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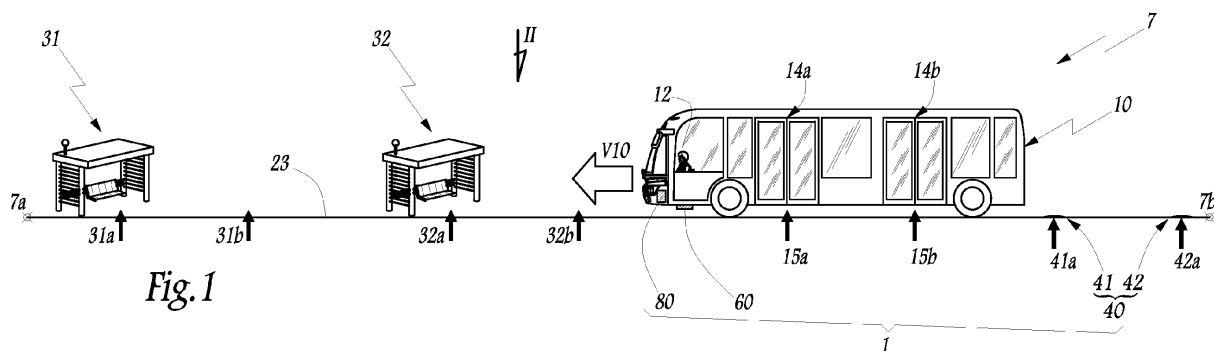
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(54) **Control system and method for passenger transport vehicles, and passenger transport vehicle configured for the use of such a system and/or of such a method**

(57) The present invention relates to a control system (1) for passenger transport vehicles (10). This system comprises transmitter means (40; 41; 42) positioned on a traffic roadway (21) or close to such a roadway, upstream of at least one stop (31; 32) provided for at least one vehicle (10), receiver means (60) positioned on each vehicle (10) and configured to receive a deceleration control signal originating from the transmitter means (40; 41; 42), and control means (80) positioned on each vehicle

(10) and configured to control a deceleration of the vehicle (10) as a function, on the one hand, of the receipt of the control signal by the receiver means (60) and, on the other hand, of at least one travelling parameter of the vehicle (10). The invention also relates to a control method for passenger transport vehicles (10). The invention also relates to a passenger transport vehicle (10) configured for the use of the control system (1) and/or of the control method.



*Fig. 1*

## Description

**[0001]** The present invention relates to a control system for passenger transport vehicles. The invention also relates to a control method for passenger transport vehicles. Finally, the invention relates to a passenger transport vehicle configured for the use of such a system and/or of such a method.

**[0002]** The field of the invention is that of control systems fitted to public transport vehicles, with respect to traffic management and improving passenger flows. In particular, the invention relates to buses, coaches, trams and passenger transport vehicles controlled by a driver.

**[0003]** Public transport is subject to multiple constraints which may affect its regularity, with economic consequences and in terms of passenger satisfaction. These constraints are often independent of the desire of the driver, such as the traffic problems. However, there is a considerable margin of progression associated with managing the travelling of the vehicle. In particular, stopping and starting at bus stops can be improved in order to make it easier for the passengers to get off and on. Therefore, each second gained at a stop makes it possible to improve the fluidity of the system and to achieve economies.

**[0004]** Vehicle guidance systems are known, for example for assistance with parking. Equally, control systems are known for the automatic control of rail transport, for example the underground trainsets, which do not share the travelling space with other vehicles and pedestrians. However, no control system is known that is suitable for managing the slowing of a vehicle of the bus type until it is stationary at a precise point, in the traffic conditions on the roadway. The object of the present invention is to propose a control system for a vehicle of the bus type, this system making it possible to control the deceleration of the bus as it approaches a bus stop and to stop the bus at a precise position in front of the stop.

**[0005]** Accordingly, the subject of the invention is a control system for passenger transport vehicles, comprising transmitter means positioned on a traffic roadway or close to such a roadway, upstream of at least one stop provided for at least one vehicle, receiver means positioned on each vehicle and configured to receive a deceleration control signal originating from the transmitter means, and control means positioned on each vehicle and configured to control a deceleration of the vehicle as a function, on the one hand, of the receipt of the control signal by the receiver means and, on the other hand, of at least one travelling parameter of the vehicle.

**[0006]** A further subject of the invention is a control method for a passenger transport vehicle. Each vehicle comprises a driver, at least one door associated with a reference mark, receiver means and control means. This method comprises at least the following steps:

a) the vehicle travels at a variable speed on a traffic roadway, upstream of a stop and transmitter means,

these transmitter means themselves being arranged on the roadway upstream of the stop, with a predetermined distance between a stop reference mark associated with the stop and a transmitter reference mark associated with the transmitter means,  
b) the receiver means of the vehicle register a deceleration control signal originating from the transmitter means at the transmitter reference mark,  
c) the control signal is transmitted from the receiver means to the control means, which calculate a deceleration value as a function of the predetermined distance and the speed of the vehicle,  
d) the control means automatically control the deceleration of the vehicle up to the stop,  
e) the vehicle is stopped automatically at the stop by the control means, with the reference mark associated with the door being positioned at the stop reference mark associated with the stop,  
f) passengers get off at the stop and/or get onto the vehicle, and  
g) the vehicle starts off again and leaves the stop. Therefore, the invention makes it possible to precisely control the deceleration of the vehicle as it approaches each stop. The fact that the vehicle always stops exactly at the same location at a given stop allows the operator to organize the stops in terms of safety and passenger flow. Moreover, the driver no longer has to manage the lateral position of the vehicle during the period of deceleration. In addition, the traffic conditions are taken into account by a computation algorithm incorporated into the control system.

