



- (51) **International Patent Classification:**
B60T 7/12 (2006.01) *B60W 10/18* (2012.01)
B60K 28/14 (2006.01)
- (21) **International Application Number:**
PCT/SE2013/051425
- (22) **International Filing Date:**
2 December 2013 (02.12.2013)
- (25) **Filing Language:** Swedish
- (26) **Publication Language:** English
- (30) **Priority Data:**
1251465-9 20 December 2012 (20.12.2012) SE
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(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) **Title:** SAFE SYSTEM AND METHOD PERTAINING TO A PARKING BRAKE

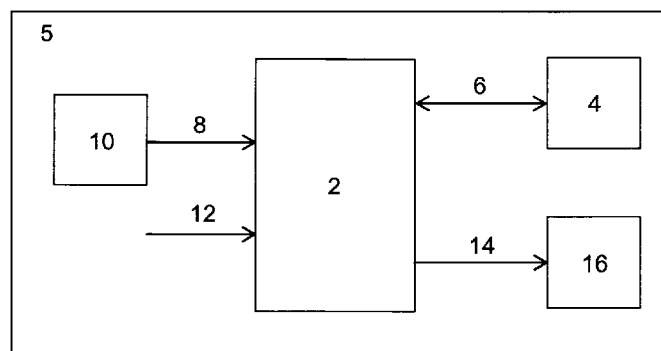


FIG. 1

(57) **Abstract:** A safety system (2) for an electronically activatable and deactivatable parking brake (4) for a vehicle (5), which system (2) is adapted to generating to said parking brake (4) a first control signal (6) which contains control instructions concerning activation or deactivation of the parking brake. The safety system is adapted to receiving an emergency signal (8), preferably from a (manually operable) emergency circuit-breaker (10) of the vehicle, and a speed signal (12) containing information about the vehicle's current speed. If an emergency signal (8) is received and the vehicle's current speed is lower than a predetermined speed threshold V_j, said first control signal (6) conveying instructions to activate the parking brake (4) is generated, and the safety system (2) is adapted to generating a second control signal (14) arranged to inactivate one or more essential systems (16) of the vehicle, e.g. to disconnect the power supply or switch off the engine, which second control signal is generated if the parking brake has been activated by the first control signal.

Title

Safe system and method pertaining to a parking brake

Field of the invention

- 5 The present invention relates to a safety system and a method according to the preambles of the independent claims.

The invention relates in particular to a safety system for electronically activatable and deactivatable parking brakes for vehicles.

10 Background to the invention

- Electronically operated parking brakes for cars and trucks are becoming increasingly common. The way they generally work is that the parking brake lever is replaced by a small circuit-breaker and the power required to activate the parking brake is generated by, for example, an electromagnet which can pull the
- 15 handbrake wire or may alternatively be mounted directly on the brake yoke. Pneumatic parking brakes are commonest for trucks. A strong coil spring urges a pushrod to push out the shoes in the parking brake (drum brake). To release the brake, a bellows is provided with compressed air to counteract the force of the spring. When the brake is to be applied, the compressed air is released from the
- 20 bellows and the spring then locks the brake. Electronically activated parking brakes in this specification means parking brakes which can in some way be activated via a signal which conveys control instructions for causing for example a wire, a pneumatic system, a hydraulic system or the like to activate or deactivate the parking brake. The parking brake may of course take the form of other types
- 25 of brake, e.g. a disc brake.

There are various different solutions whereby a parking brake is activated or deactivated in response to a condition being fulfilled or not.

Some examples of such solutions are described below.

30

US-2010/0294583 describes how the fact that the driver has drunk alcohol is detected and the vehicle is then immobilised, e.g. by activation of a parking brake.

DE-102006049419 describes a system whereby driver identification and parking brake control are linked so that the parking brake is activated until such time as a driving state is permitted.

5

It is thus currently possible to activate and deactivate a pneumatic parking brake electronically. This may be effected by the user (the driver) or automatically by a control system if certain logical conditions are fulfilled. There is also the possibility of the release of an applied parking brake being prevented if logical conditions are not fulfilled. The two above citations mention various logical conditions.

10

There are now requirements in various countries for the use, e.g. in an emergency situation, of an emergency circuit-breaker on board the vehicle to switch off the engine and the power supply.

15

The specifications cited below describe various solutions directed at automatically applying the parking brake if various predetermined conditions are fulfilled.

