[N: Converting light into electric energy, e.g. by using photo-voltaic systems]

Definition statement

This subclass/group covers:

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

Informative references

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

Solar cells per se	H01L 31/00
Components or accessories specially adapted for PV modules	H02S 40/00

B60L 8/006

[N: Converting flow of air into electric energy, e.g. by using wind turbines]

Definition statement

This subclass/group covers:

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

Informative references

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

Wind motors per se	F03D
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B60L 9/00

Electric propulsion with power supply external to vehicle
(B60L8/00, B60L13/00 take precedence)

Definition statement

This subclass/group 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 relevant to classification in this group

This subclass/group does not cover:

Electric propulsion with power supply from force of nature	B60L 8/00
Electric vehicles using electrical cells in combination with power lines	B60L 11/1801
Magnetic suspension or levitation	B60L 13/04

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 subclass/group, the following terms (or expressions) are used with the meaning indicated:

Metadyne	Special form of a rotary converter with three or more brushes
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B60L 9/16

using ac induction motors

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Asynchronous motor	Induction motor
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B60L 11/00

Electric propulsion with power supplied within the vehicle (B60L8/00, B60L13/00 take precedence; arrangements or mounting of plural diverse prime-movers for mutual or common propulsion B60K6/20; control systems specially adapted for hybrid vehicles B60W20/00)

Definition statement

This subclass/group 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, stored in electrical cells like batteries or fuel cells or converted from mechanically stored energy. This subgroup also covers electric vehicles that use auxiliary electric power supplies like capacitors

References relevant to classification in this group

This subclass/group does not cover:

Electric propulsion with power supply from force of nature	B60L 8/00
Magnetic suspension or levitation	B60L 13/04
Arrangements or mounting of plural diverse prime-movers for mutual or common propulsion	B60K 6/20

Control systems specially adapted for hybrid vehicles if propulsion other than electric is used to drive the wheels	B60W 20/00
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Informative references

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

Electrically-driven model locomotives	A63H 19/10
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B60L 11/002

using power supply means other than engine driven generators, electrical or fuel-cells

Definition statement

This subclass/group covers:

Electric vehicles using electrical energy provided by sources not covered by [B60L 11/02](#), 60L11/16 or [B60L 11/18](#) and the respective sub-groups; e.g. gas turbine driven generators, radioisotope thermoelectric generators (RTG) or energy converted from energy stored pneumatically or hydraulically.

References relevant to classification in this group

This subclass/group does not cover:

Electrical energy stored in capacitors	B6M11/00B2
Electrical energy generated by humans	B6M11/00B4

B60L 11/005

[N: using capacitors]

Definition statement

This subclass/group covers:

Electric vehicles using capacitors in addition to other sources of electrical energy e.g. to accommodate short term power fluctuations

Special rules of classification within this group

This class covers only vehicles using capacitors explicitly to provide propulsion energy.

B60L 11/007

[N: using auxiliary power supplied by humans]

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Construction of electrically-powered cycles	B62M 6/40
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B60L 11/02

using engine-driven generators

Definition statement

This subclass/group covers:

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

Informative references

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

The control of combustion engines is covered in	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

Vehicles with additional power supply	B60L 11/123
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Special rules of classification within this group

The attribution of motors and generators of being ac or dc is according to the form of the current used in the motor or generator

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Electric vehicle	Vehicles propelled by electric motors, these motors being mechanically connected to the drive wheels. This includes 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 wheel , e.g. electrical and internal combustion motors, and that are either singularly or in combination used for propulsion of the vehicle.
AC motor	Motor driven by ac
AC generator	Generator providing ac
DC motor	Motor driven by dc
DC generator	Generator providing dc

B60L 11/12

with additional electric power supply, e.g. accumulator

B60L 11/123

[N: using range extenders, e. g. series hybrid vehicles]

Definition statement

This subclass/group covers:

Electric vehicles using a range extender to increase the operating range of the battery, e.g. series hybrid vehicles.