**[0007]** According to other advantageous features of the control system according to the invention, taken in isolation or in combination:

- the travelling parameter or parameters of each vehicle are chosen from the following: speed of travel of the vehicle, distance between the stop and the corresponding transmitter means, distance remaining to be travelled for the vehicle to the stop, maximum deceleration accepted for the comfort of the passengers, crowdedness of the roadway, travelling time slot, configuration of the stop, weather conditions, or a combination of some of them;
- the route of each vehicle has several stops, and particular transmitter means are associated with each stop;
- the transmitter means comprise at least one transponder device, and the receiver means are configured to send an activation signal to the transmitter means and to receive the deceleration control signal in return.

**[0008]** According to other advantageous features of the control method according to the invention, taken in isolation or in combination:

- in step b), the receiver means of the vehicle initially transmit an activation signal which activates the transmitter means and, secondly, register the deceleration control signal originating from the transmitter means which have been previously activated;
- in step d), the deceleration is controlled by the control means as a function of travelling parameters of the vehicle, these travelling parameters being chosen from the following: speed of travel of the vehicle, distance between the stop and the corresponding transmitter means, distance remaining to be travelled for the vehicle to the stop, maximum deceleration accepted for the comfort of the passengers, crowdedness of the roadway, travelling time slot, configuration of the stop, weather conditions, or a combination of some of them;
- in step d), when a critical travelling parameter is detected by the control means or by the driver, a step h) occurs in which the driver takes manual control again and/or the vehicle is automatically stopped by the control means;
- in step h), the driver may selectively:

- h1) hand control of the vehicle to the control means capable of initiating a new automatic deceleration, according to step d), or
- h2) stop the vehicle at the stop under manual control, for the passengers to get on and/or get off, according to step f), or
- h3) not stop at the stop, in particular if no passenger wishes to get off or get on, and continue his route under manual control, according to step g).

**[0009]** A further subject of the invention is a passenger transport vehicle configured for the use of a control system and/or of a control method as mentioned above. In particular, this vehicle has receiver means and control means and is capable of travelling on a traffic roadway which comprises transmitter means. In practice, this vehicle is suitable for being used in association with the control system and/or the control method irrespective of the weather conditions and the traffic conditions.

**[0010]** The invention will be better understood on reading the following description given only as a non-limiting example and made with reference to the drawings in which:

- Figure 1 is a schematic representation of a control system according to the invention, showing a section of roadway on which a passenger transport vehicle also according to the invention travels;
- Figure 2 is another schematic representation of the control system according to the invention, in a top view in the direction of the arrow II in Figure 1;
- Figure 3 is another schematic representation of the control system according to the invention, showing a succession of roadway sections including the sec-

tion of Figures 1 and 2; and

- Figure 4 is a logic diagram showing the various steps of a control method according to the invention.

**[0011]** Figures 1 to 3 show a control system 1 for a passenger transport vehicle 10 that travels in a travelling space 2. The control system 1 comprises, on the one hand, a transmitter device 40 arranged in the travelling space and, on the other hand, a receiver device 60 and a control device 80 arranged in the vehicle 10.

**[0012]** Hereinafter, consideration is given to a vehicle 10 of the bus type in a system of driving motor vehicles on the right as is notably the case in Italy or in France. Nevertheless, the present description can easily be transposed to a system of driving on the left, as is notably the case in the United Kingdom or in Japan.

**[0013]** As can be seen in Figure 3, the travelling space 2 of the bus 10 has a succession of sections 6, 7, 6', 7' etc. Each section of the type 6 and 6' is designed for the travelling of the bus 10, while each section of the type 7 and 7' corresponds to the stopping of the bus 10 at a stop for the passengers to get off and get on. However, for the purpose of simplification, only the section 7 is shown in Figures 1 and 2. This section 7 extends between a downstream reference mark 7a and an upstream reference mark 7b.

**[0014]** The travelling space 2 has a right-hand roadway 21 which is bordered by a right-hand pavement 23 and a left-hand roadway 22 that is bordered by a left-hand pavement 24. Bus stations or stops 31, 32 and 31' are arranged on the pavement 23. Each bus stop 31, 32 and 31' comprises for example a bus shelter and a post which indicates the lines served and the bus times, and any type of street furniture or particular arrangement, such as equipment allowing people of reduced mobility to get onto the bus 10 more easily.

**[0015]** Moreover, each bus stop 31, 32 and 31' corresponds to a "tag zone" respectively 41, 42 and 41'. More precisely, each tag zone 41, 42 and 41' is associated with a precise bus stop and positioned upstream of this stop, considering the direction of travel of the bus 10. Each tag zone 41, 42 and 41' extends for example over 2 metres on the roadway 21 starting from the pavement 23. The set of tag zones 41, 42, 41' that are spread out on the roadway 21 forms the transmitter device 40 belonging to the control system 1. For the purpose of simplification, the stop 32 and the zone 42 are not shown in Figure 3.

**[0016]** In practice, a "tag" corresponds to one or more markers positioned in each zone 41, 42 and 41'. More precisely, a tag takes the form of a device of the transponder type which is configured to automatically transmit a predetermined transmitted signal in response to a predetermined received signal. These devices are preferably inserted into the roadway 21 with the aid of road works, which are relatively simple to carry out.

