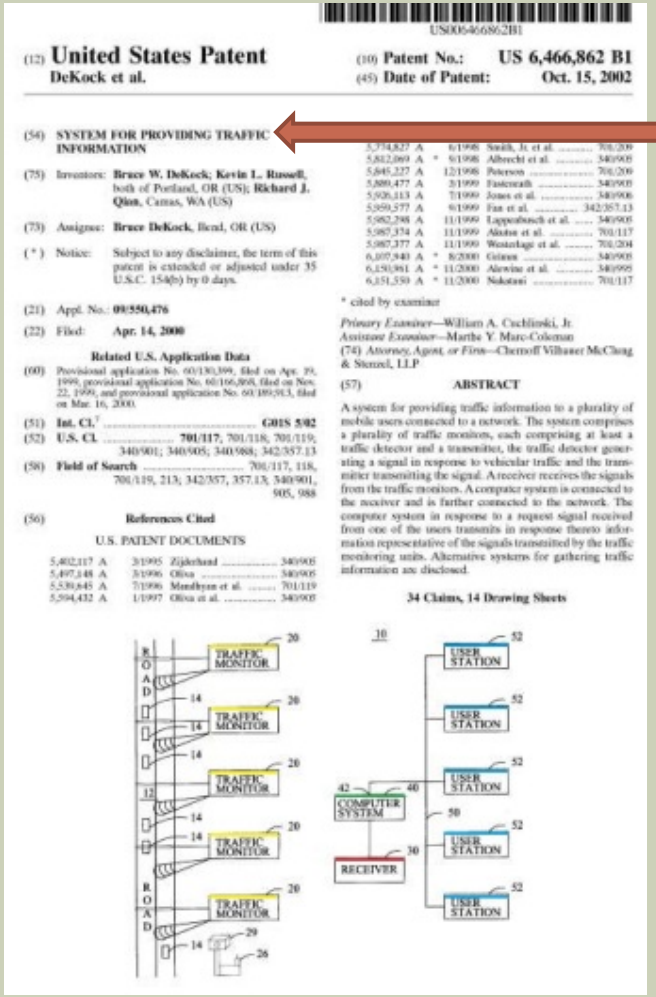
TRAFFIC'S MARKMAN PRESENTATION

SEPTEMBER 8, 2010

Google Inc. v. Traffic Information, LLC

(Case No. CV-09-642-HU)

THE TRAFFIC PATENTS



US006466862B1

(12) **United States Patent**
DeKock et al.

(10) **Patent No.: US 6,466,862 B1**
(45) **Date of Patent: Oct. 15, 2002**

(54) **SYSTEM FOR PROVIDING TRAFFIC INFORMATION**

(75) Inventors: **Bruce W. DeKock**; **Kevin L. Russell**, both of Portland, OR (US); **Richard J. Qian**, Camas, WA (US)

(73) Assignee: **Bruce DeKock**, Ilcal, OR (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/550,476**

(22) Filed: **Apr. 14, 2000**

Related U.S. Application Data

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(51) **Int. Cl.**[7] **G01S 5/02**

(52) **U.S. Cl.** **701/117**, 701/118, 701/119; 340/901; 340/905; 340/988; 342/357.13

(58) **Field of Search** 701/117, 118, 701/119, 213; 342/357, 357.13, 340/901, 905, 988

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Primary Examiner—William A. Cuchlinski, Jr.
Assistant Examiner—Marthe Y. Marc-Coleman
(74) *Attorney, Agent, or Firm*—Chernoff Vilhauer McClung & Stenzel, LLP

(57) **ABSTRACT**

A system for providing traffic information to a plurality of mobile users connected to a network. The system comprises a plurality of traffic monitors, each comprising at least a traffic detector and a transmitter, the traffic detector generating a signal in response to vehicular traffic and the transmitter transmitting the signal. A receiver receives the signals from the traffic monitors. A computer system is connected to the receiver and is further connected to the network. The computer system in response to a request signal received from one of the users transmits in response thereto information representative of the signals transmitted by the traffic monitoring units. Alternative systems for gathering traffic information are disclosed.

34 Claims, 14 Drawing Sheets

SYSTEM FOR PROVIDING TRAFFIC INFORMATION

THE TRAFFIC PATENTS

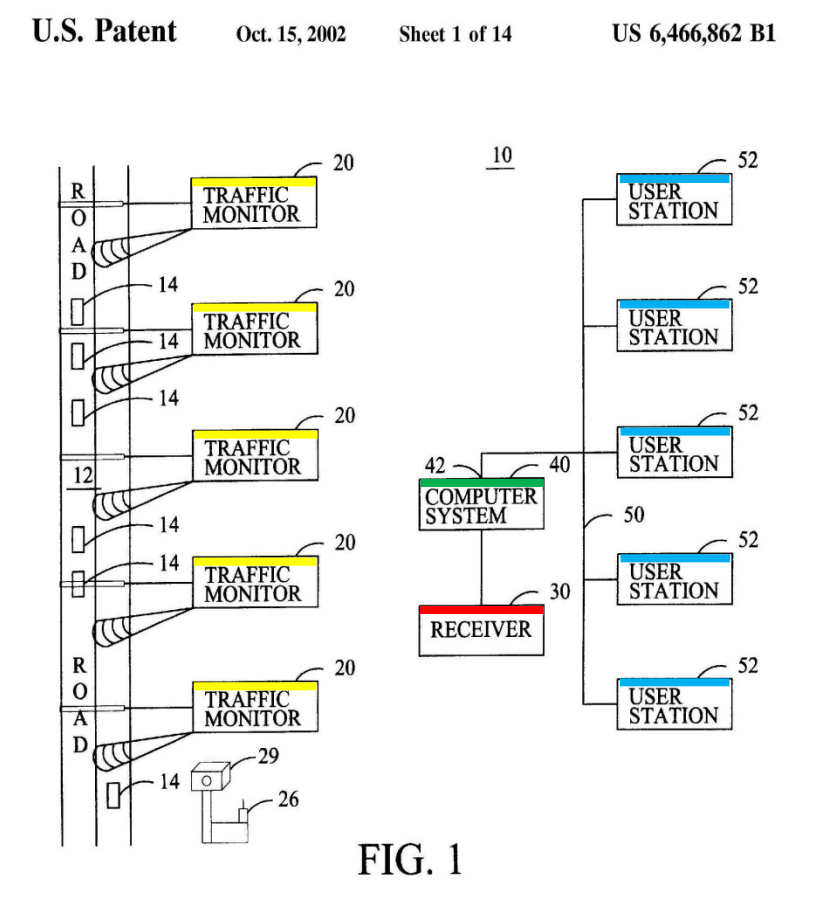

FIG. 1

Traffic Monitor — Detect vehicular movement and transmit signals including data representative of vehicular movement to Receiver

Receiver — Receives signals transmitted by Traffic Monitors

Computer System — Processes signals from Traffic Monitors via the Receiver and provides traffic information to Mobile User Stations

Mobile User Station — Displays the traffic information transmitted by the Computer System

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

TRAFFIC MONITORS/TRAFFIC INFORMATION

Signals
(from Traffic Monitor)
↓
Computer System

Traffic Information
(from Computer System)
↓
Mobile User Station

DATA FROM MOBILE USER STATION

In another embodiment, instead of deriving traffic information from traffic monitors, the computer system may derive traffic information based on data received from mobile user stations.

DATA FROM MOBILE USER STATION

diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114a–114d** and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114a–114d** display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and [illegible] the computer system **40**. The comp[illegible] the data from the traffic monitors [illegible] as necessary. It is not necessary [illegible] calculate traffic data, if desired [illegible] a user station **52**, the comput[illegible] information over the netw[illegible]

The system **10** has ma[illegible] receive contemporaneou[illegible] of locations. It allows [illegible] mation rather than w[illegible] at specified times. [illegible] vided by the syste[illegible] other traffic repo[illegible] and contemp[illegible] vehicular spe[illegible] plurality of [illegible] are provide[illegible] then [illegible] on th[illegible] not [illegible] prov[illegible] also [illegible] by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such an exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll so as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In yet another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

FIG. 3 shows an exemplary display 54 displaying the traffic information provided by the computer system 40. The computer system 40 provides data from its memory which is representative of the road 12, such as data from a map database, which is displayed as a road 112 on the display 54. The computer system 40 also provides traffic information collected by each, or a selected set, of the respective traffic monitors 20 which is displayed in portions 114a-114d and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. [9:28-38]

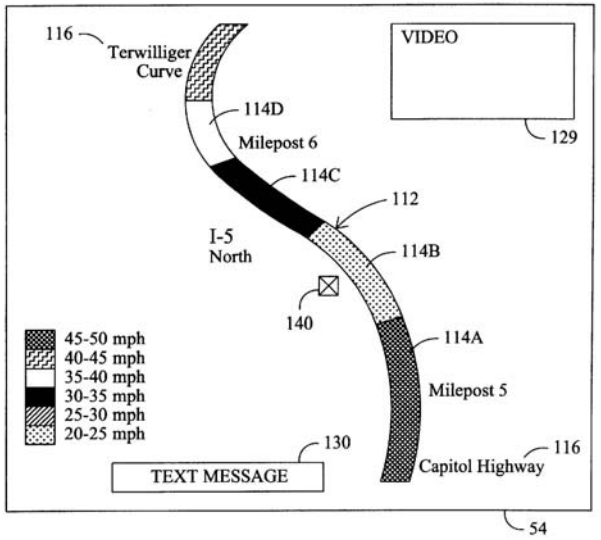

FIG. 3

CLAIM 21 – '862 PATENT

Claim 21 Does Not Recite "Traffic Monitors"

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 25 – '862 PATENT

25	The system of claim 21 wherein said computer system updates said traffic information database based on data received from said mobile user stations.

MOBILE USER STATIONS/TRAFFIC INFORMATION

Data
(from Mobile User Stations)

↓

Computer System

Traffic Information
(from Computer System)

↓

Mobile User Station

LIST OF CLAIM TERMS FOR CONSTRUCTION

1. Traffic Information
2. Traffic Monitor
3. Mobile User Station
4. Data Representative of Traffic
5. Traffic Information Database
6. In Response to / providing
7. Information representative of selected portions of said traffic information database
8. Less than all available
9. Vehicular movement
10. Displayed Graphically

TRAFFIC INFORMATION

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The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

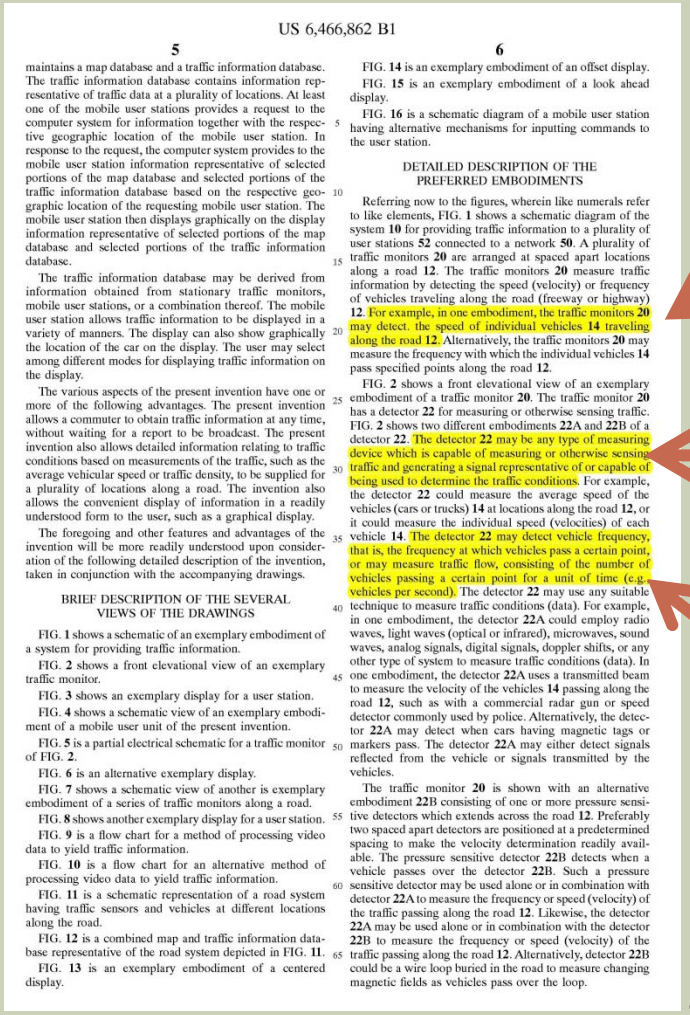
Asserted Claims

TRAFFIC INFORMATION

Traffic's Claim Construction

"traffic information" means data regarding traffic conditions, which data can include, but is not limited to, the speed, velocity, motion, density, flow, frequency of vehicles on a road, and/or other data representative of the movement of vehicles on a road.

TRAFFIC INFORMATION



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maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

The traffic information database may be derived from information obtained from stationary traffic monitors, mobile user stations, or a combination thereof. The mobile user station allows traffic information to be displayed in a variety of manners. The display can also show graphically the location of the car on the display. The user may select among different modes for displaying traffic information on the display.

The various aspects of the present invention have one or more of the following advantages. The present invention allows a commuter to obtain traffic information at any time, without waiting for a report to be broadcast. The present invention also allows detailed information relating to traffic conditions based on measurements of the traffic, such as the average vehicular speed or traffic density, to be supplied for a plurality of locations along a road. The invention also allows the convenient display of information in a readily understood form to the user, such as a graphical display.

The foregoing and other features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows a schematic of an exemplary embodiment of a system for providing traffic information.

FIG. **2** shows a front elevational view of an exemplary traffic monitor.

FIG. **3** shows an exemplary display for a user station.

FIG. **4** shows a schematic view of an exemplary embodiment of a mobile user unit of the present invention.

FIG. **5** is a partial electrical schematic for a traffic monitor of FIG. **2**.

FIG. **6** is an alternative exemplary display.

FIG. **7** shows a schematic view of another is exemplary embodiment of a series of traffic monitors along a road.

FIG. **8** shows another exemplary display for a user station.

FIG. **9** is a flow chart for a method of processing video data to yield traffic information.

FIG. **10** is a flow chart for an alternative method of processing video data to yield traffic information.

FIG. **11** is a schematic representation of a road system having traffic sensors and vehicles at different locations along the road.

FIG. **12** is a combined map and traffic information database representative of the road system depicted in FIG. **11**.

FIG. **13** is an exemplary embodiment of a centered display.

FIG. **14** is an exemplary embodiment of an offset display.

FIG. **15** is an exemplary embodiment of a look ahead display.

FIG. **16** is a schematic diagram of a mobile user station having alternative mechanisms for inputting commands to the user station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22**A and **22**B of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22**A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22**A uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22**A may detect when cars having magnetic tags or markers pass. The detector **22**A may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

The traffic monitor **20** is shown with an alternative embodiment **22**B consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22**B detects when a vehicle passes over the detector **22**B. Such a pressure sensitive detector may be used alone or in combination with detector **22**A to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22**A may be used alone or in combination with the detector **22**B to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22**B could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

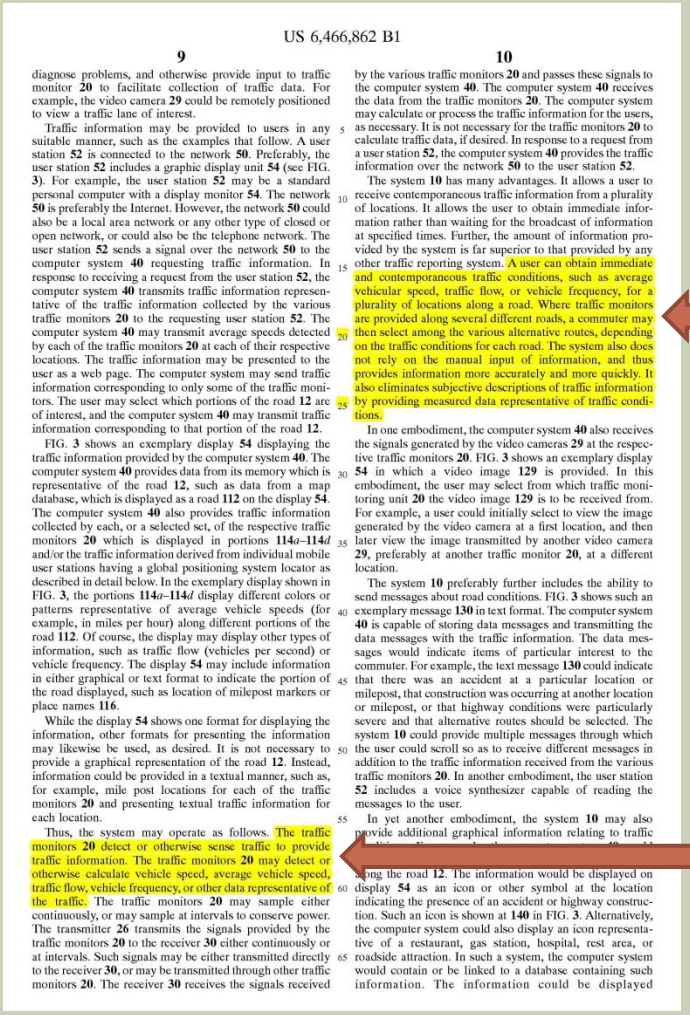
Various Types of Traffic Conditions

For example, in one embodiment, the traffic monitors 20 may detect the ***speed of individual vehicles*** 14 traveling along the road 12. [6:18-20]

The detector 22 may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the ***traffic conditions***. [6:28-31]

The detector 22 may detect vehicle ***frequency***, that is, the frequency at which vehicles pass a certain point, or may measure ***traffic flow***, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector 22 may use any suitable technique to measure ***traffic conditions*** (data). [6:35-40]

TRAFFIC INFORMATION



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diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***d* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such an exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll so as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In yet another embodiment, the system **10** may also provide additional graphical information relating to traffic

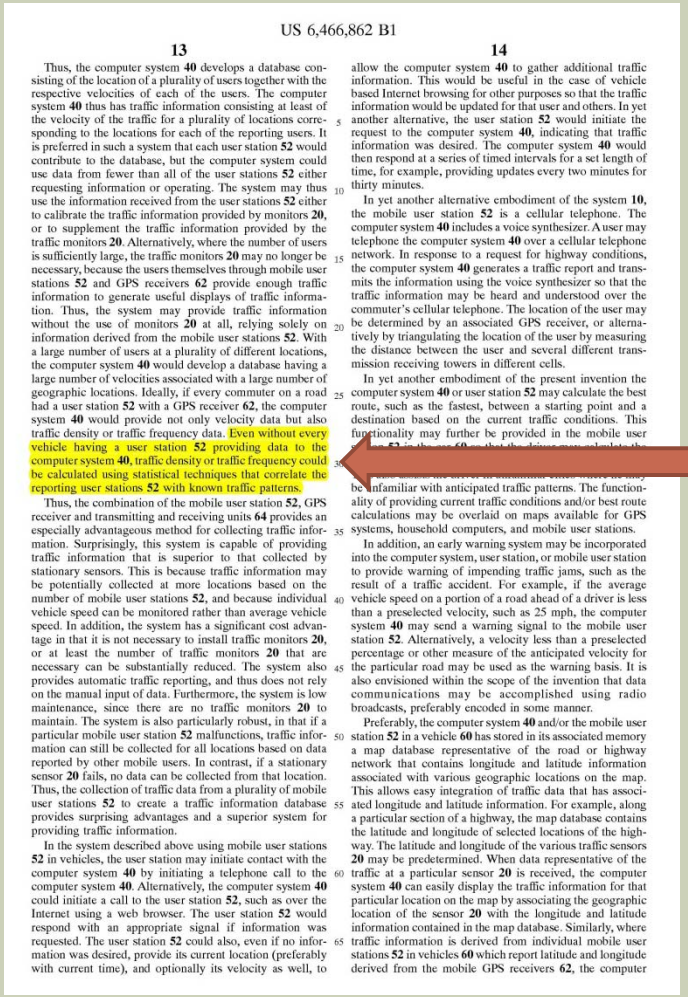
along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

Examples of traffic conditions

A user can obtain immediate and contemporaneous *traffic conditions*, such as *average vehicular speed*, *traffic flow*, or *vehicle frequency*, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the *traffic conditions* for each road. [10:15-21]

The traffic monitors 20 detect or otherwise sense traffic to provide traffic information. The traffic monitors 20 may detect or otherwise calculate *vehicle speed*, *average vehicle speed*, *traffic flow*, *vehicle frequency*, or *other data representative of the traffic*. [9:56-60]

TRAFFIC INFORMATION



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Thus, the computer system **40** develops a database consisting of the location of a plurality of users together with the respective velocities of each of the users. The computer system **40** thus has traffic information consisting at least of the velocity of the traffic for a plurality of locations corresponding to the locations for each of the reporting users. It is preferred in such a system that each user station **52** would contribute to the database, but the computer system could use data from fewer than all of the user stations **52** either requesting information or operating. The system may thus use the information received from the user stations **52** either to calibrate the traffic information provided by monitors **20**, or to supplement the traffic information provided by the traffic monitors **20**. Alternatively, where the number of users is sufficiently large, the traffic monitors **20** may no longer be necessary, because the users themselves through mobile user stations **52** and GPS receivers **62** provide enough traffic information to generate useful displays of traffic information. Thus, the system may provide traffic information without the use of monitors **20** at all, relying solely on information derived from the mobile user stations **52**. With a large number of users at a plurality of different locations, the computer system **40** would develop a database having a large number of velocities associated with a large number of geographic locations. Ideally, if every commuter on a road had a user station **52** with a GPS receiver **62**, the computer system **40** would provide not only velocity data but also traffic density or traffic frequency data. Even without every vehicle having a user station **52** providing data to the computer system **40**, traffic density or traffic frequency could be calculated using statistical techniques that correlate the reporting user stations **52** with known traffic patterns.

Thus, the combination of the mobile user station **52**, GPS receiver and transmitting and receiving units **64** provides an especially advantageous method for collecting traffic information. Surprisingly, this system is capable of providing traffic information that is superior to that collected by stationary sensors. This is because traffic information may be potentially collected at more locations based on the number of mobile user stations **52**, and because individual vehicle speed can be monitored rather than average vehicle speed. In addition, the system has a significant cost advantage in that it is not necessary to install traffic monitors **20**, or at least the number of traffic monitors **20** that are necessary can be substantially reduced. The system also provides automatic traffic reporting, and thus does not rely on the manual input of data. Furthermore, the system is low maintenance, since there are no traffic monitors **20** to maintain. The system is also particularly robust, in that if a particular mobile user station **52** malfunctions, traffic information can still be collected for all locations based on data reported by other mobile users. In contrast, if a stationary sensor **20** fails, no data can be collected from that location. Thus, the collection of traffic data from a plurality of mobile user stations **52** to create a traffic information database provides surprising advantages and a superior system for providing traffic information.

In the system described above using mobile user stations **52** in vehicles, the user station may initiate contact with the computer system **40** by initiating a telephone call to the computer system **40**. Alternatively, the computer system **40** could initiate a call to the user station **52**, such as over the Internet using a web browser. The user station **52** would respond with an appropriate signal if information was requested. The user station **52** could also, even if no information was desired, provide its current location (preferably with current time), and optionally its velocity as well, to

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allow the computer system **40** to gather additional traffic information. This would be useful in the case of vehicle based Internet browsing for other purposes so that the traffic information would be updated for that user and others. In yet another alternative, the user station **52** would initiate the request to the computer system **40**, indicating that traffic information was desired. The computer system **40** would then respond at a series of timed intervals for a set length of time, for example, providing updates every two minutes for thirty minutes.

In yet another alternative embodiment of the system **10**, the mobile user station **52** is a cellular telephone. The computer system **40** includes a voice synthesizer. A user may telephone the computer system **40** over a cellular telephone network. In response to a request for highway conditions, the computer system **40** generates a traffic report and transmits the information using the voice synthesizer so that the traffic information may be heard and understood over the commuter's cellular telephone. The location of the user may be determined by an associated GPS receiver, or alternatively by triangulating the location of the user by measuring the distance between the user and several different transmission receiving towers in different cells.

In yet another embodiment of the present invention the computer system **40** or user station **52** may calculate the best route, such as the fastest, between a starting point and a destination based on the current traffic conditions. This functionality may further be provided in the mobile user [illegible] be unfamiliar with anticipated traffic patterns. The functionality of providing current traffic conditions and/or best route calculations may be overlaid on maps available for GPS systems, household computers, and mobile user stations.

In addition, an early warning system may be incorporated into the computer system, user station, or mobile user station to provide warning of impending traffic jams, such as the result of a traffic accident. For example, if the average vehicle speed on a portion of a road ahead of a driver is less than a preselected velocity, such as 25 mph, the computer system **40** may send a warning signal to the mobile user station **52**. Alternatively, a velocity less than a preselected percentage or other measure of the anticipated velocity for the particular road may be used as the warning basis. It is also envisioned within the scope of the invention that data communications may be accomplished using radio broadcasts, preferably encoded in some manner.

Preferably, the computer system **40** and/or the mobile user station **52** in a vehicle **60** has stored in its associated memory a map database representative of the road or highway network that contains longitude and latitude information associated with various geographic locations on the map. This allows easy integration of traffic data that has associated longitude and latitude information. For example, along a particular section of a highway, the map database contains the latitude and longitude of selected locations of the highway. The latitude and longitude of the various traffic sensors **20** may be predetermined. When data representative of the traffic at a particular sensor **20** is received, the computer system **40** can easily display the traffic information for that particular location on the map by associating the geographic location of the sensor **20** with the longitude and latitude information contained in the map database. Similarly, where traffic information is derived from individual mobile user stations **52** in vehicles **60** which report latitude and longitude derived from the mobile GPS receivers **62**, the computer

Even without every vehicle having a user station 52 providing data to the computer system 40, *traffic density* or *traffic frequency* could be calculated using statistical techniques that correlate the reporting user stations 52 with known traffic patterns. [13:28-32]

TRAFFIC INFORMATION

Various Traffic Conditions May Be Included

- Individual vehicle speed/velocity..... [6:18-20; 6:32-35]
- Average vehicle speed/velocity..... [9:56-60; 10:15-21]
- Traffic density..... [13:28-32]
- Traffic flow..... [6:35-39; 9:56-60; 10:15-21]
- Vehicle frequency..... [6:35-39; 9:56-60; 10:15-21]
- "Other data representative of the traffic"... [9:56-60]

* Neither the claims nor the specification limits "traffic information" to any particular type of traffic condition

TRAFFIC INFORMATION

Traffic's Claim Construction

"traffic information" means data regarding traffic conditions, which data can include, but is not limited to, the speed, velocity, motion, density, flow, frequency of vehicles on a road, and/or other data representative of the movement of vehicles on a road.

TRAFFIC INFORMATION/TRAFFIC INFORMATION REPRESENTATIVE OF SAID SIGNALS

Traffic's Construction

"Traffic information" means data regarding traffic conditions, which data can include, but is not limited to, the speed, velocity, motion, density, flow, frequency of vehicles on a road, and/or other data representative of the movement of vehicles on a road.

Google's Construction

- "Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is
- the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors

TRAFFIC INFORMATION

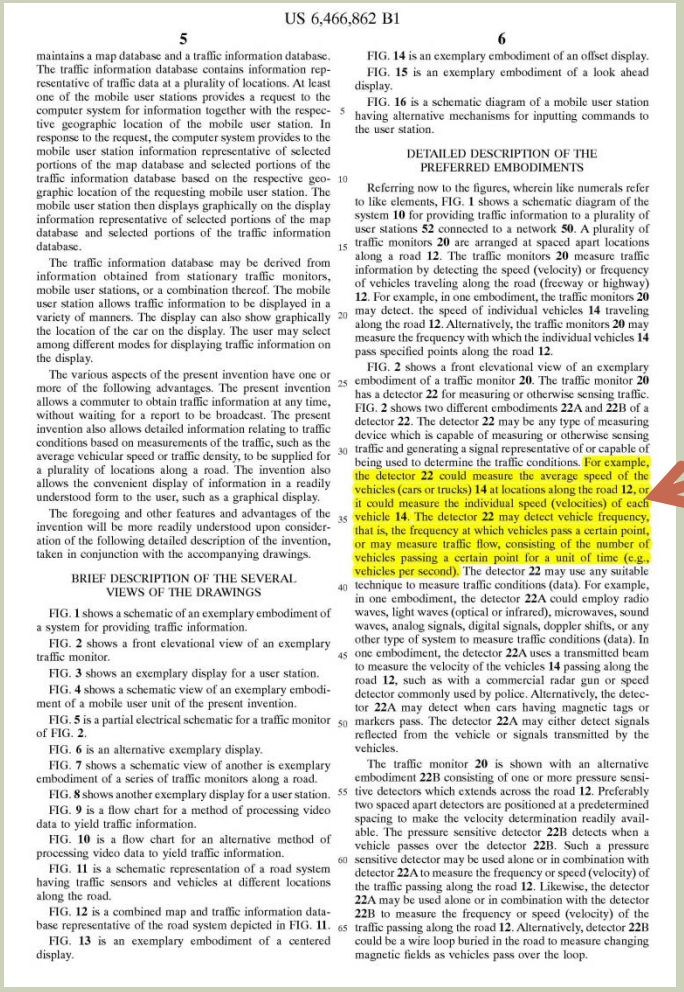
Google's Construction

- "Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is
- the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors.

