(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 001 385 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.05.2000 Bulletin 2000/20

(51) Int Cl.[7]: **G07C 5/00**

(21) Application number: **99120859.6**

(22) Date of filing: **26.10.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **12.11.1998 US 190320**

(71) Applicant: **Meritor Heavy Vehicle Systems, LLC**
Troy, MI 48084 (US)

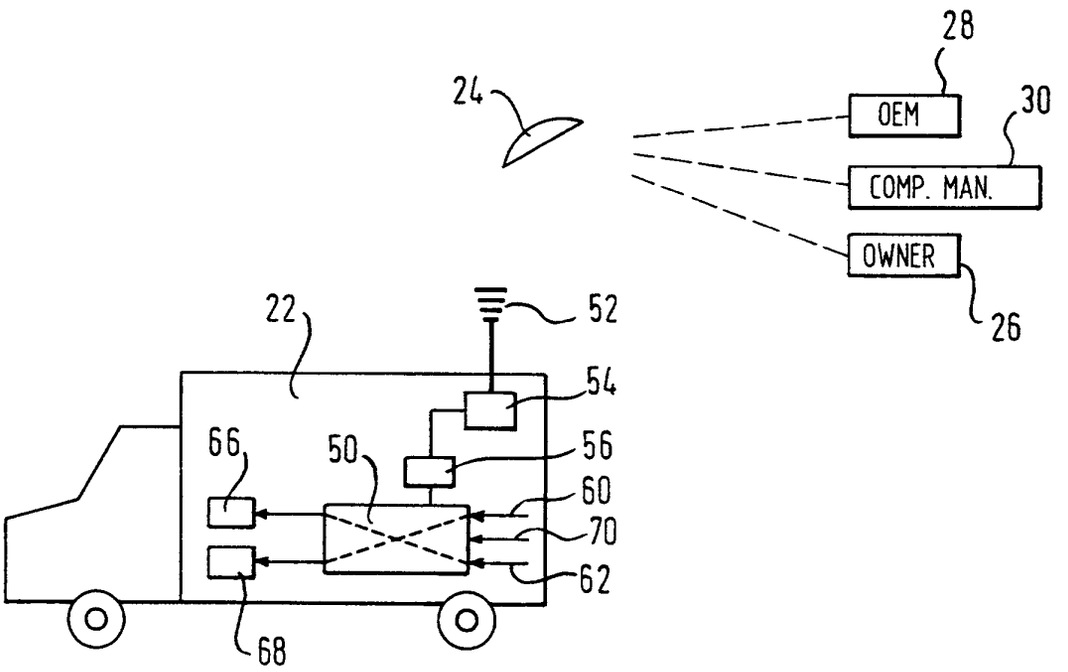
(72) Inventor: **Kyrtsos, Christos**
Southfield, MI 48076 (US)

(74) Representative: **Sties, Jochen, Dipl.-Ing.**
Prinz & Partner
Patentanwälte
Manzingerweg 7
81241 München (DE)

(54) On the fly satellite communication

(57) A satellite communication system communicates a vehicle to a number of entities. As examples, the communication system will communicate diagnostic information from the vehicle to manufacturers, including the vehicle manufacturer, component manufacturers, and the vehicle owner. The diagnostic information could include, as an example only, information from an accelerometer with regard to the vehicle having traveled over large bumps. If this information is communicated to an axle manufacturer, the axle manufacturer can use the information to question warranty returns on the particular vehicle. Further, the entities can communicate with the vehicle to upload computer information.

Fig. 3



EP 1 001 385 A2

Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to a method of communicating from a vehicle to several entities through a satellite connection.

[0002] With the advent of satellite communications, vehicles on the road communicate with their owners to provide information. As an example, a truck may communicate its fuel level, etc. to the fleet owner such that the fleet owner is able to calculate mileage, or other economic aspects of the use of the truck. Further, items such as speed, may also be transmitted to the fleet owner.

[0003] On the other hand, diagnostic information has typically not been communicated to the fleet owner. Such information would include information with regard to the way the truck has been operated, and could provide the fleet owner with information as to unsafe operation.

[0004] Further, the vehicle manufacturers, or component manufacturers, are often presented with damaged parts or vehicles for warranty return. In many cases, those parts may have been damaged through unsafe use of the vehicle or other reasons of no fault of the manufacturer. To date, the manufacturers or component manufacturers have not been able to monitor the operation of the vehicle to identify such unsafe operation.

SUMMARY OF THE INVENTION

[0005] In a disclosed embodiment of this invention, a vehicle on the road communicates diagnostic information through a satellite communication system to several entities. As an example, information with regard to the operation of the vehicle may be transmitted over satellite communication to the vehicle owner, the vehicle manufacturer, or component manufacturers.

[0006] As one example, the vehicle may be equipped with an accelerometer which would determine when the vehicle has traveled over an unusually large bump. If this information is communicated to the component manufacturer, the component manufacturer would have a record of the incident. Preferable, the signal transmitted from the vehicle would be encoded to identify the particular vehicle associated with the information being sent to the component manufacturer.