**[0017]** As an alternative, the tag devices may be positioned on the edge of the pavement 23 or at another point

in the travelling space 2. In this case, equipment to protect each device against the vehicles travelling on the roadway 21 and against vandalism may be provided.

**[0018]** The bus 10 is fitted with doors 14a and 14b, and with the receiver device 60 and the control device 80. The bus 10 is driven by a driver 12 and runs on the right-hand roadway 21, in the direction of travel, at a speed V10 which is variable. This speed V10 is controlled by the driver 12 and/or by the control device 80. The driver 12 may also steer the bus 10 in the transverse direction, that is to say by commanding a lateral movement to the left T10g or a lateral movement to the right T10d.

**[0019]** As a variant not shown, the bus 10 has more than two doors 14a and 14b, for example at least three doors. As an alternative, the bus 10 may have a single door 14a, but in this case, the flow of passengers is substantially reduced because passengers cannot get on and get off at the same time.

**[0020]** The control device 80 is configured to control at least some of the items of equipment of the bus 10, such as the engine, the gearbox, the power-assisted steering, the air conditioning, the GPS, etc. In particular, the control device 80 is suitable for automatically controlling a deceleration d1 of the bus 10.

**[0021]** The receiver device 60 is preferably an antenna, which may be placed beneath the chassis of the bus 10. This antenna 60 is permanently powered and transmits a magnetic field over a short distance. This distance depends on the power of the antenna 60 and is for example equal to 50 cm. As a variant, in order to save energy, the antenna 60 may be activated only when the speed V10 of the bus 10 is beneath a predetermined value.

**[0022]** When the bus 10 passes over a tag zone 41, 42 or 41', the magnetic field of the antenna 60 makes it possible to power the transponder device or devices, which then return a coded control signal which is specific to each zone. Therefore, the antenna 60 of the bus 10 forms an RFID (radio frequency identification) system with the transmitter device 40.

**[0023]** In practice, the control system 1 is therefore obtained by linking this RFID system to the control device 80 of the bus 10.

**[0024]** At this stage, note that each section 7 or similar comprises a portion of roadway 21, a portion of pavement 23, and at least one stop 31 and a zone 41. In general, on a given section 7 or similar, the transmitter device 40 has as many tag zones 41 and 42 as stops 31 and 32, such that the first zone 41 is complementary to the first stop 31 and the second zone 42 is complementary to the stop 32. Each stop 31 or 32 corresponds to a particular bus line. In other words, associated with each bus 10 that travels on the section 7 are a single bus stop 31 and a single tag zone 41, or else a single stop 32 and a single zone 42.

**[0025]** As a variant not shown, depending on the number of bus lines that travel on the section 7, and therefore the number of bus stops, the transmitter device 40

of the section 7 may comprise a variable number of tag zones, for example three or four zones. Equally, the tag zones may be superposed and comprise transponder devices programmed in a different manner.

**[0026]** Hereinafter it is considered that the bus 10 belongs to the line "31". In other words, as can be seen in Figure 3, the bus 10 is associated with the stop 31 and with the zone 41 on the section 7 and with the stop 31' and the zone 41' on the section 7'. If a second bus of the same line "31" travels on the section 7, it is associated with the same stop 31 and with the same zone 41. If a third bus travelling on the section 7 corresponds to a bus line different from that of the bus 10, such as the line "32", this bus is associated with the stop 32 and with the zone 42.

**[0027]** Moreover, a reference-marking system is used to improve the accuracy of the control system 1. Specifically, a tag reference mark 41a, 42b or 41a' is associated with each tag zone, respectively 41, 42 and 41'. Equally, associated with each door 14a or 14b of the bus 10 is a door reference mark 15a or 15b. Finally, each stop 31 or 32 has a reference mark which corresponds to each of the doors 14a or 14b. More precisely, the stop 31 has a reference mark 31a which is associated with the reference mark 15a, and a reference mark 31b which is associated with the reference mark 15b. The distance between the reference marks 15a and 15b is identical to the distance between the reference marks 31a and 31b. In the same manner, the stop 32 has reference marks 32a and 32b, while the stop 31' has reference marks 31a' and 31b'.

**[0028]** In general, the bus stops have a number of reference marks that is identical to the number of doors fitted to the bus 10. As a variant not shown, if the bus 10 has three doors or more, the corresponding bus stops have a reference mark associated with each door.

**[0029]** As can be seen in Figure 2, L1 marks the distance between the reference marks 31a and 41a, corresponding to the braking distance of the bus 10, with for example L1 = 120 m. Marked L3 is the distance between the reference marks 31a and 32a. Marked L4 is the distance between the reference marks 41a and 42a. Preferably, but not exclusively, for each bus to have an equivalent braking distance on one and the same section 7 or similar, L3 is equal to L4. In Figure 2, L3 is greater than L4, in other words the braking distance associated with the stop 32 is shorter than the braking distance L1 associated with the stop 31. In practice, it is notably the case when the bus of the line "32" travels at a lower speed than the bus of the line "31".

**[0030]** The exact position of each of the reference marks is established during the installation of the control system 1, more precisely of the transmitter device 40, in the travelling space 2. In particular, in Figures 1 to 3, the tag reference marks 41a, 42b and 41a' correspond to the centre of the tag zones 41, 42 or 41' respectively, just as the reference marks 15a and 15b correspond to the centre of the doors 14a and 14b. Moreover, the first stop

reference marks 31a, 32a and 31a' are positioned facing the bus stops 31, 32 and 31' in order to make it easier for the passengers to get onto the bus 10, while the second stop reference marks 31b, 32b and 31b' are positioned beside the respective bus stops in order to make it easier for passengers to get off the bus 10 and to disperse on the pavement 23.

