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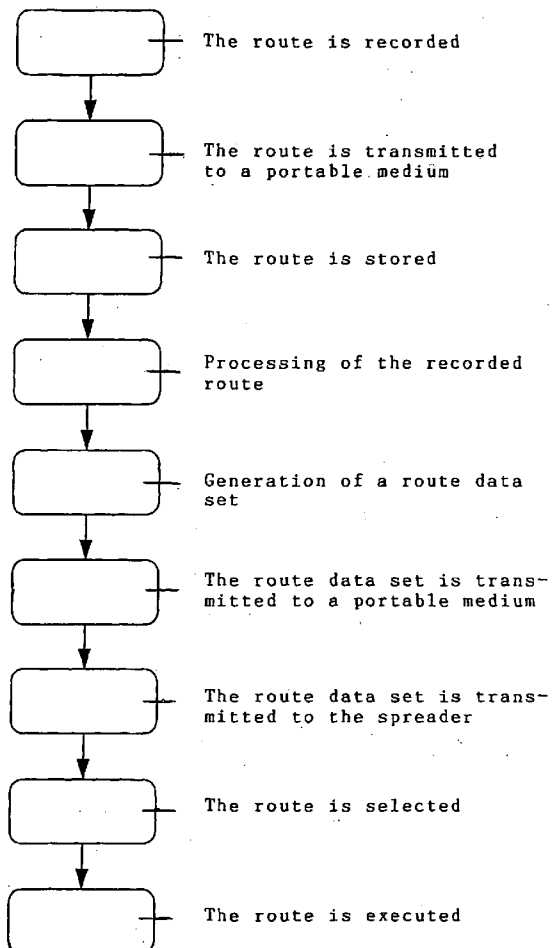
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**Barfod**(10) **Pub. No.: US 2009/0198421 A1**(43) **Pub. Date: Aug. 6, 2009**(54) **VEHICLE FOR SPREADING PRODUCTS ON  
A ROAD SURFACE****Publication Classification**(51) **Int. Cl.**  
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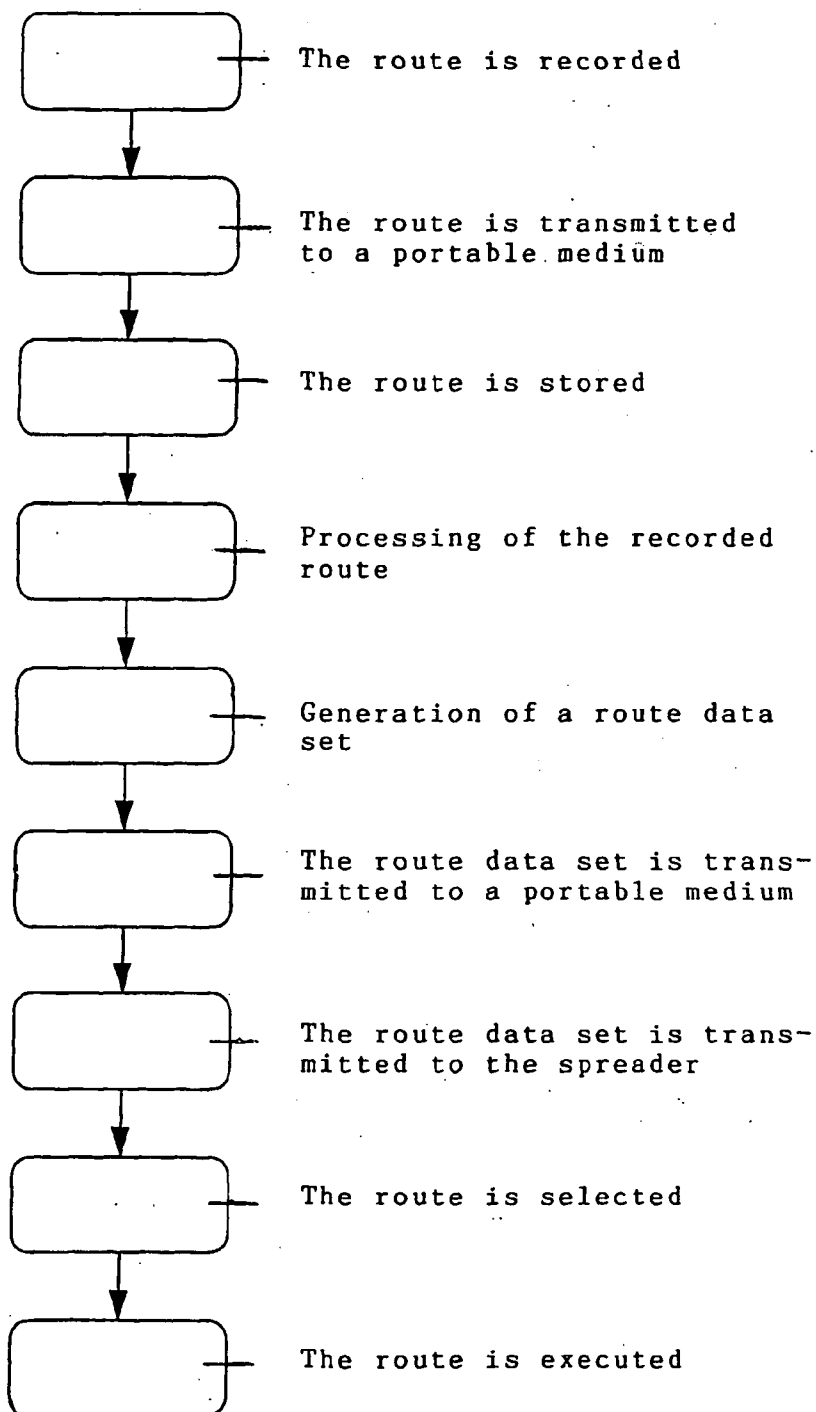
(52) **U.S. Cl. .... 701/50**(57) **ABSTRACT**(76) **Inventor: Jesper Malm Barfod,**  
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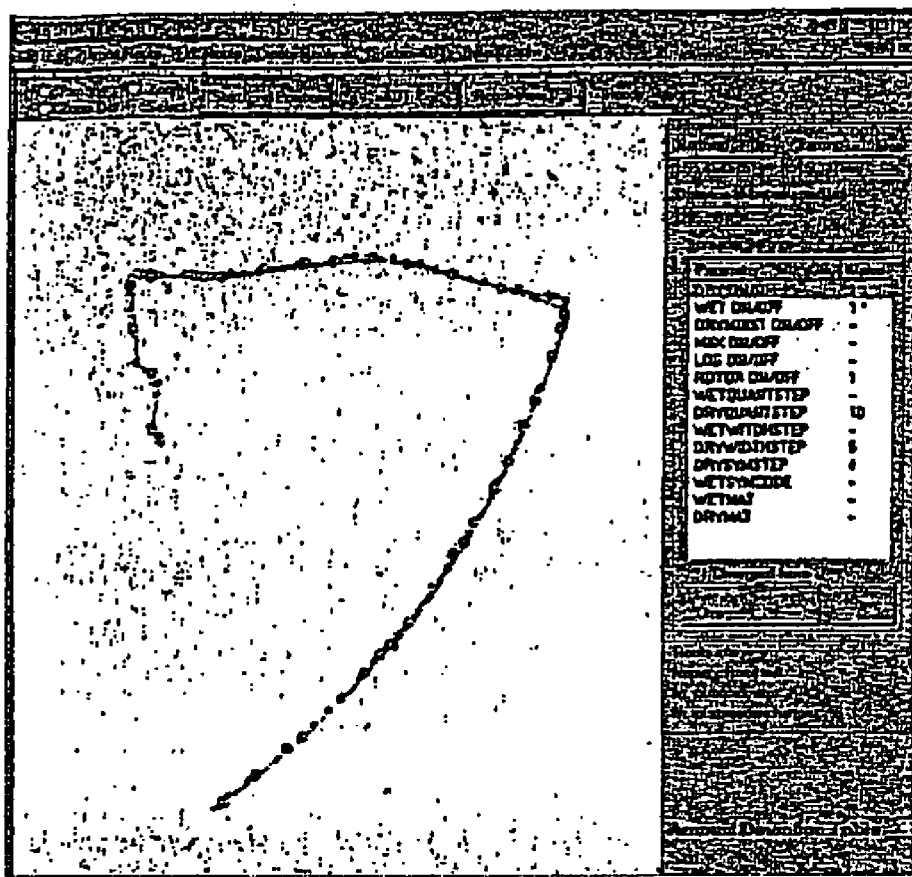
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A vehicle for spreading products on a road surface, in particular de-icing or friction-producing products, including distribution means adapted to spread said products, electronic control means cooperating with said distribution means to adjust spreading parameters, positioning means for generating a position signal correlated with the position of said vehicle, said electronic control means cooperating with said positioning means for controlling said spreading parameters in response to said position signal so as to associate said spreading parameters with the current position of said vehicle. According to the invention, the control means are vector-based, the control means also being adapted to control the spreading parameters in response to the speed and direction of said vehicle. This allows for optionally increasing the speed in some areas while automatically adjusting for instance the quantity of product spread in relation thereto, which enables the driver to concentrate more on the traffic.

