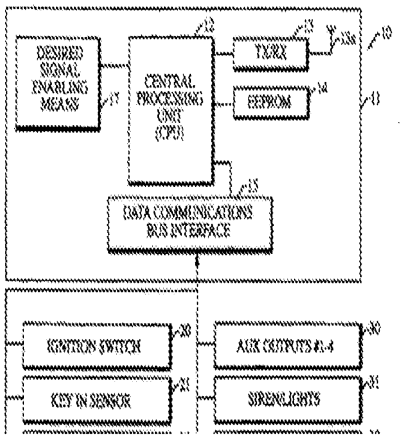
| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| **1A**<br>A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible tracking unit comprising: | The Flick '551 patent discloses a multi-vehicle compatible tracking unit for a vehicle that includes a vehicle data bus extending throughout the vehicle. *See* Abstract (*e.g.*, "A **vehicle security system** includes a vehicle security sensor and associated sensor bus interface…The vehicle security system is for a vehicle of a type including **a data communications bus connecting a plurality of vehicle devices**…The desired signal enabling circuit may preferably include a memory for storing a plurality of respective sets of **signals for different vehicles, and a selecting circuit for selecting the desired set of signals from the plurality of different sets of signals for different vehicles**.").<br><br>With respect to "multi-vehicle compatible," see 1E below. |
| **1B**<br>a vehicle position determining device; | Vehicle position determining devices, such as GPS, were well known in the art of vehicle security at the time of the filing of the Flick '278 patent application. For example, the Patent Office has already observed that vehicle position determining devices were well known in the art of vehicle security in the prosecution of the Flick '278 patent. *See* '278 patent prosecution history, Office Action dated 01/05/2011, page 2, citing to U.S. Patent No. 6,253,064 to Monroe ("Monroe") at Fig. 4a-4b and U.S. Patent No. 5,940,007 to Brinkmeyer et al. ("Brinkmeyer") at 5:6-16 (stating "…vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the Global Positioning System").<br><br>Additionally, the Patent Office determined that vehicle position determining devices were well known in the art of vehicle security in the earlier prosecution of the Flick '551 patent. *See* Flick '551 patent prosecution history, List of References Cited by Examiner dated June 10, 1997, citing U.S. Patent No. 5,081,667 to Drori et al. ("Drori") at 4:44-48 ("Inputs from a **conventional vehicle security system 13**, from a host vehicle (not shown), and from **a global positioning tracker** (not shown) are received by the system controller 20 via level conversion and filtering circuits 36.") (emphasis added).<br><br>Other prior art references not previously considered by the Patent Office also demonstrate that vehicle position determining devices, such as GPS, were well known in the art of vehicle security and tracking, even detailing the significant dollar valuation of the entire industry well prior to the filing of both the Flick '278 and Flick '551 patent applications.<br><br>For example, the Space Daily Trimble article announces the partnership of the Trimble GPS technology with the Microsoft Auto PC platform at the Consumer Electronics Show (CES) in January 1998. *Trimble Microsoft Launch GPS System for Car PC*, available at http://www.spacedaily.com/news/gps-98a.html (published Jan. 8, 1998, last visited June 25, 2019). Microsoft's Auto PC platform is a mobile computing environment that is extended to consumer vehicles and incorporated by automotive manufacturers. *Id.* In particular, the Space Daily Trimble article provides industry estimates on the high value of GPS navigation in vehicles, stating that "[a]ccording to the U.S. GPS Industry Council, car navigation will grow from $310 million in 1995 to $3 billion by 2000. The Council estimates that the GPS industry as a whole will grow to over $8 billion by the year 2000." *Id.* |

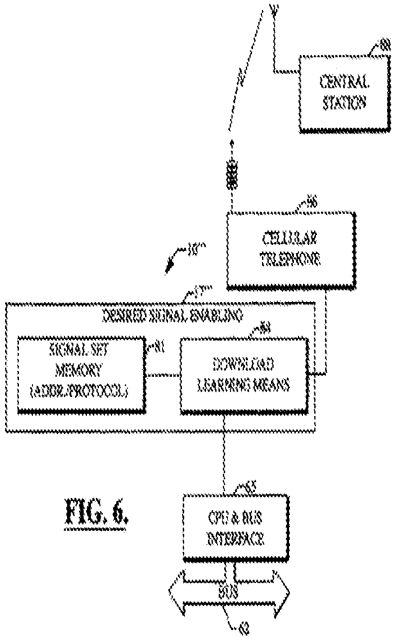
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| | The Mateja article details the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992. Jim Mateja, *Travetek Makes Mission Possible*, CHICAGO TRIBUNE, available at https://www.chicagotribune.com/news/ct-xpm-1992-04-12-9202020707-story.html (published April 12, 1992, last visited June 25, 2019).<br><br>The Holusha article details the launch of the Oldsmobile Guidestar system in late 1994 and early 1995 which uses satellites (of the Global Positioning System) to determine a car's location. John Holusha, *DRIVING SMART; Lost in Yonkers? An Olds Option Could Be a Guide*, THE NEW YORK TIMES, available at https://www.nytimes.com/1994/11/27/automobiles/driving-smart-lost-in-yonkers-an-olds-option-could-be-a-guide.html (published Nov. 27, 1994, last visited June 25, 2019). |
| **1C**<br>a wireless communications device; | The Flick '551 patent discloses a wireless communications device e.g., remote transmitter and receiver. Flick '551 patent at 4:15-20 ("The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter."); *see also*, Fig. 1 (partially reproduced below), item 13 ("TX/RX").<br><br>  |
| **1D**<br>a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle | The Flick '551 patent discloses that "[a] vehicle function controller is provided along with an associated vehicle function controller bus interface means for interfacing the vehicle function controller to the data communications bus. **The remote control system also includes desired signal enabling means for causing the vehicle function controller to operate using a desired set of signals for a desired vehicle from a plurality of possible sets of digital signals for different vehicles. Accordingly, the vehicle function controller can communicate with a vehicle device via the data communications bus so that the vehicle function controller is capable of operating the vehicle device responsive to the remote transmitter.**" Flick '551 patent, 4:18-30 (emphasis added). In |

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| position information; | other words, the Flick '551 patent discloses that the vehicle function controller can coordinate with a vehicle device (e.g., a vehicle position determining device). This same vehicle function controller coordinates and communicates with the receiver.<br><br>Claim 36 recites: "a receiver within the vehicle for receiving a signal from said remote transmitter;" and<br>"a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus." Claim 36 also recites: "desired signal enabling means for enabling said function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles **for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter**." (emphasis added).<br><br>Claim 50 recites: "enabling the vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles **for permitting the vehicle function controller to communicate via the data communications bus with at least one of the vehicle devices**." (emphasis added). Claim 50 also recites: "receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter."<br><br>As detailed in 1B above, vehicle position determining devices sending vehicle position information were well known in the art of vehicle security at the time of the invention.<br><br>For more with respect to "multi-vehicle compatible controller," see 1E below. |
| **1E**<br>said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and | The Flick '551 patent discloses a multi-vehicle compatible controller e.g., "alarm controller", coupled to the vehicle data bus for communication thereover with at least one vehicle device e.g., vehicle security sensor, using at least one corresponding vehicle device code from among a plurality thereof for different vehicles e.g., a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. *See also, e.g.*, claims 1, 15, 21, 28, 36, and 50 of the Flick '551 patent.<br><br>See e.g., "The security system preferably further includes a desired signal enabling circuit for enabling the alarm controller to operate using a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. Accordingly, the desired signal enabling circuit permits the alarm controller to communicate with the vehicle security sensor and the alarm indicator via the data communications bus so that the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor." Flick '551 patent, Abstract. |

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| | Claim 1 recites: "a vehicle security sensor and associated sensor bus interface means for interfacing said vehicle security sensor to the data communications bus;" and<br><br>"**desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said alarm controller to communicate with said vehicle security sensor and said alarm indicator via **the data communications bus** so that said alarm controller is capable of operating said alarm indicator responsive to said vehicle security sensor."<br><br>Claim 15 recites: "memory means for storing a plurality of sets of signals for different vehicles; and **selecting means for selecting a desired set of signals for a desired vehicle from the plurality of sets of signals for different vehicles**, the desired set of signals for enabling said alarm controller to communicate via **the data communications bus** with at least one of the vehicle security sensor and the alarm indicator."<br><br>Claim 21 recites: "**desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said alarm controller to communicate via **the data communications bus** with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals."<br><br>Claim 28 recites: "**enabling said alarm controller to operate using a set of desired signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said alarm controller to communicate via **the data communications bus** with at least one of a vehicle security sensor and an alarm indicator."<br><br>Claim 36 recites: "**desired signal enabling means for enabling said vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said vehicle function controller to communicate via **the data communications bus** with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter."<br><br>Claim 50 recites: "**enabling the vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting the vehicle function controller to communicate via **the data communications bus** with at least one of the vehicle devices." |
| **1F**<br>a downloading interface for permitting downloading of | The Flick '551 patent discloses downloading of enabling data e.g., learning the desired set of signals from another device or central station, for use by said multi-vehicle compatible controller, with the set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. *See also, e.g.*, claims 23, 24, 8, and 35 of the Flick '551 patent. |

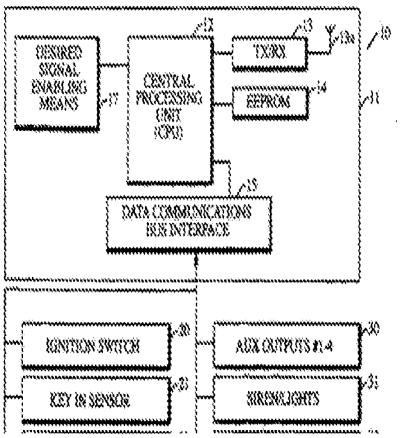
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| enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller. | "In yet another embodiment, the desired signal enabling means may comprise learning means for learning the desired set of signals. For example, the learning means may comprise downloading learning means for learning the desired set of signals from another device or central station. In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone" (Col. 3, lines 50-60).<br><br>Claim 21 recites: "said desired signal enabling means comprising learning means for learning the desired set of signals."<br><br>Claim 23 recites: "download learning means for learning the desired set of signals from a downloading device."<br><br>Claim 24 recites: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device."<br><br>Claim 8 recites: "wherein said desired signal enabling means comprises download learning means for [learning][1] the desired set of signals from a downloading device."<br><br>Claim 35 recites: "wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the step of downloading the desired signals from a downloading device." |
| | |
| **2A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said downloading interface comprises a wired signal downloading interface. | It was well known at the time of the invention that the downloading interface includes a wired signal downloading interface. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that this was well known. *See* '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **3A**<br>The multi-vehicle compatible tracking unit according to claim 2 wherein said wired | The Flick '551 patent discloses the downloading interface includes a connector for temporary connection to a downloading device. *See e.g.*, Fig. 6, download learning means 84 includes a connector for temporary connection to a downloading device e.g., cellular telephone 86; see also, 3:50-60 ("In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone"; 7:55-67 ("The download learning means 84 may |

[1] Corrected in Certificate of Correction dated May 12, 1998.

