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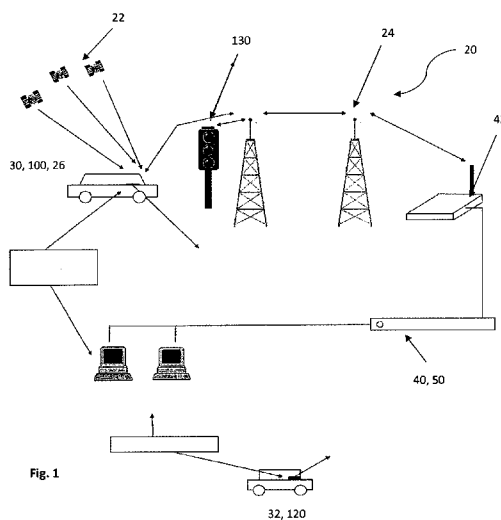
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(54) Title: TRAFFIC MANAGEMENT SYSTEM



(57) Abstract: A traffic management system comprising a locator unit (100) carried by a vehicle (30); a first global system for mobile communication (GSM) unit (104), in communication with the locator unit (100); a control centre (40) having a second global system for mobile communication (GSM) unit (105) being adapted to receive vehicle (30) speed and/or spatial location information from the first global system for mobile communication (GSM) unit (104) by a wireless communication network (22); a geographic information system (GIS) data model (42) of traffic rules in communication with the second global system for mobile communication (GSM) unit (105) and adapted to compare by a central computer processor the vehicle (30) speed and spatial location with the traffic rules; and a database (50) containing vehicle (30) identification information, the database (50) being accessible by the central computer processor to issue an infringement notice when a traffic rule is violated.



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## **Traffic management system**

### **Field of the Invention**

The present invention relates to a traffic management system. In particular, the present invention relates to an intelligent traffic management system which provides real-time enforcement and monitoring of road rules.

### **Background of the Invention**

Many traffic accidents and fatalities result from drivers operating their vehicles in a manner which is contrary to the state enforced road rules. Such rules specify the maximum speed limits, zones of limited or restricted parking, one way access streets and other such prohibitions such as U turns in certain locations. By punishing drivers who violate such driving rules, enforcement authorities are able to somewhat regulate traffic conditions. However, drivers who violate the rules are often not punished, as punishment is generally only applicable when a police officer or other such law enforcement official or camera system is present when an offense occurs. Accordingly, it is labour intensive and hence costly to have a significant number of police officers on patrol. Drivers tend to learn over time of particular locations where a police presence is likely. As such, drivers are able to alter their driving practices in areas where a police presence is likely, hence reducing the risk of being caught.

The traffic conditions in large cities are generally monitored to assess the traffic flow in regions of congestion caused by accidents, interruptions or higher than average traffic volume. However, such assessments can generally only be made based on real-time data gathered at a specific location by video camera, helicopter, law enforcement officers or other such means. Gathering traffic information and monitoring such traffic data can be labour intensive, and hence costly.

### **Object of the Invention**

It is an object of the present invention to substantially overcome or at least ameliorate one or more of the above disadvantages, or to provide a useful alternative.

## Summary of the Invention

In a first aspect, the present invention provides a traffic management system comprising:

- a locator unit carried by a vehicle;

- a first global system for mobile communication (GSM) unit, in communication with the locator unit;

- a control centre having:

  - a second global system for mobile communication (GSM) unit being adapted to receive vehicle speed and/or spatial location information from the first global system for mobile communication (GSM) unit by a wireless communication network;

  - a geographic information system (GIS) data model of traffic rules in communication with the second global system for mobile communication (GSM) unit and adapted to compare by a central computer processor the vehicle speed and spatial location with the traffic rules; and

  - a database containing vehicle identification information, the database being accessible by the central computer processor to issue an infringement notice when a traffic rule is violated.

The locator unit preferably includes a global positioning system (GPS) unit in communication with the first global system for mobile communication (GSM) unit, the global positioning system (GPS) unit being adapted to calculate the vehicles speed and/or spatial location.

The locator unit preferably includes a radio frequency identification (RFID) tag, the system further comprising:

- a sub-control centre having:

  - a first radio-frequency identification (RFID) interrogator station adapted to receive signal data from the radio frequency identification (RFID) tag;

  - a sub-control computer processor adapted to calculate the vehicle speed and/or spatial location using the signal data;

  - wherein the first global system for mobile communication (GSM) unit is in communication with the sub-control computer processor and adapted to transmit the vehicle speed and/or spatial location to the second global system for mobile communication (GSM).

The locator unit preferably includes a radio frequency identification (RFID) tag adapted to calculate the vehicle speed and/or spatial location; the system further comprising:

a sub-control centre having:

a first radio-frequency identification (RFID) interrogator station adapted to receive signal data from the radio frequency identification (RFID) tag;

wherein the first global system for mobile communication (GSM) unit is adapted to transmit the vehicle speed and/or spatial location to the second global system for mobile communication (GSM).

The infringement notice is preferably sent to an owner of the vehicle by short message service (SMS).

The second global system for mobile communication (GSM) unit is preferably adapted to send a warning to the locator unit when a traffic rule is violated.

The radio-frequency identification (RFID) interrogator station is preferably mounted to a law enforcement vehicle.

The database preferably records the location of each vehicle within a network, identification details of each vehicle, and the trajectory and speed of each vehicle.

The locator unit preferably includes an emergency button adapted to send an emergency signal to the control centre.

The system preferably includes a second radio-frequency identification (RFID) interrogator station adapted to receive the vehicle speed and/or spatial location information from the radio frequency identification (RFID) tag, wherein the first and second radio-frequency identification (RFID) interrogator stations are in real-time communication with each other.

The system preferably includes a processor adapted to calculate the speed and/or spatial location of the vehicle by triangulation based upon radio signals sent between the first radio-frequency identification (RFID) interrogator station, the second radio-frequency identification (RFID) interrogator station and the radio frequency identification (RFID) tag.

The locator preferably includes a speaker and the warning is an audible warning.

In a second aspect, the present invention provides a method of monitoring a traffic network, the method including the steps of:

providing a locator unit in a vehicle, the locator unit having a global positioning system (GPS) unit and a first global system for mobile communication (GSM) unit;

calculating the vehicles speed and/or spatial location by a first computer processor in communication with the global positioning system (GPS) unit;

transmitting the vehicles speed and/or spatial location from the first global system for mobile communication (GSM) to a second global system for mobile communication (GSM) unit at a control centre by a wireless communication network;

comparing the vehicle speed and/or spatial location with traffic rules stored in a geographic information system (GIS) data model by a second computer processor in communication with the second global system for mobile communication (GSM);

retrieving vehicle identification information by the second computer processor from a database; and

issuing an infringement notice by the second computer processor when a traffic rule is violated.

In a third aspect, the present invention provides a method of monitoring a traffic network, the method including the steps of:

providing a locator unit in a vehicle, the locator unit having a radio frequency identification (RFID) tag;

transmitting signal data from the radio frequency identification (RFID) tag to a first radio-frequency identification (RFID) interrogator station;

calculating the vehicles speed and/or spatial location by a first computer processor;

transmitting the vehicles speed and/or spatial location from a first global system for mobile communication (GSM) to a second global system for mobile communication (GSM) unit at a control centre by a wireless communication network;

comparing the vehicle speed and/or spatial location with traffic rules stored in a geographic information system (GIS) data model by a second computer processor in communication with the second global system for mobile communication (GSM);

retrieving vehicle identification information by the second computer processor from a database; and

issuing an infringement notice by the second computer processor when a traffic rule is violated.

### **Brief Description of the Drawings**

A preferred embodiment of the invention will now be described by way of specific example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic diagram showing an intelligent traffic management system of a first embodiment;

Fig. 2 is a schematic diagram showing an intelligent traffic management system of a second embodiment;

Fig. 3 is a flow chart depicting real-time speed enforcement;

Fig. 4 is a flow chart depicting real-time red light violation enforcement;

Fig. 5 is a flow chart depicting the location and isolation of a wanted vehicle;

Fig. 6 is a flow chart depicting monitoring of an overtaking manoeuvre;

Fig. 7 is a flow chart depicting the monitoring of paid parking zones;

Fig. 8 is a flow chart depicting the enforcement of a one way zone;

Fig. 9 is a flow chart depicting the monitoring of an emergency lane; and

Fig. 10 is a flow chart depicting operation of an emergency button;

Fig. 11 is a flow chart depicting speed enforcement in accordance with the second embodiment;

Fig. 12 is a flow chart depicting the location and isolation of a wanted vehicle in accordance with the second embodiment;

Fig. 13 is schematic diagram showing the system of the second embodiment used in a parking area; and

Fig. 14 is a flow chart showing the system used for parking applications.

### **Detailed Description of the Preferred Embodiments**

An intelligent traffic management system 20 of a first embodiment is depicted in Fig. 1. The system 20 includes a global navigation satellite system (GNSS) 22 and a wireless carrier network and communication system 24 (cellular network).

Information concerning the current position and speed of a given vehicle 30 is obtained by a first global positioning system (GPS) device 26 which communicates with the satellite system 22. The global positioning system (GPS) device 26 may include an inertial navigation system (INS) and dead reckoning system. The communication system 24 enables real time transmission of data and hence communication of the vehicle's 30 location and

speed to a traffic control centre 40 via SMS/GPRS, 3G or 4G.

The traffic management system 20 includes a geographic information system (GIS) data model 42 located at the traffic control centre 40. The data model 42 has a centrally based digital road map. The data model 42 also contains information concerning local speed limits and road rules.

The traffic management system 20 retrieves the local speed limits and road rules from the data model 42 and for the vehicle's 30 given location and compares vehicle's 30 status and travelling speed with permitted maximum speed and road legal requirement to determine if the vehicle 30 is speeding or non-compliant with road rules.

If the vehicle 30 is identified as non-compliant with the speed limit and/or road rules, identification data concerning the vehicle 30 is retrieved based on the vehicle 30 registration number. A speed or road rule requirement infringement notice is then issued automatically and the owner of the vehicle 30 is notified of the infringement notice by SMS or otherwise. The infringement notice identifies the vehicle registration number, the location of the infringement incident, date and time of the incident. Feedback to the driver can be provided by an audible alarm within the vehicle 30.