"Current" Should Be Rejected

Specification makes clear that traffic information may be based on data collected/averaged over a period of time.

TRAFFIC INFORMATION



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maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

The traffic information database may be derived from information obtained from stationary traffic monitors, mobile user stations, or a combination thereof. The mobile user station allows traffic information to be displayed in a variety of manners. The display can also show graphically the location of the car on the display. The user may select among different modes for displaying traffic information on the display.

The various aspects of the present invention have one or more of the following advantages. The present invention allows a commuter to obtain traffic information at any time, without waiting for a report to be broadcast. The present invention also allows detailed information relating to traffic conditions based on measurements of the traffic, such as the average vehicular speed or traffic density, to be supplied for a plurality of locations along a road. The invention also allows the convenient display of information in a readily understood form to the user, such as a graphical display.

The foregoing and other features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows a schematic of an exemplary embodiment of a system for providing traffic information.

FIG. **2** shows a front elevational view of an exemplary traffic monitor.

FIG. **3** shows an exemplary display for a user station.

FIG. **4** shows a schematic view of an exemplary embodiment of a mobile user unit of the present invention.

FIG. **5** is a partial electrical schematic for a traffic monitor of FIG. **2**.

FIG. **6** is an alternative exemplary display.

FIG. **7** shows a schematic view of another is exemplary embodiment of a series of traffic monitors along a road.

FIG. **8** shows another exemplary display for a user station.

FIG. **9** is a flow chart for a method of processing video data to yield traffic information.

FIG. **10** is a flow chart for an alternative method of processing video data to yield traffic information.

FIG. **11** is a schematic representation of a road system having traffic sensors and vehicles at different locations along the road.

FIG. **12** is a combined map and traffic information database representative of the road system depicted in FIG. **11**.

FIG. **13** is an exemplary embodiment of a centered display.

FIG. **14** is an exemplary embodiment of an offset display.

FIG. **15** is an exemplary embodiment of a look ahead display.

FIG. **16** is a schematic diagram of a mobile user station having alternative mechanisms for inputting commands to the user station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

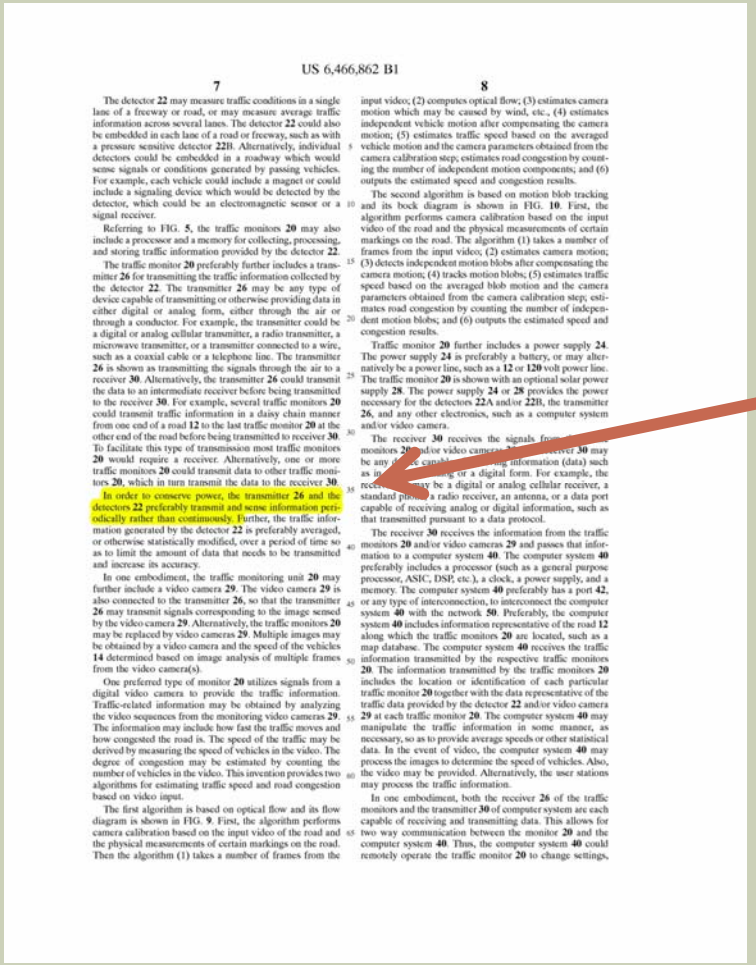
FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22**A and **22**B of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22**A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22**A uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22**A may detect when cars having magnetic tags or markers pass. The detector **22**A may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

The traffic monitor **20** is shown with an alternative embodiment **22**B consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22**B detects when a vehicle passes over the detector **22**B. Such a pressure sensitive detector may be used alone or in combination with detector **22**A to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22**A may be used alone or in combination with the detector **22**B to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22**B could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

"Current" Should Be Rejected

For example, the detector 22 could measure the average speed of the vehicles (cars or trucks) 14 at locations along the road 12, or it could measure the individual speed (velocities) of each vehicle 14. [6:31-35]

TRAFFIC INFORMATION



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The detector **22** may measure traffic conditions in a single lane of a freeway or road, or may measure average traffic information across several lanes. The detector **22** could also be embedded in each lane of a road or freeway, such as with a pressure sensitive detector **22**B. Alternatively, individual detectors could be embedded in a roadway which would sense signals or conditions generated by passing vehicles. For example, each vehicle could include a magnet or could include a signaling device which would be detected by the detector, which could be an electromagnetic sensor or a signal receiver.

Referring to FIG. **5**, the traffic monitors **20** may also include a processor and a memory for collecting, processing, and storing traffic information provided by the detector **22**.

The traffic monitor **20** preferably further includes a transmitter **26** for transmitting the traffic information collected by the detector **22**. The transmitter **26** may be any type of device capable of transmitting or otherwise providing data in either digital or analog form, either through the air or through a conductor. For example, the transmitter could be a digital or analog cellular transmitter, a radio transmitter, a microwave transmitter, or a transmitter connected to a wire, such as a coaxial cable or a telephone line. The transmitter **26** is shown as transmitting the signals through the air to a receiver **30**. Alternatively, the transmitter **26** could transmit the data to an intermediate receiver before being transmitted to the receiver **30**. For example, several traffic monitors **20** could transmit traffic information in a daisy chain manner from one end of a road **12** to the last traffic monitor **20** at the other end of the road before being transmitted to receiver **30**. To facilitate this type of transmission most traffic monitors **20** would require a receiver. Alternatively, one or more traffic monitors **20** could transmit data to other traffic monitors **20**, which in turn transmit the data to the receiver **30**.

In order to conserve power, the transmitter **26** and the detectors **22** preferably transmit and sense information periodically rather than continuously. Further, the traffic information generated by the detector **22** is preferably averaged, or otherwise statistically modified, over a period of time so as to limit the amount of data that needs to be transmitted and increase its accuracy.

In one embodiment, the traffic monitoring unit **20** may further include a video camera **29**. The video camera **29** is also connected to the transmitter **26**, so that the transmitter **26** may transmit signals corresponding to the image sensed by the video camera **29**. Alternatively, the traffic monitors **20** may be replaced by video cameras **29**. Multiple images may be obtained by a video camera and the speed of the vehicles **14** determined based on image analysis of multiple frames from the video camera(s).

One preferred type of monitor **20** utilizes signals from a digital video camera to provide the traffic information. Traffic-related information may be obtained by analyzing the video sequences from the monitoring video cameras **29**. The information may include how fast the traffic moves and how congested the road is. The speed of the traffic may be derived by measuring the speed of vehicles in the video. The degree of congestion may be estimated by counting the number of vehicles in the video. This invention provides two algorithms for estimating traffic speed and road congestion based on video input.

The first algorithm is based on optical flow and its flow diagram is shown in FIG. **9**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. Then the algorithm (1) takes a number of frames from the input video; (2) computes optical flow; (3) estimates camera motion which may be caused by wind, etc., (4) estimates independent vehicle motion after compensating the camera motion; (5) estimates traffic speed based on the averaged vehicle motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion components; and (6) outputs the estimated speed and congestion results.

The second algorithm is based on motion blob tracking and its bock diagram is shown in FIG. **10**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. The algorithm (1) takes a number of frames from the input video; (2) estimates camera motion; (3) detects independent motion blobs after compensating the camera motion; (4) tracks motion blobs; (5) estimates traffic speed based on the averaged blob motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion blobs; and (6) outputs the estimated speed and congestion results.

Traffic monitor **20** further includes a power supply **24**. The power supply **24** is preferably a battery, or may alternatively be a power line, such as a **12** or **120** volt power line. The traffic monitor **20** is shown with an optional solar power supply **28**. The power supply **24** or **28** provides the power necessary for the detectors **22**A and/or **22**B, the transmitter **26**, and any other electronics, such as a computer system and/or video camera.

The receiver **30** receives the signals from [illegible] monitors **20** and/or video cameras [illegible] receiver **30** may be any device capable of receiving information (data) such as in analog or a digital form. For example, the receiver may be a digital or analog cellular receiver, a standard pager, a radio receiver, an antenna, or a data port capable of receiving analog or digital information, such as that transmitted pursuant to a data protocol.

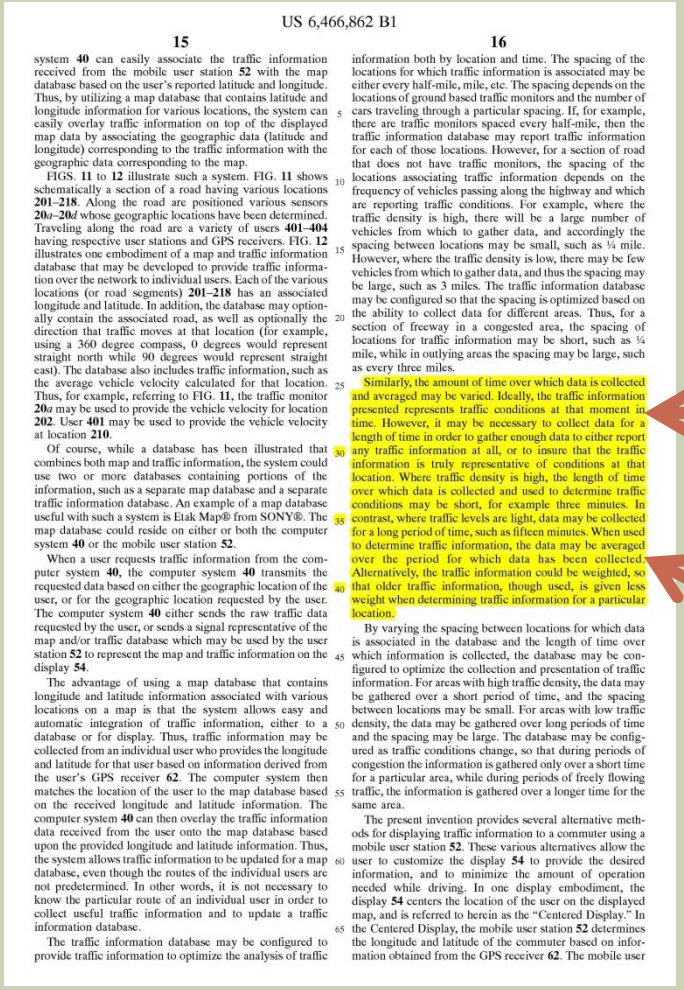
The receiver **30** receives the information from the traffic monitors **20** and/or video cameras **29** and passes that information to a computer system **40**. The computer system **40** preferably includes a processor (such as a general purpose processor, ASIC, DSP, etc.), a clock, a power supply, and a memory. The computer system **40** preferably has a port **42**, or any type of interconnection, to interconnect the computer system **40** with the network **50**. Preferably, the computer system **40** includes information representative of the road **12** along which the traffic monitors **20** are located, such as a map database. The computer system **40** receives the traffic information transmitted by the respective traffic monitors **20**. The information transmitted by the traffic monitors **20** includes the location or identification of each particular traffic monitor **20** together with the data representative of the traffic data provided by the detector **22** and/or video camera **29** at each traffic monitor **20**. The computer system **40** may manipulate the traffic information in some manner, as necessary, so as to provide average speeds or other statistical data. In the event of video, the computer system **40** may process the images to determine the speed of vehicles. Also, the video may be provided. Alternatively, the user stations may process the traffic information.

In one embodiment, both the receiver **26** of the traffic monitors and the transmitter **30** of computer system are each capable of receiving and transmitting data. This allows for two way communication between the monitor **20** and the computer system **40**. Thus, the computer system **40** could remotely operate the traffic monitor **20** to change settings,

"Current" Should Be Rejected

In order to conserve power, the transmitter 26 and the detectors 22 preferably transmit and sense information periodically rather than continuously. [7:35-37].

TRAFFIC INFORMATION



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system **40** can easily associate the traffic information received from the mobile user station **52** with the map database based on the user's reported latitude and longitude. Thus, by utilizing a map database that contains latitude and longitude information for various locations, the system can easily overlay traffic information on top of the displayed map data by associating the geographic data (latitude and longitude) corresponding to the traffic information with the geographic data corresponding to the map.

FIGS. **11** to **12** illustrate such a system. FIG. **11** shows schematically a section of a road having various locations **201–218**. Along the road are positioned various sensors **20***a*–**20***f* whose geographic locations have been determined. Traveling along the road are a variety of users **401–404** having respective user stations and GPS receivers. FIG. **12** illustrates one embodiment of a map and traffic information database that may be developed to provide traffic information over the network to individual users. Each of the various locations (or road segments) **201–218** has an associated longitude and latitude. In addition, the database may optionally contain the associated road, as well as optionally the direction that traffic moves at that location (for example, using a 360 degree compass, 0 degrees would represent straight north while 90 degrees would represent straight east). The database also includes traffic information, such as the average vehicle velocity calculated for that location. Thus, for example, referring to FIG. **11**, the traffic monitor **20***a* may be used to provide the vehicle velocity for location **202**. User **401** may be used to provide the vehicle velocity at location **210**.

Of course, while a database has been illustrated that combines both map and traffic information, the system could use two or more databases containing portions of the information, such as a separate map database and a separate traffic information database. An example of a map database useful with such a system is Etak Map® from SONY®. The map database could reside on either or both the computer system **40** or the mobile user station **52**.

When a user requests traffic information from the computer system **40**, the computer system **40** transmits the requested data based on either the geographic location of the user, or for the geographic location requested by the user. The computer system **40** either sends the raw traffic data requested by the user, or sends a signal representative of the map and/or traffic database which may be used by the user station **52** to represent the map and traffic information on the display **54**.

The advantage of using a map database that contains longitude and latitude information associated with various locations on a map is that the system allows easy and automatic integration of traffic information, either to a database or for display. Thus, traffic information may be collected from an individual user who provides the longitude and latitude for that user based on information derived from the user's GPS receiver **62**. The computer system then matches the location of the user to the map database based on the received longitude and latitude information. The computer system **40** can then overlay the traffic information data received from the user onto the map database based upon the provided longitude and latitude information. Thus, the system allows traffic information to be updated for a map database, even though the routes of the individual users are not predetermined. In other words, it is not necessary to know the particular route of an individual user in order to collect useful traffic information and to update a traffic information database.

The traffic information database may be configured to provide traffic information to optimize the analysis of traffic

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information both by location and time. The spacing of the locations for which traffic information is associated may be either every half-mile, mile, etc. The spacing depends on the locations of ground based traffic monitors and the number of cars traveling through a particular spacing. If, for example, there are traffic monitors spaced every half-mile, then the traffic information database may report traffic information for each of those locations. However, for a section of road that does not have traffic monitors, the spacing of the locations associating traffic information depends on the frequency of vehicles passing along the highway and which are reporting traffic conditions. For example, where the traffic density is high, there will be a large number of vehicles from which to gather data, and accordingly the spacing between locations may be small, such as ¼ mile. However, where the traffic density is low, there may be few vehicles from which to gather data, and thus the spacing may be large, such as 3 miles. The traffic information database may be configured so that the spacing is optimized based on the ability to collect data for different areas. Thus, for a section of freeway in a congested area, the spacing of locations for traffic information may be short, such as ¼ mile, while in outlying areas the spacing may be large, such as every three miles.

Similarly, the amount of time over which data is collected and averaged may be varied. Ideally, the traffic information presented represents traffic conditions at that moment in time. However, it may be necessary to collect data for a length of time in order to gather enough data to either report any traffic information at all, or to insure that the traffic information is truly representative of conditions at that location. Where traffic density is high, the length of time over which data is collected and used to determine traffic conditions may be short, for example three minutes. In contrast, where traffic levels are light, data may be collected for a long period of time, such as fifteen minutes. When used to determine traffic information, the data may be averaged over the period for which data has been collected. Alternatively, the traffic information could be weighted, so that older traffic information, though used, is given less weight when determining traffic information for a particular location.

By varying the spacing between locations for which data is associated in the database and the length of time over which information is collected, the database may be configured to optimize the collection and presentation of traffic information. For areas with high traffic density, the data may be gathered over a short period of time, and the spacing between locations may be small. For areas with low traffic density, the data may be gathered over long periods of time and the spacing may be large. The database may be configured as traffic conditions change, so that during periods of congestion the information is gathered only over a short time for a particular area, while during periods of freely flowing traffic, the information is gathered over a longer time for the same area.

The present invention provides several alternative methods for displaying traffic information to a commuter using a mobile user station **52**. These various alternatives allow the user to customize the display **54** to provide the desired information, and to minimize the amount of operation needed while driving. In one display embodiment, the display **54** centers the location of the user on the displayed map, and is referred to herein as the "Centered Display." In the Centered Display, the mobile user station **52** determines the longitude and latitude of the commuter based on information obtained from the GPS receiver **62**. The mobile user

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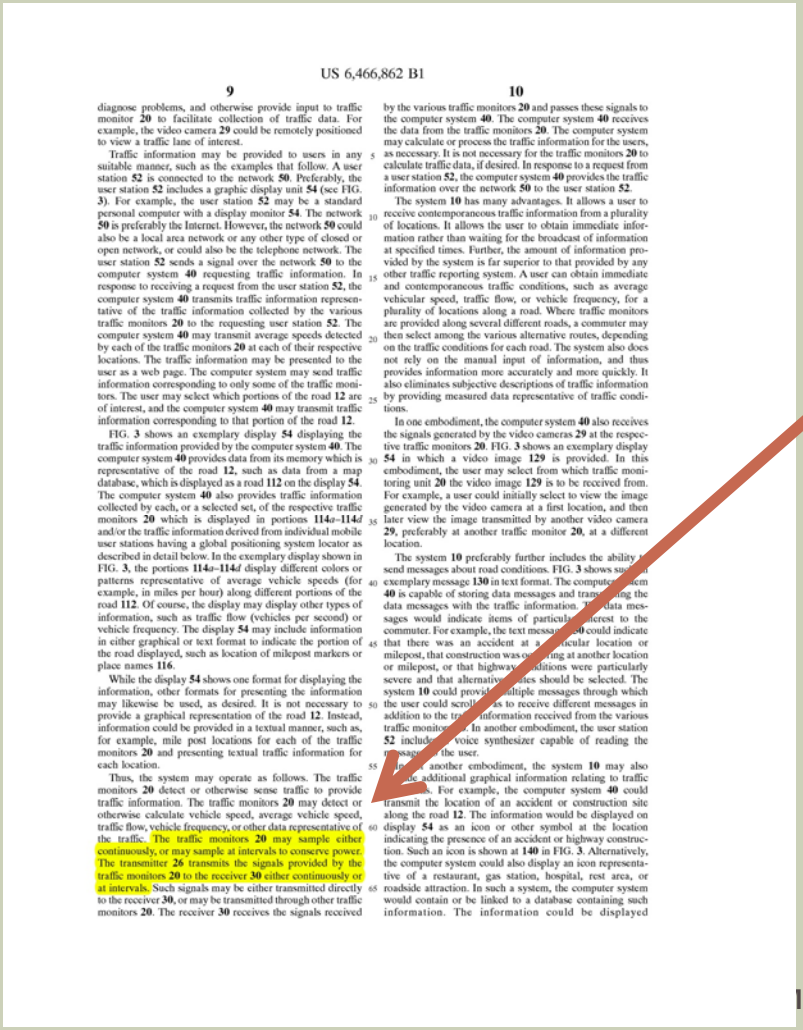
Similarly, the amount of time over which data is collected and averaged may be varied. Ideally, the traffic information presented represents traffic conditions at that moment in time. However, it may be necessary to collect data for a length of time in order to gather enough data to either report any traffic information at all, or to insure that the traffic information is truly representative of conditions at that location. Where traffic density is high, the length of time over which data is collected and used to determine traffic conditions may be short, for example three minutes. In contrast, where traffic levels are light, data may be collected for a long period of time, such as fifteen minutes. [16:25-36]

When used to determine traffic information, the data may be averaged over the period for which data has been collected. Alternatively, the traffic information could be weighted, so that older traffic information, though used, is given less weight when determining traffic information for a particular location. [16:36-42]

TRAFFIC INFORMATION



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diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***d* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll, as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the message to the user.

In another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

"Current" Should Be Rejected

The traffic monitors 20 may sample either continuously, or may sample at intervals to conserve power. The transmitter 26 transmits the signals provided by the traffic monitors 20 to the receiver 30 either continuously or at intervals. [9:61-65]

TRAFFIC INFORMATION/TRAFFIC INFORMATION REPRESENTATIVE OF SAID SIGNALS

Google's Construction

- "Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is
- the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors.

"Multiple" Should Be Rejected

Specification makes clear that "traffic information" may include the speed of an individual vehicle:

"For example, the detector 22 could measure the average speed of the vehicles (cars or trucks) 14 at locations along the road 12, or it could measure the individual speed (velocity) of each vehicle 14." [6:31-35]

TRAFFIC INFORMATION/TRAFFIC INFORMATION REPRESENTATIVE OF SAID SIGNALS

Google's Construction

- "Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is
- the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors.

"Speed, Frequency or Flow"

- Unduly restricted to three data types
- Rather "traffic information" can include variety of traffic conditions:
  - Individual vehicle speed/velocity
  - Average vehicle speed/velocity
  - Traffic density
  - Traffic flow
  - Vehicle frequency
  - "other data representative of the traffic"

TRAFFIC INFORMATION

Google's Construction

- "Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is
- the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors

Detected By One or More Traffic Monitors

- "Traffic Information" should be construed consistently across all claims.
- True, in claim 1 of the '862 patent, traffic information is representative of signals from traffic monitors.
- But not true for claim 21 of the '862 patent.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 21 – '862 PATENT

Does Not Recite "Traffic Monitors"

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 25 – '862 PATENT

25. The system of claim 21 wherein said computer system updates said traffic information database based on data received from said mobile user stations.

As Detected By One or More Traffic Monitors

Traffic information can be updated based on data received from mobile user stations.

Improper to require traffic information to be derived from data "as detected by one or more traffic monitors".

This is also why it is improper to use "traffic information representative of said signals transmitted by said traffic monitors" to limit scope of "traffic information"

TRAFFIC INFORMATION

Traffic's Claim Construction

"traffic information" means data regarding traffic conditions, which data can include, but is not limited to, the speed, velocity, motion, density, flow, frequency of vehicles on a road, and/or other data representative of the movement of vehicles on a road.

TRAFFIC INFORMATION

Google's Construction

- "Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is
- the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors

Not indefinite

- The claims provide guidance as to meaning of "traffic information"
  - E.g., claim 1 of '862 patent: "traffic information representative of signals transmitted by said traffic monitors"
- The specification provides guidance as to meaning of "traffic information"
  - See above passages (velocity, frequency, flow, etc.)
- Google was able to construe the claim

TRAFFIC INFORMATION

Not indefinite - screening

- Google says the patent teaches that certain data "should" be screened out as not "useful", citing 20:1-42
- That section actually says it "may" be desireable to screen out: "When using data from individual mobile user stations 52 to determine traffic information, it may be desireable to screen the data to determine whether it will be included in the traffic information database." [20:1-4]
- Stop sign example: if desired, the computer can determine based on geographic location whether mobile user station is at a stop sign and screen that data out. [20:4-16]

TRAFFIC INFORMATION

Not indefinite – "single fixed value"

- Google says the patent "teaches away" from representations of information that merely display "traffic flow relative to a single, fixed value"
- Not so. This is just another embodiment. Improper attempt to limit claim to this alternative embodiment.

In another embodiment, the present inventors came to the realization that merely encoding the image with a representation of the traffic flow relative to a single fixed value is not optimal. An example of such coding would be red is 0-30 mph, yellow is 30-40 mph, and green is 40+ mph. This coding is adequate for freeways but when roads are encoded that have lower speed limits, the encoding should be relative to what the speed limit is so that the user knows the relative speed of traffic on the road. Thus coding may correspond to relative speed rather than absolute speed. For example, a freeway with speed limit 55 mph would be coded 0-30 mph red, 30-40 mph yellow and 40+ mph green, while a side road with a 35 mph speed limit would be coded 0-20 mph red, 20-25 mph yellow and 25+ mph green. This permits relative encoding which is easier to interpret.

TRAFFIC MONITOR

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The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

Asserted Claims

TRAFFIC MONITOR

Traffic's Claim Construction

"Traffic monitor" means any device used to sense, measure, detect, and/or determine vehicular movement and transmit and/or provide a signal representative of vehicular movement.

TRAFFIC MONITOR

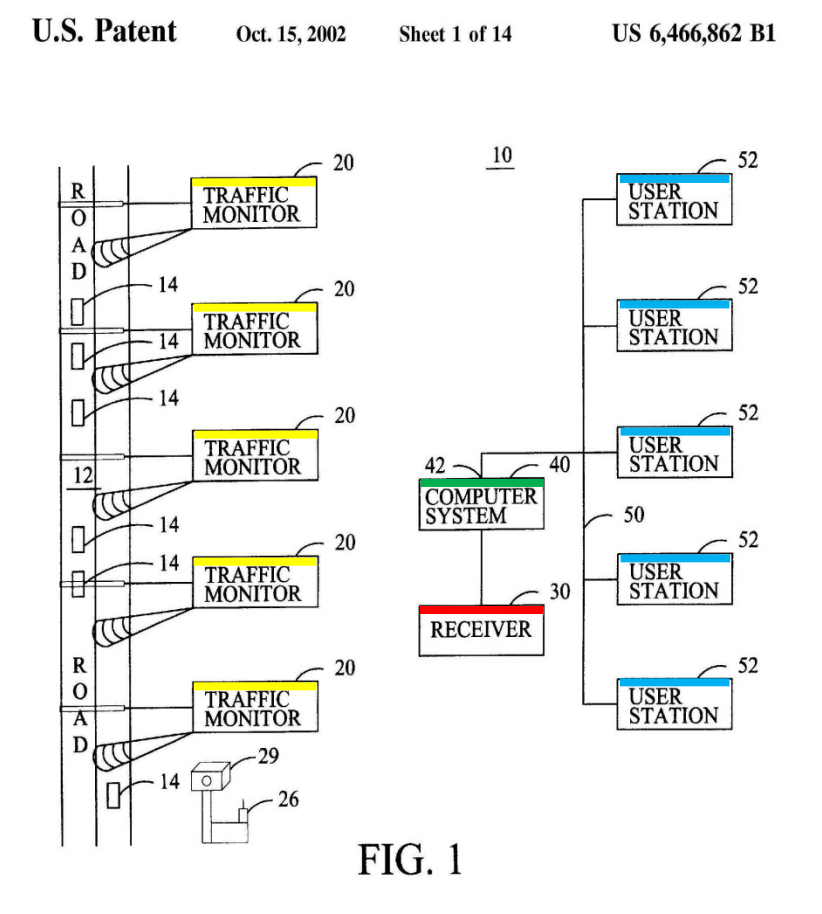


FIG. 1

Traffic Monitor — Detect vehicular movement and transmit signals including data representative of vehicular movement to receiver

Receiver — Receives signals transmitted by traffic monitors

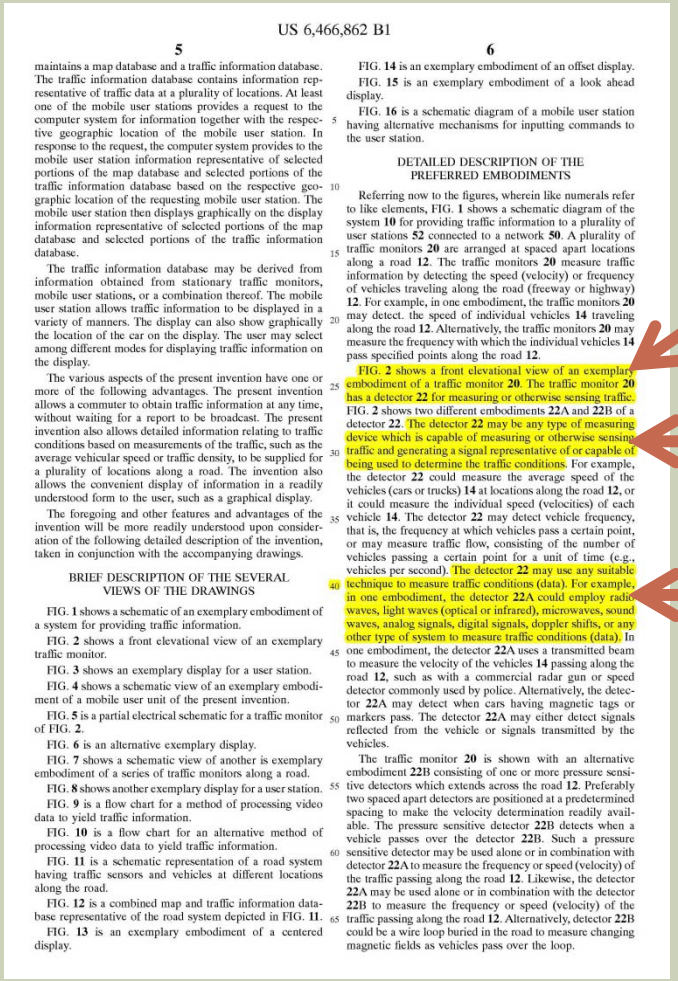
Computer System — Processes signals from Traffic Monitors via the Receiver and provides traffic information to mobile user stations

Mobile User Station — Graphically displays the traffic information transmitted by the computer system

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

TRAFFIC MONITOR



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maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

The traffic information database may be derived from information obtained from stationary traffic monitors, mobile user stations, or a combination thereof. The mobile user station allows traffic information to be displayed in a variety of manners. The display can also show graphically the location of the car on the display. The user may select among different modes for displaying traffic information on the display.