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| signal downloading interface comprises a connector for temporary connection to a downloading device. | include an interface connected to the illustrated vehicle cellular telephone 86 to permit learning or downloading of the desired signal set from a remote or central monitoring and control station 88, for example."). <br><br> As noted above, it was well known at the time of the invention that the wired signal downloading interface includes a connector for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the Office action acknowledged that this was well known. *See* Office Action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **4A** <br> The multi-vehicle compatible tracking unit according to claim 1 wherein said downloading interface comprises a wireless signal downloading interface. | The Flick '551 patent discloses the downloading interface includes a wireless signal downloading interface. <br> *See e.g.*, Fig. 6 (reproduced below); *see also*, claim 24 of the Flick '551 patent. <br><br>   <br> FIG. 6. <br><br> *See e.g.*, "For example, the learning means may comprise downloading learning means for learning the desired set of signals from another device or central station. In particular, the security system may interface to a cellular telephone and the desired set of |

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| | signals may be downloaded or received and stored via the cellular telephone." (Col. 3, lines 50-60); *see also, e.g.*, claim 24 of the Flick '551 patent. |
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| **5A**<br>The multi-vehicle compatible tracking unit according to claim 4 wherein said wireless signal downloading interface comprises a wireless receiver for temporary connection to a downloading device. | The Flick '551 patent discloses the wireless signal downloading interface includes a wireless receiver for temporary connection to a downloading device.<br>*See e.g.*, Fig. 6 and "The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter;" *see also*, claim 24 of the Flick '551 patent.<br><br>It was well known at the time of the invention that a wireless signal downloading interface includes a wireless receiver for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that "[i]t is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." See '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13. Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **6A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device. | The Flick '551 patent discloses the corresponding at least one vehicle code is for reading e.g., "data communications bus interface provides both input and output interfaces" from the at least one vehicle device.<br><br>See e.g., Fig. 2 and "In the illustrated embodiment, the CPU 12 is also operatively connected to a memory (EEPROM) 14 and a data communications bus interface 15 which provides both input and output interfaces to various vehicle devices." (Flick '551 patent, Col. 5, Lines 20-23). *See also*, claim 21 of the Flick '551 patent.<br><br>Furthermore, as observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "reading from the at least one vehicle device." See '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **7A** | The Flick '551 patent discloses the corresponding at least one vehicle code is for writing e.g., "data communications bus interface provides both input and output interfaces" from the at least one vehicle device. |

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| The multi-vehicle compatible tracking unit according to claim 1 wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device. | *See e.g.*, Fig. 2 and "In the illustrated embodiment, the CPU 12 is also operatively connected to a memory (EEPROM) 14 and a data communications bus interface 15 which provides both input and output interfaces to various vehicle devices." (Flick '551 patent, Col. 5, Lines 20-23). *See also*, claim 21 of the Flick '551 patent.<br><br>Furthermore, as observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "writing to the at least one vehicle device." *See* '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **8A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller. | As observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "permitting downloading of at least one programming instruction for said multi-vehicle compatible controller." *See* '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.<br><br>See, for example, claim 21 of the Flick '551 patent. |
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| **9A**<br>The multi-vehicle compatible tracking unit according to claim 1 further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter. | The Flick '551 patent discloses a remote transmitter e.g., TX/RX 13, and where the controller 11 performs at least one vehicle function e.g., armed and disarmed modes, in response to said remote transmitter.<br><br>See e.g., Fig. 1, partially reproduced below, TX/RX 13. |

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| |  <br>The Flick '551 patent discloses that "[t]he remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter." Flick '551 patent, 4:15-20.<br><br>*See e.g.*, "The remote transmitter 50 can switch the controller 11 between the armed and disarmed modes." Flick '551 patent, 8:2-4.<br><br>Furthermore, as observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "perform at least one vehicle remote control function..." See '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.<br><br>See for example, claims 21, 24, 36, and 50 of the Flick '551 patent. |
| | |
| **10A**<br>The multi-vehicle compatible tracking unit according to claim 9 wherein the at least one vehicle remote control function comprises at least one of a vehicle security function, a remote keyless | The Flick '551 patent discloses the at least one vehicle remote control function includes at least one of a security function e.g., "armed and disarmed modes", a remote keyless entry function e.g., "remote keyless entry system", and a remote engine starting function e.g., "remote engine starting system".<br><br>*See e.g.*, "The remote transmitter 50 can switch the controller 11 between the armed and disarmed modes." Flick '551 patent, 8:2-4. |

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| entry function, and a remote engine starting function. | *See e.g.*, "As shown in FIG. 8, the invention may be embodied in a remote keyless entry system 90 including a remote keyless entry controller 91 operated by a remote handheld transmitter 93. The controller 91 communicates with the door lock motors 94 and illustrated trunk release 96 via the data communications bus 62." Flick '551 patent, 8:13-17.<br><br>*See e.g.*, "Turning now to FIG. 9, yet another vehicle associated remote control function is illustrated and now explained. The remote engine starting system 100 includes a remote start controller 101 operable by a remote transmitter 103. The remote controller 101 may communicate via the data communications bus 62 to enable the ignition and fuel systems 106 and crank the engine starter 104." Flick '551 patent, 8:27-34.<br><br>*See also*, claims 37, 38, and 39 of the Flick '551 patent. |
| | |
| **11A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said wireless position determining device comprises a Global Positioning System (GPS) receiver. | As mentioned above, GPS was well known in the art of vehicle security at the time of the filing of the Flick '278 patent application. For example, the Patent Office has already observed that GPS was well known in the art of vehicle security in the prosecution of the Flick '278 patent. *See* '278 patent prosecution history, Office action dated 01/05/2011, page 2, citing to U.S. Patent No. 6,253,064 to Monroe ("Monroe") at Fig. 4a-4b and U.S. Patent No. 5,940,007 to Brinkmeyer et al. ("Brinkmeyer") at 5:6-16 (stating "…vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the **Global Positioning System**") (emphasis added).<br><br>Additionally, the Patent Office even determined that vehicle position determining devices were well known in the art of vehicle security in the earlier prosecution of the Flick '551 patent. *See* Flick '551 patent prosecution history, List of References Cited by Examiner dated June 10, 1997, citing U.S. Patent No. 5,081,667 to Drori et al. ("Drori") at 4:44-48 ("Inputs from a **conventional vehicle security system 13**, from a host vehicle (not shown), and from **a global positioning tracker** (not shown) are received by the system controller 20 via level conversion and filtering circuits 36.") (emphasis added).<br><br>Other prior art references not previously considered by the Patent Office also demonstrate that vehicle position determining devices, such as GPS, were well known in the art of vehicle security and tracking, even detailing the significant dollar valuation of the entire industry well prior to the filing of both the Flick '278 and Flick '551 patent applications.<br><br>For example, the Space Daily Trimble article announces the partnership of the Trimble GPS technology with the Microsoft Auto PC platform at the Consumer Electronics Show (CES) in January 1998. *Trimble Microsoft Launch GPS System for Car PC*, available at http://www.spacedaily.com/news/gps-98a.html (published Jan. 8, 1998, last visited June 25, 2019). Microsoft's Auto PC platform is a mobile computing environment that is extended to consumer vehicles and incorporated by automotive manufacturers. *Id.* In particular, the Space Daily Trimble article provides industry estimates on the high value of GPS navigation in vehicles, stating that |

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| | "[a]ccording to the U.S. GPS Industry Council, car navigation will grow from $310 million in 1995 to $3 billion by 2000. The Council estimates that the GPS industry as a whole will grow to over $8 billion by the year 2000." *Id.*<br><br>The Mateja article details the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992. Jim Mateja, *Travetek Makes Mission Possible*, CHICAGO TRIBUNE, available at https://www.chicagotribune.com/news/ct-xpm-1992-04-12-9202020707-story.html (published April 12, 1992, last visited June 25, 2019).<br><br>The Holusha article details the launch of the Oldsmobile Guidestar system in late 1994 and early 1995 which uses satellites (of the Global Positioning System) to determine a car's location. John Holusha, *DRIVING SMART; Lost in Yonkers? An Olds Option Could Be a Guide*, THE NEW YORK TIMES, available at https://www.nytimes.com/1994/11/27/automobiles/driving-smart-lost-in-yonkers-an-olds-option-could-be-a-guide.html (published Nov. 27, 1994, last visited June 25, 2019). |
| | |
| **12A**<br>The multi-vehicle compatible tracking unit according to claim 1 further comprising a housing containing said vehicle position determining device, said wireless communications device, said multi-vehicle compatible controller, and said downloading interface. | The Flick '551 patent discloses a housing. *See e.g.*, Fig. 1, illustrating controller 11 in a housing. |
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| **13A**<br>A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising: | See Claim 1A. |

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| **13B**<br>a vehicle position determining device; | See Claim 1B. |
| **13C**<br>a wireless communications device; | See Claim 1C. |
| **13D**<br>a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information; | See Claim 1D. |
| **13E**<br>said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and | See Claim 1E. |
| **13F**<br>a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller; | See Claim 1F. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| **13G**<br>said downloading interface comprising a connector for temporary connection to a downloading device. | The Flick '551 patent discloses the downloading interface includes a connector for temporary connection to a downloading device. See e.g., Fig. 6, download learning means 84 includes a connector for temporary connection to a downloading device e.g., cellular telephone 86; see also, 3:50-60 ("In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone"; 7:55-67 ("The download learning means 84 may include an interface connected to the illustrated vehicle cellular telephone 86 to permit learning or downloading of the desired signal set from a remote or central monitoring and control station 88, for example.").<br><br>It was well known at the time of the invention that a wireless signal downloading interface includes a connector for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that "[i]t is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." See '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13. Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **14A**<br>The multi-vehicle compatible tracking unit according to claim 13 wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device. | See Claim 6A. |
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| **15A**<br>The multi-vehicle compatible tracking unit according to claim 13 wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device. | See Claim 7A. |
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| **16A**<br>The multi-vehicle compatible | See Claim 8A. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| tracking unit according to claim 13 wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller. | |
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| **17A**<br>The multi-vehicle compatible tracking unit according to claim 13 further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter. | See Claim 9A. |
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| **18A**<br>A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising: | See Claim 1A. |
| **18B**<br>a vehicle position determining device; | See Claim 1B. |
| **18C**<br>a wireless communications | See Claim 1C. |