The geographic information system (GIS) data model 42 is designed for the traffic management system 20, and includes:

- digital roads network identifying one and two-way roads with maximum and minimum speed limits.
- Legal requirement zones including overtaking lanes, no overtaking lanes, emergency lanes, bus lanes, restricted zones, no parking zones, paid parking zones, no stopping or standing zones, Overtaking zones, No overtaking zones, Height limit zones and Traffic light zones.
- Maps, satellite images, aerial photos and sketches.

The database 50 of the traffic management system 20 includes the following sub databases:

- Database 52 of all vehicles 30. This database 52 includes all information about all vehicles 30. For example, the registration number, the owner, contact details, infringements details, etc

- Database 54 of wanted vehicles.
- Database 56 for paid parking. This includes the vehicle registration number as well as any credit amount.
- Database 58 for vehicle 30 trajectories and speeds. This database 58 records vehicles 30 trajectories and speeds for a specific period set by the traffic department for accidents management and other investigation problems.

In the first embodiment, each vehicle 30 is fitted with a locator 100. The locator 100 consists of a GPS receiver 102 which is used to provide position and speed information of the locator 100 and a first global system for mobile communication GSM unit 104. The GSM unit 104 transmits the vehicle 30 data information (ID, position, velocity) collected to a second global system for mobile communication GSM unit 105 at the control centre 40 via SMS or GPRS or any other suitable communication protocol.

The locator 100 may include other systems to enhance position and speed information obtained by the GPS receiver 102. Such units can be inertial navigation system and/or dead reckoning system.

The intelligent traffic management system 20 receives data from the locators 100 in real-time and compares the locators 100 status and speeds against speed limits and road rules which are stored in the GIS data model 42. The speed limit and the road rules are retrieved from the intelligent traffic management system 20 based upon the spatial position of the locator 100.

If the driver is found to be non-compliant with the speed limit or road rules, the intelligent traffic management system 20 retrieves the vehicle 30 information and then issues an infringement notice which is saved on the database 50 of the computer server. Also a SMS message will be sent to the owner of the vehicle 30 to report the incident. An audible alarm will be sent to the driver to ask him/her to comply with the speed limits or road rules.

Police vehicles 32 are equipped with mobile intelligent traffic management system 120. The mobile intelligent traffic management 120 includes a GIS system 124 which contains digital road network, GPS locating and guiding system 126 and a GSM unit 128 to send and receive information to and from the control centre 40. The mobile intelligent traffic management

system 120 can communicate with the control centre 40 using mobile GSM networks or other such means.

At the control centre 40, the intelligent traffic management system 20 software is installed on a server and can receive real-time information from each vehicle locator 100. Each GSM unit 104 has a unique ID code which is stored at the control centre 40. Based on the ID, the vehicle 30 information, vehicle status and information of vehicle's owner can be retrieved.

In the first embodiment, the system 20 includes an integrated GPS device, GSM unit and intelligent traffic management system.

A second embodiment of the intelligent traffic management system 20 is depicted in Fig. 2. In this embodiment, the intelligent traffic management system 20 utilises radio frequency identification (RFID) and enhancement of wireless networks and communication system (cellular network). The second embodiment may be of particular benefit in scenarios where GPS devices are too expensive to be fitted to each car. Accordingly, RFID tags 34 can be used as an alternative. In the second embodiment, an (RFID) interrogator station 37 is required (moved or fixed). In the second embodiments the GIS system includes the locations of all Fixed AVI/VSI stations. Based on the fixed or mobile interrogator station 37 location, the speed limits will be retrieved from the data model 42 at the control centre 40.

RFID tags 34 are available which can provide speed information, and such tags may be included in the second embodiment.

In the second embodiment, automatic vehicle identification is based on active RFID technology, each vehicle 30 having a unique RFID identification tag 34. The identification code for each tag 34 and its information are stored in the server at the control centre 40.

An Automatic Vehicle Identification/Vehicle Speed and Location Identification (AVI/VSI) system in the form of an interrogator sub-control centre 37 can be installed at the entrance/exit of any given road or street in the city, as a fixed AVI/VSI base station 37. It also can be inside a police vehicle 32, as a mobile AVI/VSI station 37. Also the mobile AVI/VSI system 37 is integrated with a GPS device to identify the police vehicle 32 position in a real-time base. Information on the current position of a vehicle 30 is obtained by GPS,

which may be enhanced with an inertial navigation system (INS) and dead reckoning.

The mobile AVI/VSI system can be located at checkpoints and toll stations. As such, it can reliably collect data and information from vehicles 30 passing by (or stopped) in real time, on which active RFID tags 34 are installed. By using long range RFID technology, the collected data (registration number, speed) can be identified, transmitted to the AVI/VSI fixed or mobile system then to the traffic department control centre 40 via GSM/GPRS/CDMA/3G/4G) along police vehicle 32 position and then compared with the saved information in the database of the control centre 40 to judge whether the vehicle 30 is illegal, or has broken traffic laws. The results of comparison will feed back to the traffic department control centre 40 to determine the status of the vehicle 30.

In the first and second embodiments, the Geographic information system data model 42 of the traffic management system 20 which contains a central-based digital road map is then consulted to ascertain speed limit. The system 20 retrieves the speed limit for the vehicle 30 location and compares vehicle's travelling speed with a permitted maximum speed to determine if the vehicle 30 is speeding or not. Vehicles 30 that are detected to be non-compliant with speed limits will be registered and all data about the vehicle 30 will be retrieved based on vehicle registration number.

By using active RFID tags 34, the identification range can reach 100m. Fixed AVI/VSI stations 37 are used at customs, check points and toll stations of vital communication lines to examine, identify and record the passing vehicles. Equipments such as Reader/Writer, intelligent controller, data transmission unit and power supply are installed in the site. While there is a vehicle 30 with tag passing near the fixed AVI/VSI station 37, the system 20 can read the ID code of the tag 34, speed and time of passing. The data transmission unit can pass the vehicle 30 data information collected in addition to the fixed AVI/VSI station 37 identification to the control centre 40 via GSM/GPRS or other communication means. The identification of the fixed AVI/ASI station 37 is used to retrieve the location of the fixed AVI/ASI station 37 from the data model 42 at the control centre 40.

The Mobile AVI/VSI system can be installed in a police vehicle 32. It can transmit and receive data from the control centre 40 with mobile GSM networks or in the way of short message service. The equipment it contains is similar to a fixed AVI/VSI system. Police

vehicles are equipped with mobile intelligent traffic management systems 120. Each mobile system 120 includes, GIS system which contains digital road network, GPS locating and guiding system and a GSM unit to send and receive information to and from the control centre 40.

Fig. 3 is a flow chart depicting real-time speed enforcement.

The intelligent traffic management system 20 detects all vehicles in the national road network. Vehicles 30 that are detected not complying with speed limits are registered and all data about the vehicle will be retrieved based on vehicle registration number and the system will alert the driver if he/she is not comply with the speed limit.

Feedback may be an audible alarm. If the driver does not response in a pre-defined time period (e.g. 5 seconds after the alerting alarm), a speed infringements will be issued automatically and a text message will be sent to the vehicle's owner stating that an infringement notice has been issued along with the vehicle 30 registration number, location, date and time of the incident. If the drivers still insist in not complying with the speed limits the system 20 notifies an operator in the control centre 40 for further investigation. If the infringement is serious, the system 20 registers the vehicle in the wanted vehicle database.

Fig. 4 is a flow chart depicting real-time red light violation enforcement.

Each traffic light 130 is assigned a traffic light zone 132 in the database 50. Each vehicle 30 passing a traffic light zone 132 will be checked if it passes beyond the stop line during a "red light" time period. Vehicles 30 that are not complying with traffic red light signs will be registered and an infringement notice issued in the manner described above.

Fig. 5 is a flow chart depicting isolation of a wanted vehicle 30.

The intelligent traffic management system 20 system is in communication with a database that has information about stolen vehicles 30, vehicles 30 that are prohibited to be used in traffic, vehicles 30 with unpaid fines etc. If an unwanted vehicle 30 is detected the system 20 will notify the control centre 40 and the closest police patrol station.

When a car is stolen, the owner notifies police. Once the police receive the alarm, they will update the wanted vehicle database 54. The intelligent traffic management system 20 will identify the vehicle location and then SMS the stolen car location to the closest police car

which are equipped with mobile traffic management system 120 via GSM. When the police confirm the message, the traffic management system 20 will identify the best route by using route optimisation.

Fig. 6 is a flow chart depicting monitoring of an overtaking manoeuvre.

The intelligent traffic management system 20 monitors all vehicles 30 so any illegal overtaking is detected in real-time. When the system 20 detects that a locator 100 of a first vehicle has overtaken the locator 100 of a second vehicle, the system 20 assesses the data model 60 to determine if overtaking is permitted at this location. If overtaking is not permitted, an infringement notice is issued in the manner described above.

The intelligent traffic management system 20 reminds drivers to keep a safe distance from the vehicle 30 in front, such as 40 metres. The safe distance is calculated automatically in a real-time and based on vehicle 30 speeds.

Fig. 7 is a flow chart depicting the monitoring of paid parking zones. The intelligent traffic management system 20 monitors all vehicles 30 so any illegal parking is detected in a real time and an infringement notice issued. This also applies to drivers who violate no stopping or no standing zones. When a vehicle parks in a paid parking area, the system 20 will check the paid parking database if the vehicle 30 has sufficient credit for parking or not based on the vehicle registration number. The system 20 will store the parking start and end data and time along with the parking ID and will charge the vehicle 30 account for the parking period.

The intelligent traffic management system 20 monitors all vehicles 30 so the height of the vehicle 30 is checked before the vehicle 30 enters a tunnel. When illegal vehicle 30 is detected the system 20 will alert the driver to stop immediately. An infringement will be issued automatically and a text message will be sent to the vehicle owner stating that a "Height" infringement has been issued.

As depicted in the flow chart of Fig. 8, the system 20 detects vehicles 30 moving in the wrong direction on one-way roadways. An infringement notice will be issued as described above.

The GIS data model 60 includes the information about which vehicles 30 are allowed in excluded areas. If an unwanted vehicle 30 is detected, the system 20 will notify the control centre 40. This system can also be used to control access gates if an authorised vehicle is detected.

The system 20 detects all vehicles in a specified lane and compares those with the GIS data model 60. Vehicles 30 that are detected without permission will be registered and all data about the vehicle will be sent to the control centre 40 for further investigation. An infringement notice will be issued as described above.

Fig. 9 depicts a flow chart for monitoring of an emergency lane where only authorised vehicles are permitted. The system 20 detects all vehicles 30 in the specified lane and compares those with the GIS data model 60. Vehicles 30 detected without permission are issued an infringement notice as described above.