The various aspects of the present invention have one or more of the following advantages. The present invention allows a commuter to obtain traffic information at any time, without waiting for a report to be broadcast. The present invention also allows detailed information relating to traffic conditions based on measurements of the traffic, such as the average vehicular speed or traffic density, to be supplied for a plurality of locations along a road. The invention also allows the convenient display of information in a readily understood form to the user, such as a graphical display.

The foregoing and other features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows a schematic of an exemplary embodiment of a system for providing traffic information.

FIG. **2** shows a front elevational view of an exemplary traffic monitor.

FIG. **3** shows an exemplary display for a user station.

FIG. **4** shows a schematic view of an exemplary embodiment of a mobile user unit of the present invention.

FIG. **5** is a partial electrical schematic for a traffic monitor of FIG. **2**.

FIG. **6** is an alternative exemplary display.

FIG. **7** shows a schematic view of another is exemplary embodiment of a series of traffic monitors along a road.

FIG. **8** shows another exemplary display for a user station.

FIG. **9** is a flow chart for a method of processing video data to yield traffic information.

FIG. **10** is a flow chart for an alternative method of processing video data to yield traffic information.

FIG. **11** is a schematic representation of a road system having traffic sensors and vehicles at different locations along the road.

FIG. **12** is a combined map and traffic information database representative of the road system depicted in FIG. **11**.

FIG. **13** is an exemplary embodiment of a centered display.

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FIG. **14** is an exemplary embodiment of an offset display.

FIG. **15** is an exemplary embodiment of a look ahead display.

FIG. **16** is a schematic diagram of a mobile user station having alternative mechanisms for inputting commands to the user station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22**A and **22**B of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22**A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22**A uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22**A may detect when cars having magnetic tags or markers pass. The detector **22**A may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

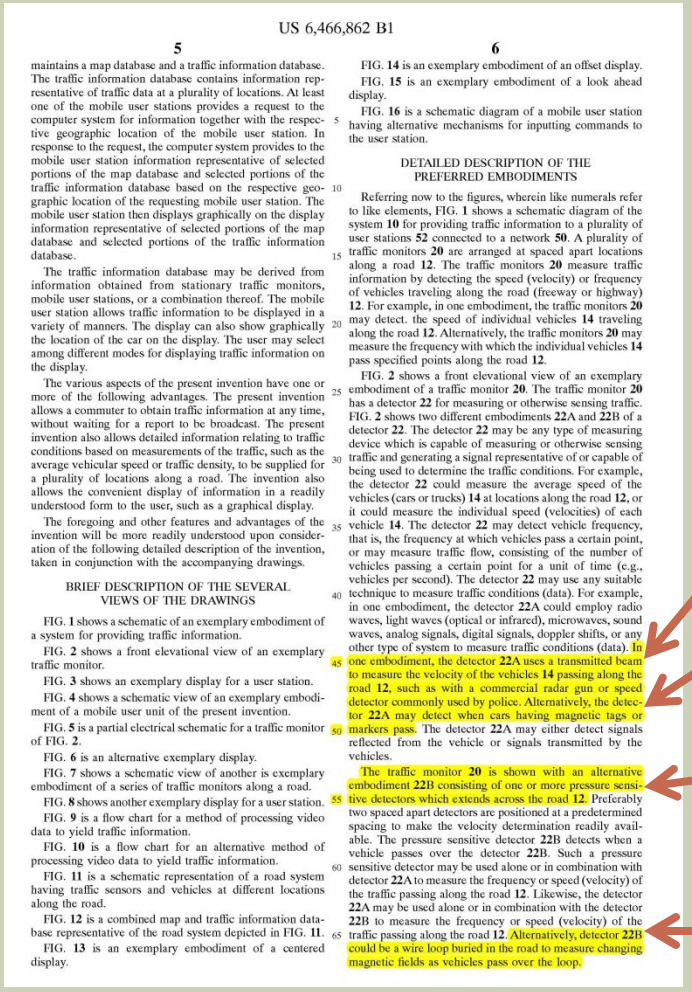
The traffic monitor **20** is shown with an alternative embodiment **22**B consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22**B detects when a vehicle passes over the detector **22**B. Such a pressure sensitive detector may be used alone or in combination with detector **22**A to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22**A may be used alone or in combination with the detector **22**B to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22**B could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

FIG. 2 shows a front elevational view of an exemplary embodiment of a traffic monitor 20. The traffic monitor 20 has a detector 22 for *measuring* or otherwise *sensing* traffic. [6:24-26]

The detector 22 may be *any type of measuring device* which is capable of *measuring* or otherwise *sensing* traffic and generating a signal representative of or capable of being used to determine the traffic conditions. [6:28-31]

The detector 22 may use any suitable technique to *measure* traffic conditions (data). For example, in one embodiment, the detector 22A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). [6:39-44]

TRAFFIC MONITOR



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maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22**A and **22**B of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22**A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22**A uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22**A may detect when cars having magnetic tags or markers pass. The detector **22**A may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

The traffic monitor **20** is shown with an alternative embodiment **22**B consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22**B detects when a vehicle passes over the detector **22**B. Such a pressure sensitive detector may be used alone or in combination with detector **22**A to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22**A may be used alone or in combination with the detector **22**B to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22**B could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

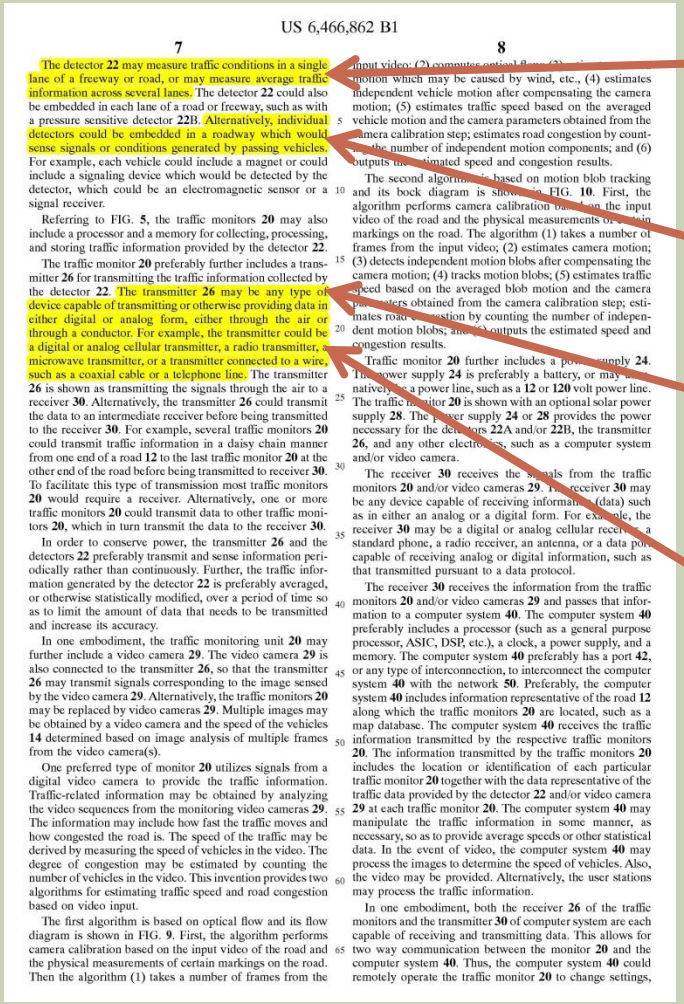
In one embodiment, the detector 22A uses a transmitted beam to ***measure*** the velocity of the vehicles 14 passing along the road 12, such as with a commercial radar gun or speed detector commonly used by police. [6:45-48]

Alternatively, the detector 22A may ***detect*** when cars having magnetic tags or markers pass. [6:48-50]

The traffic monitor 20 is shown with an alternative embodiment 22B consisting of one or more pressure sensitive detectors which extends across the road 12. [6:53-55]

Alternatively, detector 22B could be a wire loop buried in the road to ***measure*** changing magnetic fields as vehicles pass over the loop. [6:65-67]

TRAFFIC MONITOR



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The detector **22** may measure traffic conditions in a single lane of a freeway or road, or may measure average traffic information across several lanes. The detector **22** could also be embedded in each lane of a road or freeway, such as with a pressure sensitive detector **22B**. Alternatively, individual detectors could be embedded in a roadway which would sense signals or conditions generated by passing vehicles. For example, each vehicle could include a magnet or could include a signaling device which would be detected by the detector, which could be an electromagnetic sensor or a signal receiver.

Referring to FIG. **5**, the traffic monitors **20** may also include a processor and a memory for collecting, processing, and storing traffic information provided by the detector **22**.

The traffic monitor **20** preferably further includes a transmitter **26** for transmitting the traffic information collected by the detector **22**. The transmitter **26** may be any type of device capable of transmitting or otherwise providing data in either digital or analog form, either through the air or through a conductor. For example, the transmitter could be a digital or analog cellular transmitter, a radio transmitter, a microwave transmitter, or a transmitter connected to a wire, such as a coaxial cable or a telephone line. The transmitter **26** is shown as transmitting the signals through the air to a receiver **30**. Alternatively, the transmitter **26** could transmit the data to an intermediate receiver before being transmitted to the receiver **30**. For example, several traffic monitors **20** could transmit traffic information in a daisy chain manner from one end of a road **12** to the last traffic monitor **20** at the other end of the road before being transmitted to receiver **30**. To facilitate this type of transmission most traffic monitors **20** would require a receiver. Alternatively, one or more traffic monitors **20** could transmit data to other traffic monitors **20**, which in turn transmit the data to the receiver **30**.

In order to conserve power, the transmitter **26** and the detectors **22** preferably transmit and sense information periodically rather than continuously. Further, the traffic information generated by the detector **22** is preferably averaged, or otherwise statistically modified, over a period of time so as to limit the amount of data that needs to be transmitted and increase its accuracy.

In one embodiment, the traffic monitoring unit **20** may further include a video camera **29**. The video camera **29** is also connected to the transmitter **26**, so that the transmitter **26** may transmit signals corresponding to the image sensed by the video camera **29**. Alternatively, the traffic monitors **20** may be replaced by video cameras **29**. Multiple images may be obtained by a video camera and the speed of the vehicles **14** determined based on image analysis of multiple frames from the video camera(s).

One preferred type of monitor **20** utilizes signals from a digital video camera to provide the traffic information. Traffic-related information may be obtained by analyzing the video sequences from the monitoring video cameras **29**. The information may include how fast the traffic moves and how congested the road is. The speed of the traffic may be derived by measuring the speed of vehicles in the video. The degree of congestion may be estimated by counting the number of vehicles in the video. This invention provides two algorithms for estimating traffic speed and road congestion based on video input.

The first algorithm is based on optical flow and its flow diagram is shown in FIG. **9**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. Then the algorithm (1) takes a number of frames from the

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input video; (2) computes optical flows; (3) ... motion which may be caused by wind, etc., (4) estimates independent vehicle motion after compensating the camera motion; (5) estimates traffic speed based on the averaged vehicle motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion components; and (6) outputs the estimated speed and congestion results.

The second algorithm is based on motion blob tracking and its block diagram is shown in FIG. **10**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. The algorithm (1) takes a number of frames from the input video; (2) estimates camera motion; (3) detects independent motion blobs after compensating the camera motion; (4) tracks motion blobs; (5) estimates traffic speed based on the averaged blob motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion blobs; and (6) outputs the estimated speed and congestion results.

Traffic monitor **20** further includes a power supply **24**. The power supply **24** is preferably a battery, or may alternatively be a power line, such as a **12** or **120** volt power line. The traffic monitor **20** is shown with an optional solar power supply **28**. The power supply **24** or **28** provides the power necessary for the detectors **22A** and/or **22B**, the transmitter **26**, and any other electronics, such as a computer system and/or video camera.

The receiver **30** receives the signals from the traffic monitors **20** and/or video cameras **29**. The receiver **30** may be any device capable of receiving information (data) such as in either an analog or a digital form. For example, the receiver **30** may be a digital or analog cellular receiver, a standard phone, a radio receiver, an antenna, or a data port capable of receiving analog or digital information, such as that transmitted pursuant to a data protocol.

The receiver **30** receives the information from the traffic monitors **20** and/or video cameras **29** and passes that information to a computer system **40**. The computer system **40** preferably includes a processor (such as a general purpose processor, ASIC, DSP, etc.), a clock, a power supply, and a memory. The computer system **40** preferably has a port **42**, or any type of interconnection, to interconnect the computer system **40** with the network **50**. Preferably, the computer system **40** includes information representative of the road **12** along which the traffic monitors **20** are located, such as a map database. The computer system **40** receives the traffic information transmitted by the respective traffic monitors **20**. The information transmitted by the traffic monitors **20** includes the location or identification of each particular traffic monitor **20** together with the data representative of the traffic data provided by the detector **22** and/or video camera **29** at each traffic monitor **20**. The computer system **40** may manipulate the traffic information in some manner, as necessary, so as to provide average speeds or other statistical data. In the event of video, the computer system **40** may process the images to determine the speed of vehicles. Also, the video may be provided. Alternatively, the user stations may process the traffic information.

In one embodiment, both the receiver **26** of the traffic monitors and the transmitter **30** of computer system are each capable of receiving and transmitting data. This allows for two way communication between the monitor **20** and the computer system **40**. Thus, the computer system **40** could remotely operate the traffic monitor **20** to change settings,

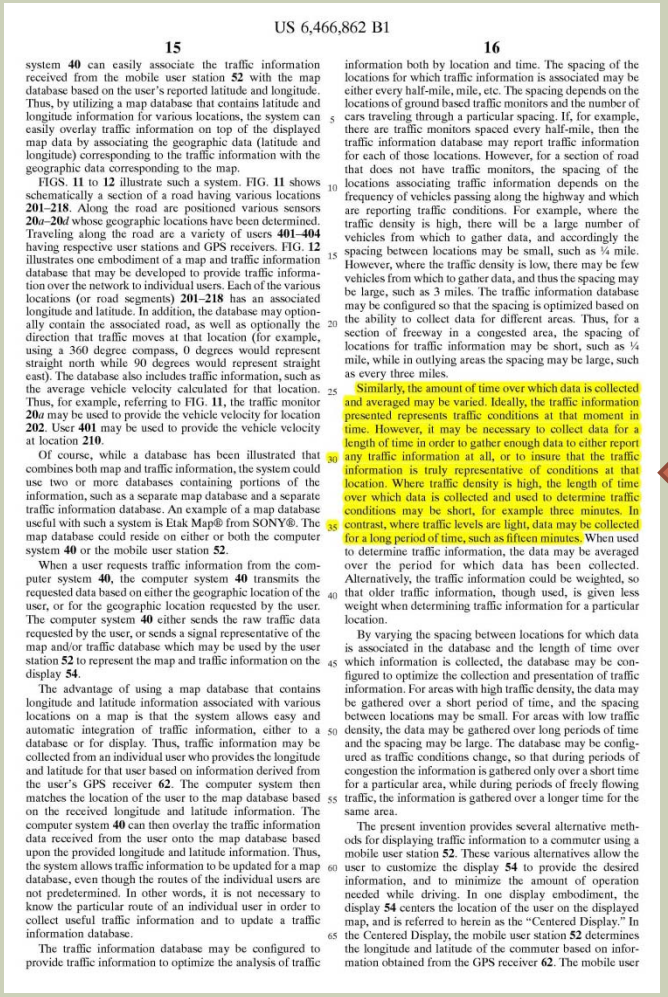
The detector 22 may *measure* traffic conditions in a single lane of a freeway or road, or may *measure* average traffic information across several lanes. [7:1-3]

Alternatively, individual detectors could be embedded in a roadway which would *sense* signals or conditions generated by passing vehicles. [7:5-7]

The transmitter 26 may be *any type of device* capable of transmitting or otherwise providing data in either digital or analog form, either through the air or through a conductor. [7:17-20]

For example, the transmitter could be a digital or analog cellular transmitter, a radio transmitter, a microwave transmitter, or a transmitter connected to a wire, such as a coaxial cable or a telephone line. [7:20-23]

TRAFFIC MONITOR



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15 16

system **40** can easily associate the traffic information received from the mobile user station **52** with the map database based on the user's reported latitude and longitude. Thus, by utilizing a map database that contains latitude and longitude information for various locations, the system can easily overlay traffic information on top of the displayed map data by associating the geographic data (latitude and longitude) corresponding to the traffic information with the geographic data corresponding to the map.

FIGS. **11** to **12** illustrate such a system. FIG. **11** shows schematically a section of a road having various locations **201–218**. Along the road are positioned various sensors **20***a–20f* whose geographic locations have been determined. Traveling along the road are a variety of users **401–404** having respective user stations and GPS receivers. FIG. **12** illustrates one embodiment of a map and traffic information database that may be developed to provide traffic information over the network to individual users. Each of the various locations (or road segments) **201–218** has an associated longitude and latitude. In addition, the database may optionally contain the associated road, as well as optionally the direction that traffic moves at that location (for example, using a 360 degree compass, 0 degrees would represent straight north while 90 degrees would represent straight east). The database also includes traffic information, such as the average vehicle velocity calculated for that location. Thus, for example, referring to FIG. **11**, the traffic monitor **20***a* may be used to provide the vehicle velocity for location **202**. User **401** may be used to provide the vehicle velocity at location **210**.

Of course, while a database has been illustrated that combines both map and traffic information, the system could use two or more databases containing portions of the information, such as a separate map database and a separate traffic information database. An example of a map database useful with such a system is Etak Map® from SONY®. The map database could reside on either or both the computer system **40** or the mobile user station **52**.

When a user requests traffic information from the computer system **40**, the computer system **40** transmits the requested data based on either the geographic location of the user, or for the geographic location requested by the user. The computer system **40** either sends the raw traffic data requested by the user, or sends a signal representative of the map and/or traffic database which may be used by the user station **52** to represent the map and traffic information on the display **54**.

The advantage of using a map database that contains longitude and latitude information associated with various locations on a map is that the system allows easy and automatic integration of traffic information, either to a database or for display. Thus, traffic information may be collected from an individual user who provides the longitude and latitude for that user based on information derived from the user's GPS receiver **62**. The computer system then matches the location of the user to the map database based on the received longitude and latitude information. The computer system **40** can then overlay the traffic information data received from the user onto the map database based upon the provided longitude and latitude information. Thus, the system allows traffic information to be updated for a map database, even though the routes of the individual users are not predetermined. In other words, it is not necessary to know the particular route of an individual user in order to collect useful traffic information and to update a traffic information database.

The traffic information database may be configured to provide traffic information to optimize the analysis of traffic information both by location and time. The spacing of the locations for which traffic information is associated may be either every half-mile, mile, etc. The spacing depends on the locations of ground based traffic monitors and the number of cars traveling through a particular spacing. If, for example, there are traffic monitors spaced every half-mile, then the traffic information database may report traffic information for each of those locations. However, for a section of road that does not have traffic monitors, the spacing of the locations associating traffic information depends on the frequency of vehicles passing along the highway and which are reporting traffic conditions. For example, where the traffic density is high, there will be a large number of vehicles from which to gather data, and accordingly the spacing between locations may be small, such as ¼ mile. However, where the traffic density is low, there may be few vehicles from which to gather data, and thus the spacing may be large, such as 3 miles. The traffic information database may be configured so that the spacing is optimized based on the ability to collect data for different areas. Thus, for a section of freeway in a congested area, the spacing of locations for traffic information may be short, such as ¼ mile, while in outlying areas the spacing may be large, such as every three miles.

Similarly, the amount of time over which data is collected and averaged may be varied. Ideally, the traffic information presented represents traffic conditions at that moment in time. However, it may be necessary to collect data for a length of time in order to gather enough data to either report any traffic information at all, or to insure that the traffic information is truly representative of conditions at that location. Where traffic density is high, the length of time over which data is collected and used to determine traffic conditions may be short, for example three minutes. In contrast, where traffic levels are light, data may be collected for a long period of time, such as fifteen minutes. When used to determine traffic information, the data may be averaged over the period for which data has been collected. Alternatively, the traffic information could be weighted, so that older traffic information, though used, is given less weight when determining traffic information for a particular location.

By varying the spacing between locations for which data is associated in the database and the length of time over which information is collected, the database may be configured to optimize the collection and presentation of traffic information. For areas with high traffic density, the data may be gathered over a short period of time, and the spacing between locations may be small. For areas with low traffic density, the data may be gathered over long periods of time and the spacing may be large. The database may be configured as traffic conditions change, so that during periods of congestion the information is gathered only over a short time for a particular area, while during periods of freely flowing traffic, the information is gathered over a longer time for the same area.

The present invention provides several alternative methods for displaying traffic information to a commuter using a mobile user station **52**. These various alternatives allow the user to customize the display **54** to provide the desired information, and to minimize the amount of operation needed while driving. In one display embodiment, the display **54** centers the location of the user on the displayed map, and is referred to herein as the "Centered Display." In the Centered Display, the mobile user station **52** determines the longitude and latitude of the commuter based on information obtained from the GPS receiver **62**. The mobile user

Similarly, the amount of time over which data is collected and averaged may be varied. Ideally, the traffic information presented represents traffic conditions at that moment in time. However, it may be necessary to collect data for a length of time in order to gather enough data to either report any traffic information at all, or to insure that the traffic information is truly representative of conditions at that

location. Where traffic density is high, the length of time over which data is collected and used to determine traffic conditions may be short, for example three minutes. In contrast, where traffic levels are right, data may be collected for a long period of time, such as fifteen minutes. [16:25-36]

TRAFFIC MONITOR

Traffic's Claim Construction

"Traffic monitor" means any device used to sense, measure, detect, and/or determine vehicular movement and transmit and/or provide a signal representative of vehicular movement.

TRAFFIC MONITOR

Traffic's Construction

Any device used to sense, measure, detect, and/or determine vehicular movement and transmit and/or provide a signal representative of vehicular movement.

Google's Construction

A stationary device capable of determining the current speed, frequency, or flow of multiple vehicles traveling along a road.

TRAFFIC MONITOR

Google's Construction

- A stationary device capable of determining the current speed, frequency, or flow of multiple vehicles traveling along a road.

Stationary

- Claims do not say TM is "stationary"
- Improperly imports limitation into claims.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

TRAFFIC MONITOR

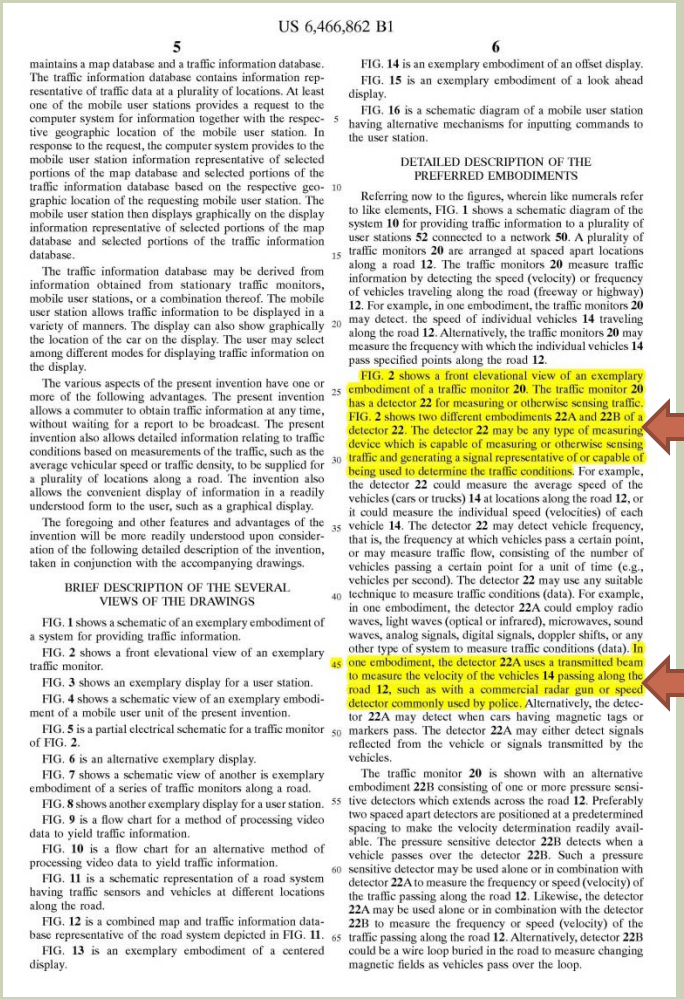
Google's Construction

- A stationary device capable of determining the current speed, frequency, or flow of multiple vehicles traveling along a road.

Stationary

- Improperly excludes disclosed embodiments.
- Specification does not require this limitation.
- Instead, specification says TM can be "any type of measuring device".

TRAFFIC MONITOR



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maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

The traffic information database may be derived from information obtained from stationary traffic monitors, mobile user stations, or a combination thereof. The mobile user station allows traffic information to be displayed in a variety of manners. The display can also show graphically the location of the car on the display. The user may select among different modes for displaying traffic information on the display.

The various aspects of the present invention have one or more of the following advantages. The present invention allows a commuter to obtain traffic information at any time, without waiting for a report to be broadcast. The present invention also allows detailed information relating to traffic conditions based on measurements of the traffic, such as the average vehicular speed or traffic density, to be supplied for a plurality of locations along a road. The invention also allows the convenient display of information in a readily understood form to the user, such as a graphical display.

The foregoing and other features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows a schematic of an exemplary embodiment of a system for providing traffic information.

FIG. **2** shows a front elevational view of an exemplary traffic monitor.

FIG. **3** shows an exemplary display for a user station.

FIG. **4** shows a schematic view of an exemplary embodiment of a mobile user unit of the present invention.

FIG. **5** is a partial electrical schematic for a traffic monitor of FIG. **2**.

FIG. **6** is an alternative exemplary display.

FIG. **7** shows a schematic view of another is exemplary embodiment of a series of traffic monitors along a road.

FIG. **8** shows another exemplary display for a user station.

FIG. **9** is a flow chart for a method of processing video data to yield traffic information.

FIG. **10** is a flow chart for an alternative method of processing video data to yield traffic information.

FIG. **11** is a schematic representation of a road system having traffic sensors and vehicles at different locations along the road.

FIG. **12** is a combined map and traffic information database representative of the road system depicted in FIG. **11**.

FIG. **13** is an exemplary embodiment of a centered display.

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FIG. **14** is an exemplary embodiment of an offset display.

FIG. **15** is an exemplary embodiment of a look ahead display.

FIG. **16** is a schematic diagram of a mobile user station having alternative mechanisms for inputting commands to the user station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22**A and **22**B of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22**A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22**A uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22**A may detect when cars having magnetic tags or markers pass. The detector **22**A may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

The traffic monitor **20** is shown with an alternative embodiment **22**B consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22**B detects when a vehicle passes over the detector **22**B. Such a pressure sensitive detector may be used alone or in combination with detector **22**A to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22**A may be used alone or in combination with the detector **22**B to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22**B could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

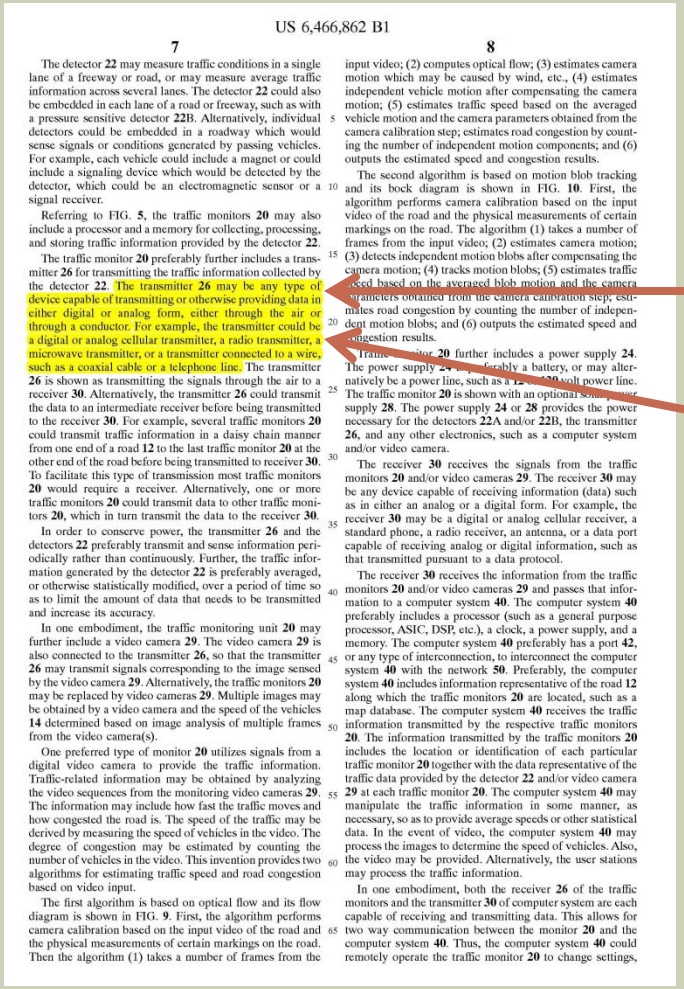
"Stationary" Should Be Rejected

FIG. 2 shows a front elevational view of an exemplary embodiment of a traffic monitor 20. The traffic monitor 20 has a detector 22 for measuring or otherwise sensing traffic. FIG. 2 shows two different embodiments 22A and 22B of a detector 22. The detector 22 may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. [6:24-31]

In one embodiment, the detector 22A uses a transmitted beam to measure the velocity of the vehicles 14 passing along the road 12, such as with a commercial radar gun or speed detector commonly used by police. [6:44-48]

- Police radar guns are not "stationary" devices.
- Google's construction improperly excludes this embodiment.