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| device; | |
| **18D**<br>a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information; | See Claim 1D. |
| **18E**<br>said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and | See Claim 1E. |
| **18F**<br>a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller; | See Claim 1F. |
| **18G**<br>said downloading interface comprising a wireless receiver for temporary connection to a downloading device. | The Flick '551 patent discloses the wireless signal downloading interface includes a wireless receiver for temporary connection to a downloading device.<br><br>*See e.g.*, Fig. 6 and "The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter." (Flick '551 patent, 4:16-18); *see also*, claim 24 of the Flick '551 patent. |

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| | It was well known at the time of the invention that a wireless signal downloading interface includes a wireless receiver for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that "[i]t is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." *See* '278 Office Action dated 6/22/2010, rejection of claims 2-3 and 13. Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **19A**<br>The multi-vehicle compatible tracking unit according to claim 18 wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device. | See Claim 6A. |
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| **20A**<br>The multi-vehicle compatible tracking unit according to claim 18 wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device. | See Claim 7A. |
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| **21A**<br>The multi-vehicle compatible tracking unit according to claim 18 wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi- | See Claim 8A. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| vehicle compatible controller. | |
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| **22A**<br>The multi-vehicle compatible tracking unit according to claim 18 further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter. | See Claim 9A. |
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| **1A**<br>A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible tracking unit comprising: | Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of a vehicle position determining device to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 1 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent:<br>Claim 21 of the Flick '551 patent recites: "A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices."<br><br>*See also* claims 1, 15, 28, 36 and 50 of the Flick '551 patent:<br>• Claim 1 includes "A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices."<br>• Claim 15 includes "A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices."<br>• Claim 28 includes "A method for operating a vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices."<br>• Claim 36 includes "A remote control system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices."<br>• Claim 50 includes "A method for remotely controlling a vehicle function for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices." |
| **1B**<br>a vehicle position determining device; | Vehicle position determining devices, such as GPS, were well known in the art of vehicle security at the time of the filing of the Flick '278 patent application. For example, the Patent Office has already observed that vehicle position determining devices were well known in the art of vehicle security in the prosecution of the Flick '278 patent. *See* '278 patent prosecution history, Office Action dated 01/05/2011, page 2, citing to U.S. Patent No. 6,253,064 to Monroe ("Monroe") at Fig. 4a-4b and U.S. Patent No. 5,940,007 to Brinkmeyer et al. ("Brinkmeyer") at 5:6-16 (stating "...vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the Global Positioning System").<br><br>Additionally, the Patent Office determined that vehicle position determining devices were well known in the art of vehicle security in the earlier prosecution of the Flick '551 patent. *See* Flick '551 patent prosecution history, List of References Cited by Examiner dated June 10, 1997, citing U.S. Patent No. 5,081,667 to Drori et al. ("Drori") at 4:44-48 ("Inputs from a **conventional vehicle** |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| | **security system 13**, from a host vehicle (not shown), and from **a global positioning tracker** (not shown) are received by the system controller 20 via level conversion and filtering circuits 36.") (emphasis added).<br><br>Other prior art references not previously considered by the Patent Office also demonstrate that vehicle position determining devices, such as GPS, were well known in the art of vehicle security and tracking, even detailing the significant dollar valuation of the entire industry well prior to the filing of both the Flick '278 and Flick '551 patent applications.<br><br>For example, the Space Daily Trimble article announces the partnership of the Trimble GPS technology with the Microsoft Auto PC platform at the Consumer Electronics Show (CES) in January 1998. *Trimble Microsoft Launch GPS System for Car PC*, available at http://www.spacedaily.com/news/gps-98a.html (published Jan. 8, 1998, last visited June 25, 2019). Microsoft's Auto PC platform is a mobile computing environment that is extended to consumer vehicles and incorporated by automotive manufacturers. *Id.* In particular, the Space Daily Trimble article provides industry estimates on the high value of GPS navigation in vehicles, stating that "[a]ccording to the U.S. GPS Industry Council, car navigation will grow from $310 million in 1995 to $3 billion by 2000. The Council estimates that the GPS industry as a whole will grow to over $8 billion by the year 2000." *Id.*<br><br>The Mateja article details the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992. Jim Mateja, *Travetek Makes Mission Possible*, CHICAGO TRIBUNE, available at https://www.chicagotribune.com/news/ct-xpm-1992-04-12-9202020707-story.html (published April 12, 1992, last visited June 25, 2019).<br><br>The Holusha article details the launch of the Oldsmobile Guidestar system in late 1994 and early 1995 which uses satellites (of the Global Positioning System) to determine a car's location. John Holusha, *DRIVING SMART; Lost in Yonkers? An Olds Option Could Be a Guide*, THE NEW YORK TIMES, available at https://www.nytimes.com/1994/11/27/automobiles/driving-smart-lost-in-yonkers-an-olds-option-could-be-a-guide.html (published Nov. 27, 1994, last visited June 25, 2019). |
| **1C**<br>a wireless communications device; | Flick '551 patent:<br>Claim 24, which depends off claim 23, which depends off claim 21, recites: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." |
| **1D**<br>a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said | Flick '551 patent:<br>Claim 36 recites: "a receiver within the vehicle for receiving a signal from said remote transmitter;" and<br>"a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus." Claim 36 also recites: "desired signal enabling means for enabling said function controller to operate **using a desired set of signals for a corresponding desired vehicle** |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| wireless communications device to send vehicle position information; | **from a plurality of sets of signals for different vehicles for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter**." (emphasis added).<br><br>Claim 50 recites: "enabling the vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles **for permitting the vehicle function controller to communicate via the data communications bus with at least one of the vehicle devices**." (emphasis added). Claim 50 also recites: "receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter."<br><br>As detailed in 1B above, vehicle position determining devices sending vehicle position information were well known in the art of vehicle security at the time of the invention.<br><br>For more with respect to "multi-vehicle compatible controller," see 1E below. |
| **1E**<br>said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and | Flick '551 patent:<br>Claim 1 recites: "a vehicle security sensor and associated sensor bus interface means for interfacing said vehicle security sensor to the data communications bus;" and "**desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said alarm controller to communicate with said vehicle security sensor and said alarm indicator via **the data communications bus** so that said alarm controller is capable of operating said alarm indicator responsive to said vehicle security sensor."<br><br>Claim 15 recites: "memory means for storing a plurality of sets of signals for different vehicles; and **selecting means for selecting a desired set of signals for a desired vehicle from the plurality of sets of signals for different vehicles**, the desired set of signals for enabling said alarm controller to communicate via **the data communications bus** with at least one of the vehicle security sensor and the alarm indicator."<br><br>Claim 21 recites: "**desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said alarm controller to communicate via **the data communications bus** with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| | Claim 28 recites: "**enabling said alarm controller to operate using a set of desired signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said alarm controller to communicate via **the data communications bus** with at least one of a vehicle security sensor and an alarm indicator."<br><br>Claim 36 recites: "**desired signal enabling means for enabling said vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting said vehicle function controller to communicate via **the data communications bus** with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter."<br><br>Claim 50 recites: "**enabling the vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles** for permitting the vehicle function controller to communicate via **the data communications bus** with at least one of the vehicle devices." |
| **1F**<br>a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller. | Flick '551 patent:<br>Claim 21 recites: "said desired signal enabling means comprising learning means for learning the desired set of signals."<br><br>Claim 23 recites: "download learning means for learning the desired set of signals from a downloading device."<br><br>Claim 24 recites: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device."<br><br>Claim 8 recites: "wherein said desired signal enabling means comprises download learning means for [learning][1] the desired set of signals from a downloading device."<br><br>Claim 35 recites: "wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the step of downloading the desired signals from a downloading device." |
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| **2A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said | Claim 2 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of a wired signal downloading interface to be an obvious variant of the invention claimed in the Flick '551 claims. |

[1] Corrected in Certificate of Correction dated May 12, 1998.

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| downloading interface comprises a wired signal downloading interface. | Claim 2 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>It was well known at the time of the invention that a downloading interface includes a wired signal downloading interface. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that this was well known. See '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **3A**<br>The multi-vehicle compatible tracking unit according to claim 2 wherein said wired signal downloading interface comprises a connector for temporary connection to a downloading device. | Claim 3 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of a temporary connection to a downloading device to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 3 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>As noted above, it was well known at the time of the invention that the wired signal downloading interface includes a connector for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the Office action acknowledged that this was well known. See Office action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |
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| **4A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said downloading interface comprises a wireless signal downloading interface. | Claim 4 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of a wireless signal downloading interface to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 4 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
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| | Flick '551 patent:<br>Claim 24 recites: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." |
| | |
| **5A**<br>The multi-vehicle compatible tracking unit according to claim 4 wherein said wireless signal downloading interface comprises a wireless receiver for temporary connection to a downloading device. | Claim 5 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of a wireless receiver for temporary connection to a downloading device to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 5 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent:<br>Claim 24 includes "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." Accordingly, cellular involves temporary connections as it moves in and out of cell phone service range. |
| | |
| **6A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device. | Claim 6 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of "wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 6 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent:<br>Claim 21 recites: "communicate via the data communications bus with at least one of the vehicle security sensor," which includes reading from the at least one vehicle device.<br><br>Claim 21 recites: "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to |

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| | communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." |
| | |
| **7A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device. | Claim 7 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of "wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 7 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent:<br>Claim 21 recites: "communicate via the data communications bus with at least one of the vehicle security sensor," which includes writing to the at least one vehicle device.<br><br>Claim 21 recites: "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." |
| | |
| **8A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller. | Claim 8 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of "wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 8 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent: |

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| | Claim 21 recites: "learning means for learning the desired set of signals" and claim 23 recites "download learning means for learning the desired set of signals from a downloading device."<br><br>Claim 21 recites: "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." |
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| **9A**<br>The multi-vehicle compatible tracking unit according to claim 1 further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter. | Claim 9 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of "wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 9 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent:<br>Claim 21 recites: "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals."<br><br>Claim 24 recites: "cellular telephone means cooperating with said download learning means for receiving signals" which necessarily involves a remote transmitter.<br><br>Claim 36 recites: "a remote transmitter;" and "a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus; and" "desired signal enabling means for enabling said vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter." |