[0007] If the vehicle component is later presented to the manufacturer for warranty return, the subcomponent manufacturer will be able to question the propriety of the warranty return based upon the incident recorded through the satellite communication. Other examples might be communication of information to the component manufacturer with regard to braking intensity as an indication of why there may have been unusual wear on a braking system. Of course, the types of diagnostic information are endless, and it is the concept of the communication of that information which is the inventive aspect of this invention.

[0008] In addition, the vehicle manufacturers or component manufacturers can communicate to the vehicle to update the code, computer programs or aplets being utilized for the diagnostic systems. Known technology allows the provision of encoded software to the vehicle which would communicate to a computer on the vehicle that it should update its code. The manufacturer would then have the updated code follow the encoded signal.

[0009] These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWING

[0010] Figure 1 is a schematic view of one system incorporating the present invention.

[0011] Figure 2 is a basic flow chart.

[0012] Figure 3 shows another feature.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0013] Figure 1 shows a system 20 incorporating the present invention, and having a vehicle 22 communicating through a satellite 24 to the fleet owner 26, the vehicle manufacturer 28, and a component manufacturer 30. The component manufacturer box 30 could actually be a number of different manufacturers each receiving information, if different manufacturers manufactured the brakes, axles, etc.

[0014] The vehicle is equipped with an antenna transmitter 32 for sending and receiving information through the satellite 24. The computer 34 on the vehicle communicates signals to and from the antenna/transmitter 32.

[0015] An accelerometer 36 is shown schematically associated with one axle on the vehicle 22. The method of this invention will be described with regard to the operation of this accelerometer 36. It should be understood that any type of diagnostic information, including information with regard to the brakes, the engine, etc. could be incorporated into this invention. This invention is not concerned with how different information can be utilized for diagnostic purposes; rather, it is concerned with the communication of diagnostic information once it has been gathered.

[0016] As shown in Figure 2, a flow chart for this method could be described as operating the vehicle and gathering diagnostic information such as through the accelerometer 36. The accelerometer 36 is useful to determine when an axle has taken a large vibration such as going over a large bump. Other types of diagnostic information could include the force applied to the brakes on any particular actuation, racing the engine, etc. This diagnostic information is transmitted and captured by

any one of entities 26, 28 or 30. The entities store the information, and then utilize that information.

[0017] As one example, should the accelerometer 38 indicate that the vehicle 22 has been frequently driven over large bumps, the axle manufacturer may store that information. Now, when the owner of the vehicle attempts to return the axle as having been defective, the axle manufacturer 30 will be able to utilize that information to show the owner of the vehicle 22 that perhaps the axle was not defective.

[0018] In addition, once satellite communication to supply diagnostic information to and from the vehicle is developed, much more complex computing can be done on information gathered at the vehicle. As an example, very complex computing can be applied to data gathered at the vehicle. This complex programming (*e.g.* fuzzy logic) is very powerful in providing information about what the sensed data might mean. However, the vehicle owners have been reluctant to invest in the cost of the expensive computers on each vehicle which would be necessary for processing the information. With the present invention, the data can be uplinked to a computer at the component or vehicle manufacturer who can then perform the computing by a single computer for an entire fleet of vehicles. This thus makes practically available much higher level processing of gathered diagnostic data.

[0019] The communications from the vehicle to the entities are coded such that the entities will be able to determine the particular vehicle, such as by the vehicle information number.

[0020] In addition, any one of entities 26, 28 and 30 can communicate with the computer 34 on the vehicle through the satellite 24 to update the computer code. The concept of encoded signals to actuate the computer 34 to accept new software is known. This system will utilize such computer technology to allow the computer 34 to be updated to accept and utilize new types of diagnostic information gathering.

[0021] Figure 3 shows another feature wherein the satellite 24 communicates to the vehicle 22 and the manufacturer 28, 30 or owner 26 to provide the ability to modify hardware at the vehicle. As an example, a logic cell array 50 may be incorporated into the vehicle. Logic cell arrays are known and are utilized to provide a plurality of reconfigurable paths between various inputs and outputs. The paths are reconfigured by the simple application of software instructions. Logic cell array technology is known. However, once the logic cell or ray technology 50 has been incorporated into the vehicle, instructions can pass from the satellite 24 into a satellite link 52, microprocessor 54, and used in combination with code 56 to reconfigure the logic cell arrays.

[0022] This would allow the manufacturer or owner 26, 28, 30 to modify the logic cell array to address specific problems. As an example, if there is a connection or sensor problem with the current status of the logic cell array, an instruction can be uplinked to reconfigure the logic cell array to bypass the problem. Again, the technology for bypassing a problem with a logic cell array is known. It is the use of the satellite link to actuate the bypass which is inventive here.