TRAFFIC MONITOR



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The detector **22** may measure traffic conditions in a single lane of a freeway or road, or may measure average traffic information across several lanes. The detector **22** could also be embedded in each lane of a road or freeway, such as with a pressure sensitive detector **22**B. Alternatively, individual detectors could be embedded in a roadway which would sense signals or conditions generated by passing vehicles. For example, each vehicle could include a magnet or could include a signaling device which would be detected by the detector, which could be an electromagnetic sensor or a signal receiver.

Referring to FIG. **5**, the traffic monitors **20** may also include a processor and a memory for collecting, processing, and storing traffic information provided by the detector **22**.

The traffic monitor **20** preferably further includes a transmitter **26** for transmitting the traffic information collected by the detector **22**. The transmitter **26** may be any type of device capable of transmitting or otherwise providing data in either digital or analog form, either through the air or through a conductor. For example, the transmitter could be a digital or analog cellular transmitter, a radio transmitter, a microwave transmitter, or a transmitter connected to a wire, such as a coaxial cable or a telephone line. The transmitter **26** is shown as transmitting the signals through the air to a receiver **30**. Alternatively, the transmitter **26** could transmit the data to an intermediate receiver before being transmitted to the receiver **30**. For example, several traffic monitors **20** could transmit traffic information in a daisy chain manner from one end of a road **12** to the last traffic monitor **20** at the other end of the road before being transmitted to receiver **30**. To facilitate this type of transmission most traffic monitors **20** would require a receiver. Alternatively, one or more traffic monitors **20** could transmit data to other traffic monitors **20**, which in turn transmit the data to the receiver **30**.

In order to conserve power, the transmitter **26** and the detectors **22** preferably transmit and sense information periodically rather than continuously. Further, the traffic information generated by the detector **22** is preferably averaged, or otherwise statistically modified, over a period of time so as to limit the amount of data that needs to be transmitted and increase its accuracy.

In one embodiment, the traffic monitoring unit **20** may further include a video camera **29**. The video camera **29** is also connected to the transmitter **26**, so that the transmitter **26** may transmit signals corresponding to the image sensed by the video camera **29**. Alternatively, the traffic monitors **20** may be replaced by video cameras **29**. Multiple images may be obtained by a video camera and the speed of the vehicles **14** determined based on image analysis of multiple frames from the video camera(s).

One preferred type of monitor **20** utilizes signals from a digital video camera to provide the traffic information. Traffic-related information may be obtained by analyzing the video sequences from the monitoring video cameras **29**. The information may include how fast the traffic moves and how congested the road is. The speed of the traffic may be derived by measuring the speed of vehicles in the video. The degree of congestion may be estimated by counting the number of vehicles in the video. This invention provides two algorithms for estimating traffic speed and road congestion based on video input.

The first algorithm is based on optical flow and its flow diagram is shown in FIG. **9**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. Then the algorithm (1) takes a number of frames from the input video; (2) computes optical flow; (3) estimates camera motion which may be caused by wind, etc., (4) estimates independent vehicle motion after compensating the camera motion; (5) estimates traffic speed based on the averaged vehicle motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion components; and (6) outputs the estimated speed and congestion results.

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The second algorithm is based on motion blob tracking and its bock diagram is shown in FIG. **10**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. The algorithm (1) takes a number of frames from the input video; (2) estimates camera motion; (3) detects independent motion blobs after compensating the camera motion; (4) tracks motion blobs; (5) estimates traffic speed based on the averaged blob motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion blobs; and (6) outputs the estimated speed and congestion results.

Traffic monitor **20** further includes a power supply **24**. The power supply **24** is preferably a battery, or may alternatively be a power line, such as a 12-220 volt power line. The traffic monitor **20** is shown with an optional solar power supply **28**. The power supply **24** or **28** provides the power necessary for the detectors **22**A and/or **22**B, the transmitter **26**, and any other electronics, such as a computer system and/or video camera.

The receiver **30** receives the signals from the traffic monitors **20** and/or video cameras **29**. The receiver **30** may be any device capable of receiving information (data) such as in either an analog or a digital form. For example, the receiver **30** may be a digital or analog cellular receiver, a standard phone, a radio receiver, an antenna, or a data port capable of receiving analog or digital information, such as that transmitted pursuant to a data protocol.

The receiver **30** receives the information from the traffic monitors **20** and/or video cameras **29** and passes that information to a computer system **40**. The computer system **40** preferably includes a processor (such as a general purpose processor, ASIC, DSP, etc.), a clock, a power supply, and a memory. The computer system **40** preferably has a port **42**, or any type of interconnection, to interconnect the computer system **40** with the network **50**. Preferably, the computer system **40** includes information representative of the road **12** along which the traffic monitors **20** are located, such as a map database. The computer system **40** receives the traffic information transmitted by the respective traffic monitors **20**. The information transmitted by the traffic monitors **20** includes the location or identification of each particular traffic monitor **20** together with the data representative of the traffic data provided by the detector **22** and/or video camera **29** at each traffic monitor **20**. The computer system **40** may manipulate the traffic information in some manner, as necessary, so as to provide average speeds or other statistical data. In the event of video, the computer system **40** may process the images to determine the speed of vehicles. Also, the video may be provided. Alternatively, the user stations may process the traffic information.

In one embodiment, both the receiver **26** of the traffic monitors and the transmitter **30** of computer system are each capable of receiving and transmitting data. This allows for two way communication between the monitor **20** and the computer system **40**. Thus, the computer system **40** could remotely operate the traffic monitor **20** to change settings,

"Stationary" Should Be Rejected

The transmitter 26 may be any type of device capable of transmitting or otherwise providing data in either digital or analog form, either through the air or through a conductor. [7:17-20]

For example, the transmitter could be a digital or analog cellular transmitter, a radio transmitter, a microwave transmitter, or a transmitter connected to a wire, such as a coaxial cable or a telephone line. [7:20-23]

*** Cellular transmitters are not stationary devices.**

TRAFFIC MONITOR

Google's Construction

- A stationary device capable of determining the current speed, frequency, or flow of multiple vehicles traveling along a road.

"Current" Should Be Rejected

Specification explains that "traffic monitors" can detect traffic conditions over time (e.g., average velocities) and transmit periodically.

Improper to limit claim scope to detection of "current" conditions

TRAFFIC MONITOR

maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

The traffic information database may be derived from information obtained from stationary traffic monitors, mobile user stations, or a combination thereof. The mobile user station allows traffic information to be displayed in a variety of manners. The display can also show graphically the location of the car on the display. The user may select among different modes for displaying traffic information on the display.

The various aspects of the present invention have one or more of the following advantages. The present invention allows a commuter to obtain traffic information at any time, without waiting for a report to be broadcast. The present invention also allows detailed information relating to traffic conditions based on measurements of the traffic, such as the average vehicular speed or traffic density, to be supplied for a plurality of locations along a road. The invention also allows the convenient display of information in a readily understood form to the user, such as a graphical display.

The foregoing and other features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows a schematic of an exemplary embodiment of a system for providing traffic information.

FIG. **2** shows a front elevational view of an exemplary traffic monitor.

FIG. **3** shows an exemplary display for a user station.

FIG. **4** shows a schematic view of an exemplary embodiment of a mobile user unit of the present invention.

FIG. **5** is a partial electrical schematic for a traffic monitor of FIG. **2**.

FIG. **6** is an alternative exemplary display.

FIG. **7** shows a schematic view of another is exemplary embodiment of a series of traffic monitors along a road.

FIG. **8** shows another exemplary display for a user station.

FIG. **9** is a flow chart for a method of processing video data to yield traffic information.

FIG. **10** is a flow chart for an alternative method of processing video data to yield traffic information.

FIG. **11** is a schematic representation of a road system having traffic sensors and vehicles at different locations along the road.

FIG. **12** is a combined map and traffic information database representative of the road system depicted in FIG. **11**.

FIG. **13** is an exemplary embodiment of a centered display.

FIG. **14** is an exemplary embodiment of an offset display.

FIG. **15** is an exemplary embodiment of a look ahead display.

FIG. **16** is a schematic diagram of a mobile user station having alternative mechanisms for inputting commands to the user station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

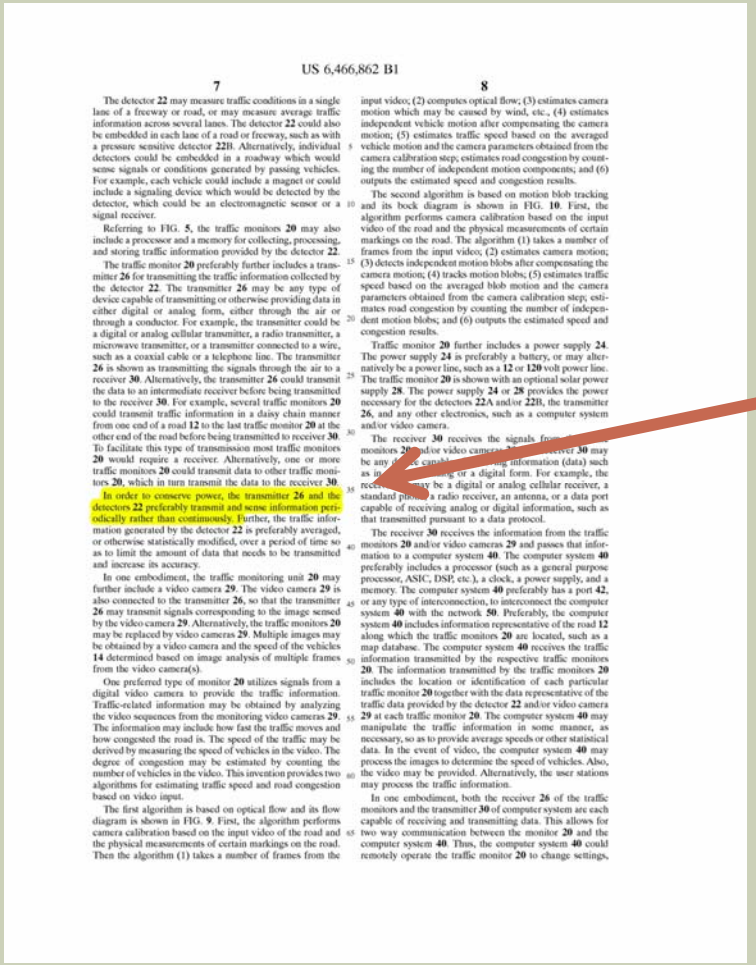
FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22**A and **22**B of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22**A could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22**A uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22**A may detect when cars having magnetic tags or markers pass. The detector **22**A may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

The traffic monitor **20** is shown with an alternative embodiment **22**B consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22**B detects when a vehicle passes over the detector **22**B. Such a pressure sensitive detector may be used alone or in combination with detector **22**A to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22**A may be used alone or in combination with the detector **22**B to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22**B could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

"Current" Should Be Rejected

For example, the detector 22 could measure the average speed of the vehicles (cars or trucks) 14 at locations along the road 12, or it could measure the individual speed (velocities) of each vehicle 14. [6:31-35]

TRAFFIC MONITOR



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The detector **22** may measure traffic conditions in a single lane of a freeway or road, or may measure average traffic information across several lanes. The detector **22** could also be embedded in each lane of a road or freeway, such as with a pressure sensitive detector **22**H. Alternatively, individual detectors could be embedded in a roadway which would sense signals or conditions generated by passing vehicles. For example, each vehicle could include a magnet or could include a signaling device which would be detected by the detector, which could be an electromagnetic sensor or a signal receiver.

Referring to FIG. **5**, the traffic monitors **20** may also include a processor and a memory for collecting, processing, and storing traffic information provided by the detector **22**.

The traffic monitor **20** preferably further includes a transmitter **26** for transmitting the traffic information collected by the detector **22**. The transmitter **26** may be any type of device capable of transmitting or otherwise providing data in either digital or analog form, either through the air or through a conductor. For example, the transmitter could be a digital or analog cellular transmitter, a radio transmitter, a microwave transmitter, or a transmitter connected to a wire, such as a coaxial cable or a telephone line. The transmitter **26** is shown as transmitting the signals through the air to a receiver **30**. Alternatively, the transmitter **26** could transmit the data to an intermediate receiver before being transmitted to the receiver **30**. For example, several traffic monitors **20** could transmit traffic information in a daisy chain manner from one end of a road **12** to the last traffic monitor **20** at the other end of the road before being transmitted to receiver **30**. To facilitate this type of transmission most traffic monitors **20** would require a receiver. Alternatively, one or more traffic monitors **20** could transmit data to other traffic monitors **20**, which in turn transmit the data to the receiver **30**.

In order to conserve power, the transmitter **26** and the detectors **22** preferably transmit and sense information periodically rather than continuously. Further, the traffic information generated by the detector **22** is preferably averaged, or otherwise statistically modified, over a period of time so as to limit the amount of data that needs to be transmitted and increase its accuracy.

In one embodiment, the traffic monitoring unit **20** may further include a video camera **29**. The video camera **29** is also connected to the transmitter **26**, so that the transmitter **26** may transmit signals corresponding to the image sensed by the video camera **29**. Alternatively, the traffic monitors **20** may be replaced by video cameras **29**. Multiple images may be obtained by a video camera and the speed of the vehicles **14** determined based on image analysis of multiple frames from the video camera(s).

One preferred type of monitor **20** utilizes signals from a digital video camera to provide the traffic information. Traffic-related information may be obtained by analyzing the video sequences from the monitoring video cameras **29**. The information may include how fast the traffic moves and how congested the road is. The speed of the traffic may be derived by measuring the speed of vehicles in the video. The degree of congestion may be estimated by counting the number of vehicles in the video. This invention provides two algorithms for estimating traffic speed and road congestion based on video input.

The first algorithm is based on optical flow and its flow diagram is shown in FIG. **9**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. Then the algorithm (1) takes a number of frames from the input video; (2) computes optical flow; (3) estimates camera motion which may be caused by wind, etc., (4) estimates independent vehicle motion after compensating the camera motion; (5) estimates traffic speed based on the averaged vehicle motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion components; and (6) outputs the estimated speed and congestion results.

The second algorithm is based on motion blob tracking and its bock diagram is shown in FIG. **10**. First, the algorithm performs camera calibration based on the input video of the road and the physical measurements of certain markings on the road. The algorithm (1) takes a number of frames from the input video; (2) estimates camera motion; (3) detects independent motion blobs after compensating the camera motion; (4) tracks motion blobs; (5) estimates traffic speed based on the averaged blob motion and the camera parameters obtained from the camera calibration step; estimates road congestion by counting the number of independent motion blobs; and (6) outputs the estimated speed and congestion results.

Traffic monitor **20** further includes a power supply **24**. The power supply **24** is preferably a battery, or may alternatively be a power line, such as a **12** or **120** volt power line. The traffic monitor **20** is shown with an optional solar power supply **28**. The power supply **24** or **28** provides the power necessary for the detectors **22**A and/or **22**B, the transmitter **26**, and any other electronics, such as a computer system and/or video camera.

The receiver **30** receives the signals from [illegible] monitors **20** and/or video cameras [illegible] receiver **30** may be any [illegible] capable of receiving information (data) such as in a digital or a digital form. For example, the receiver may be a digital or analog cellular receiver, a standard pho[illegible] a radio receiver, an antenna, or a data port capable of receiving analog or digital information, such as that transmitted pursuant to a data protocol.

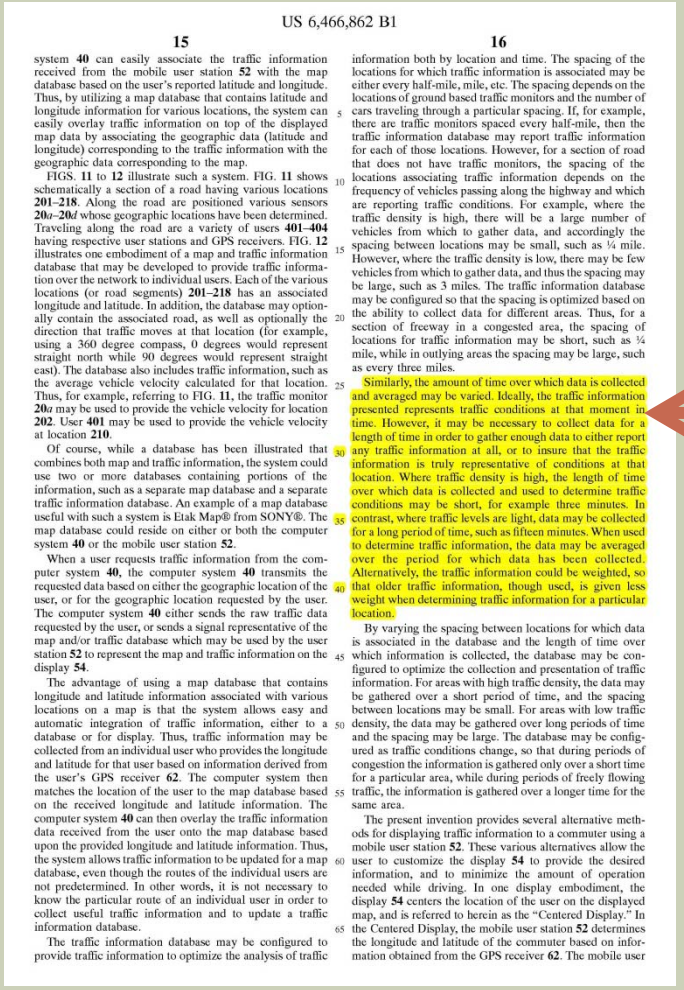
The receiver **30** receives the information from the traffic monitors **20** and/or video cameras **29** and passes that information to a computer system **40**. The computer system **40** preferably includes a processor (such as a general purpose processor, ASIC, DSP, etc.), a clock, a power supply, and a memory. The computer system **40** preferably has a port **42**, or any type of interconnection, to interconnect the computer system **40** with the network **50**. Preferably, the computer system **40** includes information representative of the road **12** along which the traffic monitors **20** are located, such as a map database. The computer system **40** receives the traffic information transmitted by the respective traffic monitors **20**. The information transmitted by the traffic monitors **20** includes the location or identification of each particular traffic monitor **20** together with the data representative of the traffic data provided by the detector **22** and/or video camera **29** at each traffic monitor **20**. The computer system **40** may manipulate the traffic information in some manner, as necessary, so as to provide average speeds or other statistical data. In the event of video, the computer system **40** may process the images to determine the speed of vehicles. Also, the video may be provided. Alternatively, the user stations may process the traffic information.

In one embodiment, both the receiver **26** of the traffic monitors and the transmitter **30** of computer system are each capable of receiving and transmitting data. This allows for two way communication between the monitor **20** and the computer system **40**. Thus, the computer system **40** could remotely operate the traffic monitor **20** to change settings,

"Current" Should Be Rejected

In order to conserve power, the transmitter 26 and the detectors 22 preferably transmit and sense information periodically rather than continuously. [7:35-37].

TRAFFIC MONITOR



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system **40** can easily associate the traffic information received from the mobile user station **52** with the map database based on the user's reported latitude and longitude. Thus, by utilizing a map database that contains latitude and longitude information for various locations, the system can easily overlay traffic information on top of the displayed map data by associating the geographic data (latitude and longitude) corresponding to the traffic information with the geographic data corresponding to the map.

FIGS. **11** to **12** illustrate such a system. FIG. **11** shows schematically a section of a road having various locations **201–218**. Along the road are positioned various sensors **20***a*–**20***d* whose geographic locations have been determined. Traveling along the road are a variety of users **401–404** having respective user stations and GPS receivers. FIG. **12** illustrates one embodiment of a map and traffic information database that may be developed to provide traffic information over the network to individual users. Each of the various locations (or road segments) **201–218** has an associated longitude and latitude. In addition, the database may optionally contain the associated road, as well as optionally the direction that traffic moves at that location (for example, using a 360 degree compass, 0 degrees would represent straight north while 90 degrees would represent straight east). The database also includes traffic information, such as the average vehicle velocity calculated for that location. Thus, for example, referring to FIG. **11**, the traffic monitor **20***a* may be used to provide the vehicle velocity for location **202**. User **401** may be used to provide the vehicle velocity at location **210**.

Of course, while a database has been illustrated that combines both map and traffic information, the system could use two or more databases containing portions of the information, such as a separate map database and a separate traffic information database. An example of a map database useful with such a system is Etak Map® from SONY®. The map database could reside on either or both the computer system **40** or the mobile user station **52**.

When a user requests traffic information from the computer system **40**, the computer system **40** transmits the requested data based on either the geographic location of the user, or for the geographic location requested by the user. The computer system **40** either sends the raw traffic data requested by the user, or sends a signal representative of the map and/or traffic database which may be used by the user station **52** to represent the map and traffic information on the display **54**.

The advantage of using a map database that contains longitude and latitude information associated with various locations on a map is that the system allows easy and automatic integration of traffic information, either to a database or for display. Thus, traffic information may be collected from an individual user who provides the longitude and latitude for that user based on information derived from the user's GPS receiver **62**. The computer system then matches the location of the user to the map database based on the received longitude and latitude information. The computer system **40** can then overlay the traffic information data received from the user onto the map database based upon the provided longitude and latitude information. Thus, the system allows traffic information to be updated for a map database, even though the routes of the individual users are not predetermined. In other words, it is not necessary to know the particular route of an individual user in order to collect useful traffic information and to update a traffic information database.

The traffic information database may be configured to provide traffic information to optimize the analysis of traffic

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information both by location and time. The spacing of the locations for which traffic information is associated may be either every half-mile, mile, etc. The spacing depends on the locations of ground based traffic monitors and the number of cars traveling through a particular spacing. If, for example, there are traffic monitors spaced every half-mile, then the traffic information database may report traffic information for each of those locations. However, for a section of road that does not have traffic monitors, the spacing of the locations associating traffic information depends on the frequency of vehicles passing along the highway and which are reporting traffic conditions. For example, where the traffic density is high, there will be a large number of vehicles from which to gather data, and accordingly the spacing between locations may be small, such as ¼ mile. However, where the traffic density is low, there may be few vehicles from which to gather data, and thus the spacing may be large, such as 3 miles. The traffic information database may be configured so that the spacing is optimized based on the ability to collect data for different areas. Thus, for a section of freeway in a congested area, the spacing of locations for traffic information may be short, such as ¼ mile, while in outlying areas the spacing may be large, such as every three miles.

Similarly, the amount of time over which data is collected and averaged may be varied. Ideally, the traffic information presented represents traffic conditions at that moment in time. However, it may be necessary to collect data for a length of time in order to gather enough data to either report any traffic information at all, or to insure that the traffic information is truly representative of conditions at that location. Where traffic density is high, the length of time over which data is collected and used to determine traffic conditions may be short, for example three minutes. In contrast, where traffic levels are light, data may be collected for a long period of time, such as fifteen minutes. When used to determine traffic information, the data may be averaged over the period for which data has been collected. Alternatively, the traffic information could be weighted, so that older traffic information, though used, is given less weight when determining traffic information for a particular location.

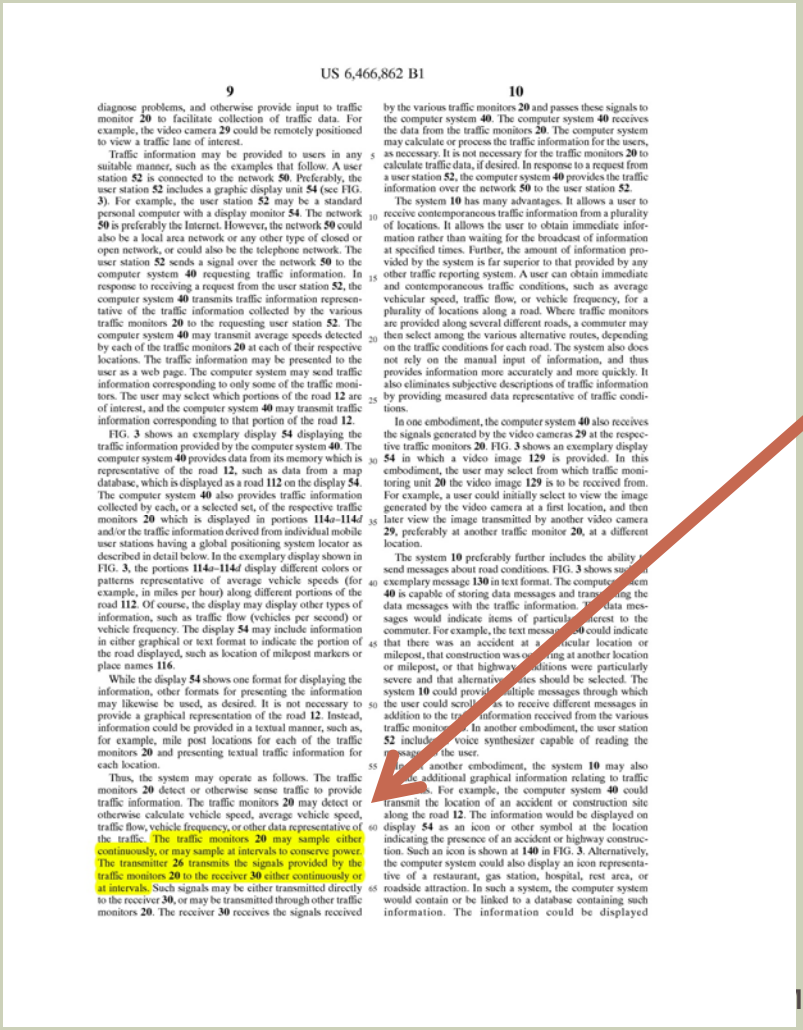
By varying the spacing between locations for which data is associated in the database and the length of time over which information is collected, the database may be configured to optimize the collection and presentation of traffic information. For areas with high traffic density, the data may be gathered over a short period of time, and the spacing between locations may be small. For areas with low traffic density, the data may be gathered over long periods of time and the spacing may be large. The database may be configured as traffic conditions change, so that during periods of congestion the information is gathered only over a short time for a particular area, while during periods of freely flowing traffic, the information is gathered over a longer time for the same area.

The present invention provides several alternative methods for displaying traffic information to a commuter using a mobile user station **52**. These various alternatives allow the user to customize the display **54** to provide the desired information, and to minimize the amount of operation needed while driving. In one display embodiment, the display **54** centers the location of the user on the displayed map, and is referred to herein as the "Centered Display." In the Centered Display, the mobile user station **52** determines the longitude and latitude of the commuter based on information obtained from the GPS receiver **62**. The mobile user

"Current" Should Be Rejected

Similarly, the amount of time over which data is collected and averaged may be varied. Ideally, the traffic information presented represents traffic conditions at that moment in time. However, it may be necessary to collect data for a length of time in order to gather enough data to either report any traffic information at all, or to insure that the traffic information is truly representative of conditions at that location. Where traffic density is high, the length of time over which data is collected and used to determine traffic conditions may be short, for example three minutes. In contrast, where traffic levels are light, data may be collected for a long period of time, such as fifteen minutes. [16:25-36]

TRAFFIC MONITOR



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diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***d* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll, as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

"Current" Should Be Rejected

The traffic monitors 20 may sample either continuously, or may sample at intervals to conserve power. The transmitter 26 transmits the signals provided by the traffic monitors 20 to the receiver 30 either continuously or at intervals. [9:61-65]

TRAFFIC MONITOR

Google's Construction

- A stationary device capable of determining the current speed, frequency, or flow of multiple vehicles traveling along a road.

"Multiple" Should Be Rejected

* Specification makes clear that "traffic monitors" may detect speed of individual vehicle:

"For example, the detector 22 could measure the average speed of the vehicles (cars or trucks) 14 at locations along the road 12, or it could measure the individual speed (velocity) of each vehicle 14." [6:31-35]

* Google's construction improperly excludes this embodiment

TRAFFIC MONITOR

Traffic's Claim Construction

"Traffic monitor" means any device used to sense, measure, detect, and/or determine vehicular movement and transmit and/or provide a signal representative of vehicular movement.