**[0031]** Therefore, the use of the control system 1 and the relative positioning of the various reference marks 15a, 15b, 31a, 31b, 41a and similar makes it possible to stop the bus 10 in the same place at each stop 31 or similar which is situated in the travelling space 2. The reference marking allows the passengers who want to get onto the bus 10 to position themselves better at the bus stops. Moreover, these bus stops can be arranged to improve the flow of passengers, for example with the aid of markings on the ground or safety barriers, or even to force the passengers to enter the bus 10 via the front door 14a.

**[0032]** Shown in Figure 4 is a logical diagram of the control method according to the invention.

**[0033]** In particular, this method is suitable for the use of the control system 1 with a bus 10 which comprises a driver 12, at least one door 14a associated with a reference mark 15a, an antenna 60 and a control device 80.

**[0034]** In a step "a)", the driver 12 drives the bus 10 under manual control. The bus 10 travels at a speed V10, which is variable, on a traffic roadway 21, upstream of a stop 31 and of a tag zone 41. The stop reference mark 31a is associated with the stop 31, while the transmitter reference mark 41a is associated with the zone 41, which belongs to the transmitter device 40. This zone 41 is itself arranged on the roadway 21 upstream of the stop 31, with a predetermined distance L1 between the stop reference mark 31a and the transmitter reference mark 41a.

**[0035]** In a step "b)", the bus 10 travels over the zone 41 which forms a triggering event. The antenna 60 of the bus 10 registers a deceleration control signal originating from the tag zone 41, more precisely at the transmitter reference mark 41a. In practice, the signal transmitted by each zone 41 is coded in a particular manner as a function of the programming of the transponder(s). Accordingly, if several buses 10 stop at stops situated close to one another but not exactly in the same position, such as the stops 31 and 32 of Figures 1 and 2, the corresponding zones 41 and 42 are configured to send a distinct signal to each bus 10 and therefore to control their respective decelerations d1 independently.

**[0036]** Preferably, in this step b), the function for activating the transponder(s) associated with the zone 41 is used by the magnetic field of the antenna 60. Initially, the antenna 60 of the bus 10 transmits an activation signal to the zone 41 which returns a deceleration control signal to the antenna 60. Therefore, secondly, the antenna 60 registers the deceleration control signal originating from the zone 41 that has just been activated.

**[0037]** In a step "c)", the control signal is transmitted by the antenna 60 to the control device 80. The RFID

system comprising the antenna 60 and the "tags" of the zone 41 indicates to the control device 80 the position of the bus 10 relative to the bus stop 31, this position corresponding to the distance L1. Therefore, as a function of the speed V10 of the bus 10 at the time that it passes over the zone 41 and as a function of the predetermined distance L1, the control device 80 uses a computing algorithm to determine the deceleration d1.

**[0038]** In a step "d)", the control device 80 automatically controls the deceleration d1 of the bus 10 up to the stop 31, notably by controlling the gearbox and the engine of the bus 10. This solution can be used irrespective of the speed V10 of the bus 10, but the deceleration d1 must be kept below a maximum value d1max authorized by the operator for the comfort of the passengers. The transverse position of the bus 10 is managed by the driver 12, who may control lateral movements T10g and T10d while the control device 80 manages only the longitudinal position of the bus 10 on the roadway 21. Moreover, in this step d), the deceleration d1 is controlled by the control device 80 as a function of travelling parameters of the bus 10. These travelling parameters are chosen from the following: speed V10 of travel of the bus 10, distance L1 between the stop 31 and the corresponding tag zone 41, distance remaining to be travelled for the bus 10 to the stop 31, maximum deceleration d1max accepted for the comfort of the passengers, space taken up on the roadway 21 by other vehicles or pedestrians, travelling time slot, configuration of the stop 31, weather conditions, or a combination of some of them. For example, if it is raining on the roadway 21, the value of d1max can be reduced. Naturally, the speed V10 and the distance L1 are two travelling parameters that are essential for the use of the method.

**[0039]** In practice, for the computation initiated in the step b), implemented in the step c) and used in the step d), the following parameters are considered: "V10" is the speed of the bus 10 at the moment when it travels over the reference mark 41a, "L1" is the distance to travel between the reference marks 41a and 31a, "t" is the time to cover the distance L1, "d1" is the automatic deceleration controlled over the distance L1 and "d1max" is the maximum deceleration desired by the operator.

**[0040]** Therefore, it is possible to define the distance L1 between the reference marks 31a and 41a, that is to say the distance L1 from the stop 31 at which the zone 41 must be positioned, as a function of the maximum deceleration d1max desired by the operator and the maximum speed of the bus 10 over the section 7 when it passes over the reference mark 41a. The computation is:  $V10 = d1 \times t$  and  $V10 = L1/t$ , therefore  $L1 = V10^2/d1$ . If  $V10 = 30 \text{ km/h}$  and  $d1max = 1.5 \text{ m/s}^2$ , then  $L1 \approx 109 \text{ m}$ , while if  $V10 = 50 \text{ km/h}$  and  $d1max = 1.5 \text{ m/s}^2$ , then  $L1 \approx 180 \text{ m}$ .