The system 20 can be used to monitor long distance truck drivers to detect avoidance of legally prescribed driver rest periods.

Each locator unit 100 is fitted with an emergency assistance button which enables the driver to send a message to the control station 40 or the closest police car 32 to ask for assistance.

The intelligent traffic management system 20 records vehicle 30 trajectories and speeds, permitting authorities to build up information about accidents, while obviating the need for law enforcement officers to physically attend the accident sites.

The intelligent traffic management system 20 logs all vehicles 30 passing in the national road network, allowing authorities such as customs officials, etc. to track the movement of vehicles 30 and individuals across borders.

The intelligent traffic management system 20 detects all vehicles 30 passing near fixed or mobile AVI/VSI stations allowing authorities to track the speed and the movement of vehicles 30 across the country and compare their speeds with the (GIS) data model 60. Vehicles 30 that are detected to be non-compliant with minimum and maximum speed limits speed limits will be sent an infringement notice in the manner described above.

When a vehicle 30 is stolen, the system 20 is in communication with a database that has information about stolen vehicles 30, and vehicles 30 that are prohibited from being used in traffic. If an unwanted vehicle 30 is detected the system notifies the control centre and the closest police patrol station. If the owner locates the car, they can alert the police. Once the police receive the alarm, they will update the wanted vehicle database 54.

Every fixed station will check the passing vehicles, reading the RFID tags of the vehicles 30 passing by and comparing with the target vehicle information. If the present vehicle is the target vehicle, then the control centre 40 sends the vehicle's identification, location of the fixed AVI/VSI station and time information to the closest police vehicle. After receiving the signal, the police can send an SMS to the police cars which are closest. When the police car 32 confirms the message, they will find the best route by using route optimisation via GPS locating and guiding system.

As depicted in Fig. 10, the system includes an emergency system which enables the driver to push a button on the locator 100 if urgent police assistance is required. In such instances the locator send a signal to the control centre 40 for help, and the control centre is able to isolate the location of the vehicle 30 and send police assistance.

Fig. 11 depicts a speed enforcement flow chart of the second embodiment, and Fig. 12 depicts a flow chart for locating a wanted vehicle according to the second embodiment. Fig. 13 depicts the system 20 of the second embodiment used in a parking station with two or more fixed AVI/VSI stations. This is in case of parking zones as per Fig 13. Ad per Fig 13 triangulation is used to calculate the spatial location of the vehicle (Not the speed of the vehicle).

Fig. 14 is a flow chart showing how the parking station calculates payment, parking times, and issues an infringement.

At each paid parking area two fixed AVI/VSI stations are fixed at a specific location so the coordinate of each station is known. Every fixed station will check the parking vehicles, reading the RFID tags 34 of the vehicles passing by and identify its location relative to each fixed AVI/VSI station. Since the fixed AVI/VSI stations are fixed in known locations and the

tags 34 provide position information, the location of the vehicle 30 can be calculated in the same coordinate system at which the parking area zones stored in the GIS data model 60 at the control centre 40.

Comparing the location of the target vehicle 30 with the paid parking zones, if the vehicle 30 is located in a parking zone, the system 20 will check via the paid parking database 56 if the vehicle 30 has sufficient credit for parking or not based on the vehicle registration number. The system 20 will store the parking start and end data and time along with the parking ID and will charge the vehicle 30 account for the parking period.

Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

**Claims:**

1. A traffic management system comprising:
  - a locator unit carried by a vehicle;
  - a first global system for mobile communication (GSM) unit, in communication with the locator unit;
  - a control centre having:
    - a second global system for mobile communication (GSM) unit being adapted to receive vehicle speed and/or spatial location information from the first global system for mobile communication (GSM) unit by a wireless communication network;
    - a geographic information system (GIS) data model of traffic rules in communication with the second global system for mobile communication (GSM) unit and adapted to compare by a central computer processor the vehicle speed and spatial location with the traffic rules; and
    - a database containing vehicle identification information, the database being accessible by the central computer processor to issue an infringement notice when a traffic rule is violated.
  
2. The traffic management system of claim 1 wherein the locator unit includes a global positioning system (GPS) unit in communication with the first global system for mobile communication (GSM) unit, the global positioning system (GPS) unit being adapted to calculate the vehicles speed and/or spatial location.
  
3. The traffic management system of claim 1, wherein the locator unit includes a radio frequency identification (RFID) tag, the system further comprising:
  - a sub-control centre having:
    - a first radio-frequency identification (RFID) interrogator station adapted to receive signal data from the radio frequency identification (RFID) tag;
    - a sub-control computer processor adapted to calculate the vehicle speed and/or spatial location using the signal data;
  - wherein the first global system for mobile communication (GSM) unit is in communication with the sub-control computer processor and adapted to transmit the vehicle speed and/or spatial location to the second global system for mobile communication (GSM).

4. The traffic management system of claim 1, wherein the locator unit includes a radio frequency identification (RFID) tag adapted to calculate the vehicle speed and/or spatial location; the system further comprising:

a sub-control centre having:

a first radio-frequency identification (RFID) interrogator station adapted to receive signal data from the radio frequency identification (RFID) tag;

wherein the first global system for mobile communication (GSM) unit is adapted to transmit the vehicle speed and/or spatial location to the second global system for mobile communication (GSM).

5. The system of any one of claims 2, 3 or 4, wherein the infringement notice is sent to an owner of the vehicle by short message service (SMS).

6. The system of any one of claims 2, 3 or 4, wherein the second global system for mobile communication (GSM) unit is adapted to send a warning to the locator unit when a traffic rule is violated.

7. The system of claim 3 or 4, wherein the radio-frequency identification (RFID) interrogator station is mounted to a law enforcement vehicle.

8. The system of any one of the preceding claims, wherein the database records the location of each vehicle within a network, identification details of each vehicle, and the trajectory and speed of each vehicle.

9. The system of any one of the preceding claims, wherein the locator unit includes an emergency button adapted to send an emergency signal to the control centre.

10. The system of claim 3 or 4, including a second radio-frequency identification (RFID) interrogator station adapted to receive the vehicle speed and/or spatial location information from the radio frequency identification (RFID) tag, wherein the first and second radio-frequency identification (RFID) interrogator stations are in real-time communication with each other.

11. The system of claim 10, including a processor adapted to calculate the speed and/or spatial location of the vehicle by triangulation based upon radio signals sent between the first radio-frequency identification (RFID) interrogator station, the second radio-frequency identification (RFID) interrogator station and the radio frequency identification (RFID) tag.

12. The system of claim 6, wherein the locator includes a speaker and the warning is an audible warning.

13. A method of monitoring a traffic network, the method including the steps of:  
providing a locator unit in a vehicle, the locator unit having a global positioning system (GPS) unit and a first global system for mobile communication (GSM) unit;

calculating the vehicles speed and/or spatial location by a first computer processor in communication with the global positioning system (GPS) unit;

transmitting the vehicles speed and/or spatial location from the first global system for mobile communication (GSM) to a second global system for mobile communication (GSM) unit at a control centre by a wireless communication network;

comparing the vehicle speed and/or spatial location with traffic rules stored in a geographic information system (GIS) data model by a second computer processor in communication with the second global system for mobile communication (GSM);

retrieving vehicle identification information by the second computer processor from a database; and

issuing an infringement notice by the second computer processor when a traffic rule is violated.

14. A method of monitoring a traffic network, the method including the steps of:  
providing a locator unit in a vehicle, the locator unit having a radio frequency identification (RFID) tag;

transmitting signal data from the radio frequency identification (RFID) tag to a first radio-frequency identification (RFID) interrogator station;

calculating the vehicles speed and/or spatial location by a first computer processor;

transmitting the vehicles speed and/or spatial location from a first global system for mobile communication (GSM) to a second global system for mobile communication (GSM) unit at a control centre by a wireless communication network;

comparing the vehicle speed and/or spatial location with traffic rules stored in a geographic information system (GIS) data model by a second computer processor in communication with the second global system for mobile communication (GSM);

retrieving vehicle identification information by the second computer processor from a database; and

issuing an infringement notice by the second computer processor when a traffic rule is violated.

