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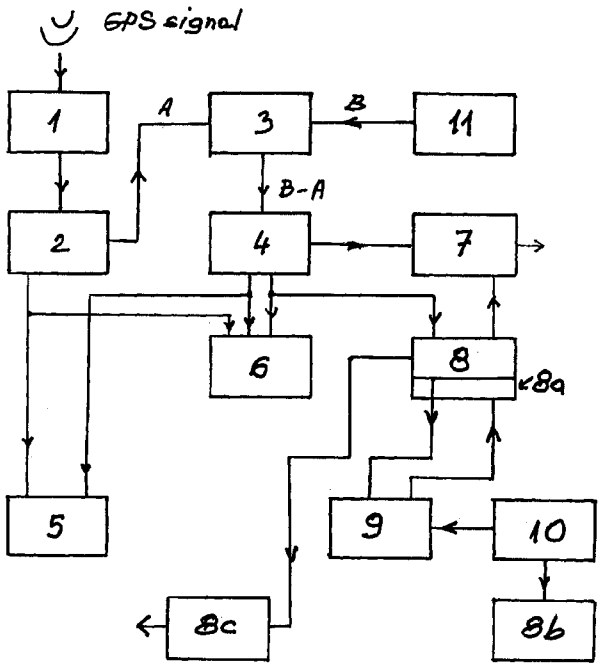

Figure 1

(57) Abstract: The subject of the invention belongs to the field of methods for an electronic road speed control in road traffic by means of electronic devices for satellite navigation and supervision of vehicles/drivers under consideration of speed limit information to contribute to driving safety. The method for electronic road speed control of road traffic and a device according to this method for electronic recording of allowed speed limit, continuous informing of a driver, and measures due to speeding lies in that a driver is continuously informed about the maximum speed limit by means of the existing GPS network and detection of GPS coordinates of a point on a road speed electronic network which determines the maximum speed limit from that point on and is displayed to the driver on the display in his vehicle. A comparator compares the maximum speed limit with the speed of the vehicle and if the maximum speed limit is violated, the driver is alarmed. If the driver fails to reduce the speed to the speed limit, a violation module turns on. Said module deducts an adequate sum from a credit card for violations. In case the time ti of driving is exceeded, the module for deducting the credit from the credit card for violations will be activated. And if the driver fails to reduce the speed to the speed limit within a time t2, he receives an audio signal as a warning that after a time t.3 the module will activate speed reduction to 50 km/h for instance.

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Method for an electronic road speed control in road traffic and a device therefor

Field of Invention

The subject of the invention belongs to the field of methods for an electronic road speed control in road traffic by means of electronic devices for satellite navigation and supervision of vehicles/drivers under consideration of speed limit information to contribute to driving safety.

Technical Problem

The technical problem is a design of a method for electronic processing of speed limits comprising a GPS navigation system and electronic equipment in a vehicle that would make it possible to warn a driver of possible speeding on a road where he currently drives, and a system for warning a driver when he speeds. The method must provide for good responsiveness of a detector or a loudspeaker in a vehicle, so that a driver may act accordingly. The task and goal of the invention is also a device based on the method for monitoring road speed and continuous informing of the driver. The device / electronic equipment in a vehicle should also include a possibility of reducing road speed as well as of deducting credit from a credit card for violations.

Prior Art

There are several known ways of informing drivers about road speed limits, but they fail to provide for a positive reaction of a driver in case of speeding. A tachograph records the speed driven by a driver in a certain period or route, but it does not record the limits required on these road routes. When a driver sets his cruise control to maximum allowed speed limit, he gets a beep warning in case of possible violation, and the driver can reduce the road speed or not as there is no evidence that he had violated a speed limit in a certain road section. Moreover, it depends on the driver whether or not he will turn on the warning signal. Or, when the driver has an RF receiver installed in his vehicle, which is permanently turned on during a drive, he receives RF signals of transmitters arranged along the road. If a vehicle violates the maximum speed limit, the driver gets warned by an audio signal and this is it. There is also known a way, in which

an audio signal is triggered in the vehicle indirectly via RF transceiver in case of speeding and this audio signal gets louder even up to 90 dB. This unpleasant beeping alert is supposed to force the driver to reduce the speed. Unfortunately, such pressure has no real effect on the driver.

There also exists an electronic device for continuous notification of the driver. This device is based on the data from a GPS network and a computer system for detecting approaching to mobile and stationary speed cameras. This device warns the drivers of approaching to a speed camera, yet does not record speeding.

