

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 [F21M 3/02](#)) }
- 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)