(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 September 2007 (13.09.2007)

PCT

(10) International Publication Number
WO 2007/102777 A1

(51) International Patent Classification:
*B60G 17/0195* (2006.01) *B62D 53/08* (2006.01)
*B60S 9/02* (2006.01)

(21) International Application Number:
PCT/SE2007/050111

(22) International Filing Date:
23 February 2007 (23.02.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0600523-5 8 March 2006 (08.03.2006) SE

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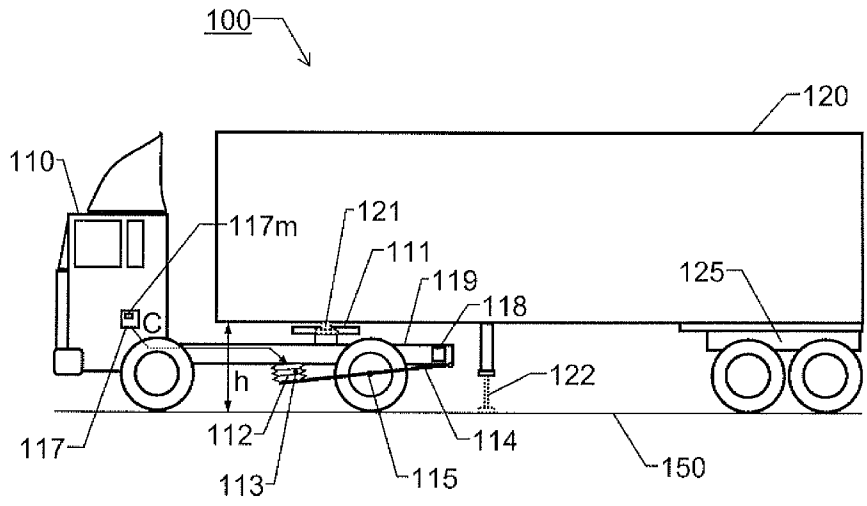
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) **Title:** AUTOMATIC ELEVATION ADJUSTMENT OF A COUPLING ARRANGEMENT




(57) **Abstract:** The present invention relates to automatic adjustment of a tow vehicle's (110) coupling arrangement (111), such that a trailer (120) can be disengaged from the vehicle (110) as smoothly as 5 possible. After engagement of at least one support leg (122) of the trailer (120), a fluid operated level control mechanism (112, 114) lowers the coupling arrangement (111) until this arrange- m e n t reaches a reference elevation ($h_{ref}$ ), which is determined by a respective length of the at least one support leg (122). 10 After having reached the reference elevation ($h_{ref}$), the fluid pressure (P) in a fluid chamber (112) of the level control mechanism is continued to be lowered until a lowering of the coupling arrangement (111) below the reference elevation ($h_{ref}$) is detected. Thereafter, the coupling arrangement (111) is re-elevated to a level being equal to the reference elevation ($h_{ref}$). At this point in time, the trailer (120) can be disengaged from the vehicle (110) without risking that the vehicle (110) drops down or hops up.

WO 2007/102777 A1

# Automatic Elevation Adjustment of a Coupling Arrangement

## THE BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates generally to elevation adjustment of vehicle elements, for instance coupling arrangements of trailer trucks. More particularly the invention relates to a control system according to the preamble of claim 1 and a motor vehicle according to claim 5. The invention also relates to a method of adjusting an elevation of a tow vehicle according to the preamble of claim 8, a computer program product according to claim 13 and a computer readable medium according to claim 14.

When disengaging trailers, semitrailers and other types of trailer cars from a tow vehicle, or a tractor, it is common practice to first manually control the tow vehicle's coupling arrangement to an elevation, which is expected to result in a desired trailer leveling (e.g. being parallel with the ground). Then, the trailer's support legs are lowered, such that the trailer can be supported by them instead of the tow vehicle. Subsequently, the trailer is disengaged, and the tow vehicle is driven away. Normally, the coupling arrangement must be elevated to a level being somewhat higher than the support legs in order to allow a proper engagement of the support legs. Therefore, before driving away the tow vehicle, it is necessary to lower its coupling arrangement to match the length of the support legs. Nevertheless, it is not a trivial task to find the optimal coupling arrangement elevation and the pressurizing of the relevant pneumatic/hydraulic means being optimal for attaining this elevation. Namely, an insufficient elevation/pressurizing results in that the tow vehicle falls down when being disengaged from the trailer; and if the elevation/ pressurizing of the coupling arrangement is too high, the tow vehicle hops up upon disengagement from the trailer.

US, 6,921,100 describes an axle weight distribution system, wherein an optimum position of the axle group on a trailer is calculated in consideration of measurements from the air suspen-

sion. The axle group is then moved to, and locked at, this optimal position by means of rails and locking pins respectively. Hence, the road train obtains safe driving characteristics. However, the disengagement of the trailer from the truck is not facilitated, or by other means improved.

EP, 0 529 544 discloses a solution for a tractor-semitrailer combination, wherein a motor-powered drive is used to engage a support leg prior to disengaging the semitrailer from the tractor. In connection with the disengagement, the pick-up plate of the tractor vehicle is vertically adjusted with respect to the axle height of the rear axle assembly of the frame, such that the pick-up plate is adjusted on a level with the support leg. This adjustment reduces the risk that the tractor "hops up" when the semitrailer is disengaged. Nevertheless, it may still be the case that the tractor "hangs on" the semitrailer, such that upon disengagement, the tractor falls down from the trailer coupling. Of course, this is highly undesirable, since it may result in material damages on both the tow vehicle and the trailer. Personal injuries may also occur.

## SUMMARY OF THE INVENTION

The object of the present invention is therefore to provide a solution, which alleviates the problems above, and thus offers an elevation control that prepares a tow vehicle for a failsafe and smooth disengagement from a trailer.