20

US-2008/0191546 for example describes an automatic brake system for a motor vehicle provided with a regulating system adapted to regulating the vehicle's brake system.

25

US-4572319 describes a parking brake system which applies the parking brake automatically when the engine is switched off.

30

US-2008/0149437 describes a system for automatic braking. When a vehicle has become stationary after use of the service brake, the parking brake is applied automatically. It may also be applied if the service brake becomes faulty.

US-2003/0090150 refers to a brake device intended to automatically apply the parking brake if the vehicle is for example involved in a collision and the driver cannot him/herself bring the vehicle to a halt if it begins to roll.

WO-2009/156833 describes a method for automatically applying a parking brake, e.g. when the driver leaves the vehicle or the engine is switched off. It is also possible for the parking brake to be used as a supplement to the service brake in an emergency situation.

In an emergency situation where an emergency circuit-breaker on board the vehicle is activated, it is not always certain that it will be possible for the driver to apply the parking brake in order to ensure that the vehicle does not begin to roll. The result may be a dangerous situation in that the vehicle might then roll off with no power supply and with the engine switched off, since the driver's activation of the emergency circuit-breaker will have disconnected the vehicle's power supply.

Another scenario is the driver activating the emergency circuit-breaker and the power supply being switched off either immediately if the vehicle is already stationary or, if it is still rolling when the circuit-breaker is activated, the power supply being switched off when the vehicle comes to a halt and is stationary. Either case results in other systems of the vehicle, e.g. an electrically activatable parking brake, ceasing to function because the power supply has been disconnected, and even if the driver tries to use the parking brake to brake the vehicle it will not work.

The object of the present invention is to improve vehicle safety in the context of activation of an emergency circuit-breaker.

Summary of the invention

The above object is achieved by the invention defined by the independent claims.

Preferred embodiments are indicated by the dependent claims.

Implementing the present invention results in enhanced functionality which is of advantage to customers in terms of comfort and increased safety. This is

achieved according to the invention by the parking brake being applied automatically when the emergency circuit-breaker is activated and the vehicle's speed is below a predetermined speed threshold and does not depend directly on the driver's active involvement. When the parking brake is thus applied, the
5 vehicle will remain braked even for example in a vehicle evacuation situation. Thereafter, one or more of the vehicle's essential systems are inactivated, e.g. by disconnecting its power supply, switching off the engine or the like.

Brief description of drawings

- 10 Figure 1 is a schematic block diagram illustrating the present invention.
Figure 2 is a flowchart illustrating the method according to preferred embodiments of the present invention.

Detailed description of preferred embodiments of the invention

- 15 The present invention will now be described in detail with reference to the drawings.

With reference to Figure 1, the present invention relates to a safety system 2 for an electronically activatable and deactivatable parking brake 4 for a vehicle 5, e.g.
20 a truck, a bus or a car.

As mentioned above, electronically activatable parking brakes in this specification means parking brakes which can in some way be activated and deactivated via a signal which conveys control instructions for causing for example a wire, a pneumatic system, a hydraulic system or the like to activate or deactivate the
25 parking brake. In addition to the possibility of the signal which activates or deactivates the parking brake being generated by the safety system according to the present invention, it is also possible for the driver to activate or deactivate the parking brake manually, e.g. by pressing a push-button.

- 30 According to the invention, the safety system 2 is adapted to generating to said parking brake 4 a first control signal 6 which contains instructions concerning activation or deactivation of the parking brake.

The instructions received by the parking brake 4 are preferably interpreted by a control unit, or relating logic, in the parking brake 4 as directing the parking brake to be activated or deactivated. Alternatively the parking brake is operated directly
5 by the control signals.

The safety system is adapted to receiving an emergency signal 8 preferably generated by a emergency circuit-breaker 10 on board the vehicle. The emergency circuit-breaker may be operable manually by the driver or by someone
10 else on board the vehicle. It is preferably situated at a location readily accessible to the driver. There may be two or more emergency circuit-breakers at different locations on board, which may be appropriate if the vehicle is a bus. The breaker may for example be under a transparent plastic cover which is moved aside if the breaker is to be activated.

15 The emergency circuit-breaker may also be operable automatically and in that case deliver an emergency signal in response to a detected occurrence, e.g. a powerful retardation or a collision. In another variant the breaker may be connected to an acoustic sensor and in that case be voice-controlled, e.g. if the
20 driver shouts.