MOBILE USER STATION

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The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

Asserted Claims

MOBILE USER STATION

Traffic's Claim Construction

"Mobile User Station" means an easily moving or movable device that can transmit data to and/or receive data from the network; it may be a cellular phone or other handheld unit, or may be installed within a car.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

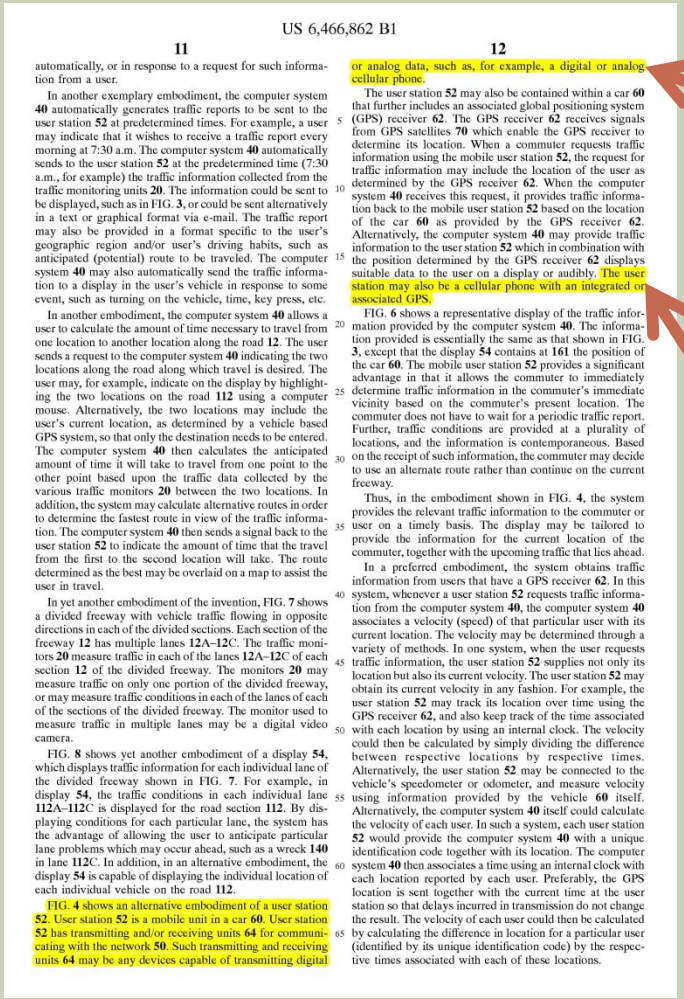
CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

MOBILE USER STATION



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automatically, or in response to a request for such information from a user.

In another exemplary embodiment, the computer system **40** automatically generates traffic reports to be sent to the user station **52** at predetermined times. For example, a user may indicate that it wishes to receive a traffic report every morning at 7:30 a.m. The computer system **40** automatically sends to the user station **52** at the predetermined time (7:30 a.m., for example) the traffic information collected from the traffic monitoring units **20**. The information could be sent to be displayed, such as in FIG. **3**, or could be sent alternatively in a text or graphical format via e-mail. The traffic report may also be provided in a format specific to the user's geographic region and/or user's driving habits, such as anticipated (potential) route to be traveled. The computer system **40** may also automatically send the traffic information to a display in the user's vehicle in response to some event, such as turning on the vehicle, time, key press, etc.

In another embodiment, the computer system **40** allows a user to calculate the amount of time necessary to travel from one location to another location along the road **12**. The user sends a request to the computer system **40** indicating the two locations along the road along which travel is desired. The user may, for example, indicate on the display by highlighting the two locations on the road **112** using a computer mouse. Alternatively, the two locations may include the user's current location, as determined by a vehicle based GPS system, so that only the destination needs to be entered. The computer system **40** then calculates the anticipated amount of time it will take to travel from one point to the other point based upon the traffic data collected by the various traffic monitors **20** between the two locations. In addition, the system may calculate alternative routes in order to determine the fastest route in view of the traffic information. The computer system **40** then sends a signal back to the user station **52** to indicate the amount of time that the travel from the first to the second location will take. The route determined as the best may be overlaid on a map to assist the user in travel.

In yet another embodiment of the invention, FIG. **7** shows a divided freeway with vehicle traffic flowing in opposite directions in each of the divided sections. Each section of the freeway **12** has multiple lanes **12**A–**12**C. The traffic monitors **20** measure traffic in each of the lanes **12**A–**12**C of each section **12** of the divided freeway. The monitors **20** may measure traffic on only one portion of the divided freeway, or may measure traffic conditions in each of the lanes of each of the sections of the divided freeway. The monitor used to measure traffic in multiple lanes may be a digital video camera.

FIG. **8** shows yet another embodiment of a display **54**, which displays traffic information for each individual lane of the divided freeway shown in FIG. **7**. For example, in display **54**, the traffic conditions in each individual lane **112**A–**112**C is displayed for the road section **112**. By displaying conditions for each particular lane, the system has the advantage of allowing the user to anticipate particular lane problems which may occur ahead, such as a wreck **140** in lane **112**C. In addition, in an alternative embodiment, the display **54** is capable of displaying the individual location of each individual vehicle on the road **112**.

FIG. **4** shows an alternative embodiment of a user station **52**. User station **52** is a mobile unit in a car **60**. User station **52** has transmitting and/or receiving units **64** for communicating with the network **50**. Such transmitting and receiving units **64** may be any devices capable of transmitting digital or analog data, such as, for example, a digital or analog cellular phone.

The user station **52** may also be contained within a car **60** that further includes an associated global positioning system (GPS) receiver **62**. The GPS receiver **62** receives signals from GPS satellites **70** which enable the GPS receiver to determine its location. When a commuter requests traffic information using the mobile user station **52**, the request for traffic information may include the location of the user as determined by the GPS receiver **62**. When the computer system **40** receives this request, it provides traffic information back to the mobile user station **52** based on the location of the car **60** as provided by the GPS receiver **62**. Alternatively, the computer system **40** may provide traffic information to the user station **52** which in combination with the position determined by the GPS receiver **62** displays suitable data to the user on a display or audibly. The user station may also be a cellular phone with an integrated or associated GPS.

FIG. **6** shows a representative display of the traffic information provided by the computer system **40**. The information provided is essentially the same as that shown in FIG. **3**, except that the display **54** contains at **161** the position of the car **60**. The mobile user station **52** provides a significant advantage in that it allows the commuter to immediately determine traffic information in the commuter's immediate vicinity based on the commuter's present location. The commuter does not have to wait for a periodic traffic report. Further, traffic conditions are provided at a plurality of locations, and the information is contemporaneous. Based on the receipt of such information, the commuter may decide to use an alternate route rather than continue on the current freeway.

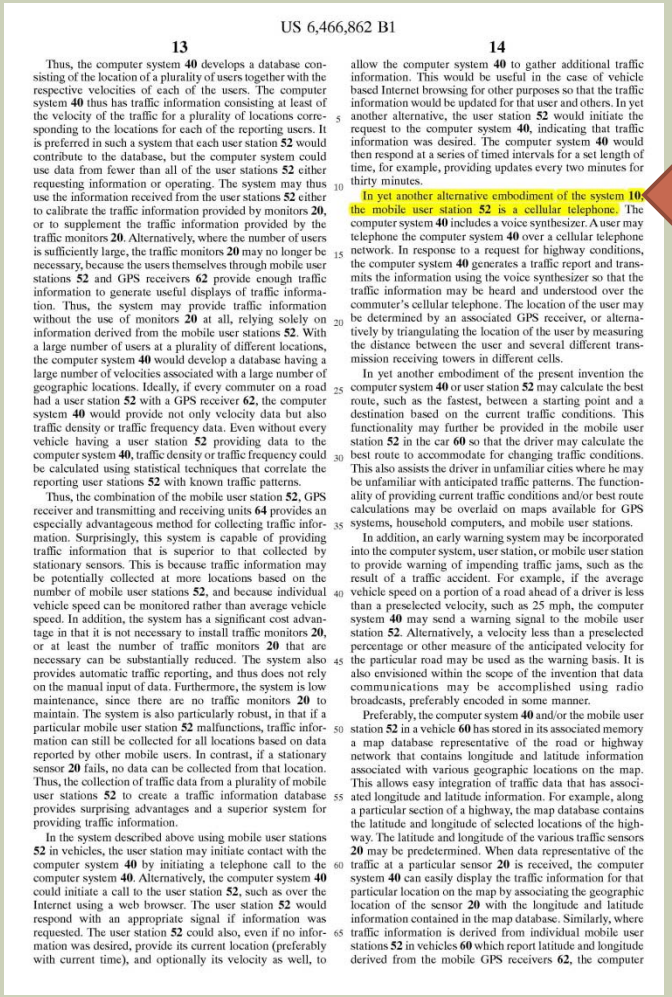
Thus, in the embodiment shown in FIG. **4**, the system provides the relevant traffic information to the commuter or user on a timely basis. The display may be tailored to provide the information for the current location of the commuter, together with the upcoming traffic that lies ahead.

In a preferred embodiment, the system obtains traffic information from users that have a GPS receiver **62**. In this system, whenever a user station **52** requests traffic information from the computer system **40**, the computer system **40** associates a velocity (speed) of that particular user with its current location. The velocity may be determined through a variety of methods. In one system, when the user requests traffic information, the user station **52** supplies not only its location but also its current velocity. The user station **52** may obtain its current velocity in any fashion. For example, the user station **52** may track its location over time using the GPS receiver **62**, and also keep track of the time associated with each location by using an internal clock. The velocity could then be calculated by simply dividing the difference between respective locations by respective times. Alternatively, the user station **52** may be connected to the vehicle's speedometer or odometer, and measure velocity using information provided by the vehicle **60** itself. Alternatively, the computer system **40** itself could calculate the velocity of each user. In such a system, each user station **52** would provide the computer system **40** with a unique identification code together with its location. The computer system **40** then associates a time using an internal clock with each location reported by each user. Preferably, the GPS location is sent together with the current time at the user station so that delays incurred in transmission do not change the result. The velocity of each user could then be calculated by calculating the difference in location for a particular user (identified by its unique identification code) by the respective times associated with each of these locations.

FIG. 4 shows an alternative embodiment of a user station 52. User station 52 is a mobile unit in a car 60. User station 52 has transmitting and/or receiving units 64 for communicating with the network 50. Such transmitting and receiving units 64 may be any devices capable of transmitting digital or analog data, such as, for example, a digital or analog cellular phone. [11:63-12:2]

The user station may also be a cellular phone with an integrated or associated GPS. [12:16-18]

MOBILE USER STATION



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13 14

Thus, the computer system **40** develops a database consisting of the location of a plurality of users together with the respective velocities of each of the users. The computer system **40** thus has traffic information consisting at least of the velocity of the traffic for a plurality of locations corresponding to the locations for each of the reporting users. It is preferred in such a system that each user station **52** would contribute to the database, but the computer system could use data from fewer than all of the user stations **52** either requesting information or operating. The system may thus use the information received from the user stations **52** either to calibrate the traffic information provided by monitors **20**, or to supplement the traffic information provided by the traffic monitors **20**. Alternatively, where the number of users is sufficiently large, the traffic monitors **20** may no longer be necessary, because the users themselves through mobile user stations **52** and GPS receivers **62** provide enough traffic information to generate useful displays of traffic information. Thus, the system may provide traffic information without the use of monitors **20** at all, relying solely on information derived from the mobile user stations **52**. With a large number of users at a plurality of different locations, the computer system **40** would develop a database having a large number of velocities associated with a large number of geographic locations. Ideally, if every commuter on a road had a user station **52** with a GPS receiver **62**, the computer system **40** would provide not only velocity data but also traffic density or traffic frequency data. Even without every vehicle having a user station **52** providing data to the computer system **40**, traffic density or traffic frequency could be calculated using statistical techniques that correlate the reporting user stations **52** with known traffic patterns.

Thus, the combination of the mobile user station **52**, GPS receiver and transmitting and receiving units **64** provides an especially advantageous method for collecting traffic information. Surprisingly, this system is capable of providing traffic information that is superior to that collected by stationary sensors. This is because traffic information may be potentially collected at more locations based on the number of mobile user stations **52**, and because individual vehicle speed can be monitored rather than average vehicle speed. In addition, the system has a significant cost advantage in that it is not necessary to install traffic monitors **20**, or at least the number of traffic monitors **20** that are necessary can be substantially reduced. The system also provides automatic traffic reporting, and thus does not rely on the manual input of data. Furthermore, the system is low maintenance, since there are no traffic monitors **20** to maintain. The system is also particularly robust, in that if a particular mobile user station **52** malfunctions, traffic information can still be collected for all locations based on data reported by other mobile users. In contrast, if a stationary sensor **20** fails, no data can be collected from that location. Thus, the collection of traffic data from a plurality of mobile user stations **52** to create a traffic information database provides surprising advantages and a superior system for providing traffic information.

In the system described above using mobile user stations **52** in vehicles, the user station may initiate contact with the computer system **40** by initiating a telephone call to the computer system **40**. Alternatively, the computer system **40** could initiate a call to the user station **52**, such as over the Internet using a web browser. The user station **52** would respond with an appropriate signal if information was requested. The user station **52** could also, even if no information was desired, provide its current location (preferably with current time), and optionally its velocity as well, to allow the computer system **40** to gather additional traffic information. This would be useful in the case of vehicle based Internet browsing for other purposes so that the traffic information would be updated for that user and others. In yet another alternative, the user station **52** would initiate the request to the computer system **40**, indicating that traffic information was desired. The computer system **40** would then respond at a series of timed intervals for a set length of time, for example, providing updates every two minutes for thirty minutes.

In yet another alternative embodiment of the system **10**, the mobile user station **52** is a cellular telephone. The computer system **40** includes a voice synthesizer. A user may telephone the computer system **40** over a cellular telephone network. In response to a request for highway conditions, the computer system **40** generates a traffic report and transmits the information using the voice synthesizer so that the traffic information may be heard and understood over the commuter's cellular telephone. The location of the user may be determined by an associated GPS receiver, or alternatively by triangulating the location of the user by measuring the distance between the user and several different transmission receiving towers in different cells.

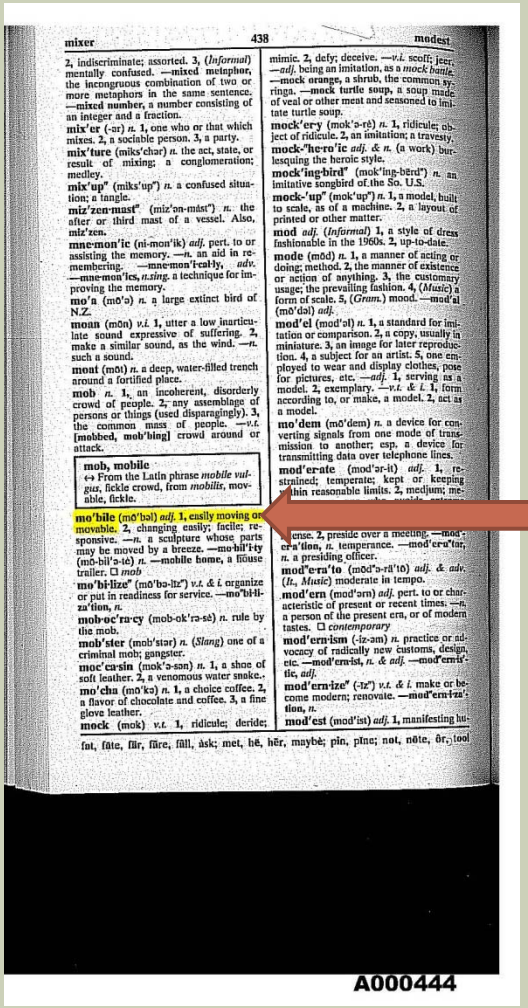
In yet another embodiment of the present invention the computer system **40** or user station **52** may calculate the best route, such as the fastest, between a starting point and a destination based on the current traffic conditions. This functionality may further be provided in the mobile user station **52** in the car **60** so that the driver may calculate the best route to accommodate for changing traffic conditions. This also assists the driver in unfamiliar cities where he may be unfamiliar with anticipated traffic patterns. The functionality of providing current traffic conditions and/or best route calculations may be overlaid on maps available for GPS systems, household computers, and mobile user stations.

In addition, an early warning system may be incorporated into the computer system, user station, or mobile user station to provide warning of impending traffic jams, such as the result of a traffic accident. For example, if the average vehicle speed on a portion of a road ahead of a driver is less than a preselected velocity, such as 25 mph, the computer system **40** may send a warning signal to the mobile user station **52**. Alternatively, a velocity less than a preselected percentage or other measure of the anticipated velocity for the particular road may be used as the warning basis. It is also envisioned within the scope of the invention that data communications may be accomplished using radio broadcasts, preferably encoded in some manner.

Preferably, the computer system **40** and/or the mobile user station **52** in a vehicle **60** has stored in its associated memory a map database representative of the road or highway network that contains longitude and latitude information associated with various geographic locations on the map. This allows easy integration of traffic data that has associated longitude and latitude information. For example, along a particular section of a highway, the map database contains the latitude and longitude of selected locations of the highway. The latitude and longitude of the various traffic sensors **20** may be predetermined. When data representative of the traffic at a particular sensor **20** is received, the computer system **40** can easily display the traffic information for that particular location on the map by associating the geographic location of the sensor **20** with the longitude and latitude information contained in the map database. Similarly, where traffic information is derived from individual mobile user stations **52** in vehicles **60** which report latitude and longitude derived from the mobile GPS receivers **62**, the computer

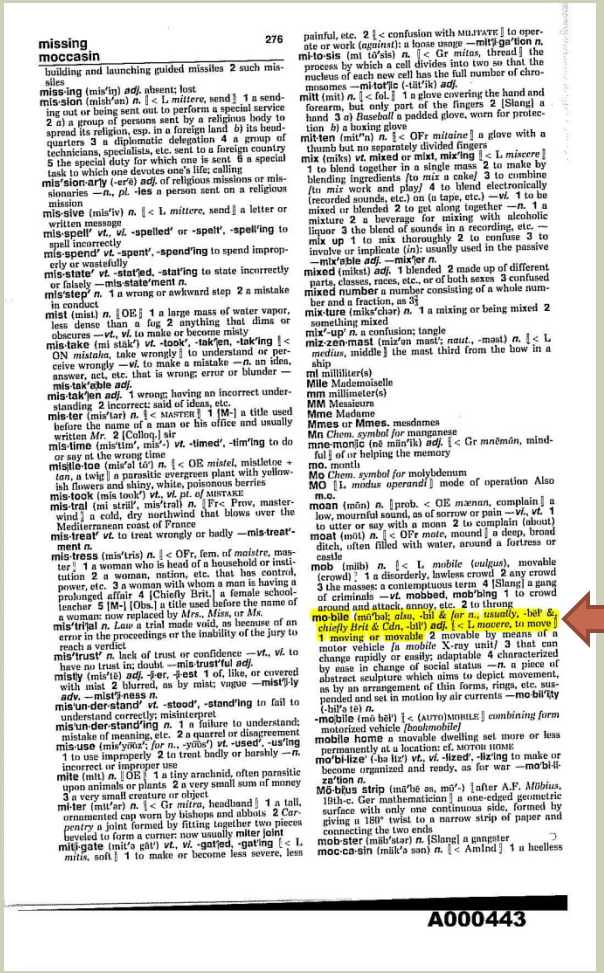
In yet another alternative embodiment of the system 10, the mobile user station 52 is a cellular telephone. [14:11-12]

MOBILE USER STATION



Mobile: "easily moving or movable"

MOBILE USER STATION



building and launching guided missiles **2** such missiles

miss·ing (mis'iŋ) *adj.* absent; lost

mis·sion (mish'ən) *n.* [< L *mittere*, send] **1** a sending out or being sent out to perform a special service **2** *a)* a group of persons sent by a religious body to spread its religion, esp. in a foreign land *b)* its headquarters **3** a diplomatic delegation **4** a group of technicians, specialists, etc. sent to a foreign country **5** the special duty for which one is sent **6** a special task to which one devotes one's life; calling

mis'sion·ar·y (-er'ē) *adj.* of religious missions or missionaries —*n., pl.* **-ies** a person sent on a religious mission

mis·sive (mis'iv) *n.* [< L *mittere*, send] a letter or written message

mis·spell' *vt., vi.* **-spelled'** or **-spelt', -spell'ing** to spell incorrectly

mis·spend' *vt.* **-spent', -spend'ing** to spend improperly or wastefully

mis·state' *vt.* **-stat'ed, -stat'ing** to state incorrectly or falsely —**mis·state'ment** *n.*

mis'step' *n.* **1** a wrong or awkward step **2** a mistake in conduct

mist (mist) *n.* [OE] **1** a large mass of water vapor, less dense than a fog **2** anything that dims or obscures —*vt., vi.* to make or become misty

mis·take (mi stāk') *vt.* **-took', -tak'en, -tak'ing** [< ON *mistaka*, take wrongly] to understand or perceive wrongly —*vi.* to make a mistake —*n.* an idea, answer, act, etc. that is wrong; error or blunder —**mis·tak'a·ble** *adj.*

mis·tak'en *adj.* **1** wrong; having an incorrect understanding **2** incorrect; said of ideas, etc.

mis·ter (mis'tər) *n.* [< MASTER] **1** [M-] a title used before the name of a man or his office and usually written *Mr.* **2** [Colloq.] sir

mis·time (mis'tīm', mis'-) *vt.* **-timed', -tim'ing** to do or say at the wrong time

mis'tle·toe (mis'əl tō') *n.* [< OE *mistel*, mistletoe + *tan*, a twig] a parasitic evergreen plant with yellowish flowers and shiny, white, poisonous berries

mis·took (mis took') *vt., vi. pt. of* MISTAKE

mis·tral (mi strāl', mis'trəl) *n.* [Fr< Prov, master-wind] a cold, dry northwind that blows over the Mediterranean coast of France

mis·treat' *vt.* to treat wrongly or badly —**mis·treat'ment** *n.*

mis·tress (mis'tris) *n.* [< OFr, fem. of *maistre*, master] **1** a woman who is head of a household or institution **2** a woman, nation, etc. that has control, power, etc. **3** a woman with whom a man is having a prolonged affair **4** [Chiefly Brit.] a female schoolteacher **5** [M-] [Obs.] a title used before the name of a woman: now replaced by *Mrs., Miss,* or *Ms.*

mis·tri'al *n. Law* a trial made void, as because of an error in the proceedings or the inability of the jury to reach a verdict

mis·trust' *n.* lack of trust or confidence —*vt., vi.* to have no trust in; doubt —**mis·trust'ful** *adj.*

mist·y (mis'tē) *adj.* **-i·er, -i·est** **1** of, like, or covered with mist **2** blurred, as by mist; vague —**mist'i·ly** *adv.* —**mist'i·ness** *n.*

mis'un·der·stand' *vt.* **-stood', -stand'ing** to fail to understand correctly; misinterpret

mis'un·der·stand'ing *n.* **1** a failure to understand; mistake of meaning, etc. **2** a quarrel or disagreement

mis·use (mis'yōōz'; *for n.,* -yōōs') *vt.* **-used', -us'ing** **1** to use improperly **2** to treat badly or harshly —*n.* incorrect or improper use

mite (mīt) *n.* [OE] **1** a tiny arachnid, often parasitic upon animals or plants **2** a very small sum of money **3** a very small creature or object

mi·ter (mīt'ər) *n.* [< Gr *mitra*, headband] **1** a tall, ornamented cap worn by bishops and abbots **2** *Carpentry* a joint formed by fitting together two pieces beveled to form a corner: now usually **miter joint**

mit·i·gate (mit'ə gāt') *vt., vi.* **-gat'ed, -gat'ing** [< L *mitis*, soft] **1** to make or become less severe, less painful, etc. **2** [< confusion with MILITATE] to operate or work (*against*): a loose usage —**mit'i·ga'tion** *n.*

mi·to·sis (mī tō'sis) *n.* [< Gr *mitos*, thread] the process by which a cell divides into two so that the nucleus of each new cell has the full number of chromosomes —**mi·tot'ic** (-tät'ik) *adj.*

mitt (mit) *n.* [< fol.] **1** a glove covering the hand and forearm, but only part of the fingers **2** [Slang] a hand **3** *a) Baseball* a padded glove, worn for protection *b)* a boxing glove

mit·ten (mit'n) *n.* [< OFr *mitaine*] a glove with a thumb but no separately divided fingers

mix (miks) *vt.* **mixed** or **mixt, mix'ing** [< L *miscere*] **1** to blend together in a single mass **2** to make by blending ingredients *[to mix* a cake*]* **3** to combine *[to mix* work and play*]* **4** to blend electronically (recorded sounds, etc.) on (a tape, etc.) —*vi.* **1** to be mixed or blended **2** to get along together —*n.* **1** a mixture **2** a beverage for mixing with alcoholic liquor **3** the blend of sounds in a recording, etc. — **mix up** **1** to mix thoroughly **2** to confuse **3** to involve or implicate (in): usually used in the passive —**mix'a·ble** *adj.* —**mix'er** *n.*

mixed (mikst) *adj.* **1** blended **2** made up of different parts, classes, races, etc., or of both sexes **3** confused

mixed number a number consisting of a whole number and a fraction, as $3\frac{1}{2}$

mix·ture (miks'chər) *n.* **1** a mixing or being mixed **2** something mixed

mix'-up' *n.* a confusion; tangle

miz·zen·mast (miz'ən mast'; *naut.,* -məst) *n.* [< L *medius*, middle] the mast third from the bow in a ship

ml milliliter(s)

Mlle Mademoiselle

mm millimeter(s)

MM Messieurs

Mme Madame

Mmes or **Mmes.** mesdames

Mn *Chem. symbol for* manganese

mne·mon'ic (nē män'ik) *adj.* [< Gr *mnēmōn*, mindful] of or helping the memory

mo. month

Mo *Chem. symbol for* molybdenum

MO [L *modus operandi*] mode of operation Also **m.o.**

moan (mōn) *n.* [prob. < OE *mænan*, complain] a low, mournful sound, as of sorrow or pain —*vi., vt.* **1** to utter or say with a moan **2** to complain (about)

moat (mōt) *n.* [< OFr *mote*, mound] a deep, broad ditch, often filled with water, around a fortress or castle

mob (mäb) *n.* [< L *mobile (vulgus)*, movable (crowd)] **1** a disorderly, lawless crowd **2** any crowd **3** the masses: a contemptuous term **4** [Slang] a gang of criminals —*vt.* **mobbed, mob'bing** **1** to crowd around and attack, annoy, etc. **2** to throng

mo·bile (mō'bəl; *also,* -bil & *for n., usually,* -bēl' & *chiefly Brit & Can.,* -bīl') *adj.* [< L *movere*, to move] **1** moving or movable **2** movable by means of a motor vehicle *[a mobile* X-ray unit*]* **3** that can change rapidly or easily; adaptable **4** characterized by ease in change of social status —*n.* a piece of abstract sculpture which aims to depict movement, as by an arrangement of thin forms, rings, etc. suspended and set in motion by air currents —**mo·bil'i·ty** (-bil'ə tē) *n.*

-mobile (mō bēl') [< (AUTO)MOBILE] *combining form* motorized vehicle *[bookmobile]*

mobile home a movable dwelling set more or less permanently at a location: cf. MOTOR HOME

mo'bi·lize' (-bə līz') *vt., vi.* **-lized', -liz'ing** to make or become organized and ready, as for war —**mo·bi·li·za'tion** *n.*

Mö·bius strip (mā'bē əs, mō'-) [after A.F. *Möbius*, 19th-c. Ger mathematician] a one-edged geometric surface with only one continuous side, formed by giving a 180° twist to a narrow strip of paper and connecting the two ends

mob·ster (mäb'stər) *n.* [Slang] a gangster

moc·ca·sin (mäk'ə sən) *n.* [< Algnd] **1** a heelless

A000443

Mobile: "moving or movable"

MOBILE USER STATION

Traffic's Claim Construction

"Mobile User Station" means an easily moving or movable device that can transmit data to and/or receive data from the network; it may be a cellular phone or other handheld unit, or may be installed within a car.

MOBILE USER STATION

Traffic's Construction

An easily moving or movable device that can transmit data to and/or receive data from the network; it may be a cellular phone or other handheld unit, or may be installed within a car.

Google's Construction

A mobile device, distinct from a traffic monitor, capable of determining and displaying traffic information.

MOBILE USER STATION

Google's Construction

- A mobile device, distinct from a traffic monitor, capable of determining and displaying traffic information.

"Distinct From a Traffic Monitor" Should Be Rejected

- Unnecessary
- Why not say:
  - "distinct from a computer system"?
  - "distinct from a receiver?
- Apparent attempt to read limitations into claims that are not there to confuse infringement issues.

MOBILE USER STATION

Google's Construction

- A mobile device, distinct from a traffic monitor, capable of determining and displaying traffic information.

"Determining" Should Be Rejected

- Capable of displaying is supported by claims
- "Determining" is not supported

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

MOBILE USER STATION

Google's Construction

- A mobile device, distinct from a traffic monitor, capable of determining and displaying traffic information.

"Determining" Should Be Rejected

- Specification states:

"Alternatively, the user stations may process the traffic information." [8:60-61]

- Not required by the specification
- Improperly importing optional limitation into claims
- Invites further claim construction

MOBILE USER STATION

Traffic's Claim Construction

"Mobile User Station" means an easily moving or movable device that can transmit data to and/or receive data from the network; it may be a cellular phone or other handheld unit, or may be installed within a car.

DATA REPRESENTATIVE OF TRAFFIC

Home

The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

Asserted Claims

DATA REPRESENTATIVE OF TRAFFIC

Traffic's Claim Construction

No construction necessary; alternatively, traffic information.