**Route recording: editing and executing**

## Route recording: editing and executing

**Fig 1**

**Fig 2**

## VEHICLE FOR SPREADING PRODUCTS ON A ROAD SURFACE

### TECHNICAL FIELD

**[0001]** The invention relates to a vehicle for spreading products on a road surface, in particular de-icing or friction-producing products, including distribution means supported by said vehicle and adapted to spread said products on said road surface, electronic control means cooperating with said distribution means to determine the spreading parameters in response to a preset route, said spreading parameters for instance being the quantity of product spread per unit area, the width and symmetry of the spreading, positioning means for generating a position and direction signal correlated with the position and the direction of said vehicle, said electronic control means cooperating with said positioning means for controlling said spreading parameters in response to said position signal so as to associate at least one of said spreading parameters with the current position and speed of said vehicle.

### BACKGROUND ART

**[0002]** EP 835962 and U.S. Pat. No. 6,154,699 both disclose a vehicle of the above type, the spreading parameters being controlled in response to the position of the vehicle. However, a vehicle of this type is not completely satisfactory as it lacks the ability to adjust for various conditions, e.g. the conditions in an intersection or a roundabout or when travelling over or under bridges and through tunnels.

### DISCLOSURE OF INVENTION

**[0003]** The object of the invention is therefore to provide a vehicle of the above type, which is more advanced than hitherto known.

**[0004]** According to the invention, a vehicle of the above type is characterised in that the spreading/distribution defined by the preset route is initiated only when the position and the direction of said vehicle generated by the positioning means substantially match a correlated position and direction according to the preset route.

**[0005]** The fact that the control means also control the spreading parameters in response to the speed and the direction of the vehicle allows for optionally increasing the speed in some areas while automatically adjusting for instance the quantity of product spread in relation thereto. This automatic adjustment enables the driver to concentrate more on the traffic, which evidently increases road safety.

**[0006]** Furthermore, according to the invention, the positioning means may include a GPS-system.

**[0007]** Additionally, according to the invention, while driving, the driver may also be navigated by means of the GPS-system, which is also used as a GPS-navigation system. As a result, the driver no longer needs to concentrate as much on the route as earlier, and he will thus be able to concentrate more on the traffic.

**[0008]** Furthermore, according to the invention, the positioning means may include a gyro to enable the vehicle to also know the correct position and direction when there is no clear view of the GPS-satellites.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** The invention is explained in detail below with reference to the drawings, in which

**[0010]** FIG. 1 is a flow chart to show how a route is "recorded", edited and executed, and

**[0011]** FIG. 2 is an example of a route depicted on a monitor.

### BEST MODES FOR CARRYING OUT THE INVENTION

**[0012]** An effective winter service provides passable roads throughout the winter season by using effective equipment minimising the consumption of salt while distributing an uniform spreading pattern across the entire width of the road.