In one alternative the emergency signal 8 is arranged to be generated by other systems on board the vehicle. This may for example happen when any of a number of predefined dangerous situations arises or is about to arise, e.g. related
25 to the vehicle's speed.

The safety system is further adapted to receiving a speed signal 12 containing information about the vehicle's current speed. This signal is for example available via the vehicle's data bus system.

30 The safety system compares the vehicle's current speed with a predetermined speed threshold V_T , and if an emergency signal 8 is received and the vehicle's

current speed is below a predetermined threshold V_T , said first control signal 6 conveying instructions to activate the parking brake 4 is generated, i.e. the parking brake receives control signals requiring it to brake the vehicle and keep it braked. The threshold V_T is a low speed, preferably 8 km/h or less. It may for example be set at 0 km/h, in which case only when the vehicle is stationary will the parking brake be activated if the emergency circuit-breaker is activated.

The safety system 2 is further adapted to generating a second control signal 14 arranged to inactivate one or more of the vehicle's essential systems 16, which second signal is generated if the parking brake is activated by the first control signal 6. The safety system 2 is preferably also adapted to receiving a feedback signal from the parking brake as confirmation that it has been activated and is applied, which are presuppositions for it to be possible for the second control signal 14 to be generated.

The vehicle's essential systems 16 means systems which it is important to switch off in an emergency situation, e.g. the engine, fuel pumps, cooling system, power supply system.

In one embodiment the second control signal is arranged to disconnect the vehicle's power supply, thereby de-energising the majority of the vehicle's systems.

In another embodiment the second control signal is arranged to switch off the vehicle's engine, e.g. by disconnecting the power supply to certain parts of the engine or by throttling the engine's fuel supply.

To disconnect the vehicle's power supply it is for example possible for the second control signal 14 to be arranged to cause a battery master switch of the vehicle to disconnect the power supply to the engine and other systems on board. This master switch is situated close to the vehicle's battery system, and disconnecting the power supply close to the battery system will de-energise most of the vehicle's systems, which is desirable in an emergency situation, e.g. if a fire breaks out.

In one embodiment, if the safety system detects that no emergency signal is being received, the first control signal conveying instructions to deactivate the parking brake is delivered. In other words, resetting the emergency circuit-breaker
5 deactivates the parking brake.

In another embodiment, if the safety system detects that no emergency signal is being received and that the parking brake has been deactivated manually, the first control signal conveying instructions to deactivate the parking brake is delivered.
10 In other words, resetting the emergency circuit-breaker deactivates the parking brake in situations where the brake has been deactivated manually. A variation of this embodiment sets the further requirement, for the emergency circuit-breaker to be deactivatable, that the deactivation has to be demanded after the emergency circuit-breaker has been reset.

15

The present invention comprises also a method in a safety system for an electronically activatable or deactivatable parking brake for a vehicle. The method is illustrated by the flowchart in Figure 2.

The activation or deactivation of the parking brake takes place in response to a
20 first control signal to the parking brake, containing instructions concerning activation or deactivation of the parking brake.

The safety system is adapted to

- receiving an emergency signal from an emergency circuit-breaker,
- receiving a speed signal containing information about the vehicle's current
25 speed,

and the method comprises the steps of

- generating a first control signal conveying instructions to activate the parking brake if an emergency signal is received and if the vehicle's current speed is below a predetermined speed threshold, and thereafter of
30 - generating a second control signal arranged to inactivate essential systems of the vehicle.

Essential systems for the vehicle means systems which it is important to switch off in an emergency situation, e.g. the engine, fuel pumps, cooling system, power supply system.

- 5 In one embodiment the second control signal is arranged to disconnect the vehicle's power supply, thereby de-energising most of the vehicle's systems.

In another embodiment the second control signal is arranged to switch off the vehicle's engine, e.g. by disconnecting the power supply to certain parts of the
10 engine or by throttling its fuel supply.

In the diagram the method is illustrated by checking whether an emergency signal has been received and, if such is the case, by comparing the vehicle's current speed with the predetermined threshold value V_T and, if the current speed is
15 below V_T , by activating the parking brake and thereafter disconnecting the vehicle's power supply. The speed threshold V_T is a low speed, preferably 8 km/h or less. It may for example be set at zero km/h, which means that only when the vehicle is stationary will the parking brake be activated if the emergency circuit-breaker has been activated.