[0023] As shown in Figure 3, the logic cell array 50 might take an input 60 from its sensor and a second input 62 from some other source. The logic cell arrays may then transmit those inputs to outputs such as microprocessor 66 or some other input or output 68. The other logic cell array may also take another input 70 which could be from a redundant sensor. If the sensor 60 fails, the logic cell array can be reconfigured through the satellite link to utilize information from the sensor 70. This is one example only, and this technology will provide powerful benefits to the maintenance of fleets. This would allow the fixing of a problem at a vehicle, without the requirement of a maintenance person travelling to the vehicle.

[0024] Finally, once the sensor or diagnostic data is uplinked to the manufacturers 28 or 30, that information can then be used to model the real world faced by the components in the field. This will allow the manufacturer to better design the components.

[0025] A preferred embodiment of this invention has been disclosed; however, a worker of ordinary skill in the art would recognize that certain modifications come within the scope of this invention. For that reason the following claims should be studied to determine the true scope and content of this invention.

Claims

1. A method of communicating information comprising:

   gathering diagnostic information with regard to the operation of a vehicle on the vehicle;
   transmitting said gathered information through a satellite link to a remote entity.

2. A method as recited in Claim 1, wherein said remote entity includes a manufacturer of at least a portion of the vehicle.

3. A method as recited in Claim 2, wherein said entity is a component manufacture.

4. A method as recited in Claim 2, wherein said entity is the vehicle manufacturer.

5. A method as recited in Claim 2, wherein said information is utilized in connection with warranty claims by said manufacturer.

6. A method as recited in Claim 1, wherein said diagnostic information relates to a potential damage on at least a vehicle component.

7. A method as recited in Claim 1, wherein said entities can communicate with said vehicle to update computer code on a computer mounted on said vehicle.

8. A method as recited in Claim 7, wherein the computer code updates are utilized to reconfigure a control on the vehicle.

9. A method as recited in Claim 1, wherein said transmitted gathered information is used in combination with a complex computer program at the remote entity.

Fig. 1

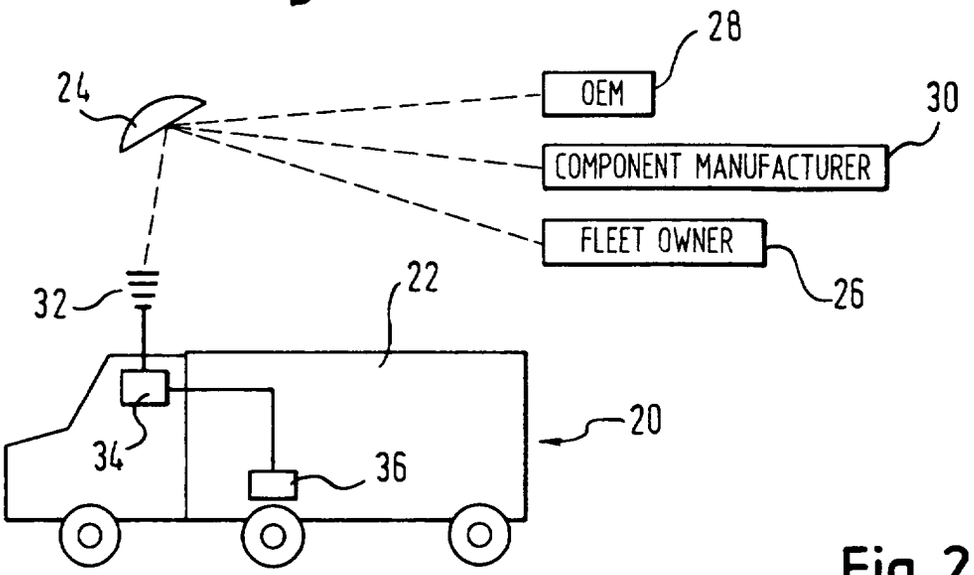

28
24
OEM
30
COMPONENT MANUFACTURER
FLEET OWNER
26
32
22
20
34
36

Fig. 2

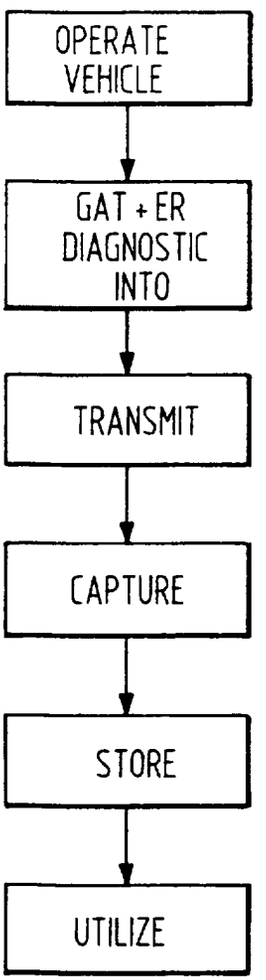

OPERATE VEHICLE
GAT + ER DIAGNOSTIC INTO
TRANSMIT
CAPTURE
STORE
UTILIZE

Fig. 3