

CPC**COOPERATIVE PATENT CLASSIFICATION****B61L****GUIDING RAILWAY TRAFFIC; ENSURING THE SAFETY OF RAILWAY TRAFFIC**

(power supply lines for electrically-propelled vehicles [B60M](#); vehicle signalling in general [B60Q](#); brakes or auxiliary equipment [B61H](#), [B61K](#); point or crossing construction [E01B](#); insulated rail joints [E01B 11/54](#); optical devices in general [G02](#); controlling in general [G05](#); electric communication technique [H04](#))

B61L 1/00

Devices along the route controlled by interaction with the vehicle or vehicle train, {e.g. pedals} (detonators [B61L 5/20](#); operation of points or signals by passage of the vehicle [B61L 11/00](#), [B61L 13/00](#); central traffic control systems controlled by train [B61L 27/04](#); operation of gates, or gates and signals, by approaching vehicle [B61L 29/18](#))

- B61L 1/02 . Electric devices associated with track {e.g. rail contacts}
- B61L 1/025 .. {actuated by variation of resistance or by piezo-electricity}
- B61L 1/04 .. mechanically actuated by a part of the vehicle
- B61L 1/045 ... {actuated by fluid-pressure}
- B61L 1/06 .. actuated by deformation of rail; actuated by vibration in rail
- B61L 1/08 .. magnetically actuated; electrostatically actuated
- B61L 1/10 .. actuated by electromagnetic radiation; actuated by particle radiation
- B61L 1/12 . Electric devices associated with overhead trolley wires
- B61L 1/14 . Devices for indicating the passing of the end of the vehicle or vehicle train
- B61L 1/16 . Devices for counting axles; Devices for counting vehicles (counting moving objects in general [G06M](#))
- B61L 1/161 .. {characterised by the counting methods}
- B61L 1/162 .. {characterised by the error correction}
- B61L 1/163 .. {Detection devices}
- B61L 1/164 ... {Mechanical}
- B61L 1/165 ... {Electrical}
- B61L 1/166 ... {Optical}
- B61L 1/167 .. {Circuit details}
- B61L 1/168 .. {Specific transmission details}
- B61L 1/169 .. {Diagnosis}
- B61L 1/18 . Railway track circuits (automatically-operated track circuits specially adapted for section blocking for controlling traffic [B61L 23/00](#); rail joints [E01B 11/00](#))
- B61L 1/181 .. {Details}
- B61L 1/182 ... {Use of current of indifferent sort or a combination of different current types}
- B61L 1/183 {Use of means on the vehicle for improving short circuit e.g. in vehicles with rubber bandages}
- B61L 1/184 {Use of additional conductors for examining leakages between rails}
- B61L 1/185 ... {Use of direct current}
- B61L 1/186 ... {Use of rectified alternating current}

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| B61L 1/187 | ... | {Use of alternating current} |
| B61L 1/188 | ... | {Use of coded current} |
| B61L 1/20 | . | Safety arrangements for preventing or indicating malfunction of the device, e.g. by leakage current, by lightning {(remote indicating means for abnormal operations conditions G08B 21/00 , G08B 23/00 ; detectors for indicating the overheating of axle bearings B61K 9/00)} |
| B61L 3/00 | | Devices along the route for controlling devices on the vehicle or vehicle train, e.g. to release brake, to operate a warning signal |
| B61L 3/002 | . | {Recorders on the vehicle} |
| B61L 3/004 | . | {Memory means reproducing during the running of the vehicle or vehicle train, e.g. smart cards} |
| B61L 3/006 | . | {On-board optimisation of vehicle or vehicle train operation (track-side optimisation of operation B61L 27/0027)} |
| B61L 3/008 | . | {On-board target speed calculation or supervision (track-side control of safe travel B61L 27/0038 ; speed control circuitry B60L 3/08 ; speed control of electric drives B60L 15/20)} |
| B61L 3/02 | . | at selected places along the route, e.g. intermittent control {simultaneous mechanical and electrical control} |
| B61L 3/04 | .. | controlling mechanically {(arrangements of making elements acting directly on tread B60T 1/04)} |
| B61L 3/06 | .. | controlling by electromagnetic or particle radiation, e.g. by light beam (using radio waves B61L 3/12) |
| B61L 3/065 | ... | {controlling optically} |
| B61L 3/08 | .. | controlling electrically |
| B61L 3/10 | ... | using current passing between devices along the route and devices on the vehicle train |
| B61L 3/103 | .... | {Details of current transmitting conductors or contact brushes} |
| B61L 3/106 | .... | {with mechanically controlled electrical switch on the vehicle} |
| B61L 3/12 | ... | using magnetic or electrostatic induction; using radio waves |
| B61L 3/121 | .... | {using magnetic induction} |
| B61L 2003/122 | ..... | {German standard for inductive train protection, called "Induktive Zugsicherung"[INDUSI]} |
| B61L 2003/123 | ..... | {French standard for inductive train protection, called "Contrôle de vitesse par balises" [KVB]} |
| B61L 3/125 | .... | {using short-range radio transmission (long-range radio transmission B61L 15/0027 , B61L 27/0005)} |
| B61L 3/126 | .... | {Constructional details} |
| B61L 3/127 | .... | {for remote control of locomotives (remote control of locomotives within a train consist B61C 17/12)} |
| B61L 3/128 | .... | {for control of tilting trains by external control devices, e.g. by Eurobalise (tilting details B61F 5/22)} |
| B61L 3/14 | .. | to cut-off the power supply to traction motors of electrically-propelled vehicles |
| B61L 3/16 | . | Continuous control along the route |
| B61L 3/18 | .. | using electric current passing between devices along the route and devices on the vehicle or vehicle train |