According to one aspect of the invention, the object is achieved by the initially described system, wherein the control unit is further adapted to produce the control signal such that after that the coupling arrangement has reached the reference elevation, a fluid pressure in a fluid chamber of the level control mechanism is lowered until a lowering of the coupling arrangement is detected. Thereafter, the coupling arrangement is re-elevated to a level, which is equal to the reference elevation.

An important advantage attained by this system is that, when returning to the reference elevation level, it can be ensured that

no vertical forces are bridged between the tow vehicle and the trailer via the coupling arrangement. Thus, at this point in time, the trailer can be disengaged without risking that the tow vehicle hops up or falls down with respect to the trailer.

According to one embodiment of this aspect of the invention, the control unit is adapted to produce the control signal in such a manner that the coupling arrangement is adjusted to an elevation being a predetermined distance above the reference elevation before engaging the at least one support leg. Thereby, a desired trailer elevation can be obtained (after having disengaged the trailer from the tow vehicle). Naturally, this initial adjustment may involve lowering the coupling arrangement as well as elevating the same.

According to another embodiment of this aspect of the invention, the control unit is adapted to receive a signal indicative of whether or not the vehicle is coupled to a trailer. In response to a registered disengagement of the trailer from the vehicle, the control unit is adapted to produce the control signal in such a manner that the elevation of the coupling arrangement is adjusted to a drive position, preferably after fulfillment of an additional condition, e.g. upon expiry of a timer. Namely, at the point of disengagement, the coupling arrangement elevation may not be the optimal elevation for driving the vehicle, especially not if the entire vehicle frame is elevated together with the coupling arrangement.

According to yet another embodiment of this aspect of the invention, in response to a registered disengagement of the trailer from the vehicle, the control unit is adapted to measure a velocity of the vehicle. When the velocity exceeds a threshold value, the control unit is adapted to adjust the elevation to the drive position. This is desirable because velocity, say over 10 km/h, is a highly relevant criterion for the drive position.

According to another aspect of the invention, the object is achieved by a motor vehicle, which includes the above-proposed system. Preferably, the vehicle is also equipped with a coupling ar-

rangement of fifth-wheel type having at least one upper coupling flange and at least one lower coupling flange. The coupling flanges are configured, such that when a trailer is coupled thereto, an engagement member of the trailer is positioned between the upper and lower coupling flanges. The coupling flanges are configured such that at least one cooperating flange of an engagement member of the trailer is vertically movable between the upper and lower coupling flanges during a phase in which the minimal pressure level is attained. This feature is desirable, since it facilitates determination of the combination of pressure and coupling arrangement elevation at which the vehicle can be disengaged from the trailer without hopping up or falling down with respect thereto.

According to one embodiment of this aspect of the invention, the vehicle includes a frame element with respect to which the coupling arrangement is fixated. Furthermore, the level control mechanism is adapted to influence the elevation of the frame element relative to the supporting surface, i.e. the elevation of the coupling arrangement is adjusted by elevating/lowering the entire frame element. Hence, a stabile reliable, and yet flexible, coupling between the tow vehicle and the trailer is accomplished.

According to another aspect of the invention, the object is achieved by the method described initially, wherein after having reached the reference elevation, a fluid pressure in a fluid chamber of the level control mechanism is lowered until a lowering of the coupling arrangement below the reference elevation is detected. Thereafter, the coupling arrangement is again elevated to a level being equal to the reference elevation. The advantages of this method, as well as the preferred embodiments thereof, are apparent from the discussion hereinabove with reference to the proposed vehicle arrangement.

According to a further aspect of the invention the object is achieved by a computer program product directly loadable into the internal memory of a computer, comprising software for controlling the above proposed method when said program is run on

the computer.

According to another aspect of the invention the object is achieved by a computer readable medium, having a program recorded thereon, where the program is to make a computer control the above proposed method.

Generally, the invention is useful because it provides an overall efficient procedure for disengaging a trailer from a truck in a manner being mechanically lenient to all the vehicle elements involved. Further advantages, advantageous features and applications of the present invention will be apparent from the following description and the dependent claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is now to be explained more closely by means of embodiments, which are disclosed as examples, and with reference to the attached drawings.

Figure 1 schematically depicts a road train, wherein the tow vehicle includes a system according to one embodiment of the invention during an initial phase of the proposed procedure,

Figure 2 shows the road train of figure 1 after that the tow vehicle has been disengaged from the trailer,

Figures 3a-b show diagrams which illustrate how a pressure level and a coupling arrangement elevation respectively are varied over time according to one embodiment of the invention,

Figures 4a-e elucidate further details of the procedure illustrated in Figures 3a-b,

Figure 5 shows a flow diagram illustrating the general method according to the invention.

## DESCRIPTION OF EMBODIMENTS OF THE INVENTION

We refer initially to Figure 1, which shows a schematic image of

a road train 100 including a tow vehicle 110 (e.g. a trailer truck) and a trailer 120. The vehicle 110 includes a system according to one embodiment of the invention. Thus, the trailer 120 is connected to the vehicle 110 via a coupling arrangement 111, whose elevation h is adjustable above a surface 150 on which the vehicle 110 is situated. The trailer 120 has at least one support leg 122 (preferably arranged in a pair) adapted to, when in an engaged position on the surface 150, allow a stand-alone parking of the trailer 120. I.e. whenever the support legs 122 have been lowered to the ground, these legs offer the support otherwise being provided by the vehicle 110.