CLAIM 21 – '862 PATENT

"Data representative of traffic" not in claim 1 of 862 or 22 of 606

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

DATA REPRESENTATIVE OF TRAFFIC

Traffic's Constructions

Traffic Information	Data Representative of Traffic
"traffic information" means data regarding traffic conditions, which data can include, but is not limited to, the speed, velocity, motion, density, flow, frequency of vehicles on a road, and/or other data representative of the movement of vehicles on a road.	No construction necessary; alternatively, traffic information.

Google's Constructions

Traffic Information	Data Representative of Traffic
"Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors.	Indefinite; alternatively, the current speed, frequency, or flow of multiple vehicles traveling along a road.

DATA REPRESENTATIVE OF TRAFFIC

Google's Construction

- Indefinite; alternatively, the current speed, frequency, or flow of multiple vehicles traveling along a road.

Same issues as above

- Current
- Speed, frequency or flow
- Multiple

TRAFFIC INFORMATION DATABASE

Home

The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

Asserted Claims

TRAFFIC INFORMATION DATABASE

Traffic's Claim Construction

"Traffic information database" means a collection of traffic information.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

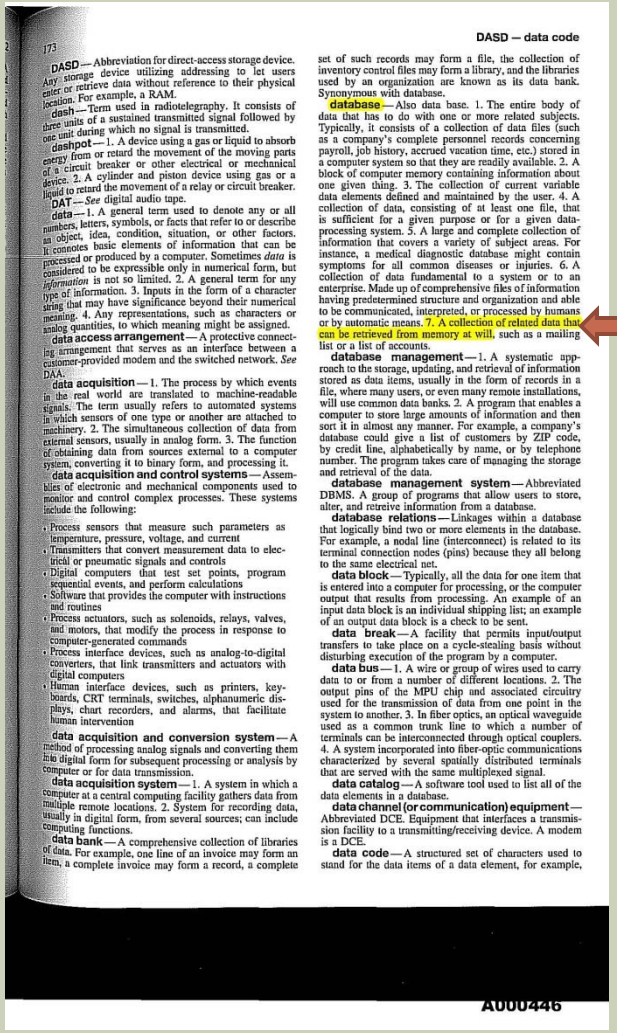
CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

TRAFFIC INFORMATION DATABASE



DASD—Abbreviation for direct-access storage device. Any storage device utilizing addressing to let users enter or retrieve data without reference to their physical location. For example, a RAM.

dash—Term used in radiotelegraphy. It consists of three units of a sustained transmitted signal followed by one unit during which no signal is transmitted.

dashpot—1. A device using a gas or liquid to absorb energy from or retard the movement of the moving parts of a circuit breaker or other electrical or mechanical device. 2. A cylinder and piston device using gas or a liquid to retard the movement of a relay or circuit breaker.

DAT—*See* digital audio tape.

data—1. A general term used to denote any or all numbers, letters, symbols, or facts that refer to or describe an object, idea, condition, situation, or other factors. It connotes basic elements of information that can be processed or produced by a computer. Sometimes *data* is considered to be expressible only in numerical form, but *information* is not so limited. 2. A general term for any type of information. 3. Inputs in the form of a character string that may have significance beyond their numerical meaning. 4. Any representations, such as characters or analog quantities, to which meaning might be assigned.

data access arrangement—A protective connecting arrangement that serves as an interface between a customer-provided modem and the switched network. *See* DAA.

data acquisition—1. The process by which events in the real world are translated to machine-readable signals. The term usually refers to automated systems in which sensors of one type or another are attached to machinery. 2. The simultaneous collection of data from external sensors, usually in analog form. 3. The function of obtaining data from sources external to a computer system, converting it to binary form, and processing it.

data acquisition and control systems—Assemblies of electronic and mechanical components used to monitor and control complex processes. These systems include the following:

- Process sensors that measure such parameters as temperature, pressure, voltage, and current
- Transmitters that convert measurement data to electrical or pneumatic signals and controls
- Digital computers that test set points, program sequential events, and perform calculations
- Software that provides the computer with instructions and routines
- Process actuators, such as solenoids, relays, valves, and motors, that modify the process in response to computer-generated commands
- Process interface devices, such as analog-to-digital converters, that link transmitters and actuators with digital computers
- Human interface devices, such as printers, keyboards, CRT terminals, switches, alphanumeric displays, chart recorders, and alarms, that facilitate human intervention

data acquisition and conversion system—A method of processing analog signals and converting them into digital form for subsequent processing or analysis by computer or for data transmission.

data acquisition system—1. A system in which a computer at a central computing facility gathers data from multiple remote locations. 2. System for recording data, usually in digital form, from several sources; can include computing functions.

data bank—A comprehensive collection of libraries of data. For example, one line of an invoice may form an item, a complete invoice may form a record, a complete set of such records may form a file, the collection of inventory control files may form a library, and the libraries used by an organization are known as its data bank. Synonymous with database.

database—Also data base. 1. The entire body of data that has to do with one or more related subjects. Typically, it consists of a collection of data files (such as a company's complete personnel records concerning payroll, job history, accrued vacation time, etc.) stored in a computer system so that they are readily available. 2. A block of computer memory containing information about one given thing. 3. The collection of current variable data elements defined and maintained by the user. 4. A collection of data, consisting of at least one file, that is sufficient for a given purpose or for a given data-processing system. 5. A large and complete collection of information that covers a variety of subject areas. For instance, a medical diagnostic database might contain symptoms for all common diseases or injuries. 6. A collection of data fundamental to a system or to an enterprise. Made up of comprehensive files of information having predetermined structure and organization and able to be communicated, interpreted, or processed by humans or by automatic means. 7. A collection of related data that can be retrieved from memory at will, such as a mailing list or a list of accounts.

database management—1. A systematic approach to the storage, updating, and retrieval of information stored as data items, usually in the form of records in a file, where many users, or even many remote installations, will use common data banks. 2. A program that enables a computer to store large amounts of information and then sort it in almost any manner. For example, a company's database could give a list of customers by ZIP code, by credit line, alphabetically by name, or by telephone number. The program takes care of managing the storage and retrieval of the data.

database management system—Abbreviated DBMS. A group of programs that allow users to store, alter, and retrieve information from a database.

database relations—Linkages within a database that logically bind two or more elements in the database. For example, a nodal line (interconnect) is related to its terminal connection nodes (pins) because they all belong to the same electrical net.

data block—Typically, all the data for one item that is entered into a computer for processing, or the computer output that results from processing. An example of an input data block is an individual shipping list; an example of an output data block is a check to be sent.

data break—A facility that permits input/output transfers to take place on a cycle-stealing basis without disturbing execution of the program by a computer.

data bus—1. A wire or group of wires used to carry data to or from a number of different locations. 2. The output pins of the MPU chip and associated circuitry used for the transmission of data from one point in the system to another. 3. In fiber optics, an optical waveguide used as a common trunk line to which a number of terminals can be interconnected through optical couplers. 4. A system incorporated into fiber-optic communications characterized by several spatially distributed terminals that are served with the same multiplexed signal.

data catalog—A software tool used to list all of the data elements in a database.

data channel (or communication) equipment—Abbreviated DCE. Equipment that interfaces a transmission facility to a transmitting/receiving device. A modem is a DCE.

data code—A structured set of characters used to stand for the data items of a data element, for example,

Database: "a collection of related data that can be retrieved from memory at will"

Source: The Modern Dictionary of Electronics (7th Ed. 1999)

TRAFFIC INFORMATION DATABASE

Q: What kind of data is in a "traffic information database"?

A: "Traffic information", which is referred to as "data representative of traffic" in claim 21

CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

TRAFFIC INFORMATION DATABASE

Traffic's Claim Construction

"Traffic information database" means a collection of traffic information.

TRAFFIC INFORMATION DATABASE

Google's Construction

- The term should be construed as part of the larger a collection of traffic information. phrase "traffic information database containing data representative of traffic" and consistent with Google's definition of "data representative of traffic."

DATA REPRESENTATIVE OF TRAFFIC

Google's Construction

- Indefinite; alternatively, the current speed, frequency, or flow of multiple vehicles traveling along a road.

Same issues as above

- Current
- Speed, frequency or flow
- Multiple

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The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

Asserted Claims

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 22 – '606 PATENT

Does not recite "in response to"
Does not recite request from mobile user station

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

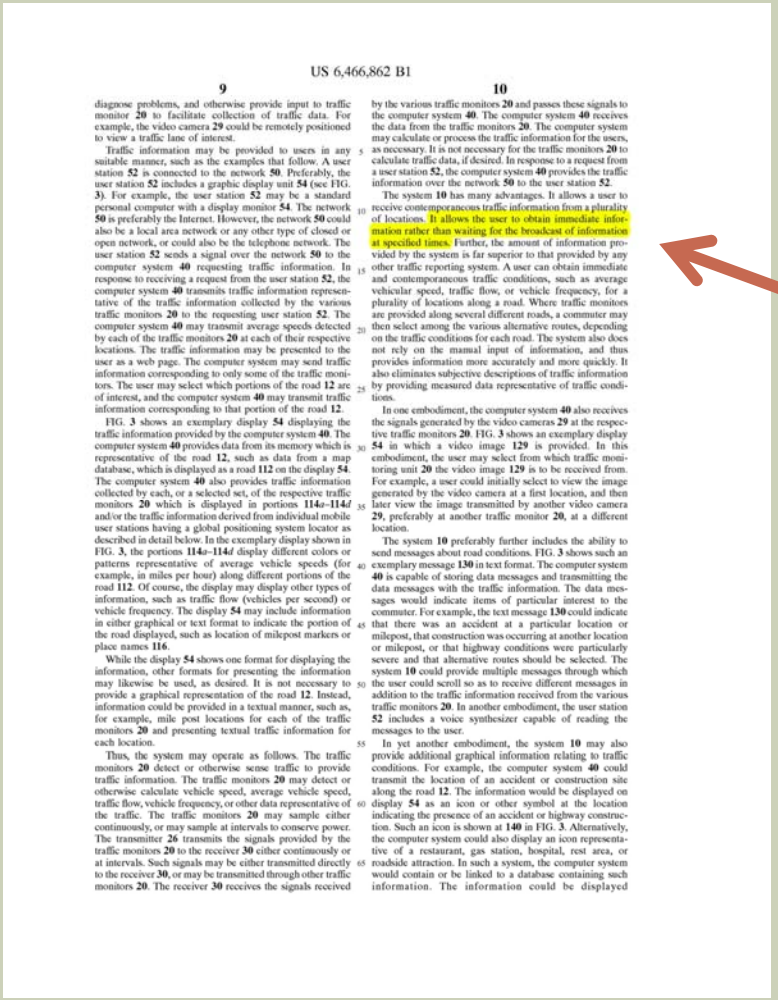
IN RESPONSE TO / PROVIDING

Traffic's Claim Construction

"in response to" means that the computer system, rather than only arbitrarily sending traffic information representative of said signals transmitted by said traffic monitors, is capable of sending traffic information representative of said signals transmitted by said traffic monitors to a mobile user station as a result of the mobile user station sending a request for traffic information to the computer system;

"providing to said one of said mobile user stations" does not need a construction. However, if one is required, "providing to said one of said mobile user stations" means that the computer system supplies data to the mobile user station

IN RESPONSE TO / PROVIDING



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diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***d* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such an exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll so as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In yet another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

No need to wait

It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. [10:10-12]

IN RESPONSE TO / PROVIDING

Google's Construction

In response to a commuter's request, providing relevant traffic information for display by the mobile user station to minimize manipulation by the commuter while driving, the request and the response must occur simultaneously

Minimize manipulation

- Claims say nothing about a commuter or minimizing manipulation by the commuter while driving
- "The commuter" is not recited in the claim; improperly adding a new human element to the claim
- Minimizing manipulation is not required by the specification
- Actually contrary to claim language and specification – both refer to a request being made (i.e., manipulation)

IN RESPONSE TO / PROVIDING

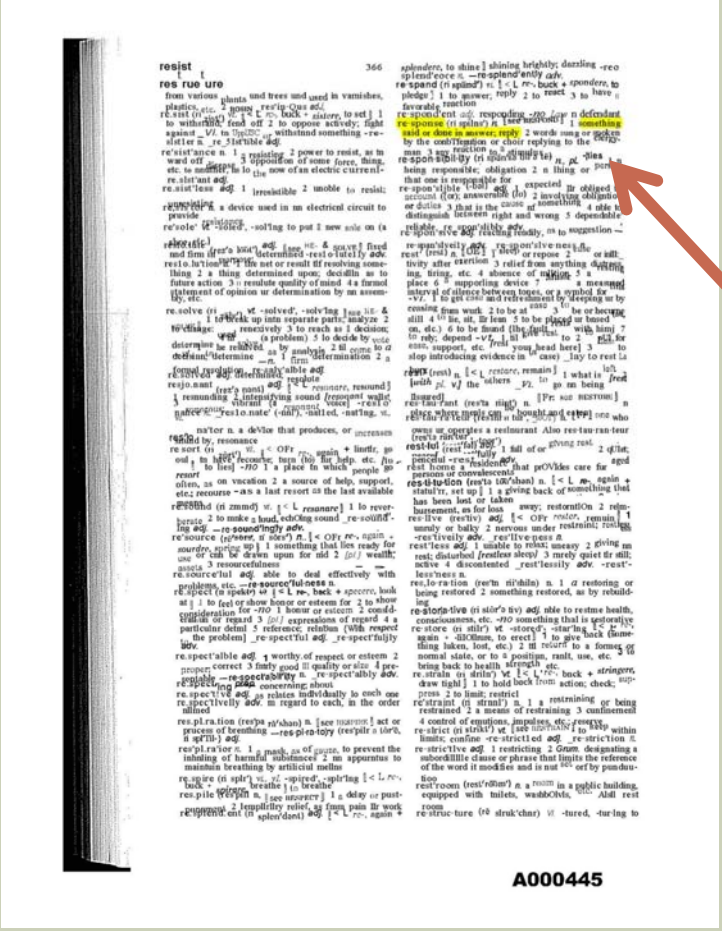
Google's Construction

In response to a commuter's request, providing relevant traffic information for display by the mobile user station to minimize manipulation by the commuter while driving, the request and the response must occur simultaneously

Simultaneously

- Claims say nothing about the request and the response occurring simultaneously
- Impossible for request and response to occur at the same time
- The must first be a request before a response can be made to it

IN RESPONSE TO / PROVIDING



"Simultaneously"

Google's "simultaneously" limitation is contrary to plain meaning of "response"

Response: "something done in answer or reply"

Source: Webster's NewWorld Compact School and Office Dictionary (3d. Ed. 1995) [A000445]

INFORMATION REPRESENTATIVE OF SELECTED PORTIONS OF SAID TRAFFIC INFORMATION DATABASE

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Claims Are Not Indefinite

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Asserted Claims

INFORMATION REPRESENTATIVE OF SELECTED PORTIONS OF SAID TRAFFIC INFORMATION DATABASE

Traffic's Claim Construction

"information representative of selected portions of said map database and selected portions of said traffic information database" means that certain data from the map database and certain data from the traffic information database are transmitted to the mobile user station.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

INFORMATION REPRESENTATIVE OF SELECTED PORTIONS OF SAID TRAFFIC INFORMATION DATABASE

Traffic's Construction

"information representative of selected portions of said map database and selected portions of said traffic information database" means that certain data from the map database and certain data from the traffic information database are transmitted to the mobile user station.

Google's Construction

Indefinite in identification of selecting entity (i.e. user or system) and kind of information selected; alternatively,

the current speed, frequency, or flow of multiple vehicles traveling along a road as detected by the traffic monitors, a subset of which is selected by the commuter.

INFORMATION REPRESENTATIVE OF SELECTED PORTIONS OF SAID TRAFFIC INFORMATION DATABASE

Google's Construction

- Indefinite in identification of selecting entity (i.e. user or system) and kind of information selected; alternatively,

the current speed, frequency, or flow of multiple vehicles traveling along a road as detected by the traffic monitors, a subset of which is selected by the commuter.

Not indefinite

- Clear from the claim language how information is selected (i.e., mobile user station sends its geographic location to the computer system, and traffic information is selected based on the geographic location received from the mobile user station)
- Clear from claim language what information is selected (i.e., traffic information based on geographic location of mobile user station)
- Google was able to construe it

INFORMATION REPRESENTATIVE OF SELECTED PORTIONS OF SAID TRAFFIC INFORMATION DATABASE

Google's Construction

- Indefinite in identification of selecting entity (i.e. user or system) and kind of information selected; alternatively,

the current speed, frequency, or flow of multiple vehicles traveling along a road as detected by the traffic monitors, a subset of which is selected by the commuter.

Same issues as before

- Should not be limited to "current" data
- Should not be restricted to only "speed, frequency or flow"
- Should not be restricted to "multiple" vehicles

LESS THAN ALL AVAILABLE TRAFFIC INFORMATION

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Claim Terms for Construction

Claims Are Not Indefinite

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Asserted Claims

LESS THAN ALL AVAILABLE TRAFFIC INFORMATION

Traffic's Claim Construction

"Less than all available traffic information" means the computer system may send traffic information corresponding to only some of the traffic monitors.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

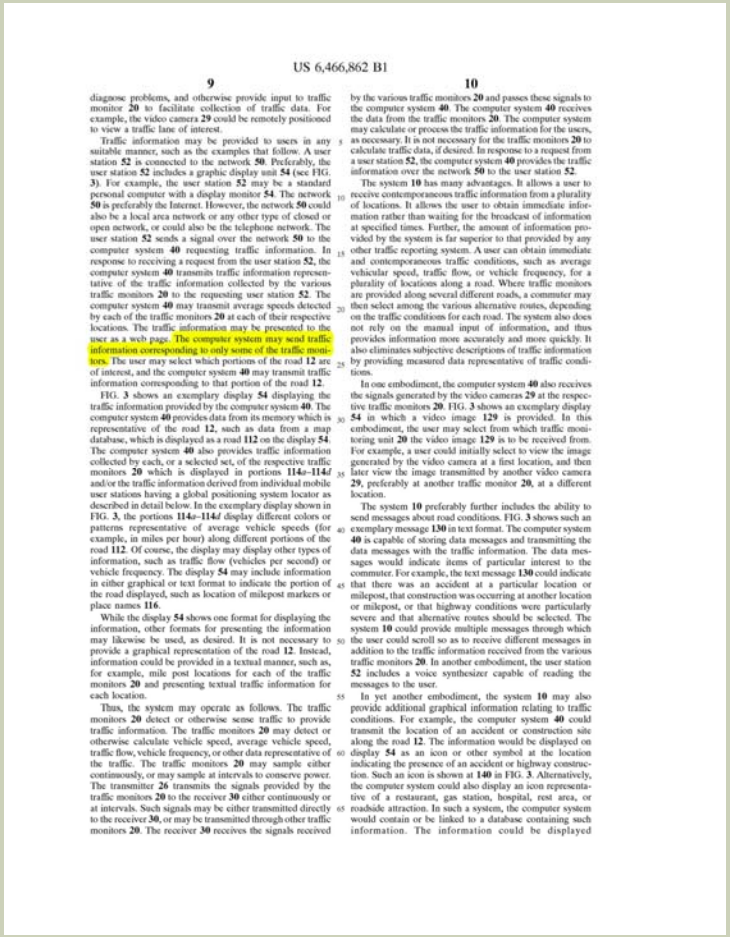
CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

LESS THAN ALL AVAILABLE TRAFFIC INFORMATION



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diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***f* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***f* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such an exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll so as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In yet another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

Traffic's construction is supported by the specification:

The computer system may send traffic information corresponding to only some of the traffic monitors. [9:23-25].

LESS THAN ALL AVAILABLE TRAFFIC INFORMATION

Traffic's Construction

The computer system may send traffic information corresponding to only some of the traffic monitors.

Google's Construction

Indefinite in degree (i.e. amount of information) and kind of information.

LESS THAN ALL AVAILABLE TRAFFIC INFORMATION

Google's Construction

- Indefinite in degree (i.e. amount of information) and kind of information.

Not Indefinite

- Term of degree is clear: less than all (i.e., less than 100%)
- Google's cases
  - *Seattle Box* – held "substantially equal to" not indefinite
  - *Enzo* – "not interfering substantially" not like "less than all"
- Not indefinite in kind of information
  - It is a subset of traffic information, i.e.,, traffic information from only some of the traffic monitors (as recited in the specification)

VEHICULAR MOVEMENT

VEHICULAR MOVEMENT

Traffic's Claim Construction

"Vehicular Movement" means the velocity, speed, position, and/or change in position of a vehicle.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 22 – '606 PATENT

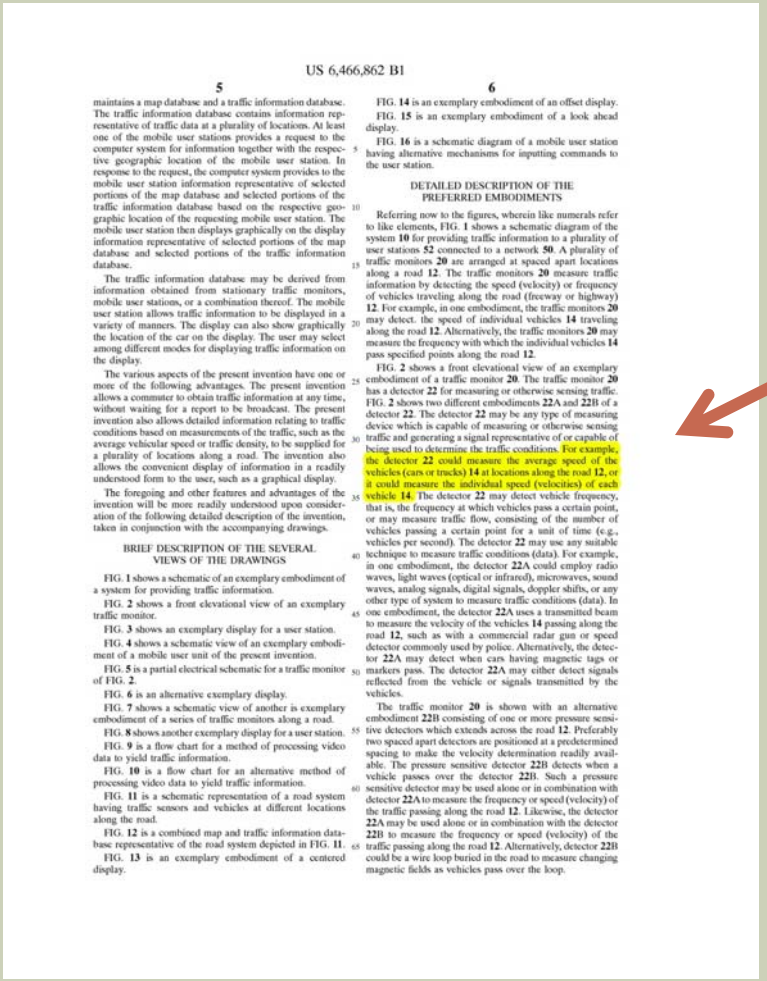
22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

VEHICULAR MOVEMENT

Traffic's Claim Construction

"Vehicular Movement" means the velocity, speed, position, and/or change in position of a vehicle.

VEHICULAR MOVEMENT



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maintains a map database and a traffic information database. The traffic information database contains information representative of traffic data at a plurality of locations. At least one of the mobile user stations provides a request to the computer system for information together with the respective geographic location of the mobile user station. In response to the request, the computer system provides to the mobile user station information representative of selected portions of the map database and selected portions of the traffic information database based on the respective geographic location of the requesting mobile user station. The mobile user station then displays graphically on the display information representative of selected portions of the map database and selected portions of the traffic information database.

The traffic information database may be derived from information obtained from stationary traffic monitors, mobile user stations, or a combination thereof. The mobile user station allows traffic information to be displayed in a variety of manners. The display can also show graphically the location of the car on the display. The user may select among different modes for displaying traffic information on the display.

The various aspects of the present invention have one or more of the following advantages. The present invention allows a commuter to obtain traffic information at any time, without waiting for a report to be broadcast. The present invention also allows detailed information relating to traffic conditions based on measurements of the traffic, such as the average vehicular speed or traffic density, to be supplied for a plurality of locations along a road. The invention also allows the convenient display of information in a readily understood form to the user, such as a graphical display.

The foregoing and other features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows a schematic of an exemplary embodiment of a system for providing traffic information.

FIG. **2** shows a front elevational view of an exemplary traffic monitor.

FIG. **3** shows an exemplary display for a user station.

FIG. **4** shows a schematic view of an exemplary embodiment of a mobile user unit of the present invention.

FIG. **5** is a partial electrical schematic for a traffic monitor of FIG. **2**.

FIG. **6** is an alternative exemplary display.

FIG. **7** shows a schematic view of another is exemplary embodiment of a series of traffic monitors along a road.

FIG. **8** shows another exemplary display for a user station.

FIG. **9** is a flow chart for a method of processing video data to yield traffic information.

FIG. **10** is a flow chart for an alternative method of processing video data to yield traffic information.

FIG. **11** is a schematic representation of a road system having traffic sensors and vehicles at different locations along the road.

FIG. **12** is a combined map and traffic information database representative of the road system depicted in FIG. **11**.

FIG. **13** is an exemplary embodiment of a centered display.

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FIG. **14** is an exemplary embodiment of an offset display.

FIG. **15** is an exemplary embodiment of a look ahead display.

FIG. **16** is a schematic diagram of a mobile user station having alternative mechanisms for inputting commands to the user station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, wherein like numerals refer to like elements, FIG. **1** shows a schematic diagram of the system **10** for providing traffic information to a plurality of user stations **52** connected to a network **50**. A plurality of traffic monitors **20** are arranged at spaced apart locations along a road **12**. The traffic monitors **20** measure traffic information by detecting the speed (velocity) or frequency of vehicles traveling along the road (freeway or highway) **12**. For example, in one embodiment, the traffic monitors **20** may detect. the speed of individual vehicles **14** traveling along the road **12**. Alternatively, the traffic monitors **20** may measure the frequency with which the individual vehicles **14** pass specified points along the road **12**.

FIG. **2** shows a front elevational view of an exemplary embodiment of a traffic monitor **20**. The traffic monitor **20** has a detector **22** for measuring or otherwise sensing traffic. FIG. **2** shows two different embodiments **22A** and **22B** of a detector **22**. The detector **22** may be any type of measuring device which is capable of measuring or otherwise sensing traffic and generating a signal representative of or capable of being used to determine the traffic conditions. For example, the detector **22** could measure the average speed of the vehicles (cars or trucks) **14** at locations along the road **12**, or it could measure the individual speed (velocities) of each vehicle **14**. The detector **22** may detect vehicle frequency, that is, the frequency at which vehicles pass a certain point, or may measure traffic flow, consisting of the number of vehicles passing a certain point for a unit of time (e.g., vehicles per second). The detector **22** may use any suitable technique to measure traffic conditions (data). For example, in one embodiment, the detector **22A** could employ radio waves, light waves (optical or infrared), microwaves, sound waves, analog signals, digital signals, doppler shifts, or any other type of system to measure traffic conditions (data). In one embodiment, the detector **22A** uses a transmitted beam to measure the velocity of the vehicles **14** passing along the road **12**, such as with a commercial radar gun or speed detector commonly used by police. Alternatively, the detector **22A** may detect when cars having magnetic tags or markers pass. The detector **22A** may either detect signals reflected from the vehicle or signals transmitted by the vehicles.

The traffic monitor **20** is shown with an alternative embodiment **22B** consisting of one or more pressure sensitive detectors which extends across the road **12**. Preferably two spaced apart detectors are positioned at a predetermined spacing to make the velocity determination readily available. The pressure sensitive detector **22B** detects when a vehicle passes over the detector **22B**. Such a pressure sensitive detector may be used alone or in combination with detector **22A** to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Likewise, the detector **22A** may be used alone or in combination with the detector **22B** to measure the frequency or speed (velocity) of the traffic passing along the road **12**. Alternatively, detector **22B** could be a wire loop buried in the road to measure changing magnetic fields as vehicles pass over the loop.

