

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	<ul style="list-style-type: none"> Electrical locking and release of the route; Electrical repeat locks {(central interlocking B61L 19/00)}
B61L 21/06	<ul style="list-style-type: none"> Vehicle-on-line indication; Monitoring locking and release of the route
B61L 21/065	<ul style="list-style-type: none"> {for signals, including signals actuated by the vehicle}
B61L 21/08	<ul style="list-style-type: none"> Order transmission and reception arrangements for giving or withholding permission
B61L 21/10	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> {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	<ul style="list-style-type: none"> {Automatic control or safety means for points for operator-less railway, e.g. transportation systems}
B61L 23/007	<ul style="list-style-type: none"> {Safety arrangements on railway crossings}
B61L 23/02	<ul style="list-style-type: none"> for indicating along the route the failure of brakes
B61L 23/04	<ul style="list-style-type: none"> for monitoring the mechanical state of the route
B61L 23/041	<ul style="list-style-type: none"> {Obstacle detection}
B61L 23/042	<ul style="list-style-type: none"> {Track changes detection}
B61L 23/044	<ul style="list-style-type: none"> {Broken rails}
B61L 23/045	<ul style="list-style-type: none"> {Rail wear}
B61L 23/047	<ul style="list-style-type: none"> {Track or rail movements}
B61L 23/048	<ul style="list-style-type: none"> {Road bed changes, e.g. road bed erosion}
B61L 23/06	<ul style="list-style-type: none"> for warning men working on the route
B61L 23/08	<ul style="list-style-type: none"> for controlling traffic in one direction only (station blocking between signal boxes in one yard B61L 21/00)
B61L 23/10	<ul style="list-style-type: none"> manually operated {e.g. block arrangements}
B61L 23/12	<ul style="list-style-type: none"> partly operated by train
B61L 23/14	<ul style="list-style-type: none"> automatically operated
B61L 23/16	<ul style="list-style-type: none"> Track circuits specially adapted for section blocking
B61L 23/161	<ul style="list-style-type: none"> {using current of indifferent sorte or a combination of different current types}
B61L 23/163	<ul style="list-style-type: none"> {using direct current}
B61L 23/165	<ul style="list-style-type: none"> {using rectified alternating current}
B61L 23/166	<ul style="list-style-type: none"> {using alternating current}
B61L 23/168	<ul style="list-style-type: none"> {using coded current}
B61L 23/18	<ul style="list-style-type: none"> specially adapted for changing lengths of track sections in dependence upon speed and traffic density
B61L 23/20	<ul style="list-style-type: none"> with transmission of instructions to stations along the route
B61L 23/22	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> using token systems, e.g. train staffs, tablets
B61L 23/26	<ul style="list-style-type: none"> 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)