References relevant to classification in this group

This subclass/group does not cover:

Electric vehicles using a engine driven generator as only power supply e.g. diesel- electric locomotives.	B60L 11/02
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Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Electric vehicle	Vehicles propelled by electric motors, these motors being mechanically connected to the drive wheels. This includes 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 wheel , e.g. electrical and internal combustion motors, and that are either singularly or in combination used for propulsion of the vehicle.
Range extender	Devices to extend the range of an electric vehicles supplied by a traction battery. Most of the time the term refers to a engine driven generator. It can however also refer to fuel cells or additional energy storage for electrical energy.

B60L 11/126

[N: the range extender having low power output with respect

to maximum power output of the vehicle]

Definition statement

This subclass/group covers:

The engine driven generator provides not enough power to supply the maximum output power of the vehicle. If only supplied by the range extender this kind of vehicle has a reduced power output.

B60L 11/14

with provision for direct mechanical propulsion

Definition statement

This subclass/group covers:

Vehicles where under certain conditions power from the engine is directly delivered to the wheels.

References relevant to classification in this group

This subclass/group does not cover:

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 within this group

Parallel classification in [B60L 11/1809](#) if aspects of charging are concerned (e.g. plug in hybrid), in [B60L 11/1851](#) if battery related problems are concerned and [B60L 11/1881](#) if fuel cell related aspects are covered.

B60L 11/16

using power stored mechanically, e.g. in fly-wheel

Definition statement

This subclass/group covers:

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

B60L 11/18

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

References relevant to classification in this group

This subclass/group does not cover:

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

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Primary cell	Electrochemical generators in which the cell energy is present in chemical form and is not regenerated
Secondary cell	Accumulator receiving and supplying electrical energy by means of reversible electrochemical reactions
Fuel cells	Electrochemical generators wherein the reactants are supplied from outside

Synonyms and Keywords

In patent documents the following abbreviations are often used :

Battery	In the field of vehicles the general term for energy sources is battery. However these kind of batteries are
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	almost exclusively rechargeable.
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B60L 11/1801

combined with an external power supply

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Charging electric vehicles	B60L 11/1809
Vehicles powered exclusively by external power supply	B60L 9/00R

B60L 11/1803

[N: for vehicles propelled by ac-motors]

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Vehicles with additional external power supply	B60L 11/1801
Vehicles powered by fuel cells	B60L 11/1881

B60L 11/1805

[N: for vehicles propelled by dc-motors]

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Vehicles with additional external power supply	B60L 11/1801
Vehicles powered by fuel cells	B60L 11/1881

B60L 11/1809

[N: Charging electric vehicles]

Definition statement

This subclass/group 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.

References relevant to classification in this group

This subclass/group does not cover:

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
Charging Batteries per se	H02J 7/00
Power conversion systems per se	H02M
Connectors per se	H02R
Arrangements for secret or secure communication	H04L 9/00

Informative references

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

Inductive coupling	H01F 38/14
Optimisation of energy with GPS or similar systems	B60L 15/2045

Special rules of classification within this group

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

B60L 11/1811

[N: using converters]

Definition statement

This subclass/group covers:

Measures and means for charging or discharging electric vehicles

distinguished by the use of converters.

B60L 11/1812

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

Definition statement

This subclass/group covers:

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

Informative references

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

Converters and inverters per se	H02M/00
Converters and inverters for vehicle drive trains	B60L 15/007

B60L 11/1814

[N: the vehicle's propulsion converter is used for charging]

Definition statement

This subclass/group covers:

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

B60L 11/1816

[N: by conductive energy transfer, e.g. connectors]

Definition statement

This subclass/group covers:

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 relevant to classification in this group

This subclass/group does not cover:

Current collectors	B60L 5/00
Charging stations	B60L 11/1824
Connectors per se	H01R
Installation of electric cables in vehicles	H02G 3/00

Synonyms and Keywords

In patent documents the following abbreviates are often used :

Pilot	Wire used for communication
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B60L 11/1818

[N: Adaptations of plugs or sockets for charging electric vehicles]

Definition statement

This subclass/group covers:

Plugs and sockets for charging electrical vehicles only in so far as specially adapted for charging or discharging electric vehicles.