**[0013]** The use of moistened salt has resulted in a reduced consumption of salt. However, under the right climatic conditions, liquid spreading can contribute to a further reduction in the consumption of salt.

**[0014]** In the attempt to continuously optimise the road service and road safety, focus has in recent years been on the need for the spreading to also adjust for varying road widths, for instance at bus lay-bys, parking lots along the road, roundabouts, etc.

**[0015]** For a driver who first and foremost needs to watch the road, it is no easy task to at the same time operate a remote control to a spreader mounted on the vehicle. In addition, it should be taken into account that a vehicle moving at a speed of approx. 50 km/h moves approx. 14 m per sec. Thus, it is easy to imagine how difficult it must be for the driver to react to the road situation in the exact moment required. It is for instance necessary to adjust the spreader just before the road width increases, e.g. at bus-lays, so as to distribute extra salt at the exact position required, but not long before that particular point. An accurate and timely correct adjustment of the spreading width is thus vital for preventing slippery roads as effectively as possible.

**[0016]** In order to obtain such effectiveness, a so-called GSS-system is used, said system being based on a GPS-controlled spreading.

**[0017]** The GSS-system works as a module, first by making a "recording" and subsequently by "playing" it. Thus, a recording is made of a particular route by travelling said route, for instance when planning the route for the next winter season. As the vehicle travels, the desired spreading adjustments are made by means of a remote control unit placed in the cabin of the vehicle, and these adjustments are stored together with the current GPS-positions, thereby building a complete spreading route.

**[0018]** The route is then studied in the administration centre, where it is depicted graphically on for instance a PC and optionally edited. FIG. 2 shows a display of a route edited by means of an editing program. The route is ready for use after editing and is stored on a memory card to be inserted into the remote control unit in the driver's cabin. The GSS-system is then ready to be used and can be activated by means of pressing a few keys on the remote control unit.

**[0019]** When the route is to be executed, the desired route is selected via the remote control unit, and the GSS-system then sets the correct quantities, widths and other relevant spreader parameters as the vehicle travels. Hence, it is now possible for the driver to concentrate on steering the vehicle to a greater extent than earlier, which increases road safety and the driver's convenience.

**[0020]** Furthermore, only the desired quantity is spread on the roads, which evidently is beneficial to the environment and road safety.

[0021] When developing the GSS-system, it was important to make the operation thereof as simple and user-friendly as possible, while a considerable precision also was required. In addition, the GSS-system should be able to adjust for unexpected incidents along the route and still be adapted so as to automatically adjust for inaccuracies in the GPS-system, mechanical inaccuracies, etc.

[0022] A GSS-system operates on the basis of the preset settings and reacts within  $\pm 5$  m. If the driver were to react with a precision of 5 m, he would need to react within  $\pm \frac{1}{3}$  sec., which naturally is not realistic in practice.

[0023] However, drivers often travel different routes, thereby significantly reducing the knowledge of each particular route. This problem is also solved by means of the GSS-system according to the invention.

[0024] The flow chart of FIG. 1 illustrates how it is possible to record and edit a route for a road machine by means of the GSS-system according to the invention.

[0025] Initially, the starting position of the vehicle is stored together with the relevant starting spreading parameters. Thereafter, the desired route is traveled, the position of the vehicle being stored every second and the spreading settings being stored by the adjustment thereof.

[0026] The recorded reference route with the respective spreading settings is then transmitted to a portable medium and inserted into a PC having a programme for processing the route. This processing programme allows for making the necessary or desired adjustments of the spreading parameters on the route.

[0027] Several routes can be collected into a route data set, which is loaded into the PC.

[0028] The generated route data sets are then transmitted to a portable registration medium corresponding to the previously used and are brought to the respective road machine for insertion into a remote control unit in the driver's cabin of the vehicle.

[0029] One of the routes in the data set is selected and activated.

[0030] The route is traveled and the specified spreading settings are activated when the vehicle reaches the respective positions. It should be noted that the respective spreading settings not only depend on the position but also on the speed and the direction of the vehicle. In a particular preferred embodiment, the respective spreading parameters also depend on the air temperature and air humidity as well as the temperature and the friction of the road.