20

The second control signal is preferably arranged to cause a battery master switch of the vehicle to disconnect the power supply to the engine and other systems on board.

- 25 In one embodiment, when the safety system detects that no emergency signal is being received, the first control signal conveying instructions to deactivate the parking brake is delivered.

In another embodiment, when the safety system detects that no emergency signal
30 is being received and that the parking brake has been deactivated manually, the first control signal conveying instructions to deactivate the parking brake is delivered. A variant of this embodiment sets the further requirement that, for the

parking brake to be deactivatable, the deactivation has to be demanded after the emergency circuit-breaker has been reset.

The present invention relates also to a computer programme product which
5 comprises computer programme instructions and is configured to conduct steps
according to the method described above when the programme instructions are
run on a computer system, the computer programme product being readable by a
computer. The computer programme may for example be implemented in the
safety system described above. Alternatively it may be part of a superordinate
10 regulating system for the vehicle.

The present invention is not restricted to the preferred embodiments described
above. Various alternatives, modifications and equivalents may be used. The
above embodiments are therefore not to be regarded as limiting the invention's
15 protective scope which is defined by the attached claims.

Claims

1. A method in a safety system for an electronically activatable and deactivatable parking brake for a vehicle in response to a first control signal to said parking brake, which signal contains control instructions concerning
5 activation or deactivation of the parking brake,
c h a r a c t e r i s e d
in that the safety system is adapted to
- receiving an emergency signal from an emergency circuit-breaker,
- receiving a speed signal containing information about the vehicle's current
10 speed,
and that the method comprises the steps of
- generating a first control signal which conveys instructions to activate the parking brake if an emergency signal is received and the vehicle's current speed is below a predetermined speed threshold, and thereafter of
15 - generating a second control signal arranged to deactivate essential systems for the vehicle.
2. The method according to claim 1, in which said second control signal is arranged to disconnect the vehicle's power supply.
20
3. The method according to claim 1 or 2, in which said second control signal is arranged to switch off the vehicle's engine.
4. The method according to any one of claims 1-3, in which said second
25 control signal is arranged to cause a battery master switch of the vehicle to disconnect the power supply to the engine and other systems of the vehicle.
5. The method according to any one of claims 1-4, in which if the safety system detects that no emergency signal is being received, said first control signal
30 conveying instructions to deactivate the parking brake is delivered.
6. The method according to any one of claims 1-4, in which if the safety

system detects that no emergency signal is being received and that the parking brake has been deactivated manually, said first control signal conveying instructions to deactivate the parking brake is delivered.

5 7. The method according to any one of claims 1-6, in which said speed threshold is 8 km/h.

8. A safety system (2) for an electronically activatable and deactivatable parking brake (4) for a vehicle (5), which system (2) is adapted to generating to
10 said parking brake (4) a first control signal (6) which contains instructions concerning activation or deactivation of the parking brake,
c h a r a c t e r i s e d
in that the safety system is adapted to receiving an emergency signal (8), preferably from an emergency circuit-breaker (10) of the vehicle, and a speed
15 signal (12) containing information about the vehicle's current speed, and if an emergency signal (8) is received and the vehicle's current speed is lower than a predetermined speed threshold V_T , said first signal (6) conveying instructions to activate the parking brake (4) is generated,
and that the safety system (2) is adapted to generating a second control signal
20 (14) arranged to inactivate one or more essential systems (16) for the vehicle, which second control signal is generated if the parking brake has been activated by the first control signal.

9. The safety system according to claim 8, in which said second control
25 signal (14) is arranged to disconnect the vehicle's power supply.

10. The safety system according to claim 8 or 9, in which said second control signal (14) is arranged to switch off the vehicle's engine.

30 11. The safety system according to any one of claims 8-10, in which said second control signal (14) is arranged to cause a battery master switch of the vehicle to disconnect the power supply to the engine and other systems of the

vehicle.

12. The safety system according to any one of claims 8-11, in which if the safety system detects that no emergency signal is being received, said first
5 control signal conveying instructions to deactivate the parking brake is delivered.

13. The safety system according to any one of claims 8-11 in which if the safety system detects that no emergency signal is being received and that the parking brake has been deactivated manually, said first control signal conveying
10 instructions to deactivate the parking brake is delivered.