B60L 11/182

[N: by inductive energy transfer]

Definition statement

This subclass/group covers:

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.

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
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Inductive couplings	H01F 38/14
Circuit arrangements for charging batteries from ac-mains using non-contact coupling, e.g. inductive, capacitive	H02J 7/025
Inductive nearfield transmission for power transfer	H04B 5/0037

B60L 11/1822

[N: by exchange of energy storage elements, e.g. removable batteries]

Definition statement

This subclass/group covers:

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.

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
Cells working by exchange of electrolyte e.g. redox cells	H01M 8/20

B60L 11/1824

[N: Details of charging stations, e.g. vehicle recognition or billing (B60L11/1811, B60L11/182, B60L11/1822 take precedence)]

Definition statement

This subclass/group covers:

Charging stations for electric vehicles and their interaction/communication

with the vehicle as well 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 relevant to classification in this group

This subclass/group does not cover:

Conductive energy transfer	B60L 11/1811
Inductive energy transfer	B60L 11/182
Exchange of energy storage elements	B60L 11/1822
Building structures for parking	E04H6
Circuits for charging batteries per se, e.g. for batteries removed from the vehicle	H02J 7/00
Arrangements for secret or secure communication	H04L 9/00

Informative references

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

Power lines of special types for vehicles using stored power	B60M 7/003
Optimisation of energy and GPS or similar system	B60L 15/20
Vending machines other than coins	G07F 7/00
Coin-freed apparatus with meter-controlled dispensing electricity	G07F 15/003
Arrangements for road pricing	G07B 15/00
Traffic control systems for road vehicles	G08G 1/00
Automatic parking traffic control	G08G 1/065

systems	
Fleet management	G08G 1/123M
Charging stations for mobile units	H02J 7/0027
Using battery charging as network buffer	H02J 7/34

B60L 11/1825

[N: Charging columns for electric vehicles]

Definition statement

This subclass/group 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 11/1827

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

Definition statement

This subclass/group covers:

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

B60L 11/1829

[N: for inductive energy transfer]

Definition statement

This subclass/group covers:

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

Informative references

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

Inductive charging of electric vehicles per see	B60L 11/182
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Special rules of classification within this group

If the vehicle is positioned the document should also be classified in [B60L 11/18LC4](#)

B60L 11/1831

[N: with position related activation of primary coils]

Definition statement

This subclass/group 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 within this group

If the primary coil are distributed along the road documents should also be classified in [B60L 11/1837](#).

Synonyms and Keywords

In patent documents the following abbreviates 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 11/1833

[N: the vehicle being positioned]

Definition statement

This subclass/group covers:

The vehicles 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 11/1835

[N: with optical position determination, e.g. by a camera]

Definition statement

This subclass/group covers:

The position of the car is determined optically.

B60L 11/1838

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

Definition statement

This subclass/group 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.

Informative references

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

Data exchange for battery identification	H02J 7/0004
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B60L 11/184

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

Definition statement

This subclass/group covers:

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

B60L 11/1842

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

Definition statement

This subclass/group covers:

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

Informative references

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

Arrangements for balancing of the load in a network by storage of energy using batteries with converting means in general	H02J 3/32
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B60L 11/1844

[N: the charging being dependent on network capabilities]

Definition statement

This subclass/group 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 11/1846

[N: Identification of the vehicle]

Definition statement

This subclass/group covers:

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

B60L 11/18L710

[N: Methods related to measuring, billing or payment]

Definition statement

This subclass/group covers:

Methods for measuring energy transferred to and from the vehicle;
Registration, billing and payment associated with the transfer of energy.