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| | Claim 50 recites: "receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter." |
| | |
| **10A**<br>The multi-vehicle compatible tracking unit according to claim 9 wherein the at least one vehicle remote control function comprises at least one of a vehicle security function, a remote keyless entry function, and a remote engine starting function. | Claim 10 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of "wherein the at least one vehicle remote control function comprises at least one of a vehicle security function, a remote keyless entry function, and a remote engine starting function" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 10 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Flick '551 patent:<br>Claim 37 recites: "vehicle function controller comprises an alarm controller being capable of generating an alarm responsive to the vehicle security sensor."<br><br>Claim 38 recites: "vehicle function controller comprises a door lock controller for moving the vehicle door locks between locked and unlocked positions responsive to said remote transmitter."<br><br>Claim 39 recites: "vehicle function controller comprises a remote start controller for operating the vehicle engine starting means responsive to said remote transmitter." |
| | |
| **11A**<br>The multi-vehicle compatible tracking unit according to claim 1 wherein said wireless position determining device comprises a Global Positioning System (GPS) receiver. | Claim 11 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of a "Global Positioning System (GPS) receiver" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 11 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.<br><br>Furthermore, Claim 11 is improper as it recites to "said wireless position determining device" of claim 1, while claim 1 only claims "a vehicle position determining device." |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
|---|---|
| | As noted in claim 1B (above) and observed during the prosecution history of the '278 patent, GPS systems were well known at the time of the invention. *See* Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article (above). |
| | |
| **12A**<br>The multi-vehicle compatible tracking unit according to claim 1 further comprising a housing containing said vehicle position determining device, said wireless communications device, said multi-vehicle compatible controller, and said downloading interface. | Claim 12 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,719,551 to Flick in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. A person of ordinary skill in the art would have found the addition of "a housing containing said vehicle position determining device, said wireless communications device, said multi-vehicle compatible controller, and said downloading interface" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Claim 12 is further rejected on the ground of double patenting over the claims of U.S. Patent No. 5,719,551 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent. |
| | |
| **13A**<br>A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising: | See Claim 1A. |
| **13B**<br>a vehicle position determining device; | See Claim 1B. |
| **13C**<br>a wireless communications device; | See Claim 1C. |
| **13D**<br>a multi-vehicle compatible | See Claim 1D. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
|---|---|
| controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information; | |
| **13E**<br>said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and | See Claim 1E. |
| **13F**<br>a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller; | See Claim 1F. |
| **13G**<br>said downloading interface comprising a connector for temporary connection to a downloading device. | A person of ordinary skill in the art would have found the addition of "a connector for temporary connection to a downloading device" to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>As noted above, it was well known at the time of the invention that the wired signal downloading interface includes a connector for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the Office action acknowledged that this was well known. See Office action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
|---|---|
| | |
| | |
| **14A**<br>The multi-vehicle compatible tracking unit according to claim 13 wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device. | See Claim 6A. |
| | |
| **15A**<br>The multi-vehicle compatible tracking unit according to claim 13 wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device. | See Claim 7A. |
| | |
| **16A**<br>The multi-vehicle compatible tracking unit according to claim 13 wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller. | See Claim 8A. |
| | |
| **17A**<br>The multi-vehicle compatible tracking unit according to | See Claim 9A. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
|---|---|
| claim 13 further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter. | |
| | |
| **18A** A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising: | See Claim 1A. |
| **18B** a vehicle position determining device; | See Claim 1B. |
| **18C** a wireless communications device; | See Claim 1C. |
| **18D** a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information; | See Claim 1D. |
| **18E** said multi-vehicle compatible controller to be coupled to | See Claim 1E. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
|---|---|
| the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and | |
| **18F**<br>a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller; | See Claim 1F. |
| **18G**<br>said downloading interface comprising a wireless receiver for temporary connection to a downloading device. | A person of ordinary skill in the art would have found the addition of a wireless receiver for temporary connection to a downloading device to be an obvious variant of the invention claimed in the Flick '551 claims.<br><br>Flick '551 patent:<br>Claim 24 includes "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." Accordingly, cellular involves temporary connections as it moves in and out of cell phone service range. |
| | |
| **19A**<br>The multi-vehicle compatible tracking unit according to claim 18 wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device. | See Claim 6A. |
| | |
| **20A** | See Claim 7A. |

| '278 CLAIM | PRIOR ART – U.S. Patent No. 5,719,551 to Flick ("Flick '551 patent") in Combination with any one of U.S. Patent No. 5,940,007 to Brinkmeyer, U.S. Patent No. 6,253,064 to Monroe, U.S. Patent No. 5,081,667 to Drori, and other Prior Art References |
|---|---|
| The multi-vehicle compatible tracking unit according to claim 18 wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device. | |
| | |
| **21A**<br>The multi-vehicle compatible tracking unit according to claim 18 wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller. | See Claim 8A. |
| | |
| **22A**<br>The multi-vehicle compatible tracking unit according to claim 18 further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter. | See Claim 9A. |
| | |

US007720597B2

(12) **United States Patent**
**Flick**

(10) **Patent No.: US 7,720,597 B2**
(45) **Date of Patent: May 18, 2010**

(54) **VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS**

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( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1430 days.

(21) Appl. No.: **11/076,259**

(22) Filed: **Mar. 9, 2005**

(65) **Prior Publication Data**

US 2005/0156716 A1 Jul. 21, 2005

**Related U.S. Application Data**

(63) Continuation of application No. 10/383,496, filed on Mar. 7, 2003, now Pat. No. 7,149,623, which is a continuation of application No. 09/859,972, filed on May 17, 2001, now Pat. No. 6,606,561.

(60) Provisional application No. 60/264,811, filed on Jan. 29, 2001, provisional application No. 60/258,005, filed on Dec. 22, 2000, provisional application No. 60/251,552, filed on Dec. 6, 2000, provisional application No. 60/252,125, filed on Nov. 20, 2000, provisional application No. 60/236,890, filed on Sep. 29, 2000, provisional application No. 60/246,463, filed on Nov. 7, 2000, provisional application No. 60/222,777, filed on Aug. 3, 2000, provisional application No. 60/205,178, filed on May 17, 2000.

(51) **Int. Cl.**
***G01C 21/00*** (2006.01)

(52) **U.S. Cl.** ..... **701/207**; 701/213; 701/36; 340/466; 340/988; 342/357.07

(58) **Field of Classification Search** ..... 340/989, 340/825.72, 988, 825.6, 5.2, 5.22, 5, 7, 5.23, 340/426.18, 426.19, 825.31, 425.5, 426, 340/852.72, 5.7, 5.71, 5.72, 5.3, 5.33, 466; 180/287; 455/456.5; 701/207, 213, 36; 307/10.3, 307/10.6, 9.1, 10.2; 342/357.07
See application file for complete search history.

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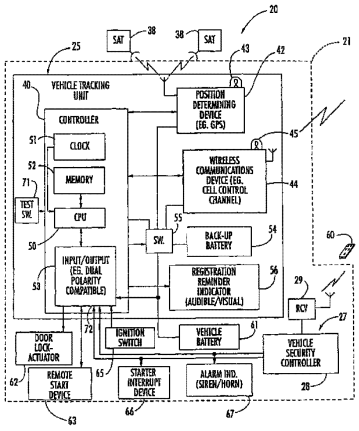
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(74) *Attorney, Agent, or Firm*—Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A vehicle control system includes a tracking unit and a function unit cooperating therewith. The tracking unit may include a vehicle position determining device, a wireless communications device, and a tracking controller cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information to a user. Further, the function unit may include at least one uniquely coded transmitter to be carried by a user, a receiver at the vehicle for receiving signals from the at least one uniquely coded transmitter, and a function controller at the vehicle and connected to the receiver for learning the at least one uniquely coded transmitter to permit control of a vehicle function by the user. The function controller may advantageously cooperate with the wireless communications device of the tracking unit for sending an alert indication of whether at least one new uniquely coded transmitter has been learned.

**29 Claims, 10 Drawing Sheets**



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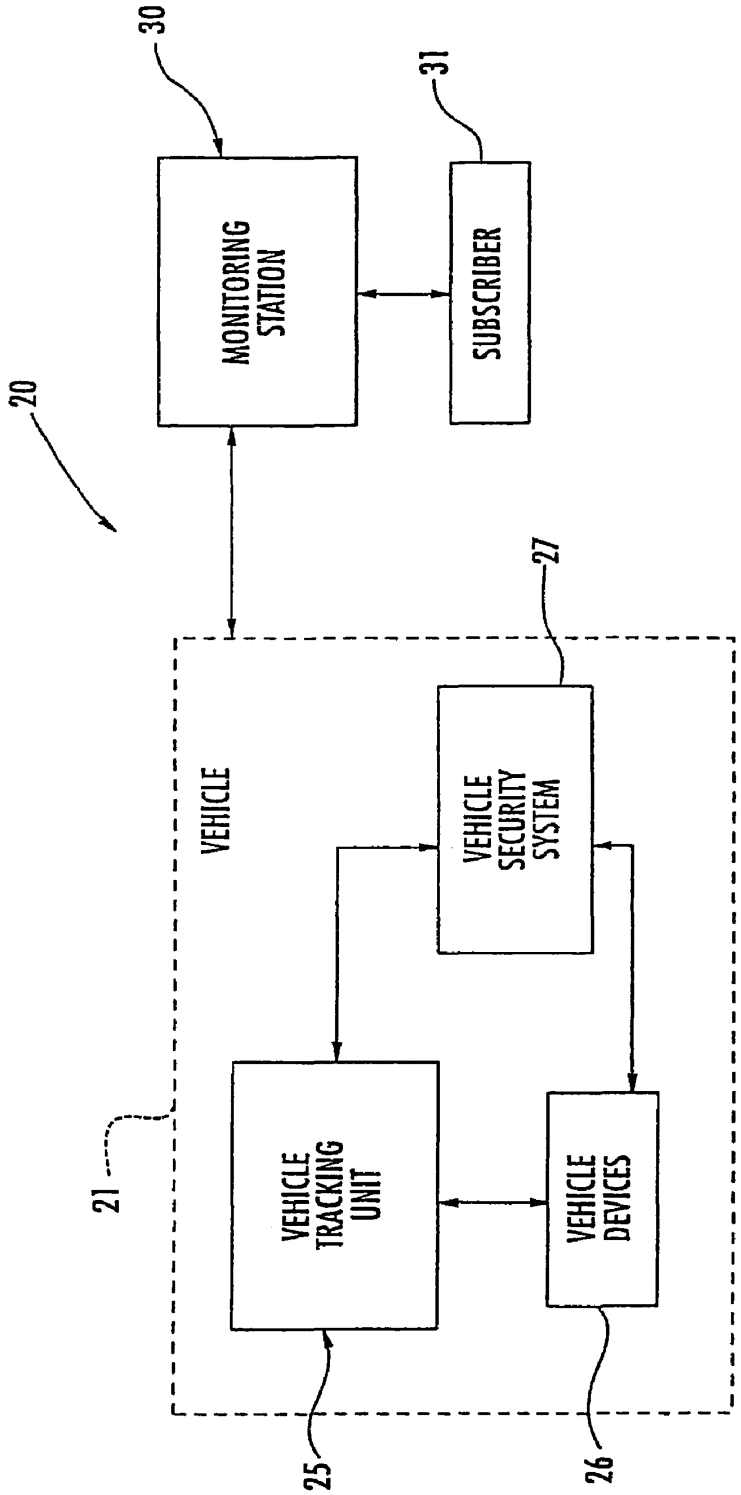



FIG. 1.