The system includes a fluid operated level control mechanism 112; 114, a height sensor means 118, a pressure sensor 113 and a control unit 117. The level control mechanism is here represented by an expandable fluid chamber 112 and a lever arm arrangement 114 which is pivotally connected to a frame element 119. Thereby, the level control mechanism is adapted to influence the elevation h of the coupling arrangement in response to a control signal C. The fluid in the chamber 112 may either be a gas (e.g. air), or a liquid depending on whether the chamber 112 forms part of a pneumatic or a hydraulic control system.

The height sensor means 118 is adapted to register a height parameter indicative of the elevation h, and report the height parameter (or the elevation h) to the control unit 117. The means 118 may employ any known technique to determine the elevation h, such as transmission of ultrasonic waves, and/or various forms of electromagnetic signals in the thermal, radio frequency and/or light range of the spectrum. In order to assess the height parameter, the means 118 and the coupling arrangement 111 must have a fixed and well-defined positional interrelationship. However, the exact location of the means 118 is essentially irrelevant. Of course, it is preferable if the means 118 is located where it is relatively protected from physical damages and dirt.

The pressure sensor 113 is adapted to register a fluid pressure

in a fluid chamber 112 of the level control mechanism, and report the fluid pressure to the control unit 117.

The control unit 117 is adapted to receive the height parameter, and in response thereto, produce the control signal C such that after engagement of the at least one support leg 122, the elevation h of the coupling arrangement 111 is lowered to a constant elevation $h_{SL}$, i.e. an elevation being determined by a respective length of the support legs 122. If the surface 150 is flat, or essentially flat, and if the support legs 122 are represented by a pair of legs mounted at the same longitudinal position on the trailer 120, these legs will have the same length. The control unit 117 is adapted to store the constant elevation $h_{SL}$ as a preliminary value of a reference elevation for the coupling arrangement 111. The elevation h is repeatedly logged thereafter. Moreover, the control unit 117 is adapted to produce the control signal C such that after having reached the reference elevation, the fluid pressure in the fluid chamber 112 is continued to be lowered. When the entire part of the trailer's 120 weight that was initially carried by the vehicle 110 has been transferred to the support legs 122, the coupling arrangement 111 will be lowered somewhat (in the order of millimetres) due to this pressure decrease. Upon detection of such a lowering, an elevation value for the coupling arrangement 111 is registered. Then, the control unit 117 is adapted to assign a reference elevation, $h_{ref}$, representing an elevation of the coupling arrangement 111 a short time before the registering of said lowering. In practice, the reference elevation, $h_{ref}$, will be almost identical to the constant elevation $h_{SL}$. However, due to a possible compression of the support legs 122 and/or a compression of the surface 150 underneath the support legs 122, there may be a minor difference between $h_{ref}$ and $h_{SL}$.

In any case, when the lowering below the reference elevation, $h_{ref}$, has been detected, the control unit 117 is adapted to produce such a control signal C that the pressure decrease ceases. Somewhat later, the pressure in the fluid chamber 112 stabilizes at a level, which preferably is registered by the control unit 117. Thereafter, the control unit 117 is adapted to produce the con-

trol signal C, such that the coupling arrangement 111 is again elevated to a level being equal to the reference elevation, $h_{ref}$. Preferably, the control unit 117 includes, or is associated with, a computer readable medium 117m (e.g. a memory module) having a program recorded thereon, where the program is adapted to make the control unit 117 control the proposed procedure.

Figure 2 shows the road train 100 of figure 1 when the trailer 120 stands on the support legs 122, the tow vehicle 110 has been disengaged from the trailer 120, and the vehicle 100 is driven away along a direction D.

Turning now to Figures 3a and 3b, we will discuss further details of this disengagement procedure. Figure 3a shows a diagram, which illustrates the pressure level P in the fluid chamber 112 as a function over time t according to one embodiment of the invention. Figure 3b shows a diagram illustrating how the elevation h of the coupling arrangement 111 is varied over time t in response to the pressure variations P shown in Figure 3a.

In order to enable, or at least highly facilitate engagement of the support legs 122, it is advantageous to adjust the coupling arrangement 111 to an elevation $h_{ref}+\Delta$ being slightly higher than a desired elevation $h_{ref}$ given by the at least one support leg 122 (i.e. being essentially equal to the constant elevation $h_{SL}$) before engaging the leg(s) 122. Hence, according to one embodiment of the invention, the control unit 117 is adapted to produce the control signal C in such a manner that the coupling arrangement 111 is initially adjusted to an elevation $h_{ref}+\Delta$ being a predetermined distance above the reference elevation $h_{ref}$. In Figure 3b, this is reflected by two dotted lines ending at $h = h_{ref}+\Delta$ at a point in time $t = t_0$ (when the proposed procedure begins). Namely, depending on the coupling arrangement's 111 initial elevation, the arrangement may either need to be elevated or lowered to attain the elevation $h_{ref}+\Delta$. Figure 3a shows corresponding adjustments of the fluid pressure P in the fluid chamber 112 to a pressure level $P_0$.

At $t = t_0$, we assume that the support legs 122 have been en-

gaged and that they are prepared to receive a vertical load from the trailer 120, so that the vehicle 110 ultimately can be driven away without the trailer 120.

During a period $t_0$ to $t_1$, the control unit 117 produces the control signal C, such that the elevation h of the coupling arrangement 111 is lowered. In connection therewith, the pressure level P in the fluid chamber 112 decreases.

At $t = t_1$, the support legs 122 make contact with the surface 150, and therefore start to receive load from the trailer 120, which up until this point in time $t_1$ has been placed exclusively on the vehicle 110. This load transfer continues until $t = t_2$, when the entire part of the load originally carried by the vehicle 110 has been transferred to the support legs 122. Since the support legs 122 are in contact with the surface 150 during the entire load transfer process, the elevation h of the coupling arrangement 111 remains on a constant elevation level, or the preliminary reference elevation $h_{ref}$ from $t_1$ to $t_2$, where $h_{ref}$ is given by a respective length of the support legs 122 (i.e. $h_{ref} \approx h_{SL}$). The load placed on a set of rear wheels 125 of the trailer 120 is essentially constant during this process.