B60L 11/18L712

[N: Fast charging]

Definition statement

This subclass/group covers:

Methods for charging vehicles considerably faster than normal charge e.g. less than 30 minutes.

B60L 11/1851

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

Definition statement

This subclass/group covers:

Monitoring the batteries includes the operating state of the batteries as well as controlling the drive in dependence of the detected variables. The term "batteries" is used as well for accumulators.

References relevant to classification in this group

This subclass/group does not cover:

Electric vehicles with fuel cells and batteries	B60L 11/1887
Charging or depolarising batteries	H02J/00

Informative references

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

Monitoring and indicating circuits	H02J 7/0021
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Synonyms and Keywords

In patent documents the following abbreviations are often used:

Battery	The term battery in the field of electric vehicles is to be seen as generic covering primary and secondary electrical cells
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B60L 11/1853

[N: by battery splitting]

Definition statement

This subclass/group 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.

B60L 11/1855

[N: by series/parallel switching]

Definition statement

This subclass/group covers:

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

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
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B60L 11/1857

[N: Battery age determination]

Definition statement

This subclass/group covers:

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

B60L 11/1859

[N: Preventing deep discharging]

Definition statement

This subclass/group covers:

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

B60L 11/1861

[N: Monitoring or controlling state of charge (SOC)]

Definition statement

This subclass/group covers:

The state of charge of the battery is determined and influences the control of the vehicle.

Informative references

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

Indicating measured values, displays	G01D
Testing/monitoring SOC	G01R 31/36M
Testing electrical conditions of batteries	G01R 31/3634

Synonyms and Keywords

In patent documents the following abbreviations are often used:

SOC	State of charge
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B60L 11/1862

[N: Target range for state of charge (SOC)]

Definition statement

This subclass/group covers:

The control of the electric vehicle is required to keep the SOC within particular range or window e.g. between 30% and 70%; e.g. to increase the live span of the battery.

B60L 11/1864

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

Definition statement

This subclass/group covers:

Methods and means to control battery sets

B60L 11/1866

[N: Balancing the charge of multiple batteries or cells]

Definition statement

This subclass/group covers:

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

B60L 11/1868

[N: Controlling two or more batteries with different voltages]

Definition statement

This subclass/group covers:

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

B60L 11/187

[N: Battery temperature regulation]

Definition statement

This subclass/group covers:

Control is affected upon the battery temperature

B60L 11/1872

[N: by control of electric loads]

Definition statement

This subclass/group 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 11/1877

[N: Arrangements of batteries]

Definition statement

This subclass/group covers:

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

B60L 11/1881

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

Definition statement

This subclass/group covers:

Electric vehicles using fuel cells

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 e.g. Redox cells	H01M 8/20
Grouping of fuel cells into batteries	H01M 8/24

B60L 11/1883

[N: Details of fuel cells]

Definition statement

This subclass/group covers:

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

Informative references

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

Fuel cells per se	H01M 8/00
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B60L 11/1885

[N: Starting of fuel cells]

Definition statement

This subclass/group covers:

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

B60L 11/1887

[N: combined with battery control]

Definition statement

This subclass/group covers:

Control of a fuel cell and of a battery

B60L 11/1888

[N: Fuel cell temperature regulation]

Definition statement

This subclass/group covers:

Control is affected upon the battery temperature.

B60L 11/189

[N: by control of electric loads]

Definition statement

This subclass/group covers:

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.

B60L 11/1896

[N: Arrangements of the fuel cells]

Definition statement

This subclass/group covers:

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

B60L 13/00

Electric propulsion for monorail vehicles, suspension vehicles or rack railways; Magnetic suspension or levitation for vehicles ([N: tracks for Maglev-type trains E01B25/00B;] electromagnets per se H01F7/06; linear motors per se H02K41/00)

References relevant to classification in this subclass

This subclass/group does not cover:

Tracks for magnetic suspension or levitation vehicles	E01B 25/30
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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 subclass/group, 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
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Rack railway	Railway with a toothed rack rail, usually between the running rails
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Synonyms and Keywords

In patent documents the following expressions/words "rack railway", "rack-and-pinion railway" and "cog railway" are often used as synonyms.