Ex. 1008 - Page 421

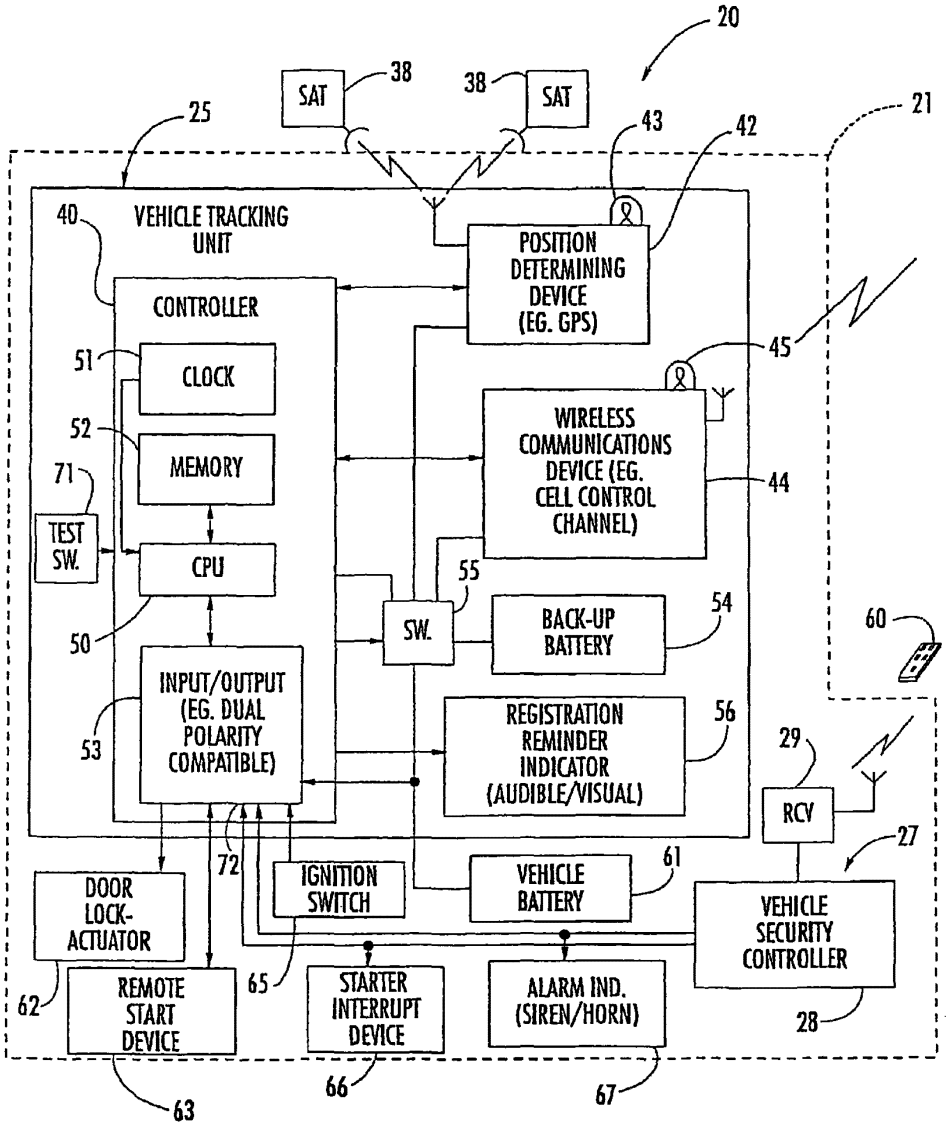

20
SAT
38
38
SAT
25
21
43
42
40
VEHICLE TRACKING UNIT
POSITION DETERMINING DEVICE (EG. GPS)
CONTROLLER
45
51
CLOCK
52
MEMORY
WIRELESS COMMUNICATIONS DEVICE (EG. CELL CONTROL CHANNEL)
44
71
TEST SW.
CPU
55
SW.
BACK-UP BATTERY
54
60
50
INPUT/OUTPUT (EG. DUAL POLARITY COMPATIBLE)
53
REGISTRATION REMINDER INDICATOR (AUDIBLE/VISUAL)
56
29
RCV
27
72
IGNITION SWITCH
VEHICLE BATTERY
61
DOOR LOCK-ACTUATOR
VEHICLE SECURITY CONTROLLER
62
REMOTE START DEVICE
65
STARTER INTERRUPT DEVICE
ALARM IND. (SIREN/HORN)
28
63
66
67

FIG. 2.

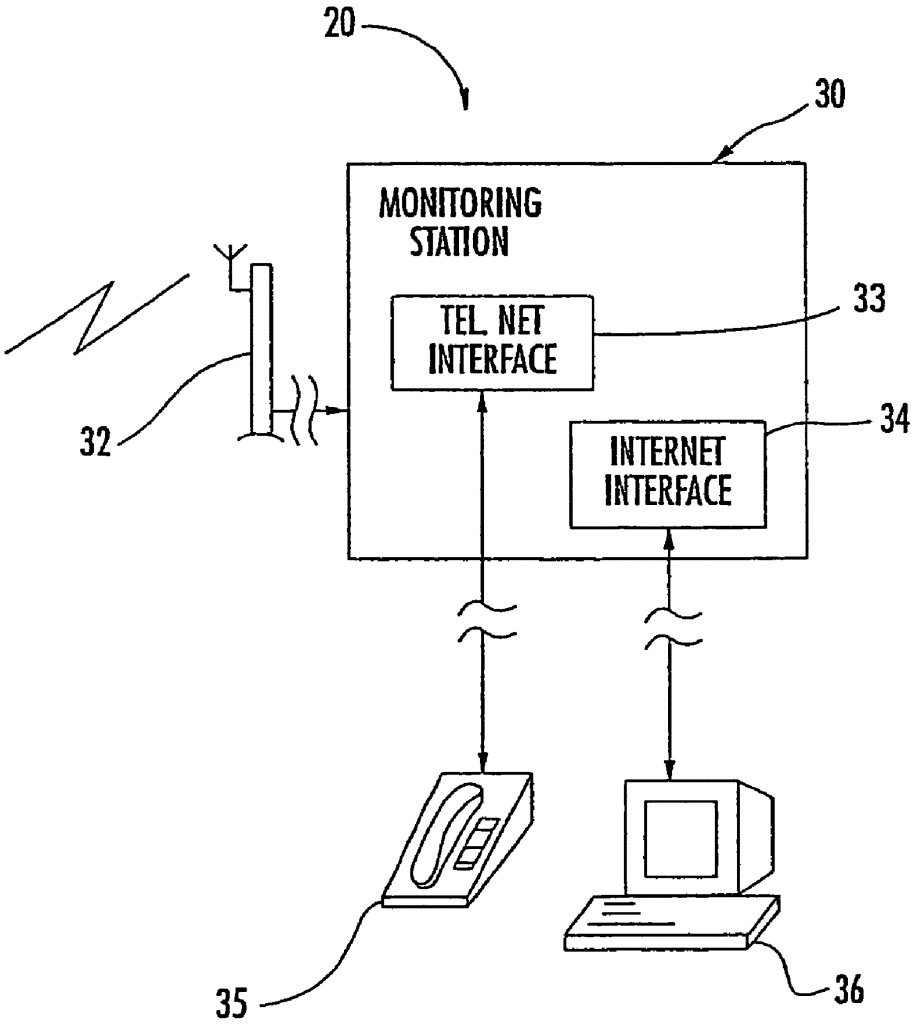

20
30
MONITORING STATION
TEL. NET INTERFACE
33
INTERNET INTERFACE
34
32
35
36

FIG. 3.