According to the invention, after $t = t_2$, the control unit 117 produces the control signal C, such that the pressure level P in the fluid chamber 112 is further lowered. At a point in time $t_3$ after $t_2$, we assume that a lowering $h_{min}$ of the coupling arrangement 111 below the reference elevation $h_{ref}$ is detected. This lowering is an effect of the pressure decrease, and is enabled by a vertical play, or free motion margin, between a trailer engagement member and cooperating members of the coupling arrangement 111. Typically, the difference between $h_{SL}$ and $h_{min}$ lies in the order of a number of millimetres.

Hence, at $t = t_3$, it is ensured that the entire part of the trailer's 120 weight that, via the coupling arrangement 111, was originally carried by the vehicle 110 has been transferred to the support legs 122. At $t_3$, the control unit 117 produces the control signal C, such that the pressure decrease in the fluid chamber

112 ceases. From $t_3$ and onwards the pressure level P is registered by the pressure sensor 113, and at a somewhat later point in time $t = t_4$, the pressure level P has levelled out, or stabilized, at a minimal pressure level $P_A$, (which is normally slightly lower than a primary pressure level $P_B$ registered at $t = t_3$).

At $t = t_4$, the control unit 117 starts to produce the control signal C, such that the coupling arrangement 111 is re-elevated until it reaches the reference elevation $h_{ref}$. Here, this occurs at $t = t_5$. During the period $t_4$ to $t_5$, the pressure level P should be essentially constant, although slightly increasing. Nevertheless, it is desirable that the pressure P be monitored also during the period $t_4$ to $t_5$. Namely, if the pressure P increases abnormally from $P_A$, say a level $P >> P_B$ is detected before reaching the reference elevation $h_{ref}$, this constitutes an error indication, for instance being due to that the support legs 122 have slipped against the surface 150, and/or that one or more of the support legs 122 are defective.

Preferably, the coupling arrangement 111 is of so-called fifth-wheel type. Figure 4a, at $t = t_0$, shows a schematic side view of such a coupling to which an engagement member 121 of the trailer 120 is connected. In practice, the arrangement 111 includes at least one locking member to secure the member 121 to the vehicle 110. However, for reasons of clarity, no such locking member is shown here. Figure 4b illustrates when, during $t_0$ to $t_1$, the arrangement 111 and the member 121 are lowered together. The fifth-wheel coupling has at least one upper coupling flange A and at least one lower coupling flange B. The coupling flanges A and B are configured, such that when the engagement member 121 is coupled thereto, at least one flange of the member 121 is positioned between the upper and lower coupling flanges A and B respectively. Moreover, the coupling flanges A and B are configured such that at least one cooperating flange of the engagement member 121 is vertically movable between the upper and lower coupling flanges A and B during a phase (during $t_2$ to $t_3$) in which the minimal pressure level $P_A$ is attained. Figure 4c illustrates this period.

In a subsequent phase $t_3$ to $t_4$, the pressure P levels out on the minimal pressure level $P_A$. As mentioned above, during this period, the coupling arrangement 111 is positioned at the constant elevation level $h_{min}$.

At $t = t_4$, the control unit 117 produces such a control signal C that the coupling arrangement 111 is re-elevated. This elevation is continued until $t = t_5$ when the coupling arrangement 111 again reaches reference elevation level $h_{ref}$. At $t_5$, the pressure P is typically close to, however not necessarily identical to, the primary pressure level $P_B$. In any case, now (even though the at least one lower coupling flange B may be in contact with the at least one flange of the member 121) it is ensured that the fluid chamber 112 has such a pressure level that the vehicle 110 can be disengaged and driven away D from the trailer 120 without risking to hop up or fall down from the trailer 120. Figure 4e illustrates this situation.

According to one embodiment of the invention, the control unit 117 is adapted to receive a signal indicative of whether or not the vehicle 110 is coupled to a trailer 120. In response to a registered disengagement of the trailer 120 from the vehicle 110, the control unit 117 is adapted to produce the control signal C in such a manner that the elevation h of the coupling arrangement 111 is adjusted to a so-called drive position. Preferably, the control unit 117 is specifically adapted to measure a velocity of the vehicle 110, and when the velocity exceeds a threshold value, the control unit 117 is adapted to adjust the elevation h to the drive position. Typically this means that the coupling arrangement 111 is raised somewhat from the disengagement level.

In order to sum up, the general method according to the invention will be described below with reference to the flow diagram in figure 5.

A first step 510 investigates whether the at least one support leg has been engaged, and if so, a step 520 follows. Otherwise, the procedure loops back and stays in the step 510. The step 520 lowers the coupling arrangement. Subsequently, a step 530

investigates whether the coupling arrangement has reached the reference elevation $h_{ref}$ (i.e. the level determined by a respective length of the at least one support leg, at which the support legs start to carry load).

If the reference elevation $h_{ref}$ has been reached, a step 540 follows. Otherwise, the procedure loops back to the step 520 for a continued lowering of the coupling arrangement. The step 540 lowers the fluid pressure further. Thereafter, a step 550 investigates whether a lowering of the coupling arrangement below the reference elevation $h_{ref}$ has been detected, and if so a step 560 follows. Otherwise, the procedure loops back to the step 540 for a continued pressure decrease. The step 560 re-elevates the coupling arrangement to a level being equal to the reference elevation $h_{ref}$. After that the procedure ends, and the trailer can be smoothly disengaged from the tow vehicle.

All of the process steps, as well as any sub-sequence of steps, described with reference to the figure 5 above may be controlled by means of a programmed computer apparatus. Moreover, although the embodiments of the invention described above with reference to the drawings comprise computer apparatus and processes performed in computer apparatus, the invention thus also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of source code; object code, a code intermediate source and object code such as in partially compiled form, or in any other form suitable for use in the implementation of the process according to the invention. The carrier may be any entity or device capable of carrying the program. For example, the carrier may comprise a storage medium, such as a Flash memory, a ROM (Read Only Memory), for example a CD (Compact Disc) or a semiconductor ROM, an EPROM (Erasable Programmable Read-Only Memory), an EEPROM (Electrically Erasable Programmable Read-Only Memory), or a magnetic recording medium, for example a floppy disc or hard disc. Further, the carrier may be a transmissible carrier such as an electrical or optical signal which may be conveyed via electrical or optical cable or by radio or by other means. When the

program is embodied in a signal which may be conveyed directly by a cable or other device or means, the carrier may be constituted by such cable or device or means. Alternatively, the carrier may be an integrated circuit in which the program is embedded, the integrated circuit being adapted for performing, or for use in the performance of, the relevant processes.

The invention is not restricted to the described embodiments in the figures, but may be varied freely within the scope of the claims.

Claims

1. A system for adjusting an elevation (h) of a tow vehicle's (110) coupling arrangement (111) above a surface (150) on which the vehicle (110) is situated, the coupling arrangement (111) being coupled to a trailer (120) having at least one support leg (122) adapted to, when in an engaged position on the surface (150), allow a stand-alone parking of the trailer (120), the system comprising:

a fluid operated level control mechanism (112, 114) adapted to influence the elevation (h) in response to a control signal (C),

a height sensor means (118) adapted to register a height parameter indicative of the elevation (h), and

a control unit (117) adapted to receive the height parameter and in response thereto produce the control signal (C) such that after engagement of the at least one support leg (122) the coupling arrangement (111) is lowered to a reference elevation ($h_{ref}$) determined by a respective length of the at least one support leg (122), characterized in that the control unit (117) is further adapted to produce the control signal (C) such that after that the coupling arrangement (111) has reached the reference elevation ($h_{ref}$)

a fluid pressure (P) is lowered in a fluid chamber (112) of the level control mechanism until a lowering of the coupling arrangement (111) below the reference elevation ($h_{ref}$) is detected, and thereafter

the coupling arrangement (111) is elevated to a level being equal to the reference elevation ($h_{ref}$).

2. The system according to claim 1, characterized in that the control unit (117) is adapted to produce the control signal (C) in such a manner that the coupling arrangement (111) is adjusted to an elevation ($h_{ref}+\Delta$) being a predetermined distance above the reference elevation ($h_{ref}$) before engaging the at least one support leg (122).

3. The system according to any one of the claims 1 or 2,

characterized in that the control unit (117) is adapted to receive a signal indicative of whether or not the vehicle (110) is coupled to a trailer (120), and in response to a registered disengagement of the trailer (120) from the vehicle (110), the control unit (117) is adapted to produce the control signal (C) in such a manner that the elevation (h) of the coupling arrangement (111) is adjusted to a drive position.

4. The system according to claim 3, characterized in that, in response to a registered disengagement of the trailer (120) from the vehicle (110), the control unit (117) is adapted to:

measure a velocity of the vehicle (110), and

adjust the elevation (h) to the drive position when the velocity exceeds a threshold value.

5. A motor vehicle (110), characterized in that it comprises the control system according to any one of the claims 1 to 4.

6. The motor vehicle (110) according to claim 5, characterized in that the coupling arrangement (111) is of fifth-wheel type having at least one upper coupling flange (A) and at least one lower coupling flange (B), the coupling flanges (A; B) being configured such that at least one cooperating flange of an engagement member (121) of the trailer (120) is vertically movable between the upper and lower coupling flanges (A; B) during a phase ($t_2 - t_3$) in which the lowering of the coupling arrangement (111) below the reference elevation ($h_{ref}$) is detected.

7. The motor vehicle (110) according to any one of the claims 5 or 6, characterized in that it comprises a frame element (119) with respect to which the coupling arrangement (111) is fixated, and the level control mechanism (112, 114) is adapted to influence the elevation (h) of the frame element (119) relative to the surface (150).

8. A method of adjusting an elevation (h) of a tow vehicle's (110) coupling arrangement (111) above a surface (150) on which the vehicle (110) is situated, the elevation (h) being ad-

justed by means of a fluid operated level control mechanism (112, 114), the coupling arrangement (111) being coupled to a trailer (120) having at least one support leg (122) adapted to, when in an engaged position on the surface (150), allow a stand-alone parking of the trailer (120), the method comprising:

investigating whether or not the at least one support leg (122) is engaged, and if the at least one support leg (122) is found to be engaged

lowering the coupling arrangement (111) to a reference elevation ($h_{ref}$) being determined by a respective length of the at least one support leg (122), characterized by after having reached the reference elevation ($h_{ref}$)

lowering a fluid pressure (P) in a fluid chamber (112) of the level control mechanism until a lowering of the coupling arrangement (111) below the reference elevation ($h_{ref}$) is detected, and thereafter

elevating the coupling arrangement (111) to a level equal to the reference elevation ($h_{ref}$).

9. The method according to claim 8, characterized by adjusting the coupling arrangement (111) to an elevation ($h_{ref}+\Delta$) a predetermined distance above the reference elevation ($h_{ref}$) before investigating whether or not the at least one support leg (122) is engaged.

10. The method according to any one of the claims 8 or 9, characterized by disengaging the trailer (120) from the vehicle (110) after having elevated the coupling arrangement (111) to the reference elevation ($h_{ref}$).