**[0041]** Conversely, the distance L1 can be set in advance as a function of town planning constraints, with for example  $L1 = 120 \text{ m}$ . In this case, it is possible to estimate the necessary deceleration d1 as a function of the speed

V10 of the bus 10 when it passes over the zone 41. The computation is:  $V10 = d1 \times t$  and  $V10 = L1/t$ , therefore  $d1 = V10^2/L1$ . If  $L1 = 120$  m and  $V10 = 30$  km/h, then  $d1 \approx 0.58$  m/s<sup>2</sup>, while if  $L1 = 120$  m and  $V10 = 50$  km/h, then  $d1 \approx 1.61$  m/s<sup>2</sup>. If  $d1_{max}$  is set to  $1.5$  m/s<sup>2</sup>, if the vehicle travels at  $50$  km/h, the control device 80 computes that  $d1 > d1_{max}$  and the step d) is stopped, as explained in detail hereafter in a step "h)".

[0042] In a step "e)", the bus 10 is stopped automatically at the stop 31 by the control device 80 with the reference mark 15a associated with the door 14a being positioned at the stop reference mark 31a associated with the stop 31. Therefore, the bus 10 is stopped exactly at the desired place by the use of the control method and of the control system 1.

[0043] In a step "f)", the passengers get off at the stop 31 and/or get onto the bus 10 in a time that is reduced by the precise positioning of the bus 10 in front of the stop 31.

[0044] In a step "g)", the bus 10 starts off again and leaves the stop 31. Preferably, the bus 10 is driven by the driver 12 under manual control. As a variant, the control device 80 can control the restarting of the bus 10, but it is necessary to respect the imperatives of safety associated with the passengers and the motor vehicle traffic. Then, according to step a), the bus 10 travels freely up to the next tag zone 41'.

[0045] However, if a travelling parameter or a critical event d2 disrupts the smooth running of the step d), the automatic deceleration d1 is stopped in step h). More precisely, the driver 12 takes over manual control again and/or the vehicle 10 is automatically stopped by the control device 80. The event d2 may be a traffic accident, the presence of a vehicle on the roadway 21, the passage of a pedestrian. Equally, the event d2 may simply be the computation of a greater deceleration d1 than the maximum authorized deceleration  $d1_{max}$ . One of the events d2 may be detected automatically by the control device 80, for example in association with sensors, or else be detected by the driver 12 who actuates a switch connected to the control device 80. Moreover, the step d) can be stopped at any moment by the driver 12 who remains in control of his vehicle.

[0046] Therefore, the control system 1 and the associated control method exhibit a compromise between, on the one hand, the automation which makes it possible to prevent as far as possible the intervention of the driver 12 and, on the other hand, the imperatives of safety specific to driving on the road. Moreover, in this step h), the driver 12 can choose between several alternatives.

[0047] According to a first alternative "h1)", the driver 12 can hand control of the bus 10 to the control device 80 capable of initiating a new automatic deceleration according to the step d). Specifically, at the moment when the step h) is triggered, the position of the bus 10 remains stored, corresponding to the distance remaining to be travelled in order to position the reference mark 14a level with the reference mark 31a. Therefore, the control de-

vice 80 can control an automatic acceleration up to a predetermined speed, followed by an automatic deceleration d1 up to the stop 31.

[0048] According to a second alternative "h2)", the driver 12 can stop the bus 10 at the stop 31 under manual control, for passengers to get on and/or get off, according to step f). This is the case notably if the distance remaining to be travelled up to the stop 31 is not sufficient to apply the alternative h1), or if the event d2 makes manual control necessary, for example if a vehicle is parking between the zone 41 and the stop 31 and must be driven round.

[0049] According to a third alternative "h3)", the driver 12 may decide not to stop the bus 10 at the bus stop 31 and continue his journey under manual control, according to the step g). In particular, this is the case if no passenger wishes to get off the bus 10 and if no passenger is present at the stop 31. The driver 12 sees that there is no need to stop and can for example deactivate the automatic deceleration mode. He has deactivated the mode with the aid of a switch or he has accelerated and exceeded the maximum authorized deceleration. As a variant, each element of the transmitter device 40 is not a "transmitter-receiver" transponder. Similarly, in this case, the receiver device 60 is not an antenna diffusing to a magnetic field which activates the transmitter device 40. In other words, the transmitter device 40 can transmit a signal to the receiver device 60 when the bus 10 passes over a tag zone, without previous activation of the transmitter device 40 by the receiver device 60.

[0050] According to an alternative, the transmitter and receiver means do not operate by exchanging frequency signals. For example, the transmitter means may take the form of a marking on the roadway, while the receiver means may be an optical device, such as a video camera or a laser sensor. In this case, the passage of the bus over the transmitter means makes it possible to stimulate the receiver means and therefore to command the deceleration of the bus. As a variant, any combination of "transmitter" means and of "receiver" means can be envisaged.