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| B61L 3/185 | ... | {using separate conductors} |
| B61L 3/20 | ... | employing different frequencies or coded pulse groups {e.g. using currents carried by traction current (operating and signalling systems using network power supply H02J 13/00)} |
| B61L 3/22 | .. | using magnetic or electrostatic induction; using electromagnetic radiation |
| B61L 3/221 | ... | {using track circuits} |
| B61L 3/222 | .... | {Arrangements on the track only} |
| B61L 2003/223 | .... | {French cab signaling system, called "Transmission Voie-Machine" [TVM]} |
| B61L 3/225 | ... | {using separate conductors along the route} |
| B61L 2003/226 | .... | {German inductive continuous train control, called 'Linienzugbeeinflussung' [LZB]} |
| B61L 3/227 | ... | {using electromagnetic radiation} |
| B61L 2003/228 | ... | {Constructional details} |
| B61L 3/24 | ... | employing different frequencies or coded pulse groups {e.g. in combination with track circuits} |
| B61L 3/243 | .... | {using alternating current} |
| B61L 3/246 | .... | {using coded current} |
| B61L 5/00 | Local operating mechanisms for points or track-mounted scotch-blocks (track-mounted scotch-blocks per se B61K); Visible or audible signals; Local operating mechanisms for visible or audible signals (B61L 11/00 takes precedence) | |
| B61L 5/02 | . | Mechanical devices for operating points or scotch-blocks {e.g. local manual control} |
| B61L 5/023 | .. | {using funicular driving means} |
| B61L 5/026 | .. | {fixing switch-rails to the driving means} |
| B61L 5/04 | . | Fluid-pressure devices for operating points or scotch-blocks |
| B61L 5/045 | .. | {using electrically controlled fluid-pressure operated driving means} |
| B61L 5/06 | . | Electric devices for operating points or scotch-blocks {e.g. using electromotive driving means} |
| B61L 5/062 | .. | {Wiring diagrams} |
| B61L 5/065 | .. | {Construction of driving mechanism} |
| B61L 5/067 | .. | {using electromagnetic driving means} |
| B61L 5/08 | . | Underground actuating arrangements, e.g. for tramways |
| B61L 5/10 | . | Locking mechanisms for points; Means for indicating the setting of points |
| B61L 5/102 | .. | {Controlling electrically} |
| B61L 5/105 | .. | {Controlling funicularly} |
| B61L 5/107 | .. | {electrical control of points position} |
| B61L 5/12 | . | Visible signals {(signalling means on the vehicle B61L 15/00; signalling means for classification yards, or the like, with multiple indicating means B61L 17/023; signalling means for road crossings B61L 29/24; lighting in general F21; visible signalling arrangements in general G08B 5/00)} |
| B61L 5/125 | .. | {Fixed signals, beacons, or the like} |
| B61L 5/14 | .. | Form signals, e.g. semaphore arms {(illumination for points, form signals B61L 9/00)} |