11. The method according to claim 10, characterized by adjusting the elevation (h) to a drive position after having disengaged the trailer (120) from the vehicle (110).

12. The method according to claim 11, characterized by the method comprising:

registering disengagement of the trailer (120) from the vehicle (110),

measuring a vehicle velocity, and if the velocity exceeds a threshold value,

adjusting the elevation (h) to the drive position.

13. A computer program product directly loadable into the internal memory of a computer, comprising software for controlling the steps of any of the claims 8 to 12 when said program is run on the computer.

14. A computer readable medium (117m), having a program recorded thereon, where the program is to make a computer control the steps of any of the claims 8 to 12.

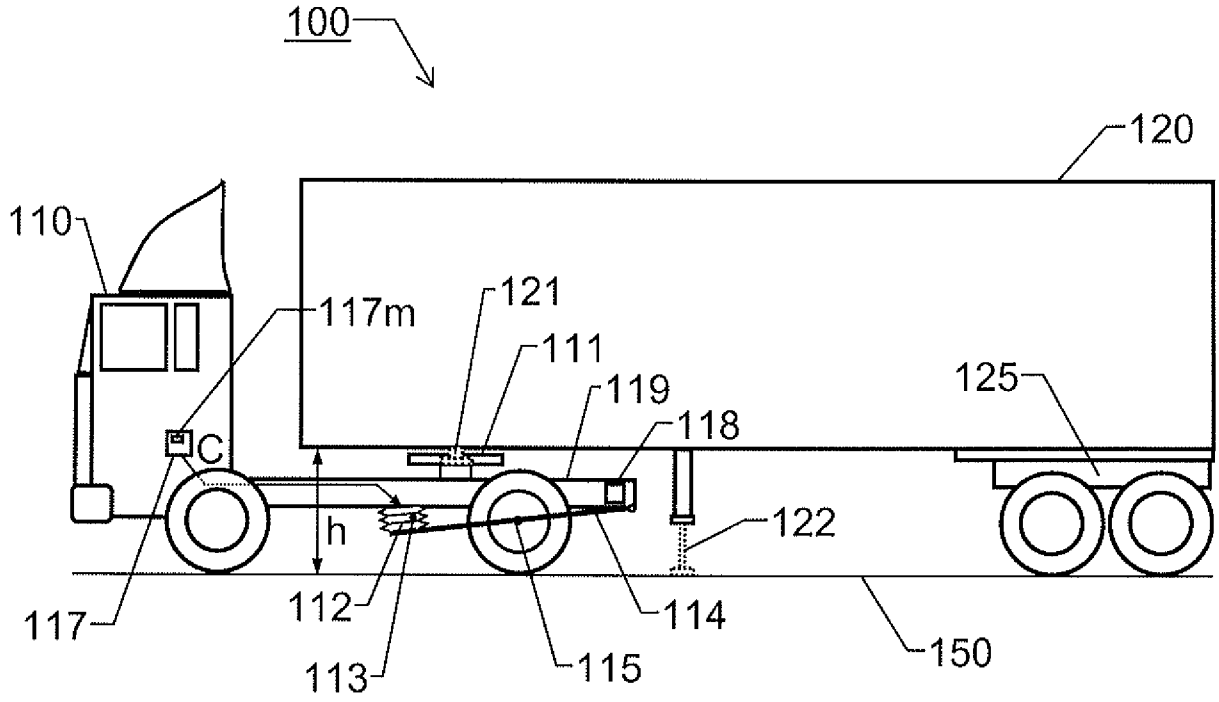

100
120
110
117m
121
111
119
125
118
C
h
122
112
114
117
113
115
150

Fig. 1

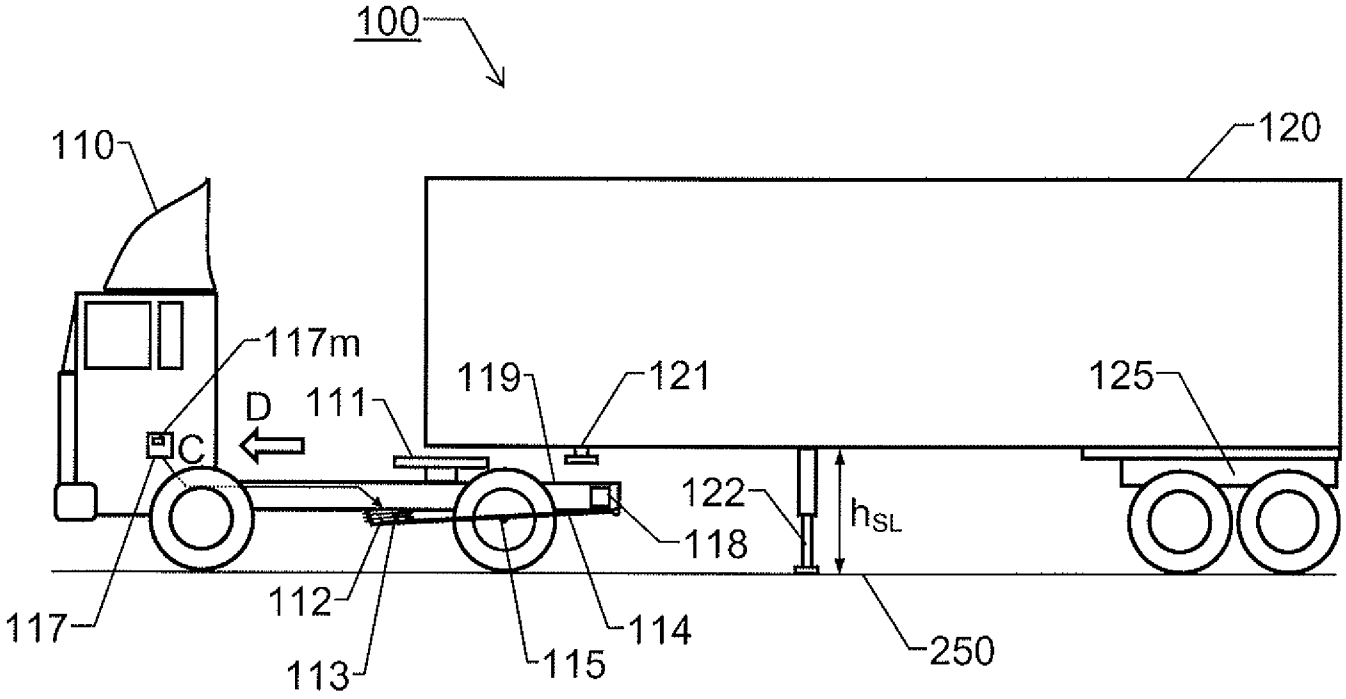

100
120
110
117m
119