## Claims

1. Control system (1) for passenger transport vehicles (10), **characterized in that** it comprises:

- transmitter means (40; 41; 42; 41') positioned on a traffic roadway (21) or close to such a roadway, upstream of at least one stop (31; 32; 31') provided for at least one vehicle (10),
- receiver means (60) positioned on each vehicle (10) and configured to receive a deceleration control signal originating from the transmitter means (40; 41; 42; 41'), and
- control means (80) positioned on each vehicle (10) and configured to control a deceleration

- (d1) of the vehicle (10) as a function, on the one hand, of the receipt of the control signal by the receiver means (60) and, on the other hand, of at least one travelling parameter of the vehicle (10). 5
2. Control system according to Claim 1, **characterized in that** the travelling parameter or parameters of each vehicle (10) are chosen from the following: speed (V10) of travel of the vehicle, distance (L1) between the stop (31; 32; 31') and the corresponding transmitter means (40; 41; 42; 41'), distance remaining to be travelled for the vehicle to the stop, maximum deceleration accepted for the comfort of the passengers, crowdedness of the roadway (21), travelling time slot, configuration of the stop, weather conditions, or a combination of some of them. 10
  3. Control system according to one of Claims 1 or 2, **characterized in that** the route of each vehicle (10) has several stops (31, 31'; 32), and **in that** particular transmitter means (41, 41'; 42) are associated with each stop. 20
  4. Control system according to one of Claims 1 to 3, **characterized in that** the transmitter means (40; 41; 42; 41') comprise at least one transponder device, and **in that** the receiver means (60) are configured to send an activation signal to the transmitter means (40) and to receive the deceleration control signal in return. 25 30
  5. Control method for passenger transport vehicles (10), each vehicle comprising a driver (12), at least one door (14a) associated with a reference mark (15a), receiver means (60) and control means (80), **characterized in that** the method comprises at least the following steps: 35
    - a) the vehicle (10) travels at a variable speed (V10) on a traffic roadway (21), upstream of a stop (31) and transmitter means (41), these transmitter means (41) themselves being arranged on the roadway (21) upstream of the stop (31), with a predetermined distance (L1) between a stop reference mark (31a) associated with the stop (31) and a transmitter reference mark (41a) associated with the transmitter means (41), 40
    - b) the receiver means (60) of the vehicle (10) register a deceleration control signal originating from the transmitter means (41) at the transmitter reference mark (41a), 50
    - c) the control signal is transmitted from the receiver means (60) to the control means (80), which calculate a deceleration value (d1) as a function of the predetermined distance (L1) and the speed (V10) of the vehicle (10), 55
  - d) the control means (80) automatically control the deceleration (d1) of the vehicle (10) up to the stop (31),
  - e) the vehicle (10) is stopped automatically at the stop (31) by the control means (80), with the reference mark (15a) associated with the door (14a) being positioned at the stop reference mark (31a) associated with the stop (31),
  - f) passengers get off at the stop (31) and/or get onto the vehicle (10), and
  - g) the vehicle (10) starts off again and leaves the stop (31).
  6. Method according to Claim 5, **characterized in that**, in step b), the receiver means (60) of the vehicle (10) initially transmit an activation signal which activates the transmitter means (41) and, secondly, register the deceleration control signal originating from the transmitter means (41) which have been previously activated. 15
  7. Method according to one of Claims 5 or 6, **characterized in that**, in step d), the deceleration (d1) is controlled by the control means (80) as a function of travelling parameters of the vehicle (10), these travelling parameters being chosen from the following: speed (V10) of travel of the vehicle, distance (L1) between the stop (31) and the corresponding transmitter means (41), distance remaining to be travelled for the vehicle to the stop, maximum deceleration accepted for the comfort of the passengers, crowdedness of the roadway (21), travelling time slot, configuration of the stop, weather conditions, or a combination of some of them. 20
  8. Method according to one of Claims 5 to 7, **characterized in that**, in step d), when a critical travelling parameter (d2) is detected by the control means (80) or by the driver (12), a step h) occurs in which the driver (12) takes manual control again and/or the vehicle (10) is automatically stopped by the control means (80). 25
  9. Method according to Claim 8, **characterized in that**, in step h), the driver (12) may selectively:
    - h1) hand control of the vehicle (10) to the control means (80) capable of initiating a new automatic deceleration, according to step d), or
    - h2) stop the vehicle (10) at the stop (31) under manual control, for the passengers to get on and/or get off, according to step f), or
    - h3) not stop at the stop (31), in particular if no passenger wishes to get off or get on, and continue his route under manual control, according to step g). 30

10. Passenger transport vehicle (10), **characterized in that** it is configured for the use of the control system (1) according to one of Claims 1 to 5, and/or of the control method according to one of Claims 6 to 9.

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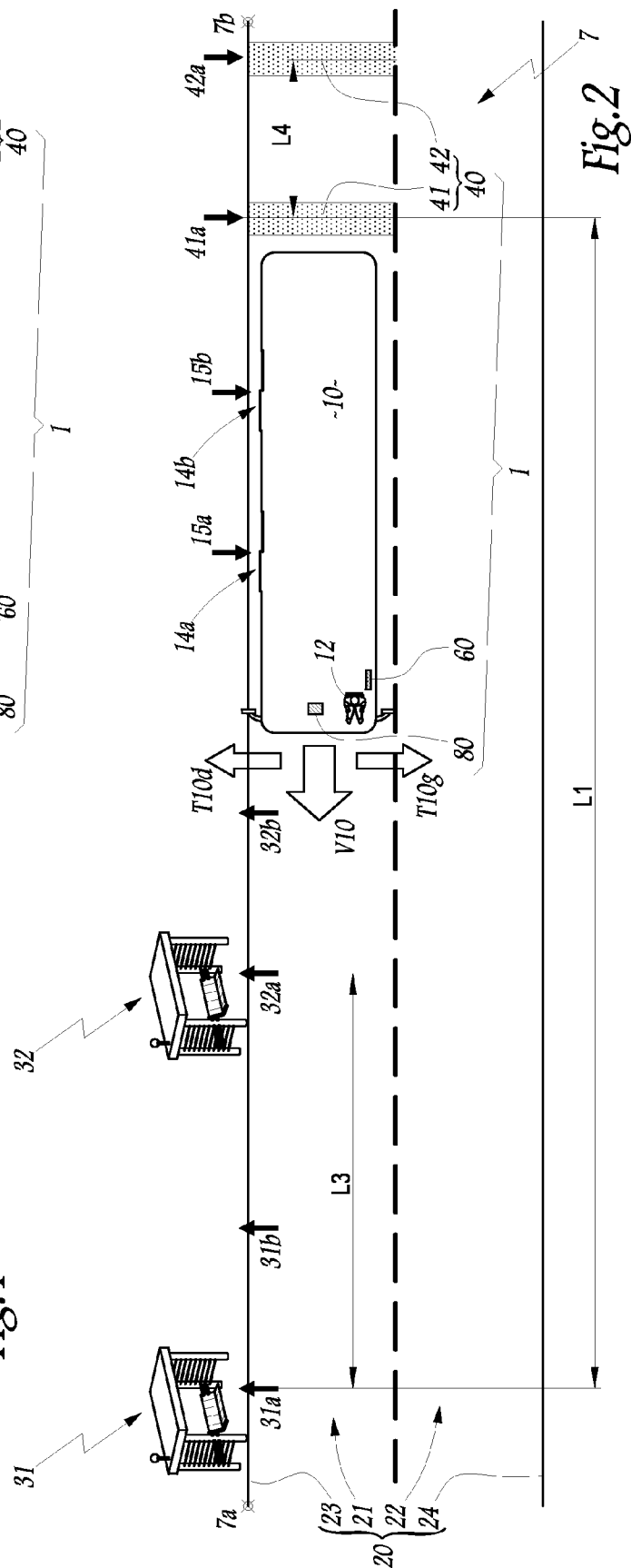
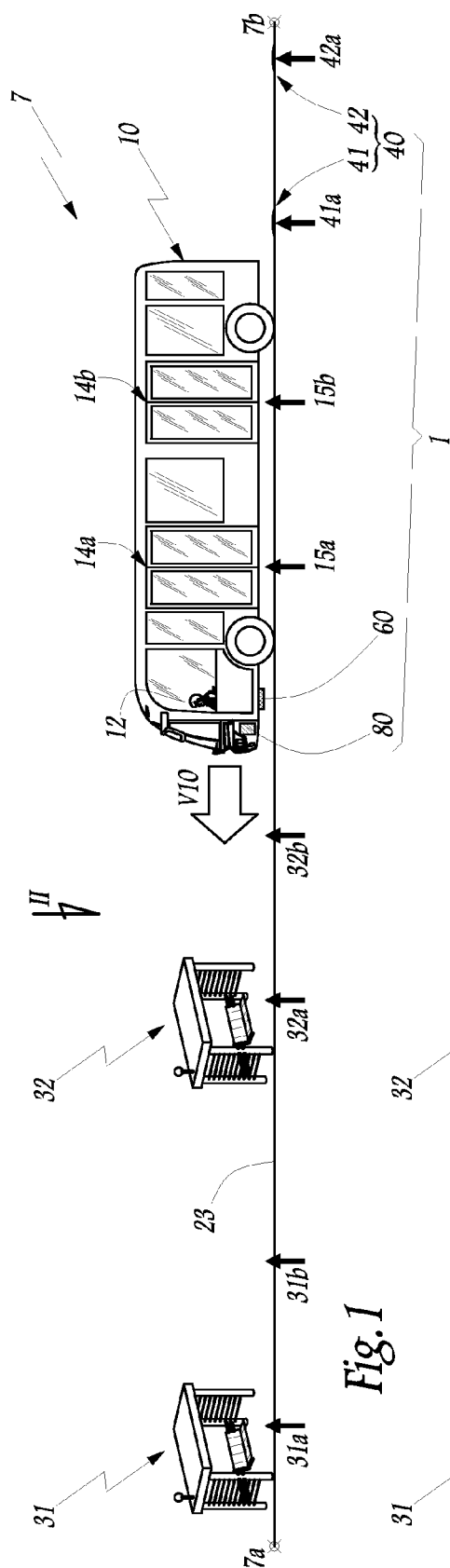
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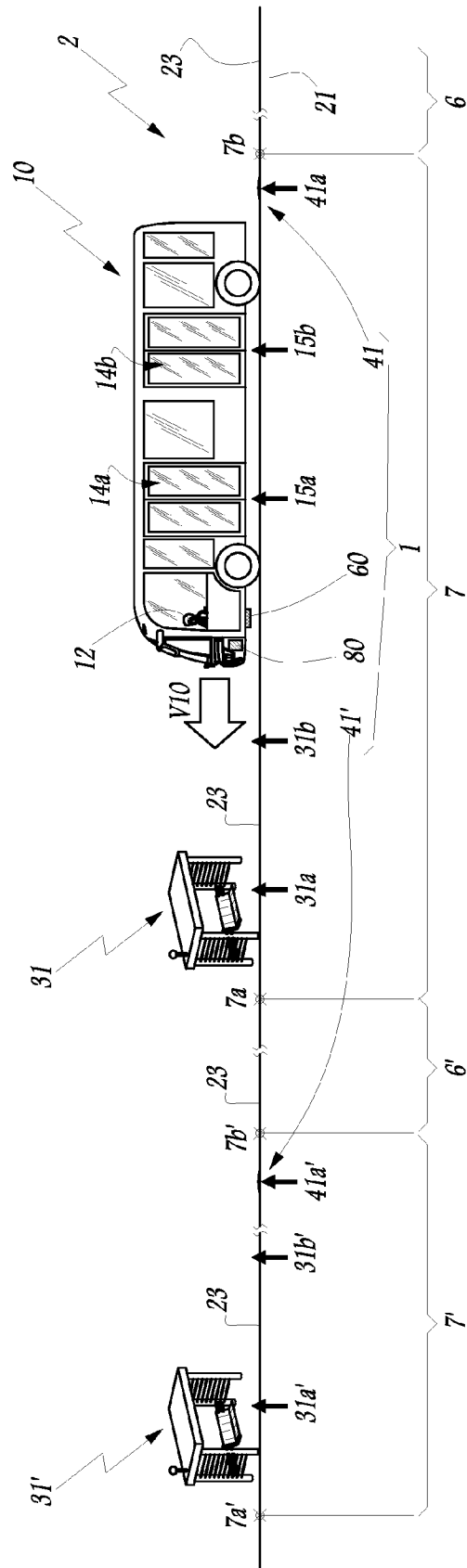
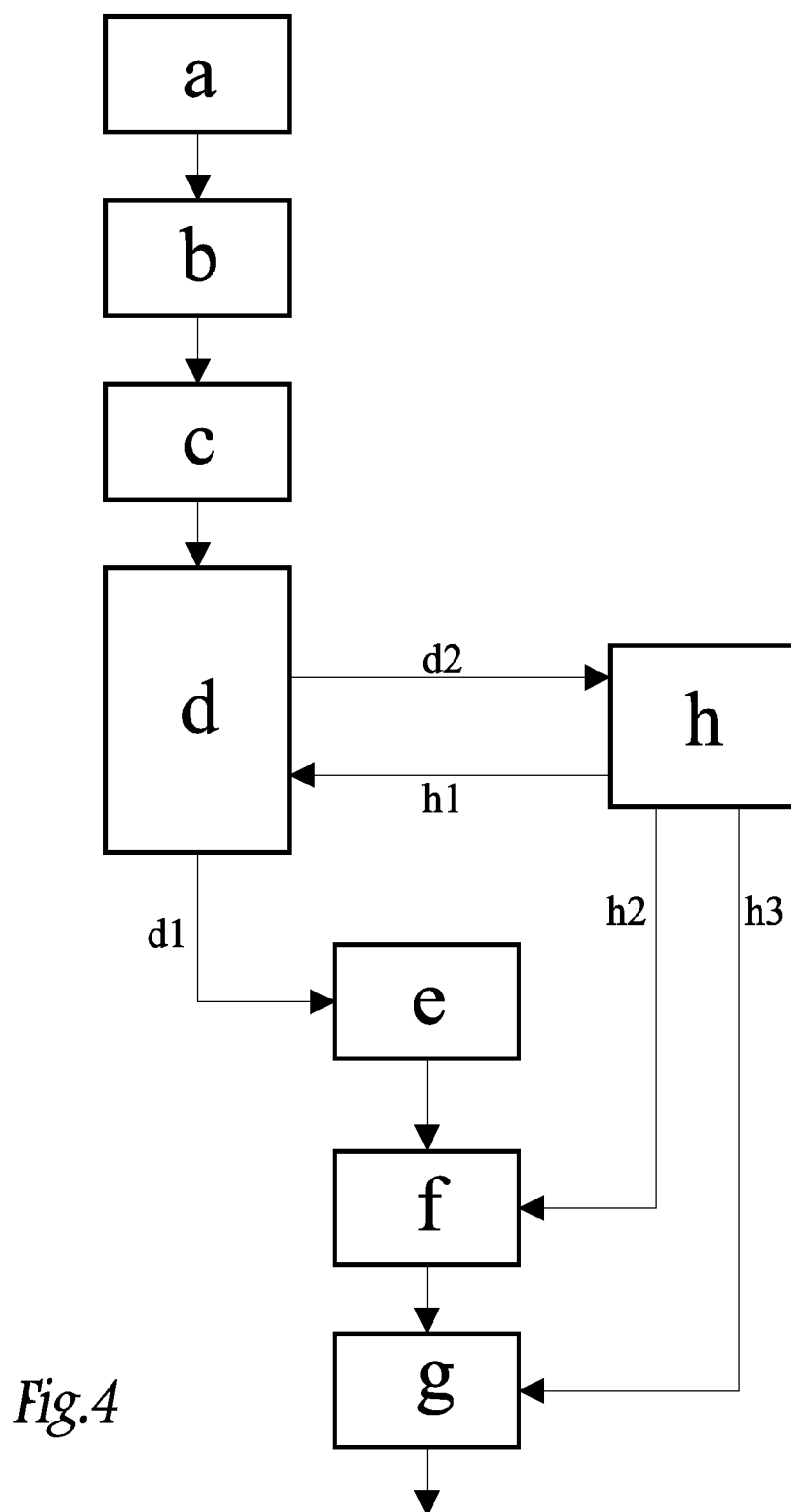


Fig. 3





## EUROPEAN SEARCH REPORT

Application Number  
EP 10 17 3079

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| Place of search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                | Date of completion of the search | Examiner                                |
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The members are as contained in the European Patent Office EDP file on  
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11-02-2011

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