B60L 13/006

[N: Electric propulsion adapted for monorail vehicles, suspension vehicles or rack railways (B60L13/03 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Electric propulsion for MagLev vehicles	B60L 13/10
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B60L 15/00

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

Definition statement

This subclass/group covers:

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

References relevant to classification in this group

This subclass/group does not cover:

Starting, controlling, braking of electric machines per se	H02P
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B60L 15/002

[N: 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 subclass/group covers:

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

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

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
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B60L 15/005

[N: for control of propulsion for vehicles propelled by linear motors]

Definition statement

This subclass/group covers:

Control for vehicles propelled by linear motors.

Informative references

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

Electric propulsion by linear motors	B60L 13/03
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B60L 15/007

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

Definition statement

This subclass/group covers:

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

Informative references

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

Converters and inverters per se	H02M/00
Converters and inverters for charging vehicles	B60L 11/1812

B60L 15/025

[N: using field orientation; Vector control; Direct Torque Control (DTC)]

Definition statement

This subclass/group 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.

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
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B60L 15/10

for automatic control superimposed on human control to limit the acceleration of the vehicle, e.g. to prevent excessive motor current

References relevant to classification in this group

This subclass/group does not cover:

Electric devices for safety purposes	B60L 3/00
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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
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B60L 15/14

with main controller driven by a servomotor (B60L15/18 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

Automatic control without contact making or breaking	B60L 15/18
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B60L 15/16

with main controller driven through a ratchet mechanism (B60L15/18 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

Automatic control without contact making or breaking	B60L 15/18
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B60L 15/20

for control of the vehicle or its driving motor to achieve a desired performance, e.g. speed, torque, programmed variation of speed

B60L 15/2009

for braking

Relationship between large subject matter areas

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

B60L 15/2018

[N: for braking on a slope]

Definition statement

This subclass/group 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.

Informative references

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

Hill holding per se	B60W 30/18118
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B60L 15/2036

[N: Electric differentials, e.g. for supporting steering of vehicles (arrangement of control devices for differential gearing B60K23/02)]

Definition statement

This subclass/group 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.

Informative references

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

Electrical power steering	B62D 5/04
Arrangement of control devices for differential gearing	B60K 23/02

B60L 15/2045

[N: for optimising the use of energy]

Definition statement

This subclass/group covers:

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

Informative references

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

Navigation based on energy use	G01C 21/3469
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B60L 15/2054

[N: by controlling transmissions or clutches]

Definition statement

This subclass/group covers:

Control is affected upon the transmission or the clutch

B60L 15/2063

[N: for creeping]

Definition statement

This subclass/group covers:

Methods emulating the creeping state of an automatic transmission.

B60L 15/2072

[N: for drive off]

Definition statement

This subclass/group covers:
Methods for accelerating the vehicle from stand still.

B60L 15/209

[N: for overtaking]

Definition statement

This subclass/group covers:
Methods facilitating the process of overtaking.

B60L 15/26

**with main controller driven through a ratchet mechanism
(B60L15/28 takes precedence)**

References relevant to classification in this group

This subclass/group does not cover:

Control without contact making or breaking	B60L 15/28
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B60L 15/32

Control or regulation of multiple-unit electrically-propelled vehicles

Definition statement

This subclass/group 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.

Informative references

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

Traction couplings	B60D 1/00
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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 B61L3/00; central rail-traffic control systems B61L27/00)

References relevant to classification in this group

This subclass/group 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 (B60L15/32 takes precedence)

References relevant to classification in this group

This subclass/group does not cover:

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