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| B61L 5/16 | ... | Local operating mechanisms for form signals |
| B61L 5/161 | | {using electromotive driving means} |
| B61L 5/162 | ..... | {Wiring diagrams} |
| B61L 5/163 | ..... | {Driving mechanisms} |
| B61L 5/165 | .... | {using electromagnetic driving means} |
| B61L 5/166 | .... | {using electrically controlled gravity operated driving means} |
| B61L 5/167 | .... | {using electrically controlled fluid-pressure operated driving means} |
| B61L 5/168 | .... | {using funicular driving means} |
| B61L 5/18 | .. | Light signals; Mechanisms associated therewith, e.g. blinders |
| B61L 5/1809 | ... | {Daylight signals} |
| B61L 5/1818 | .... | {using mobile coloured screen} |
| B61L 5/1827 | .... | {using light sources of different colours and a common optical system} |
| B61L 5/1836 | .... | {using light sources of different colours and separate optical systems} |
| B61L 5/1845 | .... | {Optical systems, lenses} |
| B61L 5/1854 | .... | {Mounting and focussing of the light source in a lamp, fixing means (focussing of the light source in reflecting mirrors F21S 48/00)} |
| B61L 5/1863 | .... | {Lamp mountings on a mast} |
| B61L 5/1872 | .... | {Mobile mounting arrangements on a mast; Arrangements for hoisting of the lamp along the mast} |
| B61L 5/1881 | .... | {Wiring diagrams for power supply, control or testing} |
| B61L 5/189 | ... | {using flashing light sources (visible signalling in general using flashing light sources G08B 5/38 ; thermal switches operating intermittently H01H 61/06 , H01H 61/08)} |
| B61L 5/20 | . | Audible signals, e.g. detonator {audible signalling} |
| B61L 5/203 | .. | {Detonators; Track mounting means; Composition of the detonative product} |
| B61L 5/206 | .. | {Signalling means for special purposes} |
| B61L 5/22 | .. | Devices for initiating the release of detonators in a certain position of a signal |
| B61L 5/24 | .. | Replacement of detonators |
| B61L 7/00 | | Remote control of local operating means for points, signals, or trackmounted scotch-blocks (B61L 11/00 takes precedence; interlocking arrangements B61L 19/00; transmission per se, see the relevant classes) |
| B61L 7/02 | . | using mechanical transmission; e.g. wire, lever |
| B61L 7/021 | .. | {Driving wheels or supports for traction wires} |
| B61L 7/022 | .. | {Guiding means or supporting foundations in beton} |
| B61L 7/024 | .. | {Coupling for wires or traction bars} |
| B61L 7/025 | .. | {Bracing or compensating arrangements} |
| B61L 7/027 | .. | {Control levers} |
| B61L 7/028 | .. | {Indicating or fixing arrangements in the event of breaking or tension difference of transmission wires for points, signals or similar} |
| B61L 7/04 | . | using fluid-pressure transmitting |
| B61L 7/06 | . | using electrical transmission |

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| B61L 7/061 | .. {using electromotive driving means} |
| B61L 7/062 | ... {Wiring diagrams} |
| B61L 7/063 | ... {Construction of driving mechanism} |
| B61L 7/065 | .. {using electromagnetic driving means} |
| B61L 7/066 | .. {using electrically controlled fluid-pressure operated driving means} |
| B61L 7/067 | .. {Supply for electric safety arrangements} |
| B61L 7/068 | .. {Protection against eddy-currents, short-circuits, or the like, for electric safety arrangements} |
| B61L 7/08 | .. Circuitry |
| B61L 7/081 | ... {Direct line wire control} |
| B61L 7/083 | ... {Common line wire control using currents of different amplitudes, polarities, frequencies, or the like} |
| B61L 7/085 | ... {Common line wire control using synchronous distributors} |
| B61L 7/086 | ... {Common line wire control using relay distributors} |
| B61L 7/088 | ... {Common line wire control using series of coded pulses} |
| B61L 7/10 | ... for light signals, e.g. for supervision, back-signalling |
| B61L 7/103 | {Electric control of the setting of signals} |
| B61L 7/106 | {for form signals} |
| B61L 9/00 | Illumination specially adapted for points, form signals, or gates (lighting in general F21) |
| B61L 9/02 | . non-electric |
| B61L 9/04 | . electric |
| B61L 11/00 | Operation of points from the vehicle or by the passage of the vehicle |
| B61L 11/02 | . Using mechanical interaction between vehicle and track |
| B61L 11/04 | .. Trailable point locks |
| B61L 11/06 | .. with fluid-pressure transmission |
| B61L 11/08 | . using electrical or magnetic interaction between vehicle and track |
| B61L 11/083 | .. {Magnetic control} |
| B61L 2011/086 | .. {German radio based operations, called "Funkfahrbetrieb" [FFB]} |
| B61L 13/00 | Operation of signals from the vehicle or by the passage of the vehicle |
| B61L 13/002 | . {actuated by the passage of the vehicle} |
| B61L 13/005 | . {optically actuated} |
| B61L 13/007 | . {acoustically actuated} |
| B61L 13/02 | . using mechanical interaction between vehicle and track {(pedals B61L 1/00)} |
| B61L 13/04 | . using electrical or magnetic interaction between vehicle and track {e.g. by conductor circuits using special means or special conductors} |
| B61L 13/042 | .. {using isolated rail sections} |
| B61L 13/045 | .. {using separated rail contacts, pedals or similar (B61L 1/02 takes precedence)} |
| B61L 13/047 | .. {controlling inductively or magnetically} |