[0031] Thus, the control means can be said to be vector-based, the control not only being dependent on a position but more generally dependent on a vector in a space.

[0032] In order to ensure that the route is executed correctly, the driver is to regularly keep an eye on the direction of travel, the speed, the coming spreading settings and the dead times.

[0033] Prior to travelling the recorded route, it is necessary to check several conditions on the chosen route. These conditions have to meet predetermined requirements in order to allow the control to be taken over by the GSS-system, and likewise when the route is deviated from, predetermined requirements have to be met before the control can be switched from the GSS-system to a subsequent manual control. In order to switch to "on-route", it is necessary to find the nearest point, said point having to be situated within 15 seconds of travel, however maximum 50 m. In addition, the next point on the route has to be situated in the direction of travel,

and the previous point has to be situated behind the spreader. If these conditions are met, the system switches to "on-route". In order to switch to "off-route", the next point and a number of subsequent points have to be situated behind the spreader. Alternatively, the distance between the next point on the route and a point perpendicular to the direction of travel and the point on the route has to be larger than a predetermined value (50 m).

[0034] When the route is deviated from, the last known spreading parameters are maintained and the driver is simultaneously notified by an alarm from the remote control unit that he has left the route.

[0035] In addition, during the execution of a route, it is possible to override the route selected by the driver by means of a radio contact, such as a GSM-connection with the spreader. This option can for instance be helpful when the road service control centre receives information, through forecasts or the like, that the weather appears to be changing, in which case it can be advantageous to travel the route with a different dosage than the dosage the driver was informed of earlier.

[0036] Furthermore, the GPS-controlled spreading can optionally be combined with a continuous measurement of the road temperature in order to adjust the preset dosage.

[0037] In addition, the GPS-controlled spreading can be combined with a continuous measurement of the friction on the road surface in order to adjust the preset dosage.

[0038] Furthermore, the route forecasts can generally be transmitted via GSM in order to adjust the preset dosage.

[0039] In a particular advantageous embodiment, the system is also equipped with a gyro to enable the vehicle to also know the correct position and direction when the route travels through a city with buildings so high that there is no clear view of the respective satellites constituting the GPS-system.

[0040] The route recording and editing are described in more details in the enclosed Manual for Eposat®.

1. A vehicle for spreading products on a road surface, in particular de-icing or friction-producing products, including distribution means supported by said vehicle and adapted to spread said products on said road surface, electronic control means cooperating with said distribution means to determine the spreading parameters in response to a preset route, said spreading parameters for instance being the quantity of product spread per unit area, the width and symmetry of the spreading, positioning means for generating a position and direction signal correlated with the position and the direction of said vehicle, said electronic control means cooperating with said positioning means for controlling said spreading parameters in response to said position signal so as to associate at least one of said spreading parameters with the current position and speed of said vehicle, wherein the spreading defined by the preset route is initiated only when the position and the direction of said vehicle generated by the monitoring means substantially match a correlated position and direction determined in the preset route, said positioning means including a GPS-system and a gyro to enable the vehicle to also know the correct position and direction when there is no clear view of the GPS-satellites.

2. A vehicle according to claim 1, characterized in that while driving, the driver is also navigated by means of said GPS-system, which is also used as a GPS-navigation system.

3. A vehicle according to claim 1, characterized in that the control means furthermore are adapted to control the spreading parameters in response to the temperature, in particular the road temperature.

4. A vehicle according to claim 1, characterized in that said control means furthermore are adapted to control the spreading parameters in response to the air humidity and/or the temperature.

5. A vehicle according to claim 1, characterized in that the last known spreading parameters are maintained when the route is deviated from, and that the driver is simultaneously

notified by an alarm from a remote control that he has left the route.

6. A vehicle according to claim 1, characterized in that the route selected by the driver can be overridden along the route by means of a radio contact, such as a GSM-connection with the spreader.

7. A vehicle according to claim 1, characterized in that the GPS-controlled spreading is combined with the continuous measurement of the road temperature in order to adjust the preset dosage.

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