14. The safety system according to any one of claims 8-13, in which said speed threshold is 8 km/h.

15. A computer programme product which comprises computer programme instructions and is configured to conduct the steps of the method according to any one of claims 1-7 when the programme instructions are run on a computer system, the computer programme product being readable by a
computer.

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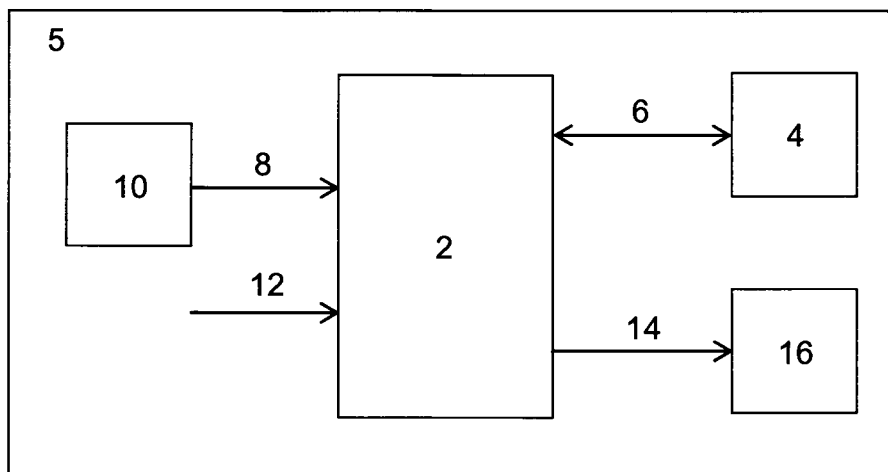


FIG. 1

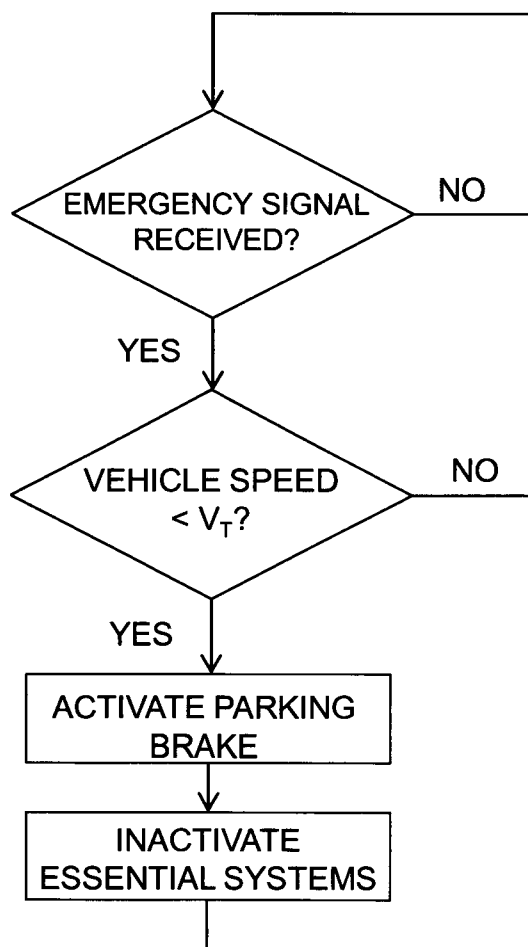


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051425

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B60K, B60T, B60W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20080039288 A1 (JAGODZINSKI VOLKER), 14 February 2008 (2008-02-14); paragraphs [0018], [0024], [0030], [0033] --	1-15
Y	US 6522246 B1 (WILLIAMS JOY A), 18 February 2003 (2003-02-18); column 3, line 36 - column 3, line 65; column 4, line 5 - column 4, line 20 --	1-15
A	EP 2199162 A1 (WABCO GMBH & CO OHG), 23 June 2010 (2010-06-23); whole document --	1-15
A	US 20030090150 A1 (KIA MOTORS CORP), 14 May 2003 (2003-05-14); whole document --	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

04-04-2014

Date of mailing of the international search report

07-04-2014

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051425

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 20080149437 A1 (HERGES MICHAEL), 26 June 2008 (2008-06-26); whole document --	1-15
A	WO 2009156833 A2 (AGCO GMBH ET AL), 30 December 2009 (2009-12-30); whole document -- -----	1-15

Continuation of: second sheet

International Patent Classification (IPC)

B60T 7/12 (2006.01)

B60K 28/14 (2006.01)

B60W 10/18 (2012.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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