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| B61L 15/00 | Indicators provided on the vehicle or vehicle train for signalling purposes; {On-board control or communication systems} |
| B61L 15/0009 | . {wiring diagrams for start- or stop-signals on vehicles having one or more carriages and having electrical communication lines between the carriages} |
| B61L 15/0018 | . {Communication with or on the vehicle or vehicle train (line transmission systems H04B 3/00)} |
| B61L 15/0027 | .. {Radio-based, e.g. using GSM-R} |
| B61L 15/0036 | .. {Conductor-based, e.g. using CAN-Bus, train-line or optical fibres} |
| B61L 15/0045 | . {Destination indicators, identification panels or distinguishing signs on the vehicles (displaying in general G09F)} |
| B61L 15/0054 | . {Train integrity supervision, e.g. end-of-train [EOT] devices} |
| B61L 15/0063 | . {Multiple on-board control systems, e.g. "2 out of 3"-systems (trackside multiple control systems B61L 27/0061)} |
| B61L 15/0072 | . {On-board train data handling (trackside train data handling B61L 27/0077)} |
| B61L 15/0081 | . {On-board diagnosis or maintenance (trackside diagnosis or maintenance B61L 27/0083)} |
| B61L 15/009 | . {On-board display devices} |
| B61L 15/02 | . Head or tail indicators, e.g. light |
| B61L 17/00 | Switching systems for classification yards (rail brakes B61K) |
| B61L 17/02 | . Details, e.g. indicating degree of track filling |
| B61L 17/023 | .. {Signalling; Signals with multiple indicating means} |
| B61L 17/026 | .. {Brake devices} |
| B61L 19/00 | Arrangements for interlocking between points and signals by means of a single interlocking device, {e.g. central control (remote control B61L 7/00; station block arrangements B61L 21/00)} |
| B61L 19/02 | . Interlocking devices having mechanical or fluid-pressure operation |
| B61L 19/023 | .. {purely mechanical (control levers B61L 7/027)} |
| B61L 19/026 | .. {using fluid-pressure operated points or signals} |
| B61L 19/04 | .. Detail- e.g. hand lever, back-signalling device |
| B61L 19/06 | . Interlocking devices having electrical operation |
| B61L 2019/065 | .. {with electronic means} |
| B61L 19/08 | .. Special arrangements for power supply for interlocking devices |
| B61L 19/10 | .. with mechanical locks |
| B61L 19/12 | ... Details |
| B61L 19/14 | .. with electrical locks |
| B61L 19/16 | ... Details |
| B61L 21/00 | Station blocking between signal boxes in one yard (interlocking between points and signals by means of a single interlocking device B61L 19/00) |
| B61L 21/02 | . Mechanical locking and release of the route; Repeat locks; Coupling of semaphores |

- B61L 21/04 Electrical locking and release of the route; Electrical repeat locks [{\(central interlocking B61L 19/00\)}](#)
- B61L 21/06 Vehicle-on-line indication; Monitoring locking and release of the route
- B61L 21/065 [{for signals, including signals actuated by the vehicle}](#)
- B61L 21/08 Order transmission and reception arrangements for giving or withholding permission
- B61L 21/10 Arrangements for trains which are closely following one another [\(automatic central traffic control systems B61L 27/04\)](#)