Speed/Velocity

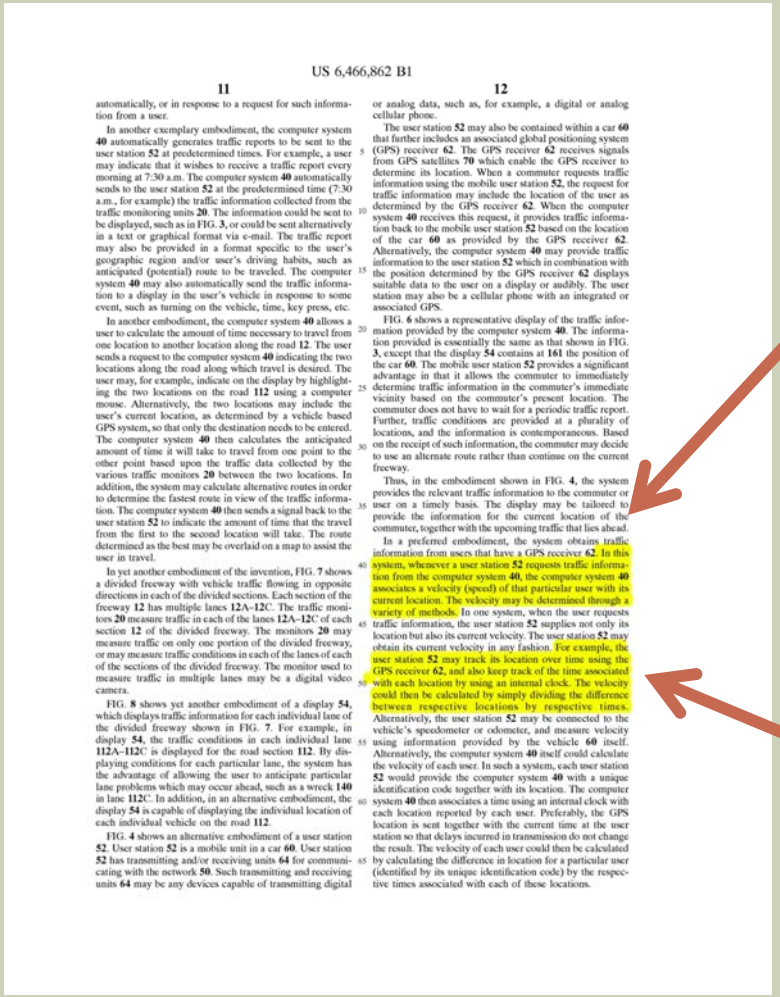
For example, the detector 22 could measure the average speed of the vehicles (cars and trucks) 14 at locations along the road 12, or it could measure the individual speed (velocities) of each vehicle 14. [6:31-35].

VEHICULAR MOVEMENT

Traffic's Claim Construction

"Vehicular Movement" means the velocity, speed, position, and/or change in position of a vehicle.

VEHICULAR MOVEMENT



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automatically, or in response to a request for such information from a user.

In another exemplary embodiment, the computer system **40** automatically generates traffic reports to be sent to the user station **52** at predetermined times. For example, a user may indicate that it wishes to receive a traffic report every morning at 7:30 a.m. The computer system **40** automatically sends to the user station **52** at the predetermined time (7:30 a.m., for example) the traffic information collected from the traffic monitoring units **20**. The information could be sent to be displayed, such as in FIG. **3**, or could be sent alternatively in a text or graphical format via e-mail. The traffic report may also be provided in a format specific to the user's geographic region and/or user's driving habits, such as anticipated (potential) route to be traveled. The computer system **40** may also automatically send the traffic information to a display in the user's vehicle in response to some event, such as turning on the vehicle, time, key press, etc.

In another embodiment, the computer system **40** allows a user to calculate the amount of time necessary to travel from one location to another location along the road **12**. The user sends a request to the computer system **40** indicating the two locations along the road along which travel is desired. The user may, for example, indicate on the display by highlighting the two locations on the road **112** using a computer mouse. Alternatively, the two locations may include the user's current location, as determined by a vehicle based GPS system, so that only the destination needs to be entered. The computer system **40** then calculates the anticipated amount of time it will take to travel from one point to the other point based upon the traffic data collected by the various traffic monitors **20** between the two locations. In addition, the system may calculate alternative routes in order to determine the fastest route in view of the traffic information. The computer system **40** then sends a signal back to the user station **52** to indicate the amount of time that the travel from the first to the second location will take. The route determined as the best may be overlaid on a map to assist the user in travel.

In yet another embodiment of the invention, FIG. **7** shows a divided freeway with vehicle traffic flowing in opposite directions in each of the divided sections. Each section of the freeway **12** has multiple lanes **12A–12C**. The traffic monitors **20** measure traffic in each of the lanes **12A–12C** of each section **12** of the divided freeway. The monitors **20** may measure traffic on only one portion of the divided freeway, or may measure traffic conditions in each of the lanes of each of the sections of the divided freeway. The monitor used to measure traffic in multiple lanes may be a digital video camera.

FIG. **8** shows yet another embodiment of a display **54**, which displays traffic information for each individual lane of the divided freeway shown in FIG. **7**. For example, in display **54**, the traffic conditions in each individual lane **112A–112C** is displayed for the road section **112**. By displaying conditions for each particular lane, the system has the advantage of allowing the user to anticipate particular lane problems which may occur ahead, such as a wreck **140** in lane **112C**. In addition, in an alternative embodiment, the display **54** is capable of displaying the individual location of each individual vehicle on the road **112**.

FIG. **4** shows an alternative embodiment of a user station **52**. User station **52** is a mobile unit in a car **60**. User station **52** has transmitting and/or receiving units **64** for communicating with the network **50**. Such transmitting and receiving units **64** may be any devices capable of transmitting digital or analog data, such as, for example, a digital or analog cellular phone.

The user station **52** may also be contained within a car **60** that further includes an associated global positioning system (GPS) receiver **62**. The GPS receiver **62** receives signals from GPS satellites **70** which enable the GPS receiver to determine its location. When a commuter requests traffic information using the mobile user station **52**, the request for traffic information may include the location of the user as determined by the GPS receiver **62**. When the computer system **40** receives this request, it provides traffic information back to the mobile user station **52** based on the location of the car **60** as provided by the GPS receiver **62**. Alternatively, the computer system **40** may provide traffic information to the user station **52** which in combination with the position determined by the GPS receiver **62** displays suitable data to the user on a display or audibly. The user station may also be a cellular phone with an integrated or associated GPS.

FIG. **6** shows a representative display of the traffic information provided by the computer system **40**. The information provided is essentially the same as that shown in FIG. **3**, except that the display **54** contains at **161** the position of the car **60**. The mobile user station **52** provides a significant advantage in that it allows the commuter to immediately determine traffic information in the commuter's immediate vicinity based on the commuter's present location. The commuter does not have to wait for a periodic traffic report. Further, traffic conditions are provided at a plurality of locations, and the information is contemporaneous. Based on the receipt of such information, the commuter may decide to use an alternate route rather than continue on the current freeway.

Thus, in the embodiment shown in FIG. **4**, the system provides the relevant traffic information to the commuter or user on a timely basis. The display may be tailored to provide the information for the current location of the commuter, together with the upcoming traffic that lies ahead.

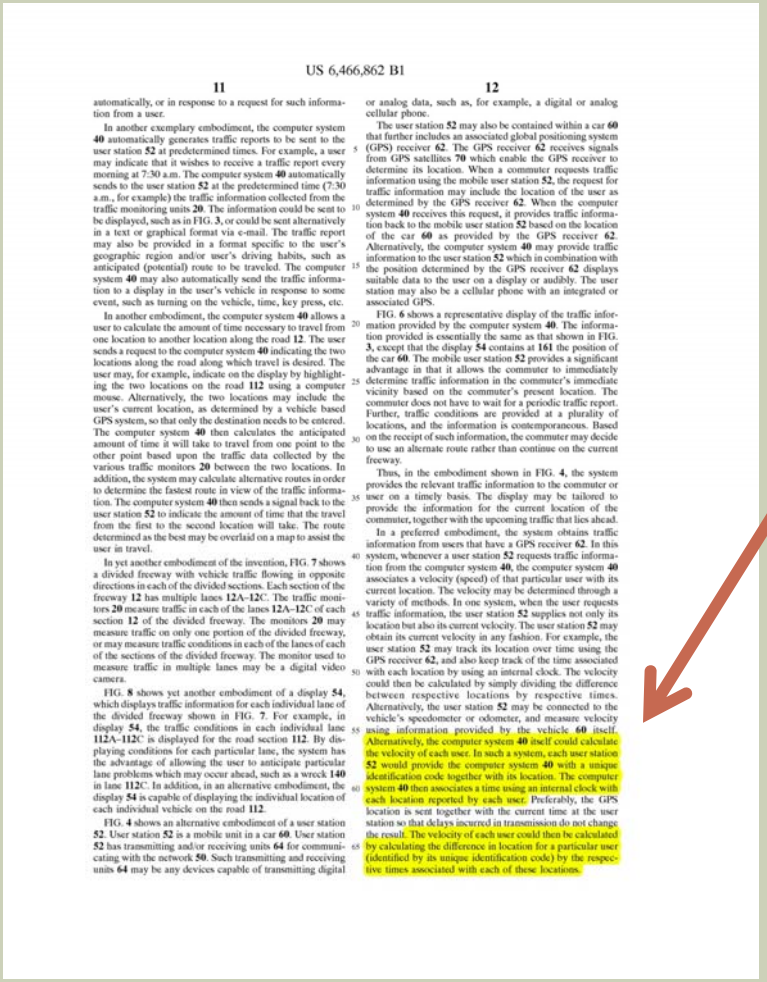
In a preferred embodiment, the system obtains traffic information from users that have a GPS receiver **62**. In this system, whenever a user station **52** requests traffic information from the computer system **40**, the computer system **40** associates a velocity (speed) of that particular user with its current location. The velocity may be determined through a variety of methods. In one system, when the user requests traffic information, the user station **52** supplies not only its location but also its current velocity. The user station **52** may obtain its current velocity in any fashion. For example, the user station **52** may track its location over time using the GPS receiver **62**, and also keep track of the time associated with each location by using an internal clock. The velocity could then be calculated by simply dividing the difference between respective locations by respective times. Alternatively, the user station **52** may be connected to the vehicle's speedometer or odometer, and measure velocity using information provided by the vehicle **60** itself. Alternatively, the computer system **40** itself could calculate the velocity of each user. In such a system, each user station **52** would provide the computer system **40** with a unique identification code together with its location. The computer system **40** then associates a time using an internal clock with each location reported by each user. Preferably, the GPS location is sent together with the current time at the user station so that delays incurred in transmission do not change the result. The velocity of each user could then be calculated by calculating the difference in location for a particular user (identified by its unique identification code) by the respective times associated with each of these locations.

Position/Location

In this system, whenever a user station 52 requests traffic information from the computer system, the computer system associates a velocity (speed) of that particular user with its current location. The velocity may then be determined through a variety of methods. [12:39-44].

For example, the user station 52 may track its location over time using the GPS receiver 62, and also keep track of the time associated with each location by using an internal clock. The velocity can then be calculated by simply dividing the difference between respective locations by respective times. [12:47-52].

VEHICULAR MOVEMENT



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automatically, or in response to a request for such information from a user.

In another exemplary embodiment, the computer system **40** automatically generates traffic reports to be sent to the user station **52** at predetermined times. For example, a user may indicate that it wishes to receive a traffic report every morning at 7:30 a.m. The computer system **40** automatically sends to the user station **52** at the predetermined time (7:30 a.m., for example) the traffic information collected from the traffic monitoring units **20**. The information could be sent to be displayed, such as in FIG. **3**, or could be sent alternatively in a text or graphical format via e-mail. The traffic report may also be provided in a format specific to the user's geographic region and/or user's driving habits, such as anticipated (potential) route to be traveled. The computer system **40** may also automatically send the traffic information to a display in the user's vehicle in response to some event, such as turning on the vehicle, time, key press, etc.

In another embodiment, the computer system **40** allows a user to calculate the amount of time necessary to travel from one location to another location along the road **12**. The user sends a request to the computer system **40** indicating the two locations along the road along which travel is desired. The user may, for example, indicate on the display by highlighting the two locations on the road **112** using a computer mouse. Alternatively, the two locations may include the user's current location, as determined by a vehicle based GPS system, so that only the destination needs to be entered. The computer system **40** then calculates the anticipated amount of time it will take to travel from one point to the other point based upon the traffic data collected by the various traffic monitors **20** between the two locations. In addition, the system may calculate alternative routes in order to determine the fastest route in view of the traffic information. The computer system **40** then sends a signal back to the user station **52** to indicate the amount of time that the travel from the first to the second location will take. The route determined as the best may be overlaid on a map to assist the user in travel.

In yet another embodiment of the invention, FIG. **7** shows a divided freeway with vehicle traffic flowing in opposite directions in each of the divided sections. Each section of the freeway **12** has multiple lanes **12**A–**12**C. The traffic monitors **20** measure traffic in each of the lanes **12**A–**12**C of each section **12** of the divided freeway. The monitors **20** may measure traffic on only one portion of the divided freeway, or may measure traffic conditions in each of the lanes of each of the sections of the divided freeway. The monitor used to measure traffic in multiple lanes may be a digital video camera.

FIG. **8** shows yet another embodiment of a display **54**, which displays traffic information for each individual lane of the divided freeway shown in FIG. **7**. For example, in display **54**, the traffic conditions in each individual lane **112**A–**112**C is displayed for the road section **112**. By displaying conditions for each particular lane, the system has the advantage of allowing the user to anticipate particular lane problems which may occur ahead, such as a wreck **140** in lane **112**C. In addition, in an alternative embodiment, the display **54** is capable of displaying the individual location of each individual vehicle on the road **112**.

FIG. **4** shows an alternative embodiment of a user station **52**. User station **52** is a mobile unit in a car **60**. User station **52** has transmitting and/or receiving units **64** for communicating with the network **50**. Such transmitting and receiving units **64** may be any devices capable of transmitting digital or analog data, such as, for example, a digital or analog cellular phone.

The user station **52** may also be contained within a car **60** that further includes an associated global positioning system (GPS) receiver **62**. The GPS receiver **62** receives signals from GPS satellites **70** which enable the GPS receiver to determine its location. When a commuter requests traffic information using the mobile user station **52**, the request for traffic information may include the location of the user as determined by the GPS receiver **62**. When the computer system **40** receives this request, it provides traffic information back to the mobile user station **52** based on the location of the car **60** as provided by the GPS receiver **62**. Alternatively, the computer system **40** may provide traffic information to the user station **52** which in combination with the position determined by the GPS receiver **62** displays suitable data to the user on a display or audibly. The user station may also be a cellular phone with an integrated or associated GPS.

FIG. **6** shows a representative display of the traffic information provided by the computer system **40**. The information provided is essentially the same as that shown in FIG. **3**, except that the display **54** contains at **161** the position of the car **60**. The mobile user station **52** provides a significant advantage in that it allows the commuter to immediately determine traffic information in the commuter's immediate vicinity based on the commuter's present location. The commuter does not have to wait for a periodic traffic report. Further, traffic conditions are provided at a plurality of locations, and the information is contemporaneous. Based on the receipt of such information, the commuter may decide to use an alternate route rather than continue on the current freeway.

Thus, in the embodiment shown in FIG. **4**, the system provides the relevant traffic information to the commuter or user on a timely basis. The display may be tailored to provide the information for the current location of the commuter, together with the upcoming traffic that lies ahead.

In a preferred embodiment, the system obtains traffic information from users that have a GPS receiver **62**. In this system, whenever a user station **52** requests traffic information from the computer system **40**, the computer system **40** associates a velocity (speed) of that particular user with its current location. The velocity may be determined through a variety of methods. In one system, when the user requests traffic information, the user station **52** supplies not only its location but also its current velocity. The user station **52** may obtain its current velocity in any fashion. For example, the user station **52** may track its location over time using the GPS receiver **62**, and also keep track of the time associated with each location by using an internal clock. The velocity could then be calculated by simply dividing the difference between respective locations by respective times. Alternatively, the user station **52** may be connected to the vehicle's speedometer or odometer, and measure velocity using information provided by the vehicle **60** itself. Alternatively, the computer system **40** itself could calculate the velocity of each user. In such a system, each user station **52** would provide the computer system **40** with a unique identification code together with its location. The computer system **40** then associates a time using an internal clock with each location reported by each user. Preferably, the GPS location is sent together with the current time at the user station so that delays incurred in transmission do not change the result. The velocity of each user could then be calculated by calculating the difference in location for a particular user (identified by its unique identification code) by the respective times associated with each of these locations.

Position/Location

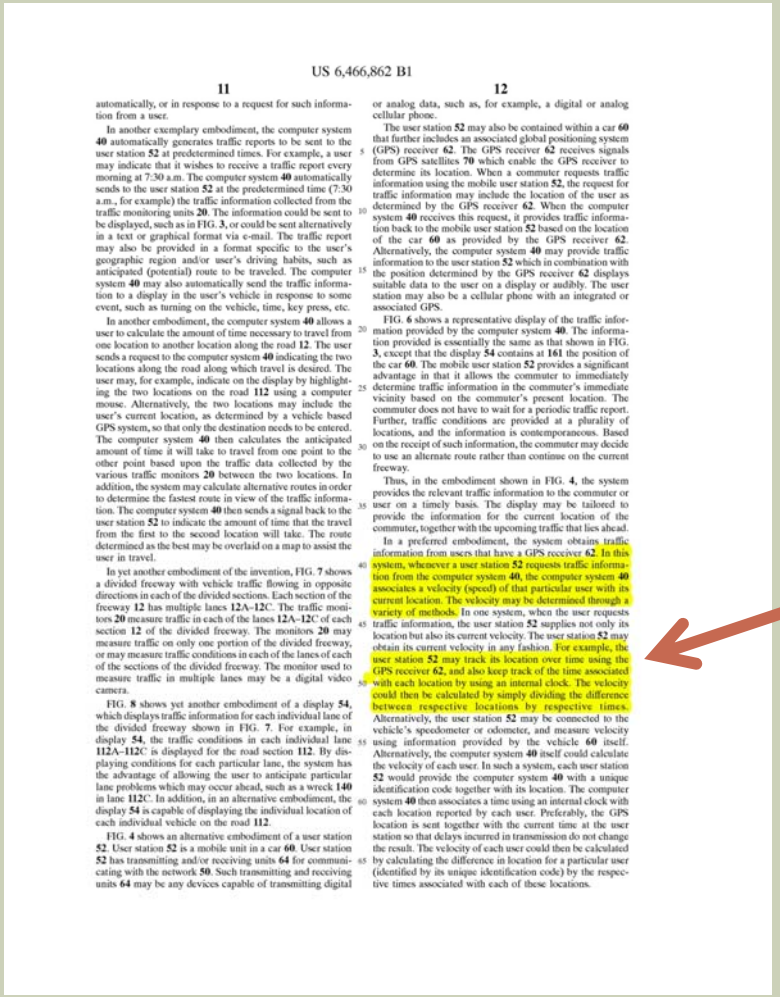
Alternatively, the computer system 40 itself could calculate the velocity of each user. In such a system, each user station 52 would provide the computer system 40 with a unique identification code together with its location. The computer system 40 then associates a time using an internal clock with each location reported by each user. [12:56-61].

VEHICULAR MOVEMENT

Traffic's Claim Construction

"Vehicular Movement" means the velocity, speed, position, and/or change in position of a vehicle.

VEHICULAR MOVEMENT



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automatically, or in response to a request for such information from a user.

In another exemplary embodiment, the computer system **40** automatically generates traffic reports to be sent to the user station **52** at predetermined times. For example, a user may indicate that it wishes to receive a traffic report every morning at 7:30 a.m. The computer system **40** automatically sends to the user station **52** at the predetermined time (7:30 a.m., for example) the traffic information collected from the traffic monitoring units **20**. The information could be sent to be displayed, such as in FIG. **3**, or could be sent alternatively in a text or graphical format via e-mail. The traffic report may also be provided in a format specific to the user's geographic region and/or user's driving habits, such as anticipated (potential) route to be traveled. The computer system **40** may also automatically send the traffic information to a display in the user's vehicle in response to some event, such as turning on the vehicle, time, key press, etc.

In another embodiment, the computer system **40** allows a user to calculate the amount of time necessary to travel from one location to another location along the road **12**. The user sends a request to the computer system **40** indicating the two locations along the road along which travel is desired. The user may, for example, indicate on the display by highlighting the two locations on the road **112** using a computer mouse. Alternatively, the two locations may include the user's current location, as determined by a vehicle based GPS system, so that only the destination needs to be entered. The computer system **40** then calculates the anticipated amount of time it will take to travel from one point to the other point based upon the traffic data collected by the various traffic monitors **20** between the two locations. In addition, the system may calculate alternative routes in order to determine the fastest route in view of the traffic information. The computer system **40** then sends a signal back to the user station **52** to indicate the amount of time that the travel from the first to the second location will take. The route determined as the best may be overlaid on a map to assist the user in travel.

In yet another embodiment of the invention, FIG. **7** shows a divided freeway with vehicle traffic flowing in opposite directions in each of the divided sections. Each section of the freeway **12** has multiple lanes **12**A–**12**C. The traffic monitors **20** measure traffic in each of the lanes **12**A–**12**C of each section **12** of the divided freeway. The monitors **20** may measure traffic on only one portion of the divided freeway, or may measure traffic conditions in each of the lanes of each of the sections of the divided freeway. The monitor used to measure traffic in multiple lanes may be a digital video camera.

FIG. **8** shows yet another embodiment of a display **54**, which displays traffic information for each individual lane of the divided freeway shown in FIG. **7**. For example, in display **54**, the traffic conditions in each individual lane **112**A–**112**C is displayed for the road section **112**. By displaying conditions for each particular lane, the system has the advantage of allowing the user to anticipate particular lane problems which may occur ahead, such as a wreck **140** in lane **112**C. In addition, in an alternative embodiment, the display **54** is capable of displaying the individual location of each individual vehicle on the road **112**.

FIG. **4** shows an alternative embodiment of a user station **52**. User station **52** is a mobile unit in a car **60**. User station **52** has transmitting and/or receiving units **64** for communicating with the network **50**. Such transmitting and receiving units **64** may be any devices capable of transmitting digital or analog data, such as, for example, a digital or analog cellular phone.

The user station **52** may also be contained within a car **60** that further includes an associated global positioning system (GPS) receiver **62**. The GPS receiver **62** receives signals from GPS satellites **70** which enable the GPS receiver to determine its location. When a commuter requests traffic information using the mobile user station **52**, the request for traffic information may include the location of the user as determined by the GPS receiver **62**. When the computer system **40** receives this request, it provides traffic information back to the mobile user station **52** based on the location of the car **60** as provided by the GPS receiver **62**. Alternatively, the computer system **40** may provide traffic information to the user station **52** which in combination with the position determined by the GPS receiver **62** displays suitable data to the user on a display or audibly. The user station may also be a cellular phone with an integrated or associated GPS.

FIG. **6** shows a representative display of the traffic information provided by the computer system **40**. The information provided is essentially the same as that shown in FIG. **3**, except that the display **54** contains at **161** the position of the car **60**. The mobile user station **52** provides a significant advantage in that it allows the commuter to immediately determine traffic information in the commuter's immediate vicinity based on the commuter's present location. The commuter does not have to wait for a periodic traffic report. Further, traffic conditions are provided at a plurality of locations, and the information is contemporaneous. Based on the receipt of such information, the commuter may decide to use an alternate route rather than continue on the current freeway.

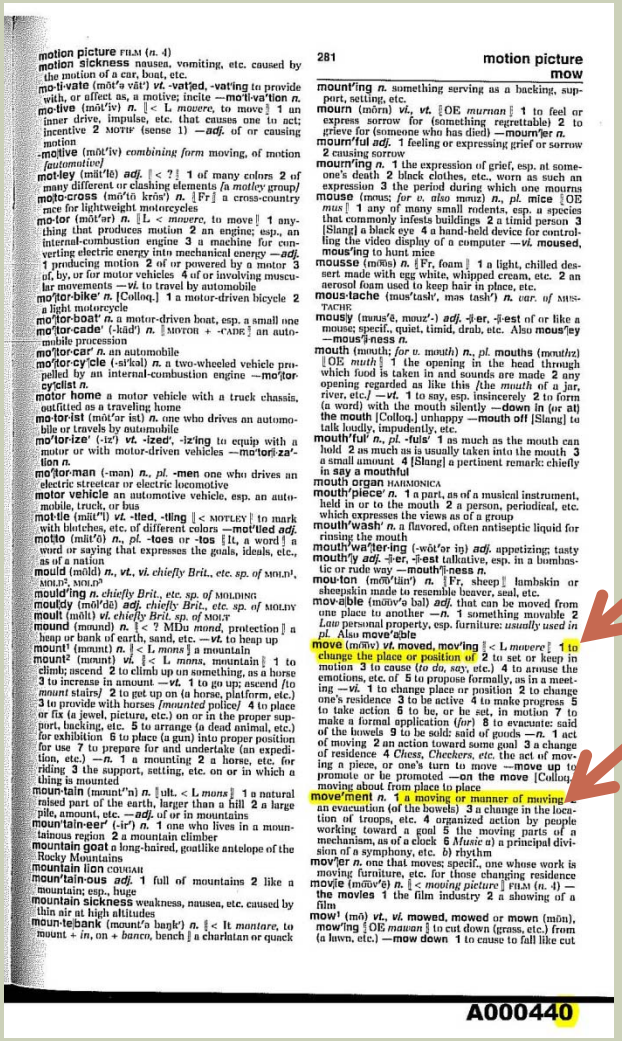
Thus, in the embodiment shown in FIG. **4**, the system provides the relevant traffic information to the commuter or user on a timely basis. The display may be tailored to provide the information for the current location of the commuter, together with the upcoming traffic that lies ahead.

In a preferred embodiment, the system obtains traffic information from users that have a GPS receiver **62**. In this system, whenever a user station **52** requests traffic information from the computer system **40**, the computer system **40** associates a velocity (speed) of that particular user with its current location. The velocity may be determined through a variety of methods. In one system, when the user requests traffic information, the user station **52** supplies not only its location but also its current velocity. The user station **52** may obtain its current velocity in any fashion. For example, the user station **52** may track its location over time using the GPS receiver **62**, and also keep track of the time associated with each location by using an internal clock. The velocity could then be calculated by simply dividing the difference between respective locations by respective times. Alternatively, the user station **52** may be connected to the vehicle's speedometer or odometer, and measure velocity using information provided by the vehicle **60** itself. Alternatively, the computer system **40** itself could calculate the velocity of each user. In such a system, each user station **52** would provide the computer system **40** with a unique identification code together with its location. The computer system **40** then associates a time using an internal clock with each location reported by each user. Preferably, the GPS location is sent together with the current time at the user station so that delays incurred in transmission do not change the result. The velocity of each user could then be calculated by calculating the difference in location for a particular user (identified by its unique identification code) by the respective times associated with each of these locations.

Change in position/location

For example, the user station 52 may track its location over time using the GPS receiver 62, and also keep track of the time associated with each location by using an internal clock. The velocity can then be calculated by simply dividing the difference between respective locations by respective times. [12:47-52].