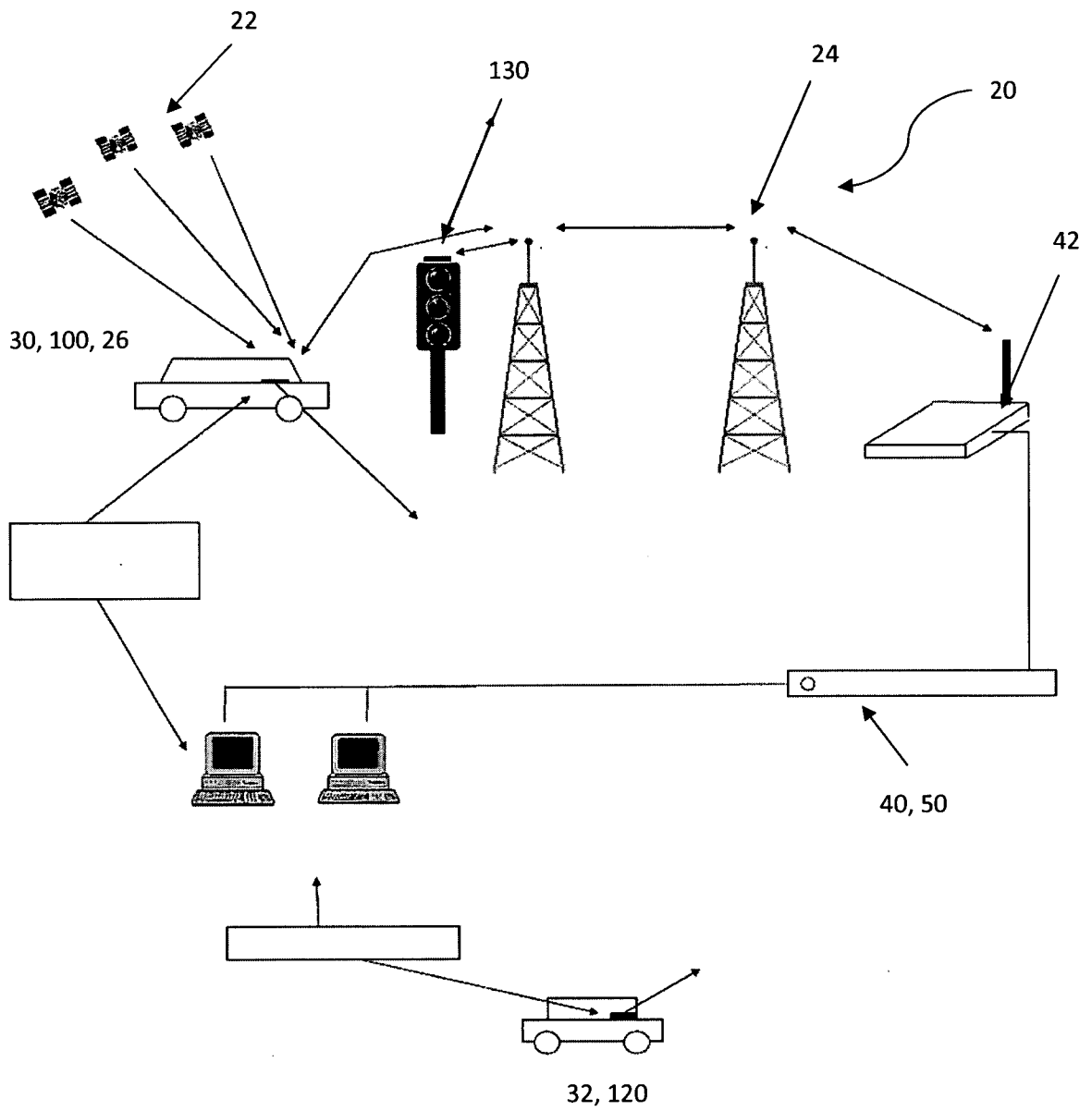


Fig. 1

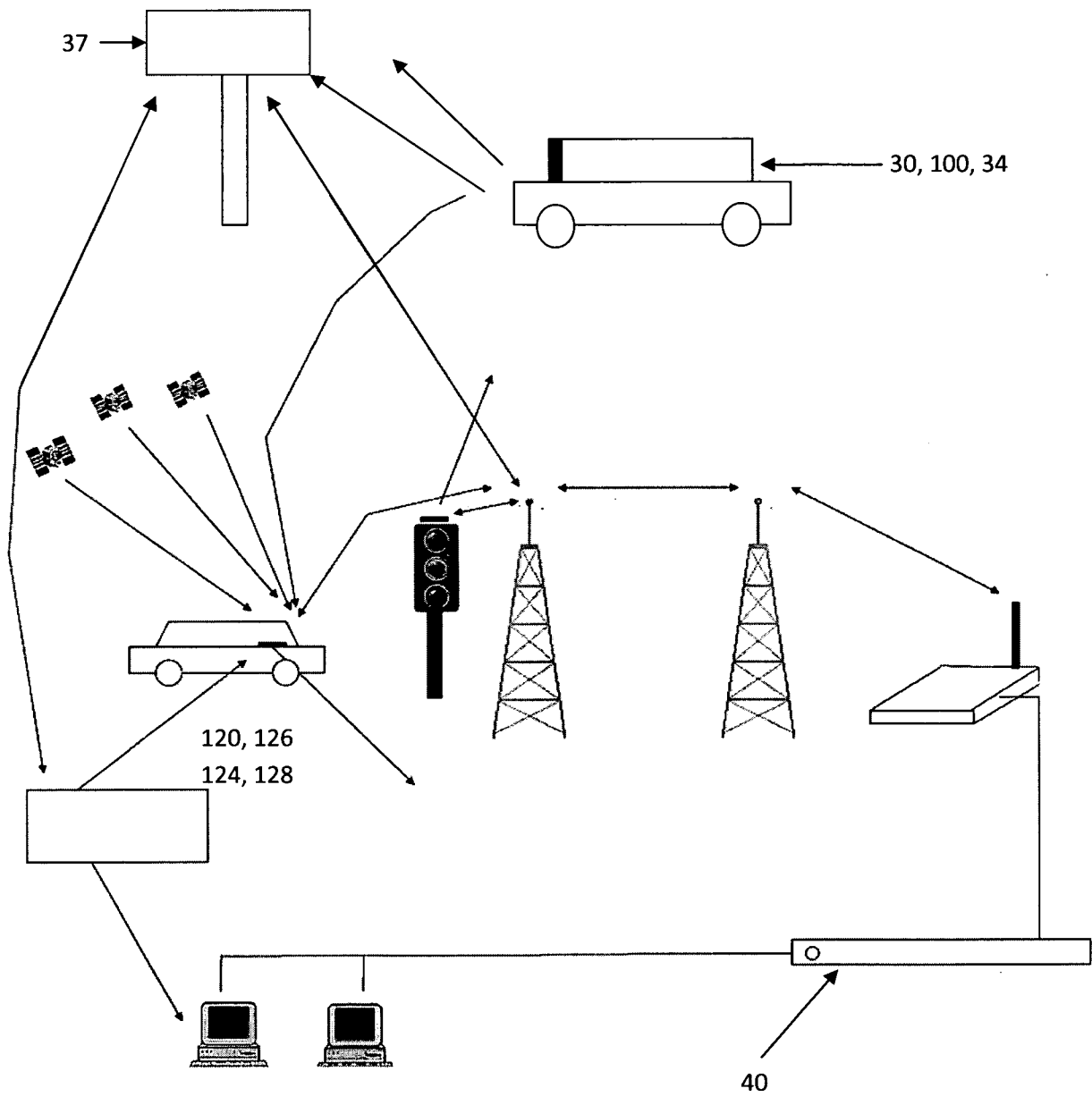


Fig. 2

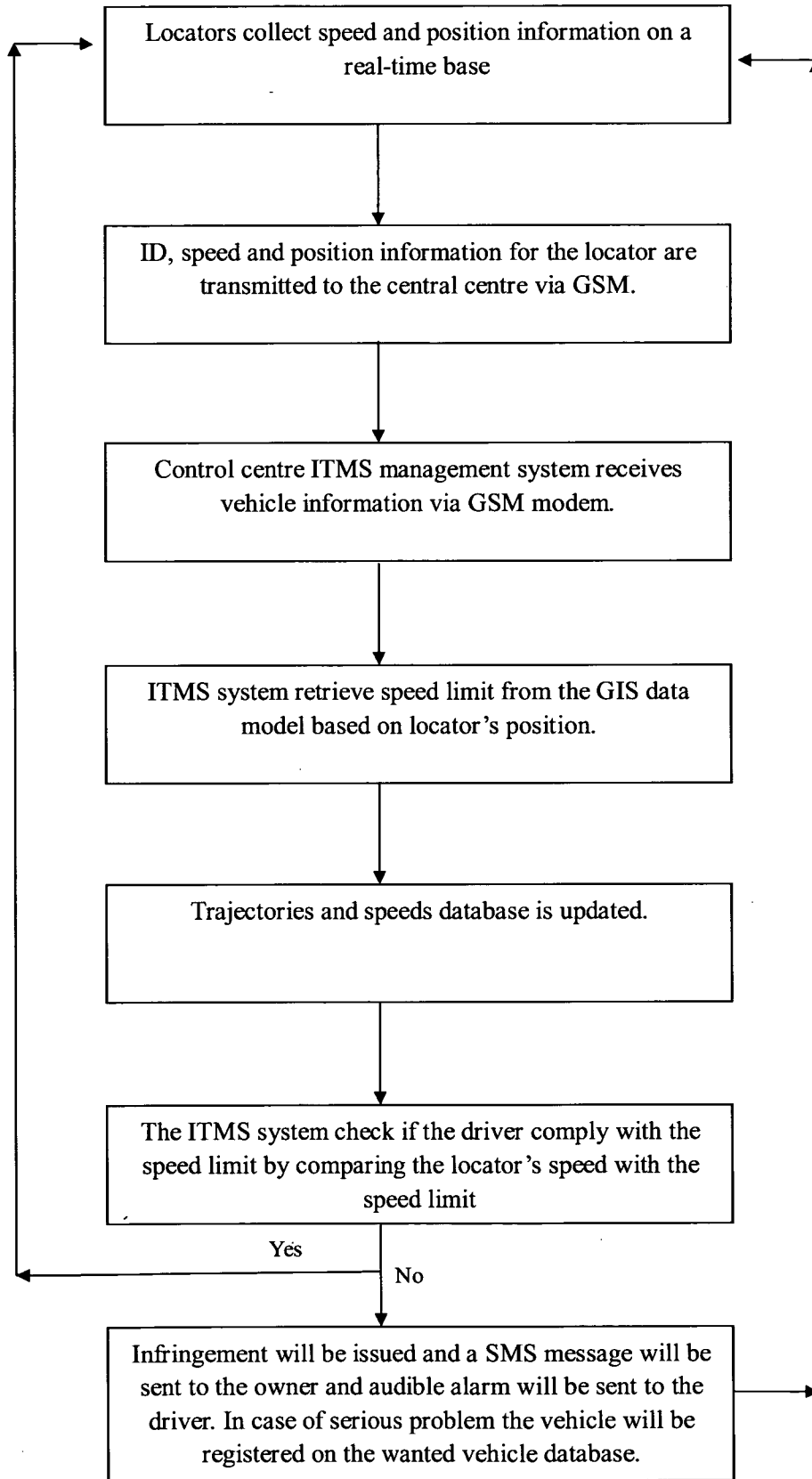


Fig. 3

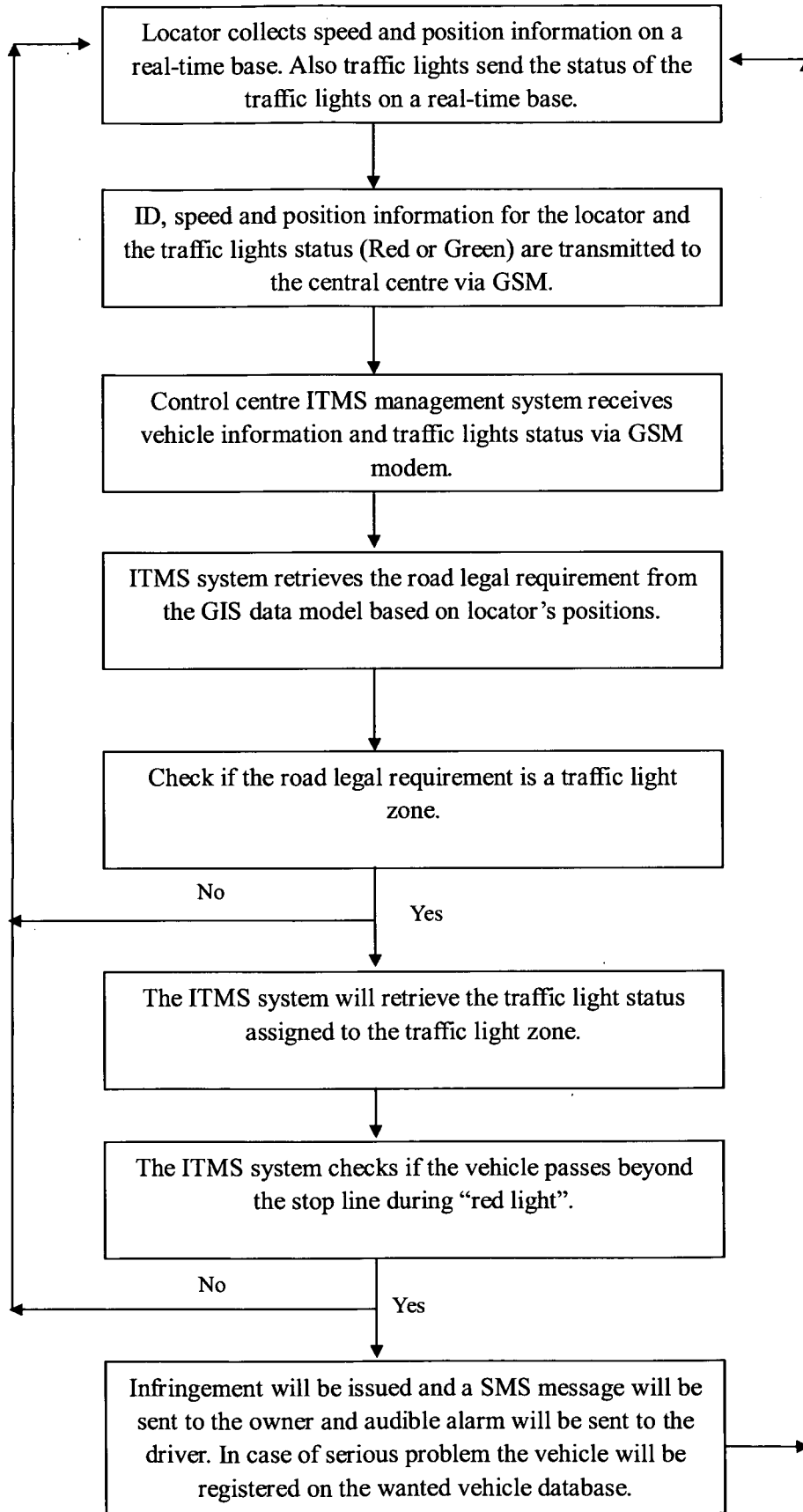


Fig. 4

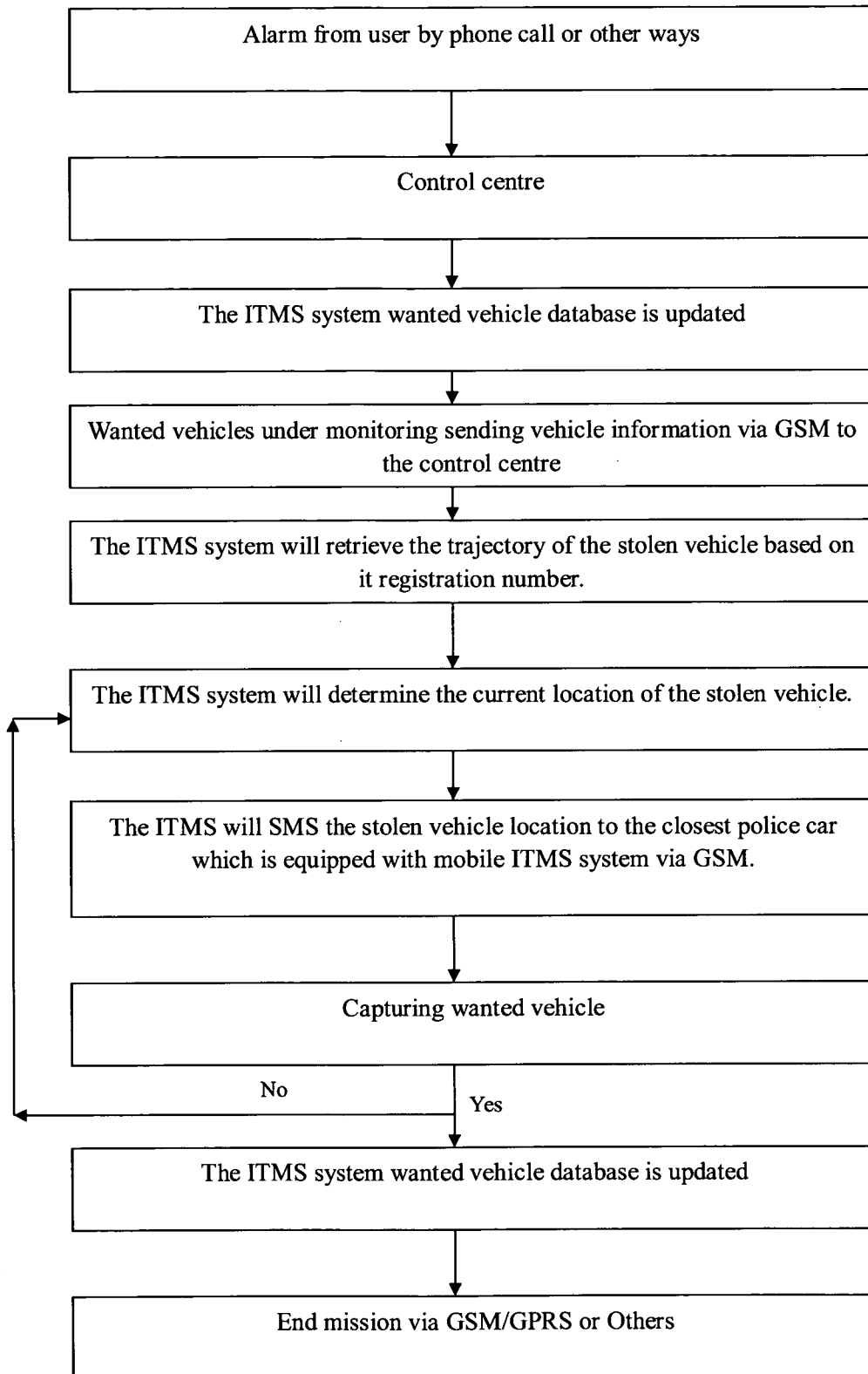


Fig. 5

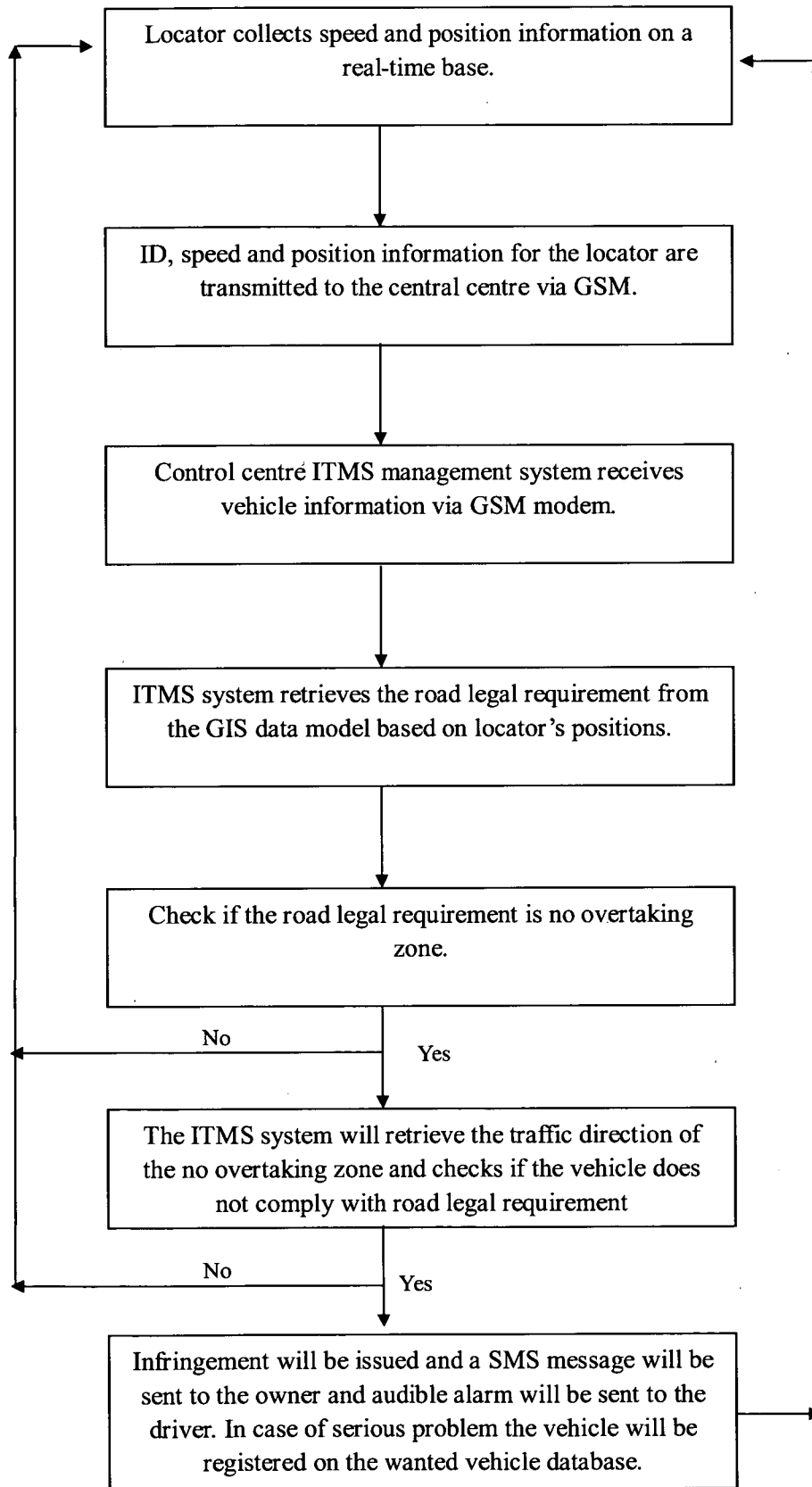


Fig. 6

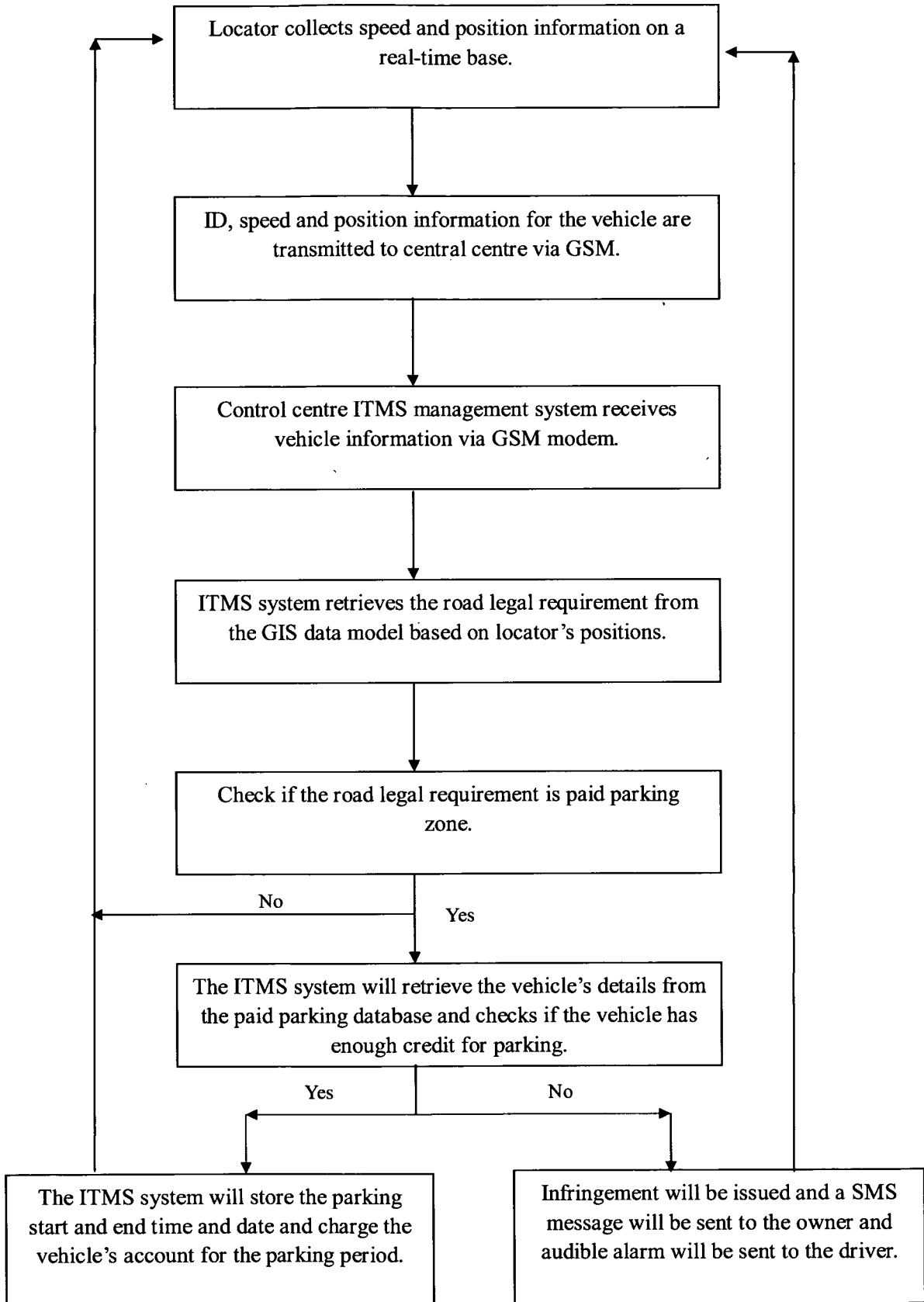


Fig. 7

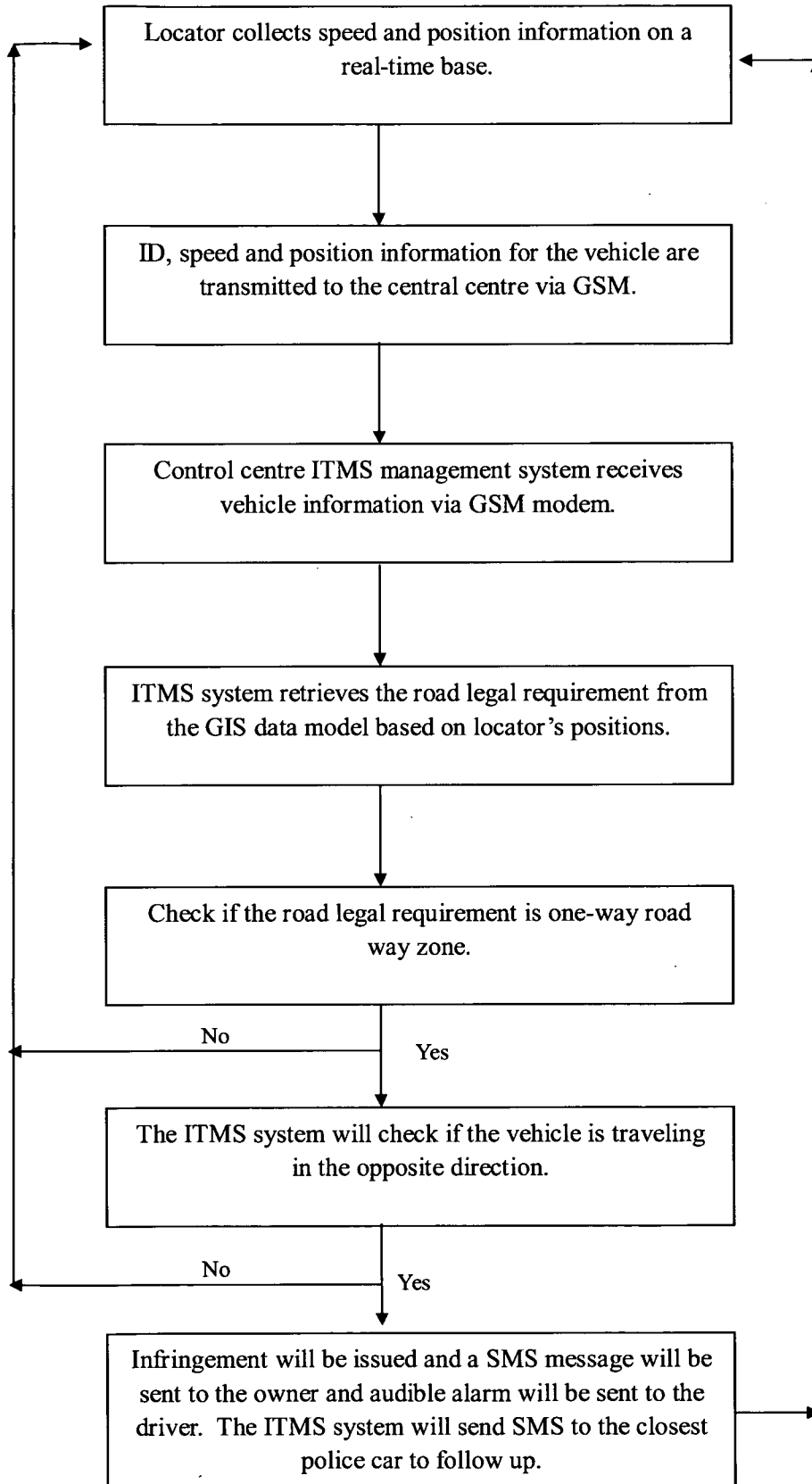


Fig. 8

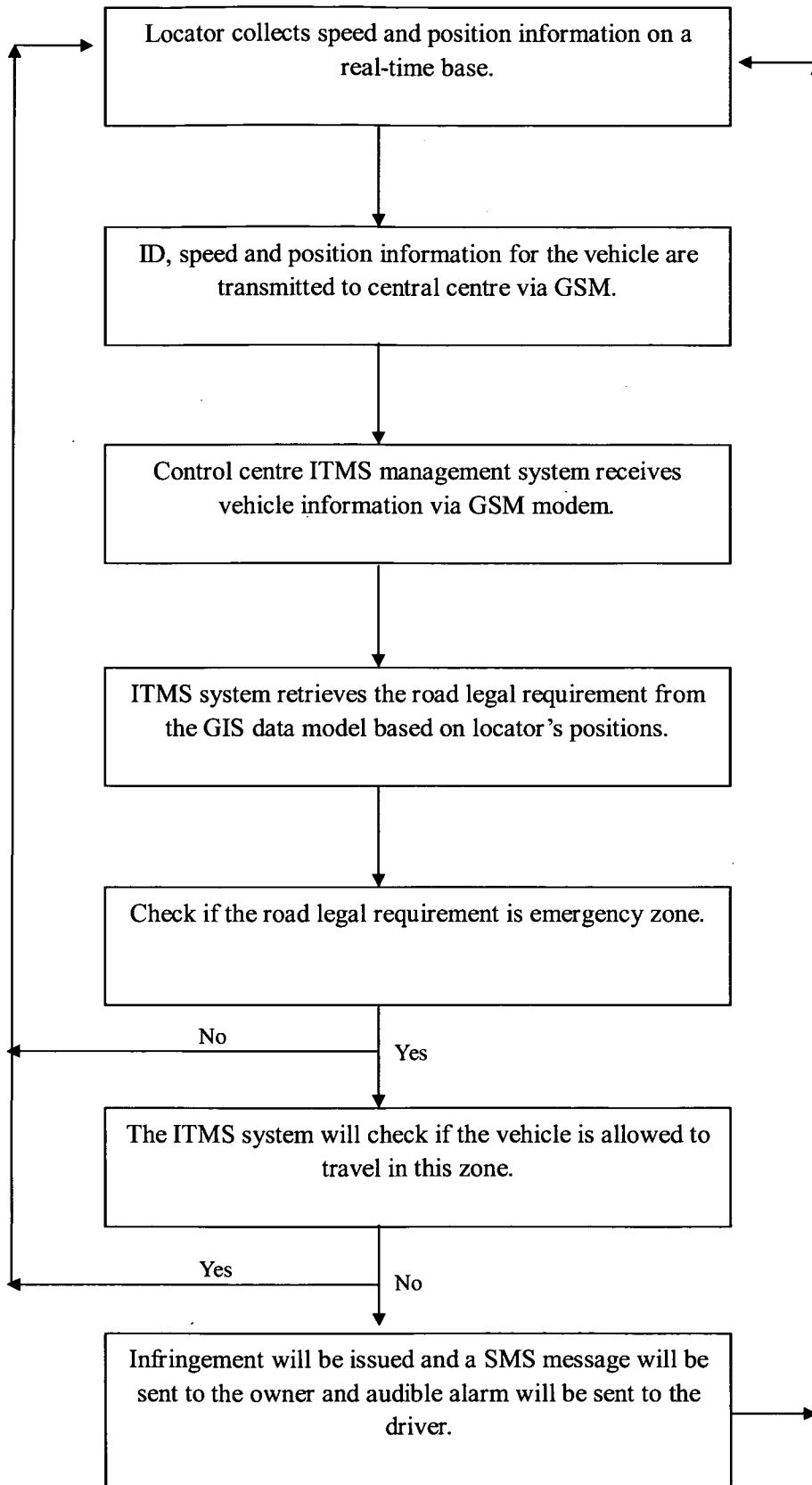


Fig. 9

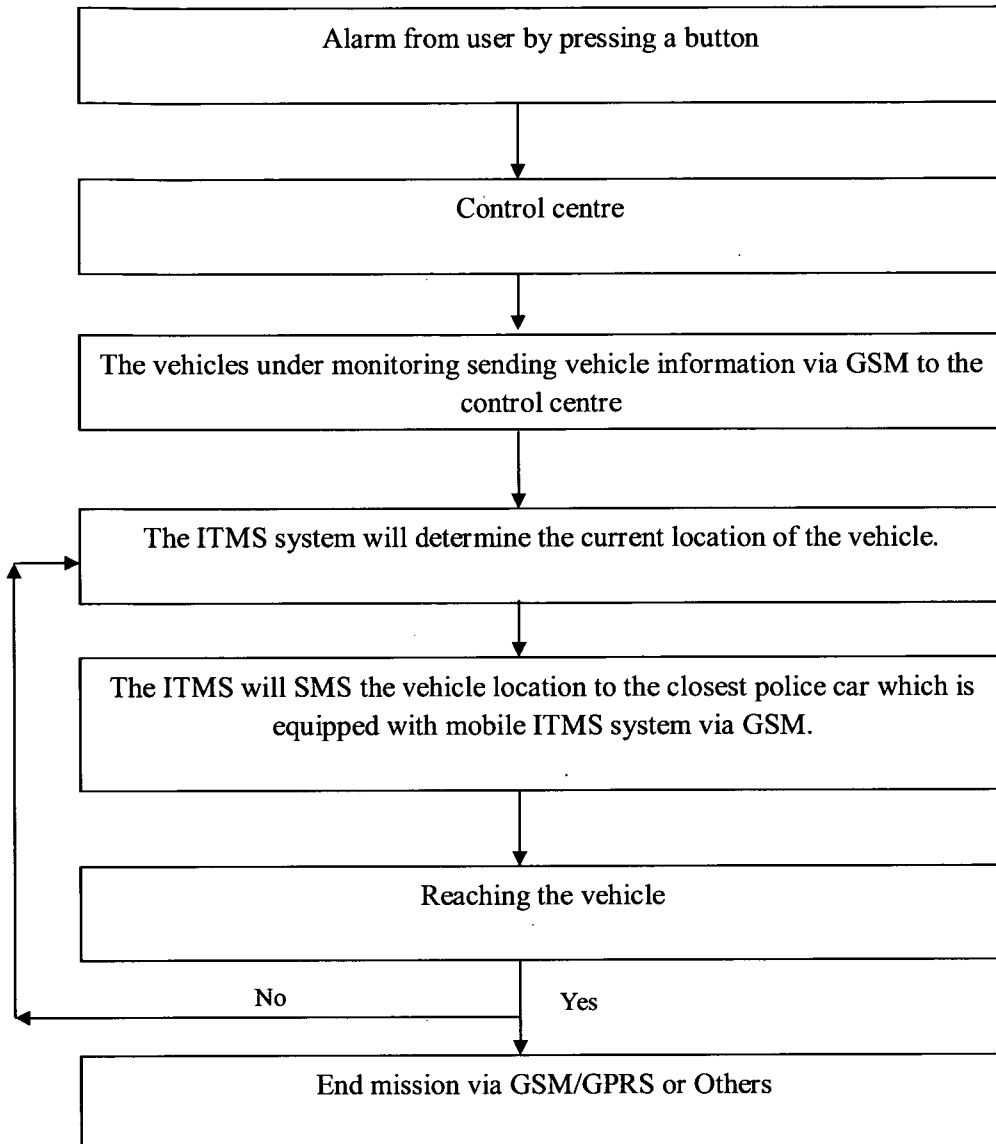


Fig. 10

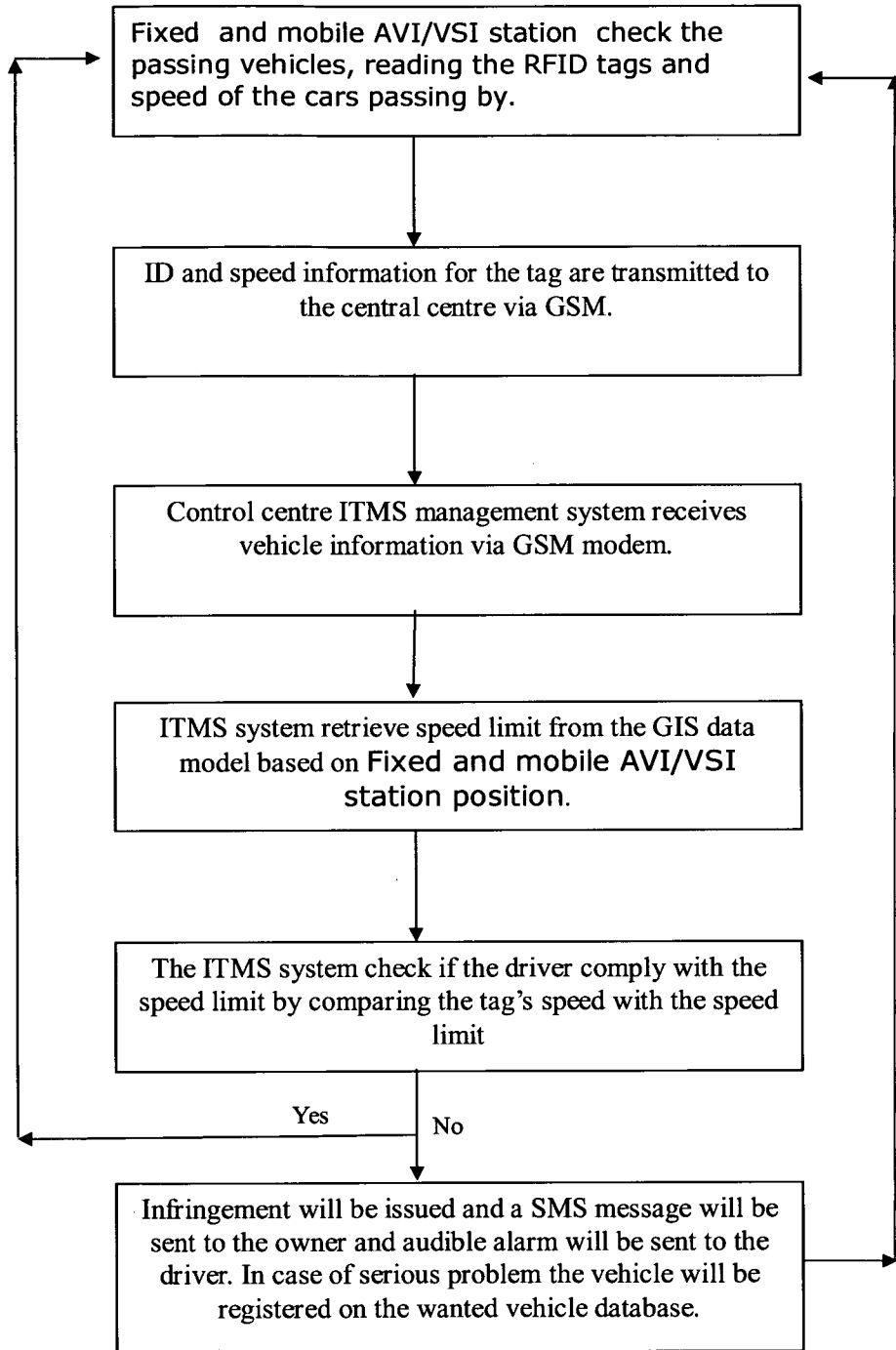


Fig. 11

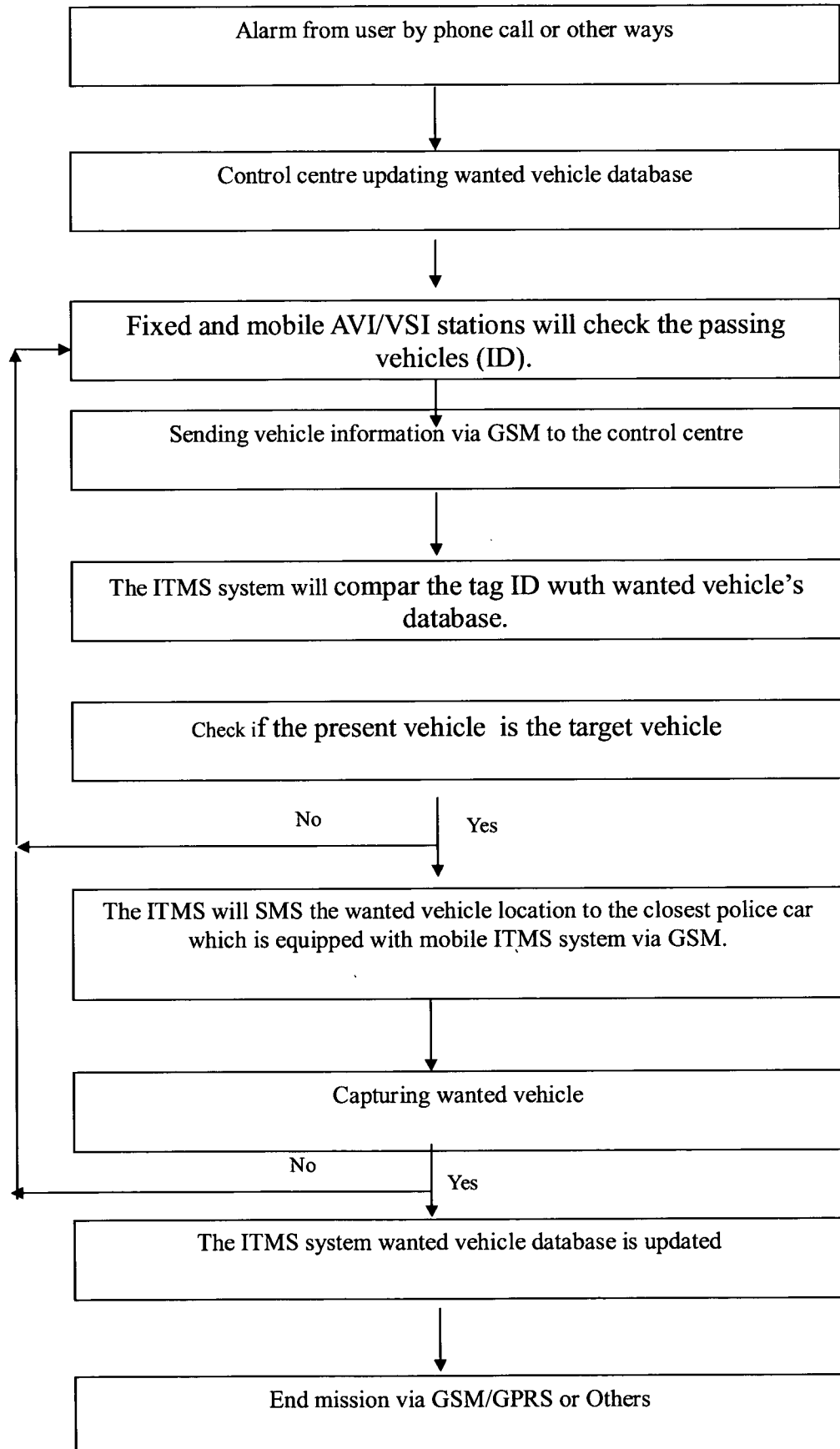


Fig. 12

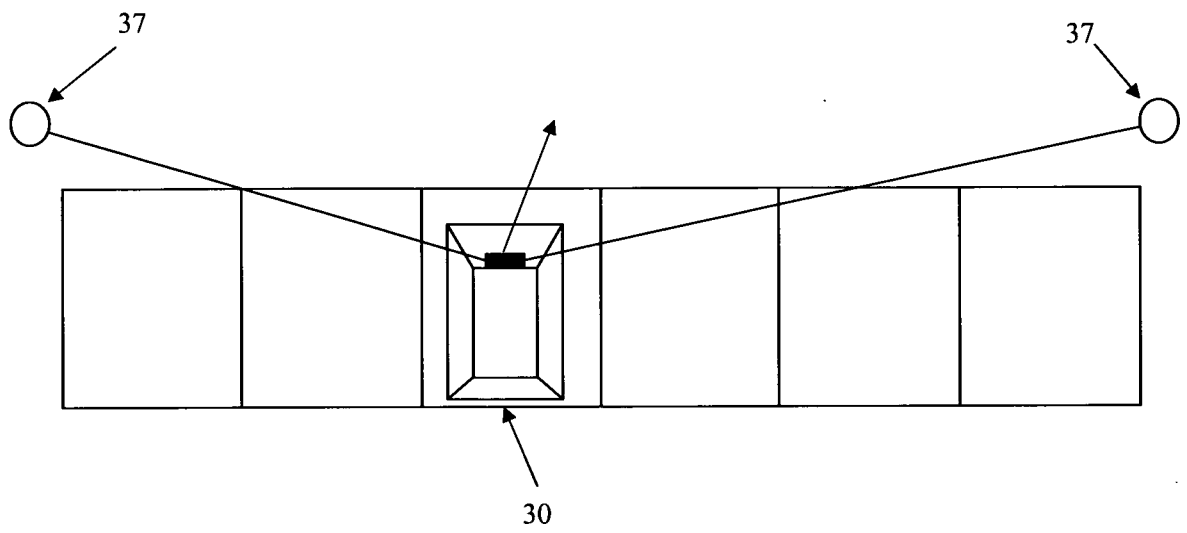


Fig. 13

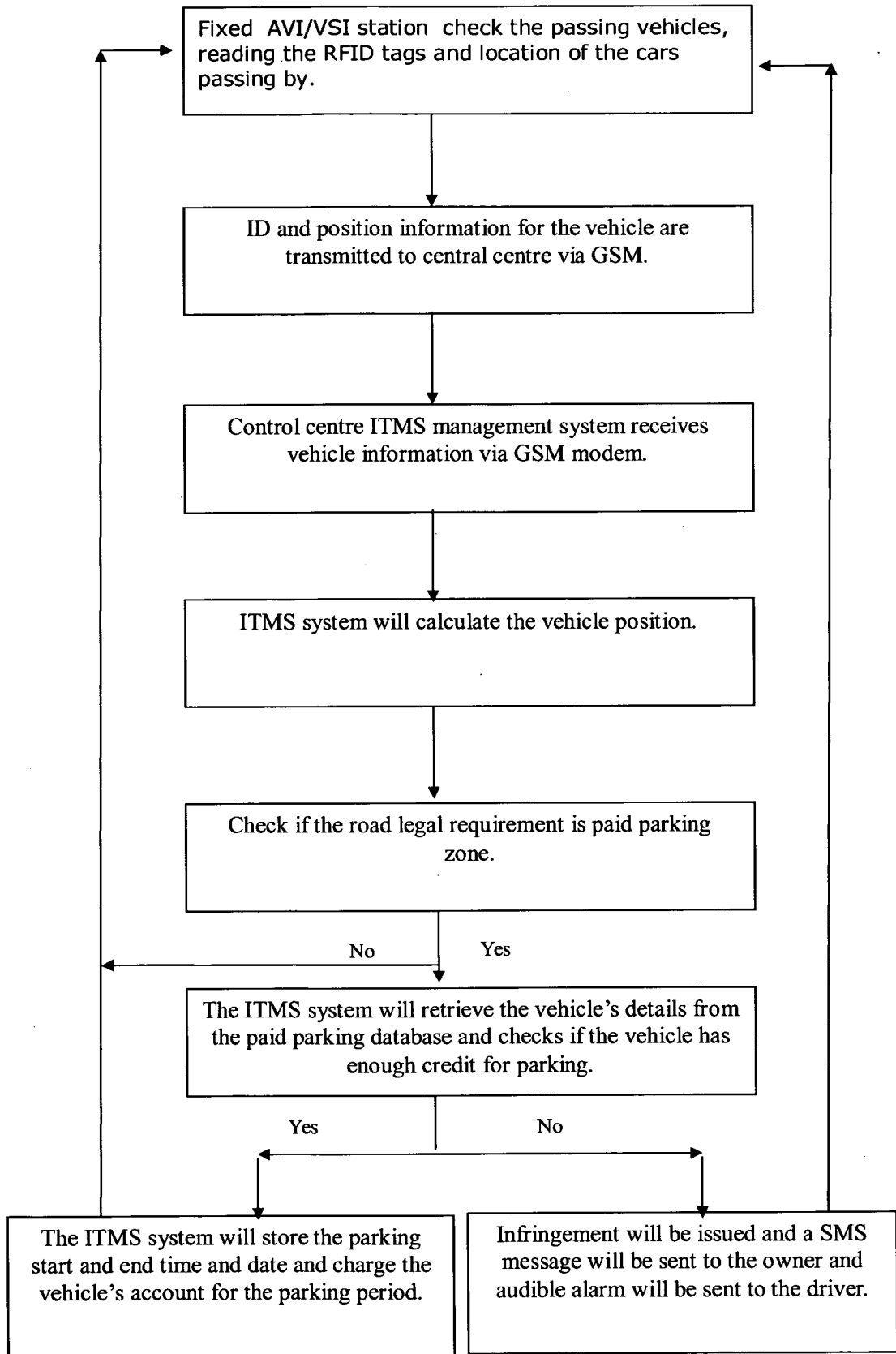


Fig. 14