Solution to the Technical Problem

The method for electronic road speed control of road traffic and a device according to this method for electronic recording of allowed speed limit, continuous informing of a driver, and measures due to speeding lies in that a driver is continuously informed about the maximum speed limit by means of the existing GPS network and detection of GPS coordinates of a point on a road speed electronic network which determines the maximum speed limit from that point on and is displayed to the driver on the display in his vehicle. A comparator compares the maximum speed limit with the speed of the vehicle and if the maximum speed limit is violated, the driver is alarmed. If the driver fails to reduce the speed to the speed limit within time t_1, a violation module turns on. Said module deducts an adequate sum from a credit card for violations. And if the driver fails to reduce the speed to the speed limit within a time t_2, he receives an audio signal as a warning that after a time t_3 the module will activate speed reduction to 50 km/h for instance.

The method for electronic road speed control of the invention will be described in more detail in the continuation by way of a block diagram in Figure 1.

The method for electronic road speed control in road traffic of the invention is designed in a way that a GPS receiver 1 sends GPS geographical coordinates of points to an

electronic network 2, on which geographical coordinates of points with speed limit information for individual road sections are marked, said coordinates being defined in a direction of driving with coordinate points $x_n y_n$ - $x_{n+1} y_{n+1}$. Data for speed limits are transferred from the electronic network 2 to the first line of a display 5 and a loudspeaker 6 that warns the driver of a new driving speed limit. Data comprising the information of maximum speed limits (A) are transferred from the electronic network 2 to the second input of a comparator 3 which receives the information on the speed (B) of the vehicle from a meter 11 via the first input. The meter 11 is a tachometer of the vehicle displaying the speed of the vehicle on the dashboard. The comparator 3 calculates a difference between the speed B from the meter 11, with which the vehicle drives, and the speed limit A from the electronic network 2. The comparator 3 sends the information on the difference between the speed B – A to a processor 4 that forwards the information to the driver in the first line of the display 5 and the loudspeaker 6.

Med vožnjo vozila se preko sprejemnika 1 GPS signala in elektronske mreže 2, ki ima elektronsko vpisane največje dovoljene hitrosti na koordinatnih točkah, kjer nastopi sprememba hitrosti vožnje v smeri vožnje in je voznik vozila opozorjen s piskom iz zvočnika 6, da je veljavna nova omejitev hitrosti v primerjavi s predhodno ter izpis na displej 5 kolikšna je ta nova omejitev hitrosti vožnje[NI]. Such warnings appear at each geographical coordinate point along the road, where the speed limit is changed.

The driver is sanctioned for speeding when the processor 4 determines a difference between the actual speed B of the vehicle from the meter 11 (tachometer) and the maximum speed limit (A) according to the road speed electronic network 2.

B - A ≤ Ø no speeding

B - A > Ø speeding

When the difference is B - A > Ø, the processor 4 triggers an electric pulse to a computer 8. Based on a positive result B – A and the level of violation above the maximum speed limit in km/h (e. g. 30, 50, 80, 100, 120, 150, 200), the computer 8 sends for instance every 5 seconds a pulse to a cash register unit 8a, said unit sends a command through a reader 9, how much credit should be deducted from a credit card

10 for violations. A display 8b displays the credit balance on the credit card 10 for violations.

The value of individual levels is to be defined by the provider of the technical realisation. A cumulative of the deducted credit for violations is stored in a memory unit 8c and can be used by an authorised regulating authority to check indiscipline of the driver.

If the speed of a vehicle exceeds the speed limit (B - A > Ø), the processor 4 triggers an electric signal on the second line of the display 5 where the current speed of the vehicle is displayed. Simultaneously, the processor 4 sends a signal for the loudspeaker 6 which gives the driver a warning beep to reduce the speed. If within the time t_1 (according to an algorithm) after having received the information on the second line of the display 5 the driver reduces the speed to the allowed speed limit, the processor 4 triggers an audio signal via loudspeaker 6 and a display on the display 5 indicating the current speed. If the driver fails to reduce the speed to the allowed speed limit within the time t_1 (according to the algorithm), the processor 4 sends a signal to the loudspeaker 6 that emits a louder audio signal, and simultaneously sends a signal for the second line of the display 5 displaying the current speed of the vehicle. The processor 4 also gives a signal to the computer 8 which triggers via the cash register unit 8a deduction of the credit from the credit card 10 for violations. As soon as the driver reduces the speed to be within the speed limit and the processor 4 has received the information that the difference in speed between B and A (B - A ≤ Ø) is within the limits, the processor 4 sends a signal to the computer 8 to stop deduction from the credit card 10 for violations.

If speeding continues for t_2 seconds (according to the algorithm), the processor 4 sends a signal to the loudspeaker 6 which triggers a stronger audio signal and the computer 8 gives a command to a control unit 7 to limit the speed of driving, which means that the speed of driving will be limited to e. g. 50 km/h after t_3 seconds. This limitation must and shall be released only by an authorised supervisor. The times t_1, t_2 and t_3 are to be determined by traffic specialists or by the organiser of the electronic road speed control.

To prevent a vehicle from wrong-way driving, a point is determined at the end of an exit lane on the road speed electronic network 2 with coordinates and an azimuth, where the driver is warned of wrong-way driving and the comparator 3 triggers an alarm for the control unit 7 to reduce the speed to e. g. 5 km/h (according to the algorithm) or to 0 km/h - STOP.

List of reference numbers:

1	receiver
2	electronic network
3	comparator
4	processor
5	display
6	loudspeaker
7	control unit
8	computer
8a	cash register unit
8b	display for a balance on the card
8c	memory unit
9	card reader
10	card
11	meter (tachometer)

t_1 is the time from an instant when the vehicle exceeds the speed limit to an instant when the driver should reduce the speed to be within the speed limit, e. g. 5 seconds – according to the algorithm;

t_2 is the time when the driver speeds for e. g. 30 seconds (according to the algorithm) from the instant when he exceeded the speed limit and has not reduced the speed to be within the speed limit;

t_3 is the time from the instant when the time t_2 has lapsed and the time t_3 starts; t_3 is the time up to speed limitation e. g. 50 km/h (according to the algorithm).

The device for an electronic road speed control in road traffic according to the above described method can be an independent device intended to be connected to the system of the vehicle through an input connector or in a combination with a key and is controlled by a specially designed algorithm that follows the steps from the method described above. The device of the invention can also be an integral part of a vehicle assembly.

Claims

1. A method for an electronic road speed control in road traffic **characterised in that** a GPS receiver (1) sends GPS geographical coordinates of points to an electronic network (2), on which geographical coordinates of points with speed limit information for individual road sections are marked, said coordinates being defined in a direction of driving with coordinate points $x_n y_n$ - $x_{n+1} y_{n+1}$; that data for maximum speed limits are transferred from the electronic network (2) to the first line of a display (5) and a loudspeaker (6) that warns the driver of a new driving speed limit; that data comprising the information of speed limits (A) are transferred from the electronic network (2) to the second input of a comparator (3) which receives the information on the speed (B) of the vehicle from a meter (11) via the first input; that the meter (11) is a tachometer of the vehicle displaying the speed of the vehicle on the dashboard; that the comparator (3) calculates a difference between the speed (B) from the meter (11), with which the vehicle drives, and the speed limit (A) from the electronic network (2); that the comparator (3) sends the information on the difference between the speed (B – A) to a processor (4) that forwards the information for the driver to the first input of the display (5) and the loudspeaker (6); that the driver is warned by a beep from the loudspeaker (6) that a new speed limit is valid in comparison with the earlier one; that the driver is warned from the loudspeaker (6) on each coordinate point along the road where a change of the speed limit occurs; that the processor (4) triggers an electric signal on the second line of the display (5) where the current speed of the vehicle is displayed, if the vehicle of the speed exceeds the speed limit; that simultaneously the processor (4) sends an electric signal for the loudspeaker (6) which gives the driver a warning beep to reduce the speed of driving; that if within the time (t_1) after having received the information on the second line of the display (5) the driver reduces the speed to the allowed speed limit, the processor (4) triggers an audio signal via loudspeaker (6) and a display on the display (5) indicating the current speed; that if the driver fails to reduce the

speed to the allowed speed limit within the time (t_1), the processor (4) sends a signal to the loudspeaker (6) that emits a louder audio signal, and simultaneously sends a signal for the second line of the display (5) displaying the current speed of the vehicle; that the processor (4) gives a signal for triggering a stronger signal on the loudspeaker (6) and simultaneously also sends a pulse to the computer (8) which triggers via the cash register unit (8a) deduction of the credit from the credit card (10) for violations; that as soon as the driver reduces the speed and the processor (4) has the information that the difference in speed between (B - A) is within the limits or is allowable, the processor (4) sends a signal to the computer (8) to stop deduction from the credit card (10) for violations.

2. Method according to claim 1, characterised in that the processor (4) has an input difference in speed (B - A), which is ≤ Ø - no speeding and no sanctions; that the difference in speed (B - A) > Ø means speeding and in this case the processor (4) triggers an electric pulse to a computer (8), which – on the basis of a positive result (B – A) and the level of violation above the maximum speed limit in km/h (e. g. 30, 50, 80, 100, 120, 150, 200) – sends for instance every 3 seconds a pulse to the computer (8), how much credit should be deducted from the credit card (10) for violations.

3. Method according to claim 1 and 2, characterised in that exceeding of the time (t_2) causes the processor (4) to send a signal to the loudspeaker (6) which triggers a stronger audio signal and the processor (4) simultaneously sends a signal also to the computer 8 which gives a command for speed limitation, which means that the speed of driving will be limited to e. g. 50 km/h after (t_3) seconds; that the release can be done only by an authorised supervisor; that the times (t_1, t_2 in t_3) are to be determined by traffic specialists in compliance with the legislation currently in force.

4. Method according to claim 1, 2 and 3, characterised in that to prevent a vehicle from wrong-way driving, a point is determined at the end of an exit lane on the

road speed electronic network (2) with coordinates and an azimuth, which defines the direction of driving only in direction of an exit from a motorway; that in case of a wrong-way driving the comparator (3) triggers an alarm (strong beep) for reducing the speed to 5 km/h or to 0 km/h - STOP.

5. A device for an electronic road speed control in road traffic, characterised in that it can be an independent device intended to be connected to the system of the vehicle through an input connector or in a combination with a key and controlled by a specially designed algorithm that follows the steps from the above method.

6. Device for an electronic road speed control in road traffic, characterised in that it can be an integral part of a vehicle assembly.

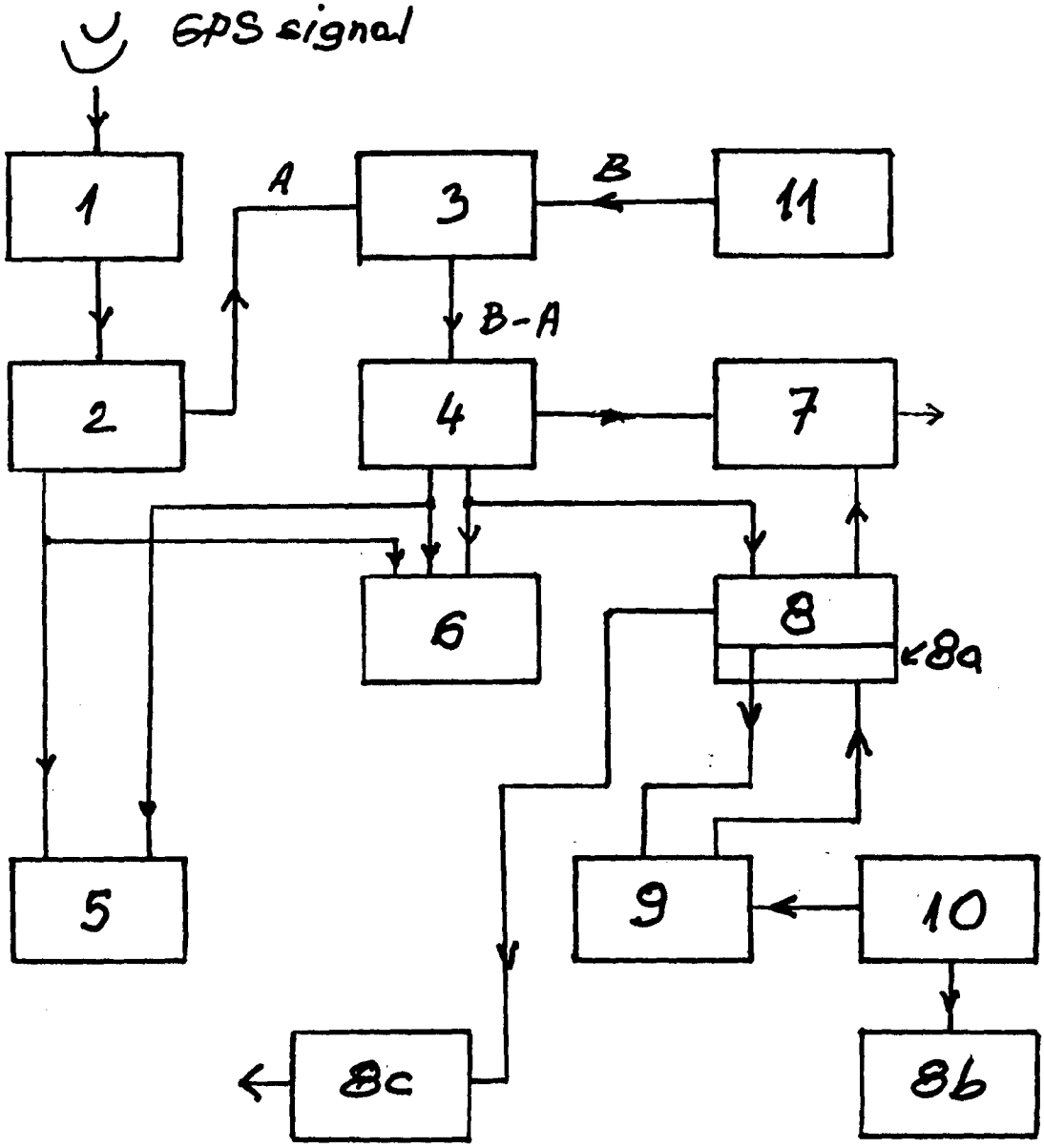

Figure 1