- B61L 23/00 Control, warning, or like safety means along the route or between vehicles or vehicle trains**
- B61L 23/002 [{Control or safety means for heart-points and crossings of aerial railways, funicular rack-railway \(points or safety systems for model railways A63H; points, crossings or hearts for aerial railway, funicular rack railway E01B 25/12\)}](#)
- B61L 23/005 [{Automatic control or safety means for points for operator-less railway, e.g. transportation systems}](#)
- B61L 23/007 [{Safety arrangements on railway crossings}](#)
- B61L 23/02 for indicating along the route the failure of brakes
- B61L 23/04 for monitoring the mechanical state of the route
- B61L 23/041 [{Obstacle detection}](#)
- B61L 23/042 [{Track changes detection}](#)
- B61L 23/044 [{Broken rails}](#)
- B61L 23/045 [{Rail wear}](#)
- B61L 23/047 [{Track or rail movements}](#)
- B61L 23/048 [{Road bed changes, e.g. road bed erosion}](#)
- B61L 23/06 for warning men working on the route
- B61L 23/08 for controlling traffic in one direction only [\(station blocking between signal boxes in one yard B61L 21/00\)](#)
- B61L 23/10 manually operated [{e.g. block arrangements}](#)
- B61L 23/12 partly operated by train
- B61L 23/14 automatically operated
- B61L 23/16 Track circuits specially adapted for section blocking
- B61L 23/161 [{using current of indifferent sorte or a combination of different current types}](#)
- B61L 23/163 [{using direct current}](#)
- B61L 23/165 [{using rectified alternating current}](#)
- B61L 23/166 [{using alternating current}](#)
- B61L 23/168 [{using coded current}](#)
- B61L 23/18 specially adapted for changing lengths of track sections in dependence upon speed and traffic density
- B61L 23/20 with transmission of instructions to stations along the route
- B61L 23/22 for controlling traffic in two directions over the same pair of rails [\(station blocking between signal boxes in one yard B61L 21/00\)](#)
- B61L 23/24 using token systems, e.g. train staffs, tablets
- B61L 23/26 with means for actuating signals from the vehicle or by passage of the vehicle

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| B61L 23/28 | .. using non-automatic blocking from a place along the route |
| B61L 23/30 | .. using automatic section blocking |
| B61L 23/32 | ... with provision for the blocking or passing sidings |
| B61L 23/34 | . Control, warnings or like safety means indicating the distance between vehicles or vehicle trains by the transmission of signals therebetween |
| B61L 25/00 | Recording or indicating positions or identities of vehicles or vehicle trains or setting of track apparatus |
| B61L 25/02 | . Indicating or recording positions or identities of vehicles or vehicle trains |
| B61L 25/021 | .. {Measuring and recording of train speed} |
| B61L 25/023 | .. {Determination of driving direction of vehicle or vehicle train} |
| B61L 25/025 | .. {Absolute localisation, e.g. providing geodetic coordinates} |
| B61L 25/026 | .. {Relative localisation, e.g. using odometer} |
| B61L 25/028 | .. {Determination of vehicle position and orientation within a train consist, e.g. serialisation} |
| B61L 25/04 | .. Indicating or recording train identities |
| B61L 25/041 | ... {using reflecting tags} |
| B61L 25/043 | ... {using inductive tags} |
| B61L 25/045 | ... {using reradiating tags} |
| B61L 25/046 | ... {using magnetic tags} |
| B61L 25/048 | ... {using programmable tags} |
| B61L 25/06 | . Indicating or recording the setting of track apparatus, e.g. of points, of signals |
| B61L 25/065 | .. {for signalling systems on the vehicle using current conduction} |
| B61L 25/08 | .. Diagrammatic displays |
| B61L 27/00 | Central traffic control systems; {Track-side control or specific communication systems} |
| B61L 27/0005 | . {Details of track-side communication} |
| B61L 27/0011 | . {Regulation, e.g. scheduling, time tables} |
| B61L 27/0016 | .. {Preparing schedules} |
| B61L 27/0022 | .. {Following schedules} |
| B61L 27/0027 | .. {Track-side optimisation of vehicle or vehicle train operation (on-board optimisation B61L 3/006)} |
| B61L 27/0033 | .. {Crew rosters and itineraries} |
| B61L 27/0038 | . {Track-side control of safe travel of vehicle or vehicle train, e.g. braking curve calculation (on-board target speed calculation and supervision B61L 3/008)} |
| B61L 2027/0044 | .. {using European Train Control System [ETCS]} |
| B61L 2027/005 | .. {using Communication-based Train Control [CBTC]} |
| B61L 27/0055 | . {Testing or simulation} |
| B61L 27/0061 | . {Track-side multiple control systems, e.g. switch-over between different systems, "2 out of 3"-systems (on-board multiple control systems B61L 15/0063)} |
| B61L 27/0066 | .. {Backup systems, e.g. switching when failures occur} |
| B61L 27/0072 | .. {Migration, e.g. parallel installations running simultaneously} |

- B61L 27/0077 . {Track-side train data handling, e.g. vehicle or vehicle train data, position reports (on-board train data handling [B61L 15/0072](#))}
- B61L 27/0083 . {Track-side diagnosis or maintenance, e.g. software upgrades (on-board diagnosis or maintenance [B61L 15/0081](#))}
- B61L 27/0088 .. {for track-side elements or systems, e.g. trackside supervision of trackside control system conditions}
- B61L 27/0094 .. {for vehicles or vehicle trains, e.g. trackside supervision of train conditions}
- B61L 27/02 . Manual systems
- B61L 27/04 . Automatic systems, e.g. controlled by train; Change-over to manual control

B61L 29/00**Safety means for rail/road crossing traffic**

- B61L 29/02 . Guards or obstacles for preventing access to the route (cattle guards connected to the permanent way [E01B 17/00](#))
- B61L 29/023 .. {Special gates}
- B61L 29/026 ... {Preventing access by means of obstacles raising across the route}
- B61L 29/04 . Gates for level crossings
- B61L 29/06 .. yielding to vehicles in one direction but operated in a different direction
- B61L 29/08 . Operation of gates; Combined operation of gates and signals
- B61L 29/10 .. Means for securing gates in their desired position
- B61L 29/12 .. Manual operation
- B61L 29/14 ... mechanically
- B61L 29/16 ... electrically
- B61L 29/18 .. Operation by approaching rail vehicle or rail vehicle train
- B61L 29/20 ... mechanically
- B61L 29/22 ... electrically
- B61L 29/222 {using conductor circuits with separate contacts or conductors}
- B61L 29/224 {using rail contacts}
- B61L 29/226 {using track-circuits, closed or short-circuited by train or using isolated rail-sections}
- B61L 29/228 {using optical means}
- B61L 29/24 . Means for warning road traffic that a gate is closed or closing, or that rail traffic is approaching, e.g. for visible or audible warning
- B61L 29/243 .. {Transmission mechanism or acoustical signals for gates}
- B61L 29/246 .. {Signals or brake- or lighting devices mounted on the road vehicle and controlled from the vehicle train}
- B61L 29/26 .. mechanically operated
- B61L 29/28 .. electrically operated
- B61L 29/282 ... {magnetic or inductive control by the vehicle}
- B61L 29/284 ... {using rail-contacts, rail microphones, or the like, controlled by the vehicle}
- B61L 29/286 ... {using conductor circuits controlled by the vehicle}
- B61L 29/288 ... {Wiring diagram of the signal control circuits}
- B61L 29/30 ... Supervision, e.g. monitoring arrangements

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| B61L 29/32 | . . . Timing, e.g. advance warning of approaching train |
| B61L 99/00 | Subject matter not provided for in other groups of this subclass |
| B61L 2201/00 | Control methods |
| B61L 2201/02 | . Fuzzy control |
| B61L 2205/00 | Communication or navigation systems for railway traffic |
| B61L 2205/02 | . Global system for mobile communication - railways (GSM-R) |
| B61L 2205/04 | . Satellite based navigation systems, e.g. GPS |
| B61L 2207/00 | Features of light signals |
| B61L 2207/02 | . using light-emitting diodes (LEDs) |
| B61L 2210/00 | Vehicle systems |
| B61L 2210/02 | . Single autonomous vehicles |
| B61L 2210/04 | . Magnetic elevation vehicles (maglev) |