VEHICULAR MOVEMENT



motion picture FILM (*n.* 4)
motion sickness nausea, vomiting, etc. caused by the motion of a car, boat, etc.
mo·ti·vate (mōt'ə vāt') *vt.* **-vat'ed, -vat'ing** to provide with, or affect as, a motive; incite —**mo'ti·va'tion** *n.*
mo·tive (mōt'iv) *n.* [< L *movere*, to move] **1** an inner drive, impulse, etc. that causes one to act; incentive **2** MOTIF (sense 1) —*adj.* of or causing motion
-motive (mōt'iv) *combining form* moving, of motion *[automotive]*
mot·ley (mät'lē) *adj.* [< ?] **1** of many colors **2** of many different or clashing elements *[a motley group]*
mo·to-cross (mō'tō krôs') *n.* [Fr] a cross-country race for lightweight motorcycles
mo·tor (mōt'ər) *n.* [L < *movere*, to move] **1** anything that produces motion **2** an engine; esp., an internal-combustion engine **3** a machine for converting electric energy into mechanical energy —*adj.* **1** producing motion **2** of or powered by a motor **3** of, by, or for motor vehicles **4** of or involving muscular movements —*vi.* to travel by automobile
mo'tor-bike' *n.* [Colloq.] **1** a motor-driven bicycle **2** a light motorcycle
mo'tor-boat' *n.* a motor-driven boat, esp. a small one
mo'tor-cade' (-kād') *n.* [MOTOR + -CADE] an automobile procession
mo'tor-car' *n.* an automobile
mo'tor-cy'cle (-sī'kəl) *n.* a two-wheeled vehicle propelled by an internal-combustion engine —**mo'tor-cy'clist** *n.*
motor home a motor vehicle with a truck chassis, outfitted as a traveling home
mo·tor·ist (mōt'ər ist) *n.* one who drives an automobile or travels by automobile
mo'tor·ize' (-īz') *vt.* **-ized', -iz'ing** to equip with a motor or with motor-driven vehicles —**mo'tor·i·za'tion** *n.*
mo'tor·man (-man) *n., pl.* **-men** one who drives an electric streetcar or electric locomotive
motor vehicle an automotive vehicle, esp. an automobile, truck, or bus
mot·tle (mät'l) *vt.* **-tled, -tling** [< MOTLEY] to mark with blotches, etc. of different colors —**mot'tled** *adj.*
motto (mät'ō) *n., pl.* **-toes** or **-tos** [It, a word] a word or saying that expresses the goals, ideals, etc., as of a nation
mould (mōld) *n., vt., vi. chiefly Brit., etc. sp. of* MOLD[1], MOLD[2], MOLD[3]
mould'ing *n. chiefly Brit., etc. sp. of* MOLDING
mouldy (mōl'dē) *adj. chiefly Brit., etc. sp. of* MOLDY
moult (mōlt) *vi. chiefly Brit. sp. of* MOLT
mound (mound) *n.* [< ? MDu *mund*, protection] a heap or bank of earth, sand, etc. —*vt.* to heap up
mount[1] (mount) *n.* [< L *mons*] a mountain
mount[2] (mount) *vi.* [< L *mons*, mountain] **1** to climb; ascend **2** to climb up on something, as a horse **3** to increase in amount. —*vt.* **1** to go up; ascend *[to mount stairs]* **2** to get up on (a horse, platform, etc.) **3** to provide with horses *[mounted police]* **4** to place or fix (a jewel, picture, etc.) on or in the proper support, backing, etc. **5** to arrange (a dead animal, etc.) for exhibition **6** to place (a gun) into proper position for use **7** to prepare for and undertake (an expedition, etc.) —*n.* **1** a mounting **2** a horse, etc. for riding **3** the support, setting, etc. on or in which a thing is mounted
moun·tain (mount'n) *n.* [ult. < L *mons*] **1** a natural raised part of the earth, larger than a hill **2** a large pile, amount, etc. —*adj.* of or in mountains
moun'tain-eer' (-ir') *n.* **1** one who lives in a mountainous region **2** a mountain climber
mountain goat a long-haired, goatlike antelope of the Rocky Mountains
mountain lion COUGAR
moun'tain·ous *adj.* **1** full of mountains **2** like a mountain; esp., huge
mountain sickness weakness, nausea, etc. caused by thin air at high altitudes
moun·te·bank (mount'ə bank') *n.* [< It *mantare*, to mount + *in*, on + *banco*, bench] a charlatan or quack

mount'ing *n.* something serving as a backing, support, setting, etc.
mourn (môrn) *vi., vt.* [OE *murnan*] **1** to feel or express sorrow for (something regrettable) **2** to grieve for (someone who has died) —**mourn'er** *n.*
mourn'ful *adj.* **1** feeling or expressing grief or sorrow **2** causing sorrow
mourn'ing *n.* **1** the expression of grief, esp. at someone's death **2** black clothes, etc., worn as such an expression **3** the period during which one mourns
mouse (mous; *for v. also* mouz) *n., pl.* **mice** [OE *mus*] **1** any of many small rodents, esp. a species that commonly infests buildings **2** a timid person **3** [Slang] a black eye **4** a hand-held device for controlling the video display of a computer —*vi.* **moused, mous'ing** to hunt mice
mousse (mo͞os) *n.* [Fr, foam] **1** a light, chilled dessert made with egg white, whipped cream, etc. **2** an aerosol foam used to keep hair in place, etc.
mous·tache (mus'tash', məs tash') *n. var. of* MUSTACHE
mously (mous'ē, mouz'-) *adj.* **-i·er, -i·est** of or like a mouse; specif., quiet, timid, drab, etc. Also **mous'ey** —**mous'i·ness** *n.*
mouth (mouth; *for v.* mouth) *n., pl.* **mouths** (mouthz) [OE *muth*] **1** the opening in the head through which food is taken in and sounds are made **2** any opening regarded as like this *[the mouth of a jar, river, etc.]* —*vt.* **1** to say, esp. insincerely **2** to form (a word) with the mouth silently —**down in (or at) the mouth** [Colloq.] unhappy —**mouth off** [Slang] to talk loudly, impudently, etc.
mouth'ful' *n., pl.* **-fuls'** **1** as much as the mouth can hold **2** as much as is usually taken into the mouth **3** a small amount **4** [Slang] a pertinent remark: chiefly in **say a mouthful**
mouth organ HARMONICA
mouth'piece' *n.* **1** a part, as of a musical instrument, held in or to the mouth **2** a person, periodical, etc. which expresses the views as of a group
mouth'wash' *n.* a flavored, often antiseptic liquid for rinsing the mouth
mouth'wa'ter·ing (-wôt'ər iŋ) *adj.* appetizing; tasty
mouth'y *adj.* **-i·er, -i·est** talkative, esp. in a bombastic or rude way —**mouth'i·ness** *n.*
mou·ton (mo͞o'tän') *n.* [Fr, sheep] lambskin or sheepskin made to resemble beaver, seal, etc.
mov·able (mo͞ov'ə bəl) *adj.* that can be moved from one place to another —*n.* **1** something movable **2** *Law* personal property, esp. furniture: *usually used in pl.* Also **move'a·ble**
move (mo͞ov) *vt.* **moved, mov'ing** [< L *movere*] **1** to change the place or position of **2** to set or keep in motion **3** to cause (*to do, say*, etc.) **4** to arouse the emotions, etc. of **5** to propose formally, as in a meeting —*vi.* **1** to change place or position **2** to change one's residence **3** to be active **4** to make progress **5** to take action **6** to be, or be set, in motion **7** to make a formal application (*for*) **8** to evacuate: said of the bowels **9** to be sold: said of goods —*n.* **1** act of moving **2** an action toward some goal **3** a change of residence **4** *Chess, Checkers, etc.* the act of moving a piece, or one's turn to move —**move up** to promote or be promoted —**on the move** [Colloq.] moving about from place to place
move'ment *n.* **1** a moving or manner of moving **2** an evacuation (of the bowels) **3** a change in the location of troops, etc. **4** organized action by people working toward a goal **5** the moving parts of a mechanism, as of a clock **6** *Music* **a)** a principal division of a symphony, etc. **b)** rhythm
mov'er *n.* one that moves; specif., one whose work is moving furniture, etc. for those changing residence
mov'ie (mo͞ov'ē) *n.* [< *moving picture*] FILM (*n.* 4) —**the movies** **1** the film industry **2** a showing of a film
mow[1] (mō) *vt., vi.* **mowed, mowed** or **mown** (mōn), **mow'ing** [OE *mawan*] to cut down (grass, etc.) from (a lawn, etc.) —**mow down** **1** to cause to fall like cut

A000440

Change in position

Move: to change the place or position of

Movement: moving or manner of moving

Source: Webster's New World Compact School and Office Dictionary (3d Ed. 1995)

VEHICULAR MOVEMENT

Traffic's Claim Construction

"Vehicular Movement" means the velocity, speed, position, and/or change in position of a vehicle.

VEHICULAR MOVEMENT

Google's Construction

The current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors.

Same issues as before

- Should not be limited to "current" data
- Should not be restricted to only "speed, frequency or flow"
- Should not be restricted to "multiple" vehicles

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The Traffic Patents

Claim Terms for Construction

Claims Are Not Indefinite

Chart of the Parties' Claim Constructions

Asserted Claims

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Traffic's Claim Construction

"Displayed Graphically" means information representative of the map database and the traffic information are displayed in a pictorial format, such as a drawing, on the display of the mobile user station. Other information may be displayed, as well.

CLAIM 1 – '862 PATENT

1	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver, remotely located from said transmitter, that receives said signals transmitted by said traffic monitors; and
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station connected to a global positioning system receiver, a display, and a communicating device; and
e.	said computer system, in response to a request for traffic information from one of said mobile user stations, providing in response thereto to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	wherein said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein said computer system has a map database, and said computer system, in response to said request for information, transmits map information representative of a portion of said map database, and said map information representative of said database is displayed graphically together with said traffic information.

CLAIM 21 – '862 PATENT

21	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of mobile user stations, each mobile user station being associated with a display, a global positioning system receiver and a communicating device to allow each of said mobile user stations to send and receive signals;
b.	a computer system interconnected with another communicating device and a network, said computer system being capable of sending and receiving signals to and from said mobile user stations;
c.	said computer system including a map database and a traffic information database, said traffic information database containing data representative of traffic at a plurality of locations;
d.	at least one of said mobile user stations providing a request to said computer system for information together with a respective geographic location of said one of said mobile user stations, and in response thereto, said computer system providing to said one of said mobile user stations information representative of selected portions of said map database and selected portions of said traffic information database based on said respective geographic location of said one of said mobile user stations; and
e.	said one of said mobile user stations displaying graphically on said display information representative of said selected portions of said map database and said selected portions of said traffic information database.

CLAIM 31 – '862 PATENT

31	The system of claim 21 wherein said location of said one of said mobile user stations is displayed graphically.

CLAIM 22 – '606 PATENT

22	A system for providing traffic information to a plurality of mobile users connected to a network, comprising:
a.	a plurality of traffic monitors, each said traffic monitor comprising at least a detector and a transmitter, said detector providing a signal including data representative of vehicular movement and said transmitter transmitting said signals;
b.	a receiver that receives said signals transmitted by said traffic monitors;
c.	a computer system interconnected with said receiver and said network;
d.	a mobile user station includes a display, and a receiving device;
e.	said computer system providing to said one of said mobile user stations traffic information representative of said signals transmitted by said traffic monitors;
f.	said traffic information transmitted by said computer system is displayed graphically on said display; and
g.	wherein less than all available traffic information is displayed by said display.

DISPLAYED GRAPHICALLY

diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***d* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, the user could initially select to view the image generated by the video camera at a first location, and then alternatively the image transmitted by another video camera preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such an exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll so as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In yet another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

In the exemplary display shown in FIG. 3, the portions *114a-114d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road 112. [9:35-41]

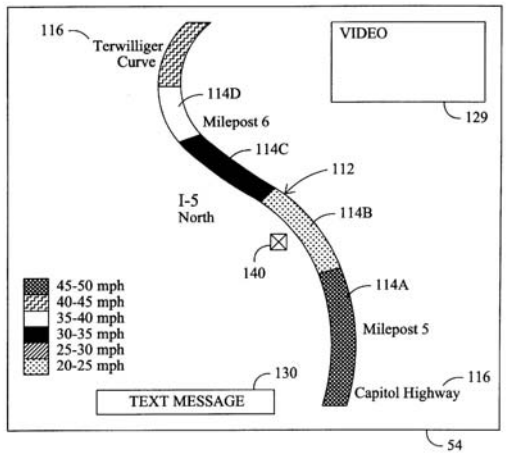

FIG. 3

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9 10

diagnose problems, and otherwise provide input to traffic monitor **20** to facilitate collection of traffic data. For example, the video camera **29** could be remotely positioned to view a traffic lane of interest.

Traffic information may be provided to users in any suitable manner, such as the examples that follow. A user station **52** is connected to the network **50**. Preferably, the user station **52** includes a graphic display unit **54** (see FIG. **3**). For example, the user station **52** may be a standard personal computer with a display monitor **54**. The network **50** is preferably the Internet. However, the network **50** could also be a local area network or any other type of closed or open network, or could also be the telephone network. The user station **52** sends a signal over the network **50** to the computer system **40** requesting traffic information. In response to receiving a request from the user station **52**, the computer system **40** transmits traffic information representative of the traffic information collected by the various traffic monitors **20** to the requesting user station **52**. The computer system **40** may transmit average speeds detected by each of the traffic monitors **20** at each of their respective locations. The traffic information may be presented to the user as a web page. The computer system may send traffic information corresponding to only some of the traffic monitors. The user may select which portions of the road **12** are of interest, and the computer system **40** may transmit traffic information corresponding to that portion of the road **12**.

FIG. **3** shows an exemplary display **54** displaying the traffic information provided by the computer system **40**. The computer system **40** provides data from its memory which is representative of the road **12**, such as data from a map database, which is displayed as a road **112** on the display **54**. The computer system **40** also provides traffic information collected by each, or a selected set, of the respective traffic monitors **20** which is displayed in portions **114***a*–**114***d* and/or the traffic information derived from individual mobile user stations having a global positioning system locator as described in detail below. In the exemplary display shown in FIG. **3**, the portions **114***a*–**114***d* display different colors or patterns representative of average vehicle speeds (for example, in miles per hour) along different portions of the road **112**. Of course, the display may display other types of information, such as traffic flow (vehicles per second) or vehicle frequency. The display **54** may include information in either graphical or text format to indicate the portion of the road displayed, such as location of milepost markers or place names **116**.

While the display **54** shows one format for displaying the information, other formats for presenting the information may likewise be used, as desired. It is not necessary to provide a graphical representation of the road **12**. Instead, information could be provided in a textual manner, such as, for example, mile post locations for each of the traffic monitors **20** and presenting textual traffic information for each location.

Thus, the system may operate as follows. The traffic monitors **20** detect or otherwise sense traffic to provide traffic information. The traffic monitors **20** may detect or otherwise calculate vehicle speed, average vehicle speed, traffic flow, vehicle frequency, or other data representative of the traffic. The traffic monitors **20** may sample either continuously, or may sample at intervals to conserve power. The transmitter **26** transmits the signals provided by the traffic monitors **20** to the receiver **30** either continuously or at intervals. Such signals may be either transmitted directly to the receiver **30**, or may be transmitted through other traffic monitors **20**. The receiver **30** receives the signals received by the various traffic monitors **20** and passes these signals to the computer system **40**. The computer system **40** receives the data from the traffic monitors **20**. The computer system may calculate or process the traffic information for the users, as necessary. It is not necessary for the traffic monitors **20** to calculate traffic data, if desired. In response to a request from a user station **52**, the computer system **40** provides the traffic information over the network **50** to the user station **52**.

The system **10** has many advantages. It allows a user to receive contemporaneous traffic information from a plurality of locations. It allows the user to obtain immediate information rather than waiting for the broadcast of information at specified times. Further, the amount of information provided by the system is far superior to that provided by any other traffic reporting system. A user can obtain immediate and contemporaneous traffic conditions, such as average vehicular speed, traffic flow, or vehicle frequency, for a plurality of locations along a road. Where traffic monitors are provided along several different roads, a commuter may then select among the various alternative routes, depending on the traffic conditions for each road. The system also does not rely on the manual input of information, and thus provides information more accurately and more quickly. It also eliminates subjective descriptions of traffic information by providing measured data representative of traffic conditions.

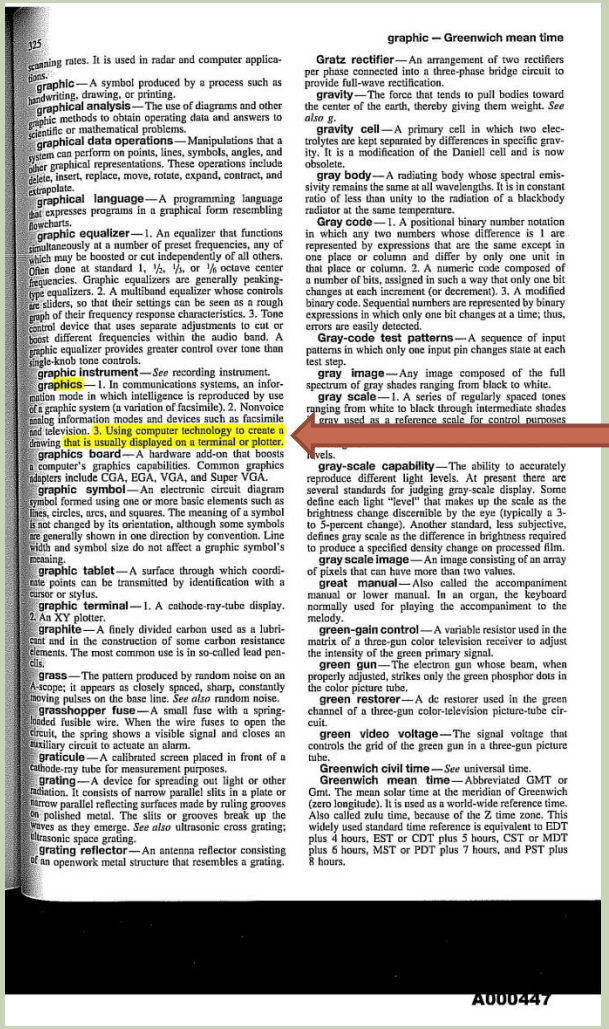
In one embodiment, the computer system **40** also receives the signals generated by the video cameras **29** at the respective traffic monitors **20**. FIG. **3** shows an exemplary display **54** in which a video image **129** is provided. In this embodiment, the user may select from which traffic monitoring unit **20** the video image **129** is to be received from. For example, a user could initially select to view the image generated by the video camera at a first location, and then later view the image transmitted by another video camera **29**, preferably at another traffic monitor **20**, at a different location.

The system **10** preferably further includes the ability to send messages about road conditions. FIG. **3** shows such an exemplary message **130** in text format. The computer system **40** is capable of storing data messages and transmitting the data messages with the traffic information. The data messages would indicate items of particular interest to the commuter. For example, the text message **130** could indicate that there was an accident at a particular location or milepost, that construction was occurring at another location or milepost, or that highway conditions were particularly severe and that alternative routes should be selected. The system **10** could provide multiple messages through which the user could scroll so as to receive different messages in addition to the traffic information received from the various traffic monitors **20**. In another embodiment, the user station **52** includes a voice synthesizer capable of reading the messages to the user.

In yet another embodiment, the system **10** may also provide additional graphical information relating to traffic conditions. For example, the computer system **40** could transmit the location of an accident or construction site along the road **12**. The information would be displayed on display **54** as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at **140** in FIG. **3**. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. In such a system, the computer system would contain or be linked to a database containing such information. The information could be displayed

In yet another embodiment, the system 10 may also provide additional graphical information relating to traffic conditions. For example, the computer system 40 could transmit the location of an accident or construction site along the road 12. The information would be displayed on display 54 as an icon or other symbol at the location indicating the presence of an accident or highway construction. Such an icon is shown at 140 in FIG. 3. Alternatively, the computer system could also display an icon representative of a restaurant, gas station, hospital, rest area, or roadside attraction. [10:55-65]

DISPLAYED GRAPHICALLY



325 graphic — Greenwich mean time

scanning rates. It is used in radar and computer applications.

graphic—A symbol produced by a process such as handwriting, drawing, or printing.

graphical analysis—The use of diagrams and other graphic methods to obtain operating data and answers to scientific or mathematical problems.

graphical data operations—Manipulations that a system can perform on points, lines, symbols, angles, and other graphical representations. These operations include delete, insert, replace, move, rotate, expand, contract, and extrapolate.

graphical language—A programming language that expresses programs in a graphical form resembling flowcharts.

graphic equalizer—1. An equalizer that functions simultaneously at a number of preset frequencies, any of which may be boosted or cut independently of all others. Often done at standard 1, ½, ⅓, or ⅙ octave center frequencies. Graphic equalizers are generally peaking-type equalizers. 2. A multiband equalizer whose controls are sliders, so that their settings can be seen as a rough graph of their frequency response characteristics. 3. Tone control device that uses separate adjustments to cut or boost different frequencies within the audio band. A graphic equalizer provides greater control over tone than single-knob tone controls.

graphic instrument—*See* recording instrument.

graphics—1. In communications systems, an information mode in which intelligence is reproduced by use of a graphic system (a variation of facsimile). 2. Nonvoice analog information modes and devices such as facsimile and television. 3. Using computer technology to create a drawing that is usually displayed on a terminal or plotter.

graphics board—A hardware add-on that boosts a computer's graphics capabilities. Common graphics adapters include CGA, EGA, VGA, and Super VGA.

graphic symbol—An electronic circuit diagram symbol formed using one or more basic elements such as lines, circles, arcs, and squares. The meaning of a symbol is not changed by its orientation, although some symbols are generally shown in one direction by convention. Line width and symbol size do not affect a graphic symbol's meaning.

graphic tablet—A surface through which coordinate points can be transmitted by identification with a cursor or stylus.

graphic terminal—1. A cathode-ray-tube display. 2. An XY plotter.

graphite—A finely divided carbon used as a lubricant and in the construction of some carbon resistance elements. The most common use is in so-called lead pencils.

grass—The pattern produced by random noise on an A-scope; it appears as closely spaced, sharp, constantly moving pulses on the base line. *See also* random noise.

grasshopper fuse—A small fuse with a spring-loaded fusible wire. When the wire fuses to open the circuit, the spring shows a visible signal and closes an auxiliary circuit to actuate an alarm.

graticule—A calibrated screen placed in front of a cathode-ray tube for measurement purposes.

grating—A device for spreading out light or other radiation. It consists of narrow parallel slits in a plate or narrow parallel reflecting surfaces made by ruling grooves on polished metal. The slits or grooves break up the waves as they emerge. *See also* ultrasonic cross grating; ultrasonic space grating.

grating reflector—An antenna reflector consisting of an openwork metal structure that resembles a grating.

Gratz rectifier—An arrangement of two rectifiers per phase connected into a three-phase bridge circuit to provide full-wave rectification.

gravity—The force that tends to pull bodies toward the center of the earth, thereby giving them weight. *See also g.*

gravity cell—A primary cell in which two electrolytes are kept separated by differences in specific gravity. It is a modification of the Daniell cell and is now obsolete.

gray body—A radiating body whose spectral emissivity remains the same at all wavelengths. It is in constant ratio of less than unity to the radiation of a blackbody radiator at the same temperature.

Gray code—1. A positional binary number notation in which any two numbers whose difference is 1 are represented by expressions that are the same except in one place or column and differ by only one unit in that place or column. 2. A numeric code composed of a number of bits, assigned in such a way that only one bit changes at each increment (or decrement). 3. A modified binary code. Sequential numbers are represented by binary expressions in which only one bit changes at a time; thus, errors are easily detected.

Gray-code test patterns—A sequence of input patterns in which only one input pin changes state at each test step.

gray image—Any image composed of the full spectrum of gray shades ranging from black to white.

gray scale—1. A series of regularly spaced tones ranging from white to black through intermediate shades of gray used as a reference scale for control purposes [illegible] levels.

gray-scale capability—The ability to accurately reproduce different light levels. At present there are several standards for judging gray-scale display. Some define each light "level" that makes up the scale as the brightness change discernible by the eye (typically a 3- to 5-percent change). Another standard, less subjective, defines gray scale as the difference in brightness required to produce a specified density change on processed film.

gray scale image—An image consisting of an array of pixels that can have more than two values.

great manual—Also called the accompaniment manual or lower manual. In an organ, the keyboard normally used for playing the accompaniment to the melody.

green-gain control—A variable resistor used in the matrix of a three-gun color television receiver to adjust the intensity of the green primary signal.

green gun—The electron gun whose beam, when properly adjusted, strikes only the green phosphor dots in the color picture tube.

green restorer—A dc restorer used in the green channel of a three-gun color-television picture-tube circuit.

green video voltage—The signal voltage that controls the grid of the green gun in a three-gun picture tube.

Greenwich civil time—*See* universal time.

Greenwich mean time—Abbreviated GMT or Gmt. The mean solar time at the meridian of Greenwich (zero longitude). It is used as a world-wide reference time. Also called zulu time, because of the Z time zone. This widely used standard time reference is equivalent to EDT plus 4 hours, EST or CDT plus 5 hours, CST or MDT plus 6 hours, MST or PDT plus 7 hours, and PST plus 8 hours.

A000447

Graphics: "using computer technology to create a drawing that is usually displayed on a terminal or plotter".

Source: The Modern Dictionary of Electronics (7th Ed. 1999)

DISPLAYED GRAPHICALLY

Traffic's Construction

Information representative of the map database and the traffic information are displayed in a pictorial format, such as a drawing, on the display of the mobile user station. Other information may be displayed, as well.

Google's Construction

Represented other than in text format.

DISPLAYED GRAPHICALLY

Google's Construction

- Represented other than in text format.

- Says nothing about what "graphically" is
- Improperly attempts to define it by what it is not

THE CLAIMS ARE NOT INDEFINITE

- Statutory presumption of validity – 35 U.S.C.§ 282
- Heavy Burden – "clear and convincing evidence"
- Must show one of ordinary skill in the art would not understand claim scope
- Standard is only met where "an accused infringer shows by clear and convincing evidence that a skilled artisan could not discern the boundaries of the claim based on the claim language, the specification, and the prosecution history, as well as her knowledge of the relevant art area." *Halliburton Energy Services, Inc. v. M-I LLC*, 514 F.3d 1244, 1249-50 (Fed. Cir. 2008).
- Must meet an "exacting standard"
- Not indefinite even if "formidable task to understand a claim"
- Only claims that are not amenable to construction or insolubly ambiguous are indefinite
- Belied by Google's ability to construe the terms

THE CLAIMS ARE NOT INDEFINITE

- Traffic Information
- Less than all available
- Traffic information representative of …
- Information representative of …

THE ASSERTED CLAIMS

- The '862 Patent
  - Claim 1
  - Claim 4
  - Claim 10
  - Claim 21
  - Claim 22
  - Claim 23
  - Claim 25
  - Claim 31
  - Claim 32
- The '606 Patent
  - Claim 22

CLAIM 4 – '862 PATENT

4	The system of claim 1 wherein said traffic detector detects vehicular speed.

CLAIM 10 – '862 PATENT

10	**The system of claim 1 wherein said computer system selects said traffic information to provide to said mobile user station based on a signal received from said global positioning system receiver.**

CLAIM 22 – '862 PATENT

22	**The system of claim 21 wherein said computer system is connected to a plurality of traffic monitors, and said traffic information database contains data derived from said traffic monitors.**

CLAIM 23 – '862 PATENT

23	The system of claim 22 wherein said computer system updates said traffic information database based on data received from said mobile user stations.

CLAIM 25 – '862 PATENT

25	The system of claim 21 wherein said computer system updates said traffic information database based on data received from said mobile user stations.

CLAIM 31 – '862 PATENT

31	The system of claim 21 wherein said location of said one of said mobile user stations is displayed graphically.

CLAIM 32 – '862 PATENT

32	The system of claim 31 wherein said displayed location of said one of said mobile user stations changes based on movement of said mobile user station.

CHART OF THE PARTIES' CLAIM CONSTRUCTIONS 1-5

No.	Claim Phrase	Traffic's Construction	Google's Construction
1	Computer System	a computer or computers that receive data representative of vehicular movement from the traffic monitors and send traffic information representative of said signals transmitted by said traffic monitors to the mobile user stations by way of the network.	No construction necessary
2	Data representative of traffic	No construction necessary; alternatively, traffic information.	Indefinite; alternatively, the current speed, frequency, or flow of multiple vehicles traveling along a road
3	Displayed/displaying graphically	Information representative of the map database and the traffic information are displayed in a pictorial format, such as a drawing, on the display of the mobile user station. Other information may be displayed, as well.	Represented other than in text format
4	Information representative of…selected portions of said traffic information database	"information representative of selected portions of said map database and selected portions of said traffic information database" means that certain data from the map database and certain data from the traffic information database are transmitted to the mobile user station.	Indefinite in identification of selecting entity (i.e. user or system) and kind of information selected; alternatively, the current speed, frequency, or flow of multiple vehicles traveling along a road as detected by the traffic monitors, a subset of which is selected by the commuter
5	interconnected	The computer system facilitates the continuous or periodic movement of data from the receiver to the network.	No construction necessary

CHART OF THE PARTIES' CLAIM CONSTRUCTIONS 6-10

No.	Claim Phrase	Traffic's Construction	Google's Construction
6	Less than all available traffic information	The computer system may send traffic information corresponding to only some of the traffic monitors	Indefinite in degree (i.e. amount of information) and kind of information
7	Map database	A collection of map data representative of, but not limited to, roads, streets, highways, latitude and longitude information	No construction necessary
8	Mobile user station	An easily moving or movable device that can transmit data to and/or receive data from the network; it may be a cellular phone or other handheld unit, or may be installed within a car	A mobile device, distinct from a traffic monitor, capable of determining and displaying traffic information
9	Providing..in response to/thereto	"in response to" means that the computer system, rather than only arbitrarily sending traffic information representative of said signals transmitted by said traffic monitors, is capable of sending traffic information representative of said signals transmitted by said traffic monitors to a mobile user station as a result of the mobile user station sending a request for traffic information to the computer system; "providing to said one of said mobile user stations" does not need a construction. However, if one is required, "providing to said one of said mobile user stations" means that the computer system supplies data to the mobile user	In response to a commuter's request, providing relevant traffic information for display by the mobile user station to minimize manipulation by the commuter while driving, the request and the response must occur simultaneously
10	Said user	No construction necessary; alternatively, said mobile user station of claim 1.	Indefinite; alternatively, a person who operates a mobile user station

CHART OF THE PARTIES' CLAIM CONSTRUCTIONS 11-15

No.	Claim Phrase	Traffic's Construction	Google's Construction
11	Traffic information	"traffic information" means data regarding traffic conditions, which data can include, but is not limited to, the speed, velocity, motion, density, flow, frequency of vehicles on a road, and/or other data representative of the movement of vehicles on a road.	"Traffic information" should be construed in the context of "traffic information representative of said signals transmitted by said traffic monitors;" if considered separately, the term is indefinite, alternatively it is the current speed, frequency or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors
12	Traffic information representative of said signals transmitted by said traffic monitors	No construction necessary; alternatively, "traffic information," as previously defined	Indefinite; alternatively, the current speed, frequency, or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors
13	Traffic information database	A collection of traffic information	The term should be construed as part of the larger a collection of traffic information. phrase "traffic information database containing data representative of traffic" and consistent with Google's definition of "data representative of traffic."
14	Traffic monitors	Any device used to sense, measure, detect, and/or determine vehicular movement and transmit and/or provide a signal representative of vehicular movement	A stationary device capable of determining the current speed, frequency, or flow of multiple vehicles traveling along a road
15	Vehicular movement	the velocity, speed, position, and/or change in position of a vehicle	The current speed, frequency, or flow of multiple vehicles traveling along a road as detected by one or more traffic monitors