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/AU2010/000382**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <i>G08G 1/017</i> (2006.01) <i>G08G 1/052</i> (2006.01) <i>G01S 13/94</i> (2006.01) <i>G08G 1/13</i> (2006.01)					
According to International Patent Classification (IPC) or to both national classification and IPC					
<b>B. FIELDS SEARCHED</b>					
Minimum documentation searched (classification system followed by classification symbols)					
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI, EPODOC with IPC marks and keywords including traffic control/management/monitoring, speed, velocity, location, position, vehicle, car, gsm, gps, rfid, identify, infringement, offence, fine etc.					
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>					
<b>Category*</b>	<b>Citation of document, with indication, where appropriate, of the relevant passages</b>	<b>Relevant to claim No.</b>			
X	US 2007/0061155 A1 (JI et al.) 15 March 2007 - See whole document, in particular the abstract, the figures, paragraphs [0007], [0014], [0017]-[0021], [0029]-[0031], [0039], [0047]-[0050], claim 15	1-2, 6, 8-9, 12-13			
X ----- Y	US 2006/0055561 A1 (KAMALI et al.) 16 March 2006 - See whole document, in particular the abstract, the figures, paragraphs [0011], [0017]-[0023], [0029]	1-8, 13-14 ----- 10-11			
Y	Derwent Abstract Accession no 2007-228665, KR 20060083087 A (JUNG et al.) 20 July 2006 - Abstract	10-11			
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex					
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; border: none;">                     * Special categories of cited documents:                      "A" document defining the general state of the art which is not considered to be of particular relevance                      "E" earlier application or patent but published on or after the international filing date                      "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)                      "O" document referring to an oral disclosure, use, exhibition or other means                      "P" document published prior to the international filing date but later than the priority date claimed                 </td> <td style="width: 33%; border: none;">                     "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention                      "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone                      "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art                      "&amp;" document member of the same patent family                 </td> <td style="width: 33%; border: none;"></td> </tr> </table>			* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family				
Date of the actual completion of the international search 31 May 2010		Date of mailing of the international search report - 4 JUN 2010			
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. +61 2 6283 7999		Authorized officer <b>MLADEN MITIC</b> AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 3193			

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

**PCT/AU2010/000382**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
US 2007061155	NONE
US 2006055561	NONE
KR 20060083087	NONE

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX