

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 }
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
- 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](#))}
- 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
- 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 }

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
- 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
- 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)