121
125
D
111
C
122
$h_{SL}$
118
112
114
117
113
115
250

Fig. 2

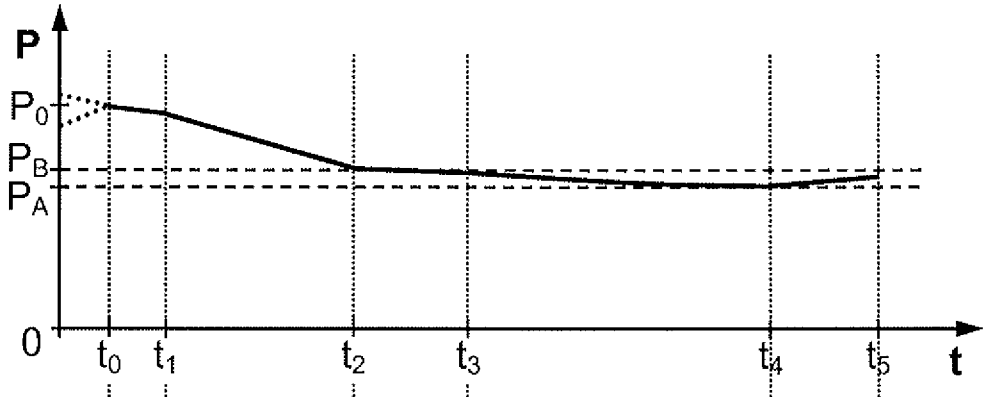



Fig. 3a

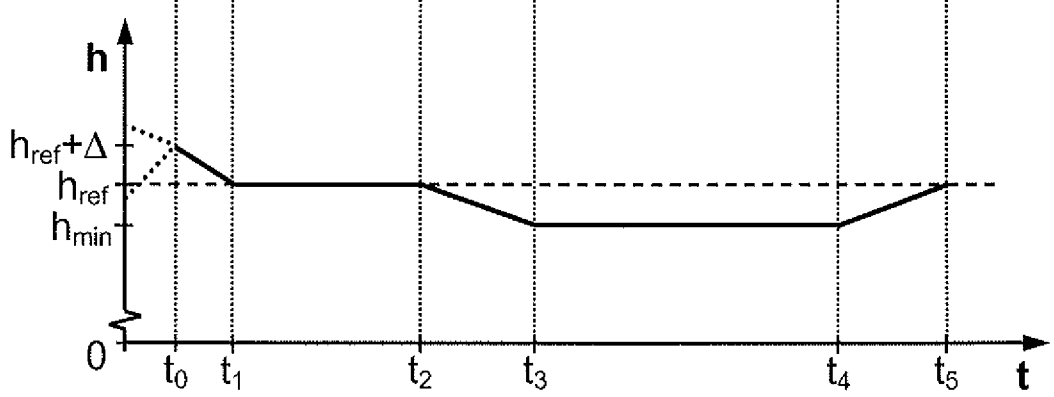



Fig. 3b

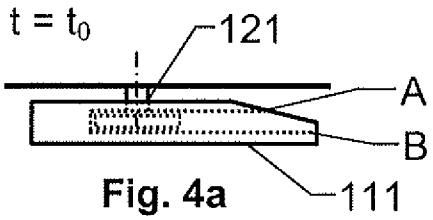



Fig. 4a

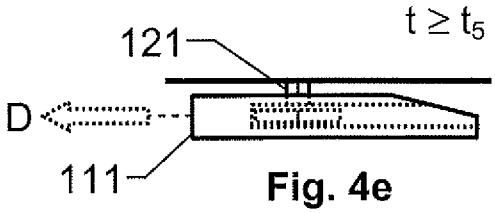



Fig. 4e

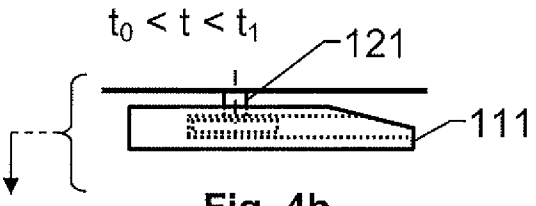



Fig. 4b

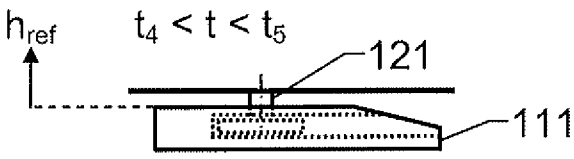



Fig. 4d

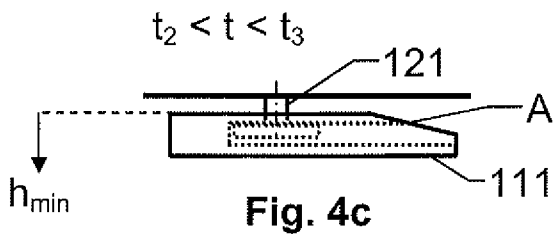



Fig. 4c

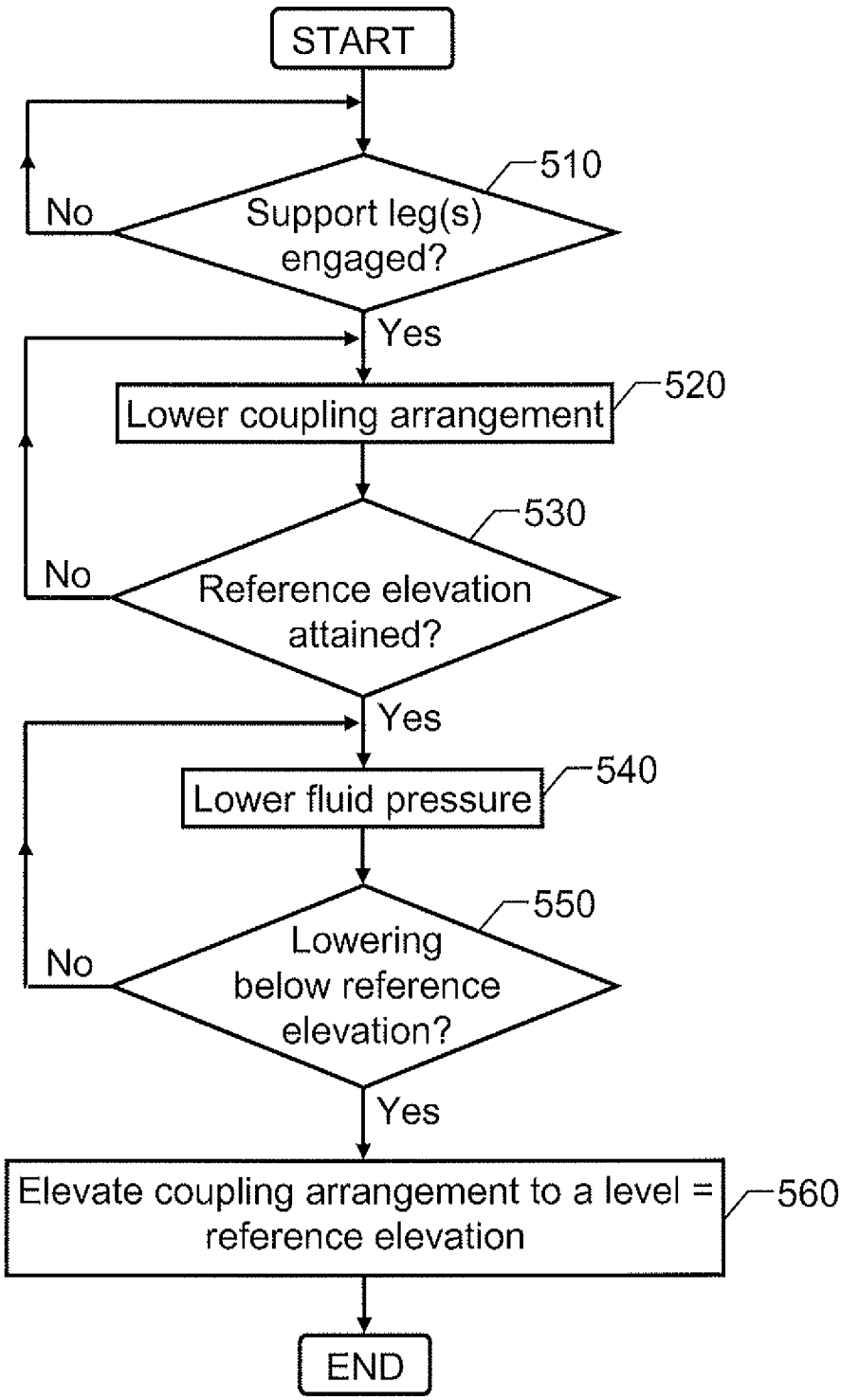

START
510
No
Support leg(s) engaged?
Yes
520
Lower coupling arrangement
530
No
Reference elevation attained?
Yes
540
Lower fluid pressure
550
No
Lowering below reference elevation?
Yes
Elevate coupling arrangement to a level = reference elevation
560
END

**Fig. 5**

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2007/050111

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: B60G, B60S, B65D

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, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | DATABASE EPODOC/EPO<br>abstract<br>JP 55083611 A (SHIN MEIWA IND CO LTD)<br>24 June 1980 (1980-06-24)<br>--- | 1-14 |
| A | EP 0529544 B1 (ROCKINGER SPEZIALFABRIK FÜR ANHÄNGERKUPPLUNGEN GMBH & CO), 22 January 1997 (22.01.1997)<br>--- | 1-14 |
| A | WO 2005108194 A1 (DAIMLERCHRYSLER AG), 17 November 2005 (17.11.2005)<br>--- | 1-14 |

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 31 May 2007 | 04 -06- 2007 |
| Name and mailing address of the ISA/<br>Swedish Patent Office<br>Box 5055, S-102 42 STOCKHOLM<br>Facsimile No. +46 8 666 02 86 | Authorized officer<br>Hans Nordström/EK<br>Telephone No. +46 8 782 25 00 |

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2007/050111

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 3214188 A (G ALFIERI), 26 October 1965 (26.10.1965)<br>---<br>-------- | 1-14 |

**International patent classification (IPC)**
***B60G 17/0195*** (2006.01)
***B60S 9/02*** (2006.01)
***B62D 53/08*** (2006.01)

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