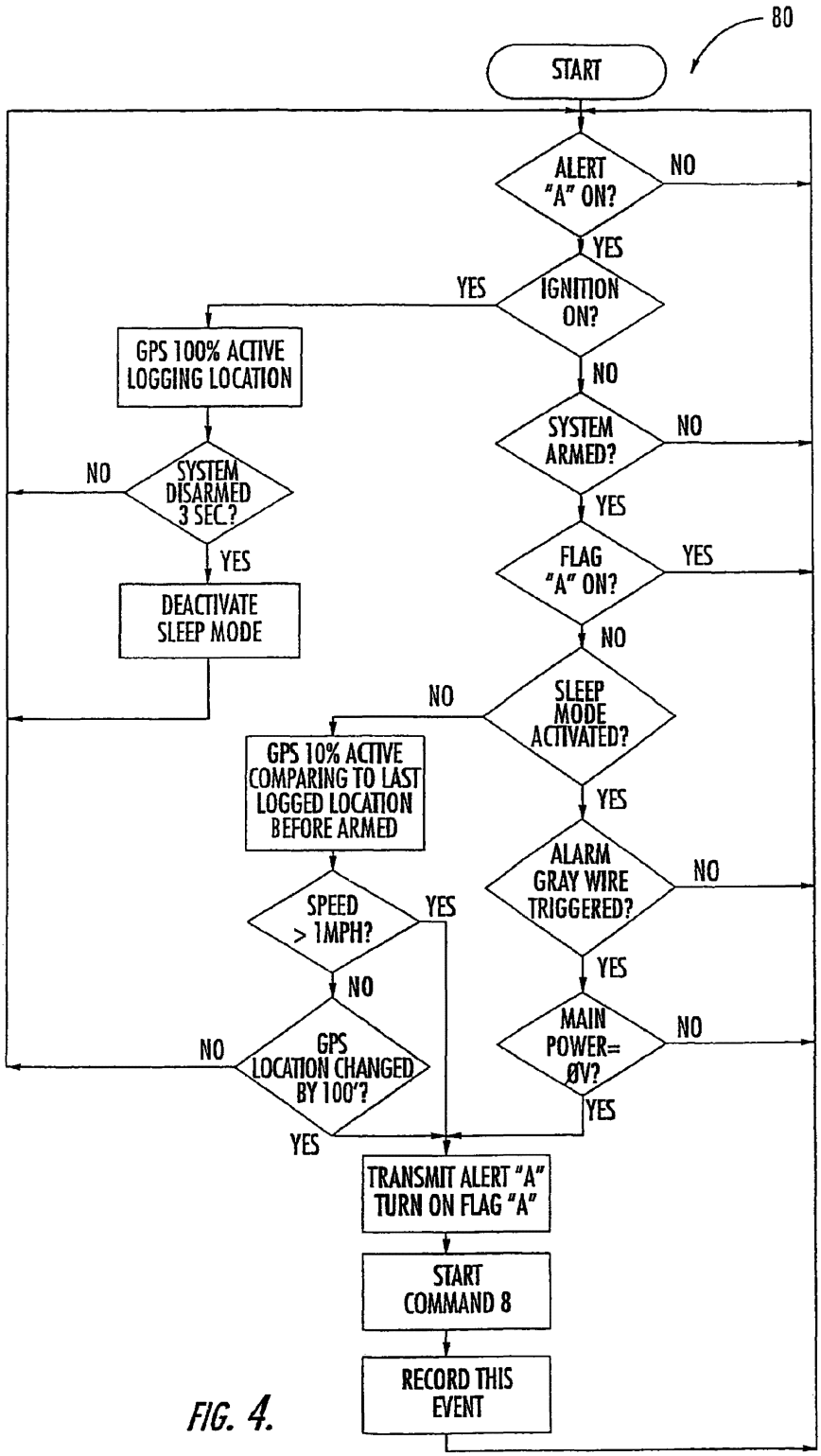

80
START
ALERT "A" ON?
NO
YES
IGNITION ON?
YES
GPS 100% ACTIVE LOGGING LOCATION
NO
SYSTEM ARMED?
NO
YES
SYSTEM DISARMED 3 SEC?
NO
YES
DEACTIVATE SLEEP MODE
FLAG "A" ON?
YES
NO
SLEEP MODE ACTIVATED?
NO
YES
GPS 10% ACTIVE COMPARING TO LAST LOGGED LOCATION BEFORE ARMED
ALARM GRAY WIRE TRIGGERED?
NO
YES
SPEED > 1MPH?
YES
NO
MAIN POWER= ØV?
NO
YES
GPS LOCATION CHANGED BY 100'?
NO
YES
TRANSMIT ALERT "A" TURN ON FLAG "A"
START COMMAND 8
RECORD THIS EVENT

FIG. 4.

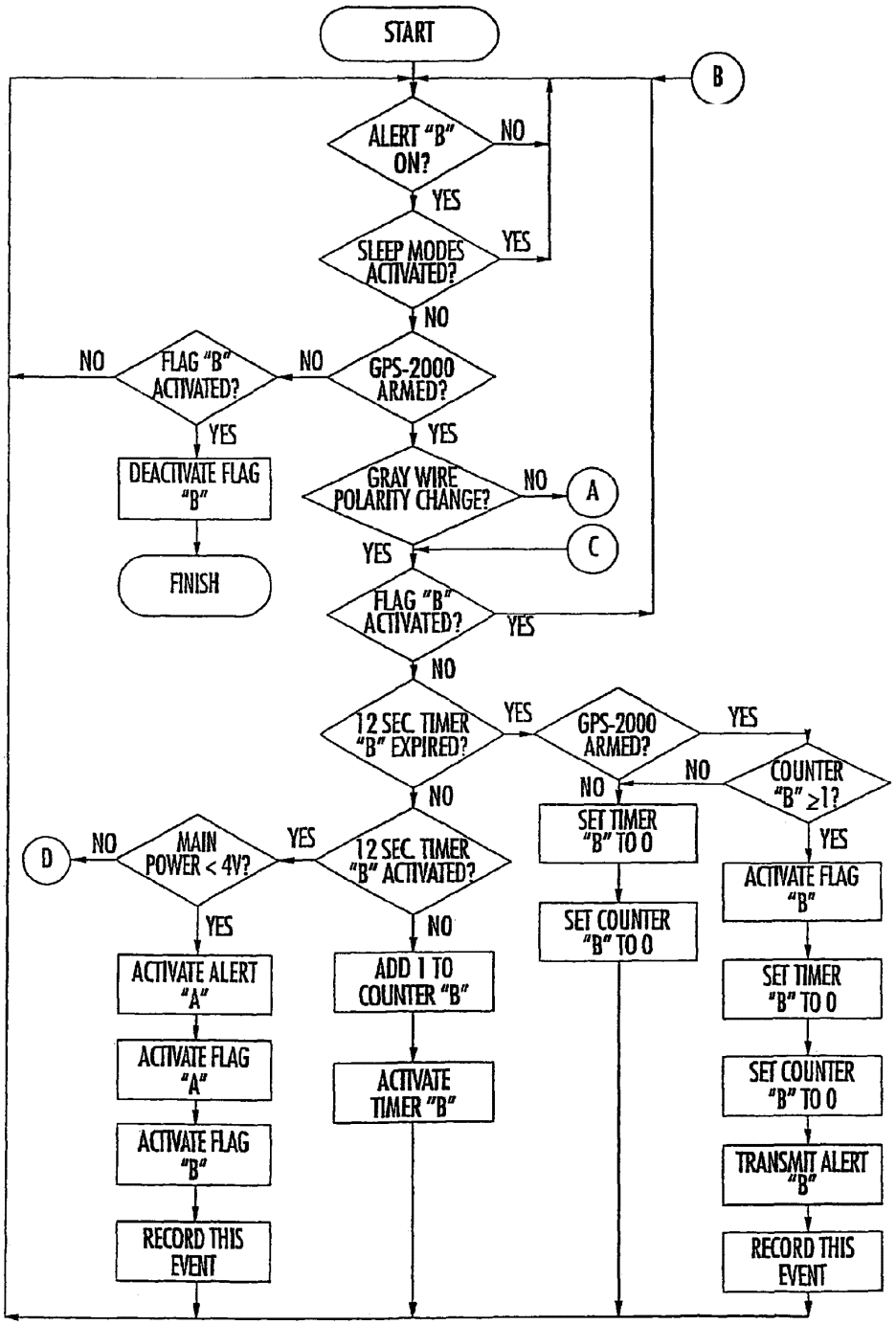

START
B
ALERT "B" ON?
NO
YES
SLEEP MODES ACTIVATED?
YES
NO
FLAG "B" ACTIVATED?
NO
GPS-2000 ARMED?
NO
YES
YES
DEACTIVATE FLAG "B"
GRAY WIRE POLARITY CHANGE?
NO
A
C
YES
FINISH
FLAG "B" ACTIVATED?
YES
NO
12 SEC. TIMER "B" EXPIRED?
YES
GPS-2000 ARMED?
YES
NO
COUNTER "B" ≥1?
NO
YES
D
NO
MAIN POWER < 4V?
YES
12 SEC. TIMER "B" ACTIVATED?
SET TIMER "B" TO 0
ACTIVATE FLAG "B"
YES
NO
SET COUNTER "B" TO 0
ACTIVATE ALERT "A"
ADD 1 TO COUNTER "B"
SET TIMER "B" TO 0
ACTIVATE FLAG "A"
ACTIVATE TIMER "B"
SET COUNTER "B" TO 0
ACTIVATE FLAG "B"
TRANSMIT ALERT "B"
RECORD THIS EVENT
RECORD THIS EVENT

FIG. 5A.

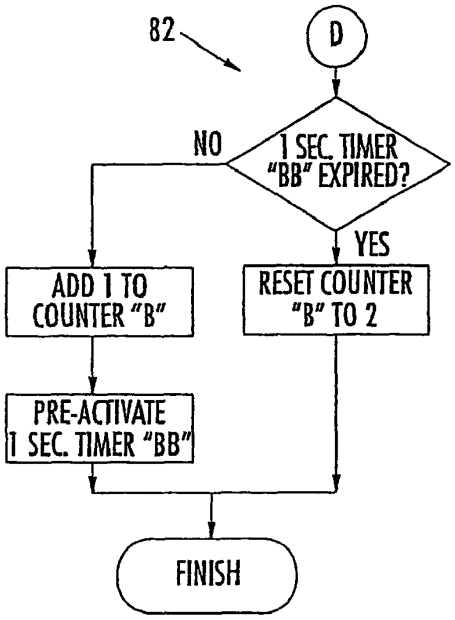

82
D
1 SEC. TIMER "BB" EXPIRED?
NO
YES
ADD 1 TO COUNTER "B"
RESET COUNTER "B" TO 2
PRE-ACTIVATE 1 SEC. TIMER "BB"
FINISH

FIG. 5B.

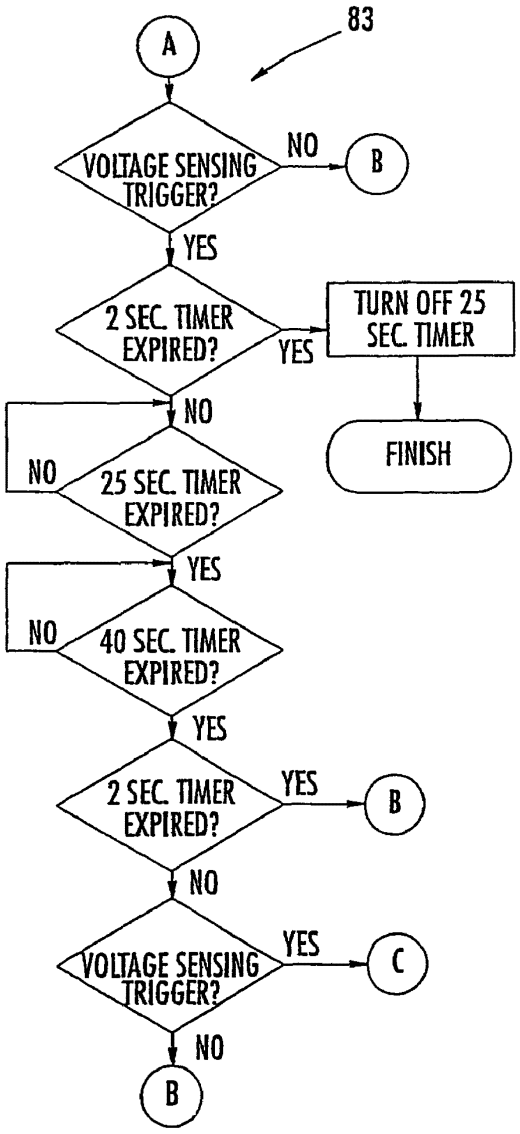

83
A
VOLTAGE SENSING TRIGGER?
NO
B
YES
2 SEC. TIMER EXPIRED?
YES
TURN OFF 25 SEC. TIMER
FINISH
NO
NO
25 SEC. TIMER EXPIRED?
YES
NO
40 SEC. TIMER EXPIRED?
YES
2 SEC. TIMER EXPIRED?
YES
B
NO
VOLTAGE SENSING TRIGGER?
YES
C
NO
B

FIG. 5C.

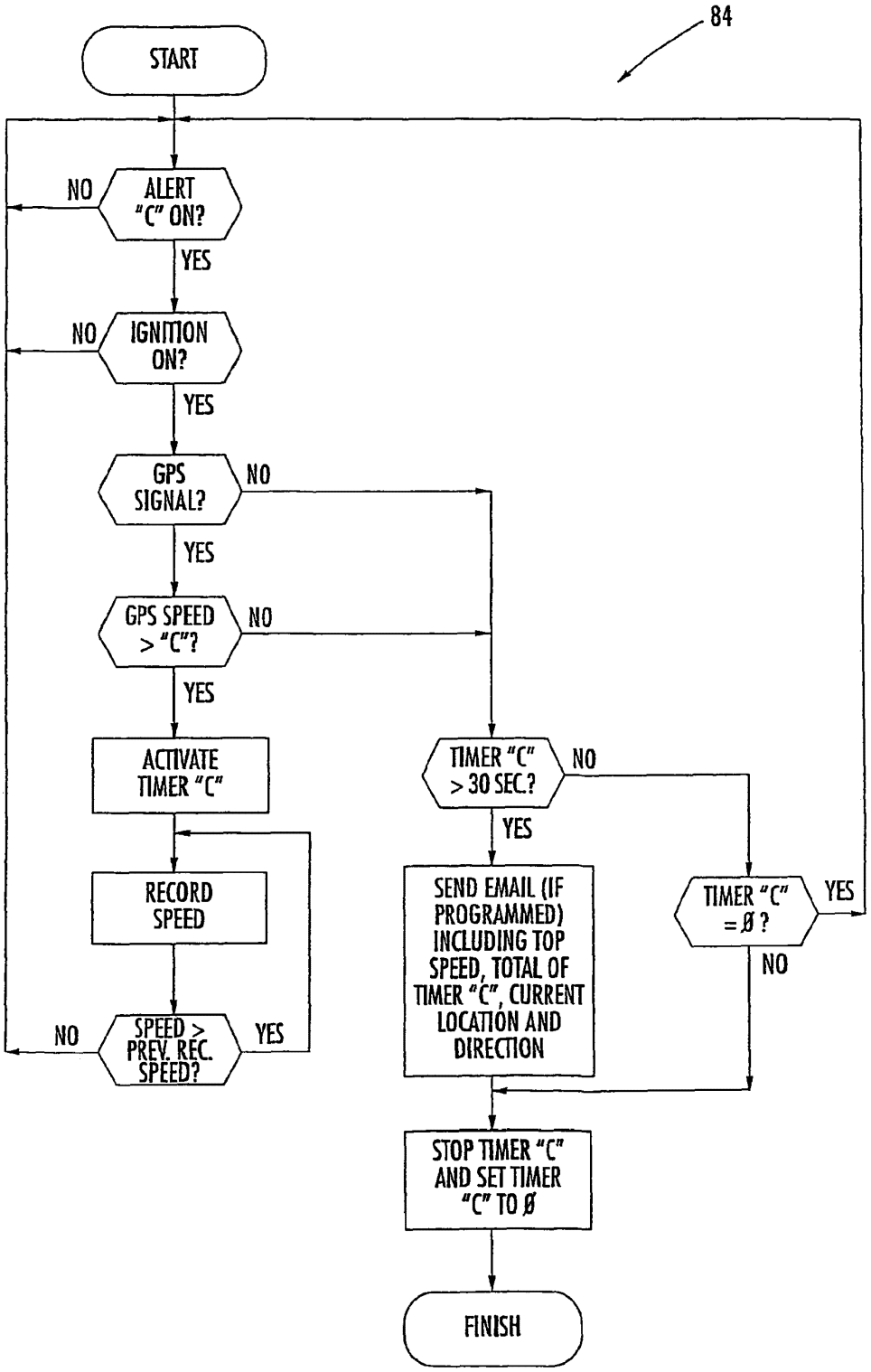

84
START
ALERT "C" ON?
NO
YES
IGNITION ON?
NO
YES
GPS SIGNAL?
NO
YES
GPS SPEED > "C"?
NO
YES
ACTIVATE TIMER "C"
RECORD SPEED
SPEED > PREV. REC. SPEED?
NO
YES
TIMER "C" > 30 SEC.?
NO
YES
SEND EMAIL (IF PROGRAMMED) INCLUDING TOP SPEED, TOTAL OF TIMER "C", CURRENT LOCATION AND DIRECTION
TIMER "C" = Ø ?
YES
NO
STOP TIMER "C" AND SET TIMER "C" TO Ø
FINISH

FIG. 6.

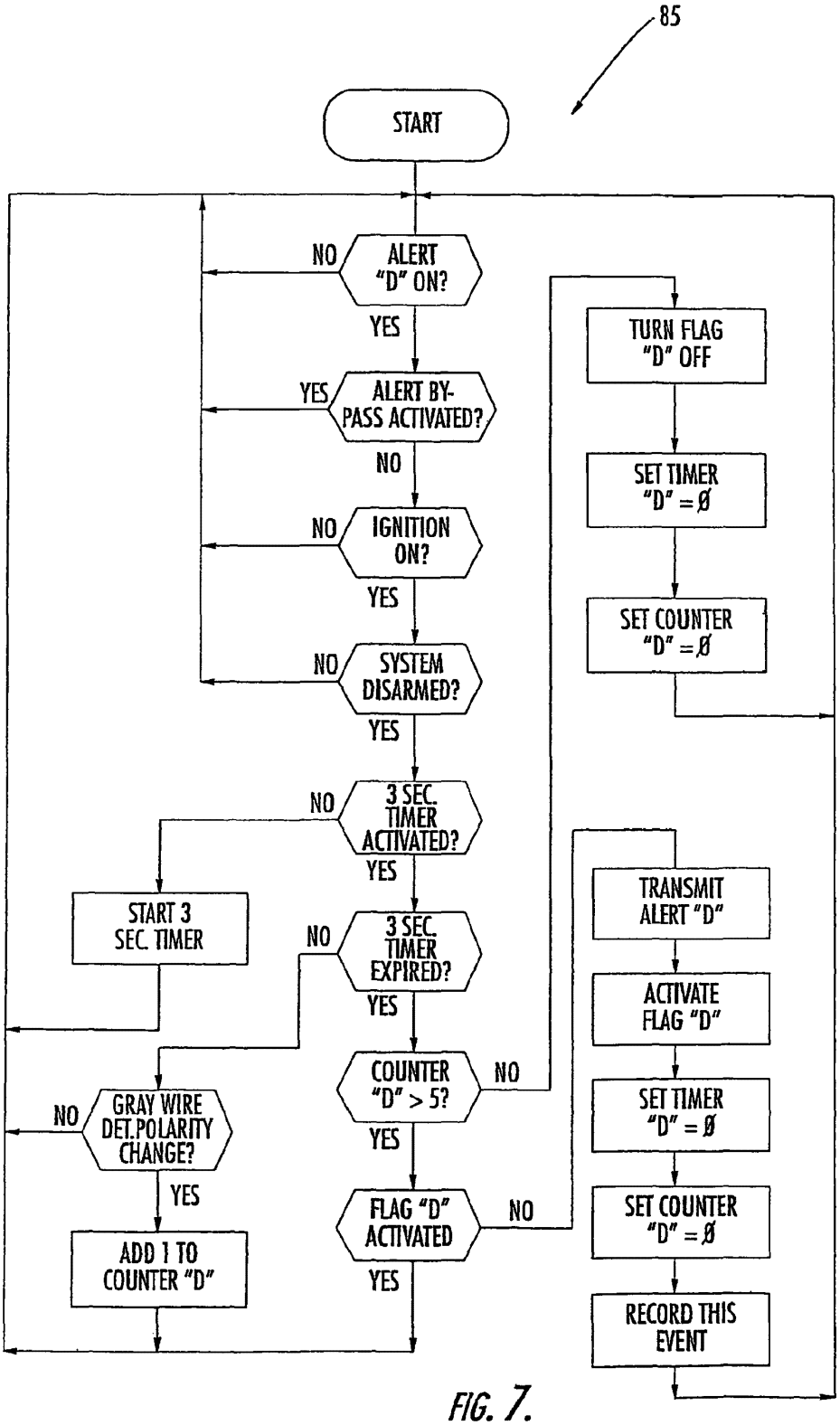

85
START
NO
ALERT "D" ON?
YES
YES
ALERT BY-PASS ACTIVATED?
NO
NO
IGNITION ON?
YES
NO
SYSTEM DISARMED?
YES
NO
3 SEC. TIMER ACTIVATED?
YES
START 3 SEC. TIMER
NO
3 SEC. TIMER EXPIRED?
YES
COUNTER "D" > 5?
NO
YES
NO
GRAY WIRE DET.POLARITY CHANGE?
YES
ADD 1 TO COUNTER "D"
FLAG "D" ACTIVATED
NO
YES
TURN FLAG "D" OFF
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
TRANSMIT ALERT "D"
ACTIVATE FLAG "D"
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
RECORD THIS EVENT

FIG. 7.

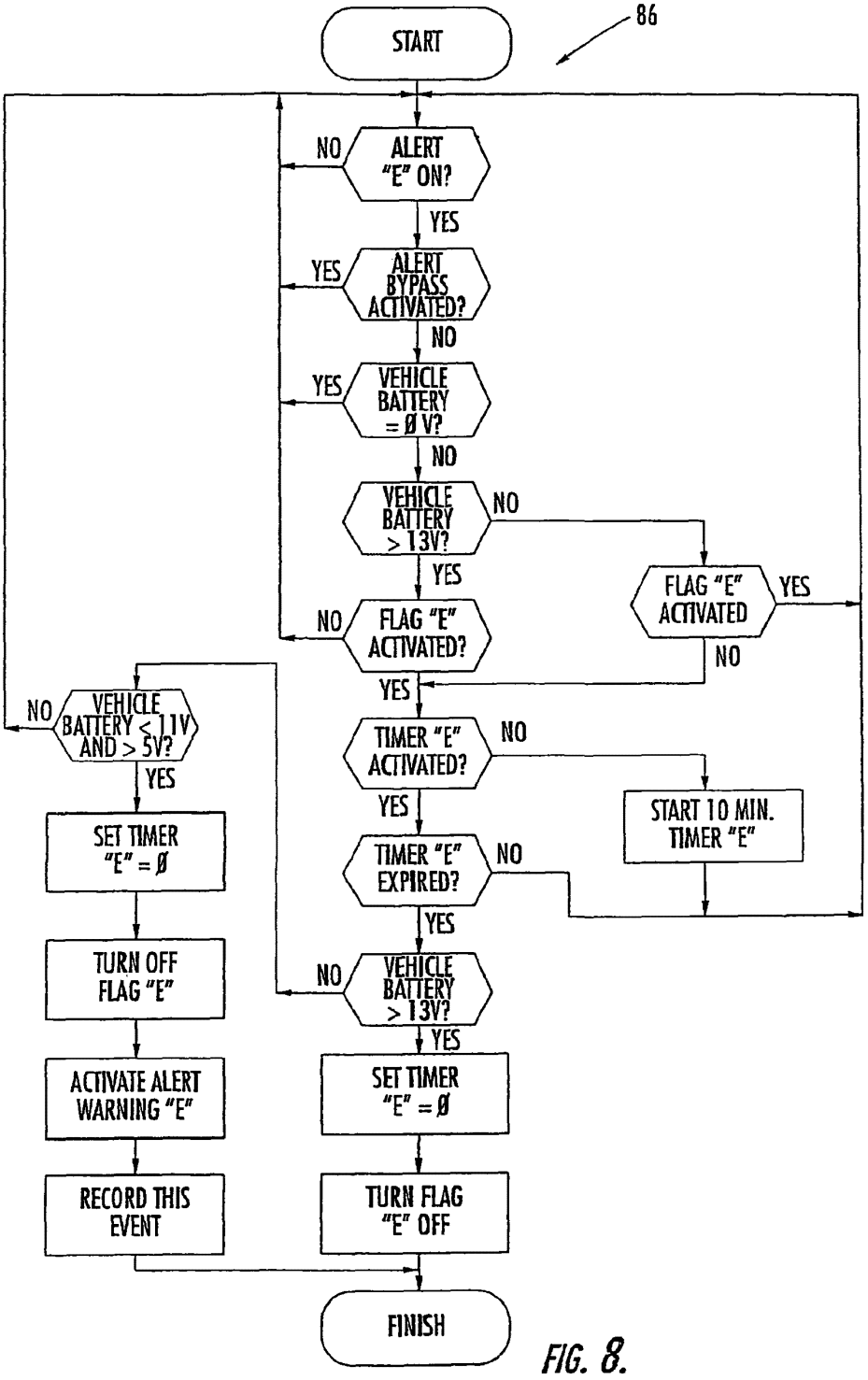

86
START
ALERT "E" ON?
NO
YES
ALERT BYPASS ACTIVATED?
YES
NO
VEHICLE BATTERY = Ø V?
YES
NO
VEHICLE BATTERY > 13V?
NO
YES
FLAG "E" ACTIVATED?
NO
YES
FLAG "E" ACTIVATED
YES
NO
VEHICLE BATTERY < 11V AND > 5V?
NO
YES
TIMER "E" ACTIVATED?
NO
YES
START 10 MIN. TIMER "E"
SET TIMER "E" = Ø
TIMER "E" EXPIRED?
NO
YES
TURN OFF FLAG "E"
VEHICLE BATTERY > 13V?
NO
YES
ACTIVATE ALERT WARNING "E"
SET TIMER "E" = Ø
RECORD THIS EVENT
TURN FLAG "E" OFF
FINISH

FIG. 8.

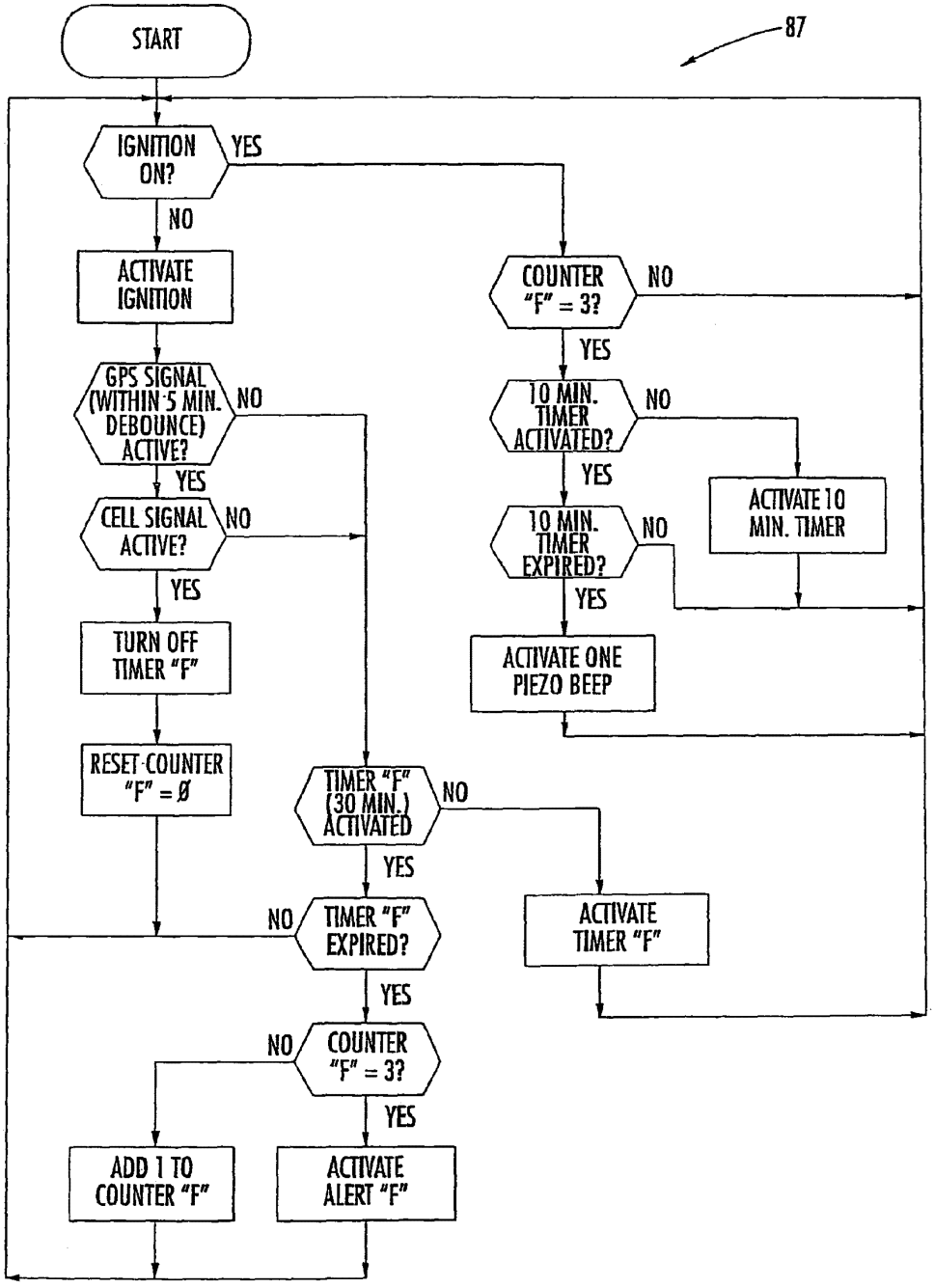

87
START
IGNITION ON?
YES
NO
ACTIVATE IGNITION
GPS SIGNAL (WITHIN 5 MIN. DEBOUNCE) ACTIVE?
NO
YES
CELL SIGNAL ACTIVE?
NO
YES
TURN OFF TIMER "F"
RESET COUNTER "F" = Ø
TIMER "F" (30 MIN.) ACTIVATED
NO
YES
TIMER "F" EXPIRED?
NO
YES
COUNTER "F" = 3?
NO
YES
ADD 1 TO COUNTER "F"
ACTIVATE ALERT "F"
ACTIVATE TIMER "F"
COUNTER "F" = 3?
NO
YES
10 MIN. TIMER ACTIVATED?
NO
YES
ACTIVATE 10 MIN. TIMER
10 MIN. TIMER EXPIRED?
NO
YES
ACTIVATE ONE PIEZO BEEP

FIG. 9.

# VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS

## RELATED APPLICATIONS

The present application is a continuation of U.S. patent application Ser. No. 10/383,496 filed Mar. 7, 2003 now U.S. Pat. No. 7,149,623, which is a continuation of U.S. patent application Ser. No. 09/859/972 filed on May 17, 2001 now U.S. Pat. No. 6,606,561 which, in turn, was based upon provisional patent application Ser. Nos. 60/264,811 filed on Jan. 29, 2001; 60/258,005, filed Dec. 22, 2000; 60/251,552, flied Dec. 6, 2000; 60/252,125, filed Nov. 20, 2000; 60/236,890, filed Sep. 29, 2000; 60/246,463, filed Nov. 7, 2000; 60/222, 777, filed Aug. 3, 2000; 60/205,178, filed May 17, 2000; and non-provisional U.S. patent application Ser. No. 09/859,972, the entire contents of each of which are incorporated herein by reference.

## FIELD OF THE INVENTION

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## BACKGROUND OF THE INVENTION

Motor vehicles, such as passenger cars, trucks, busses, fleet vehicles, etc. are widely used and knowing the locations of such vehicles is often desired. For example, should a vehicle be stolen, it would be beneficial to know the vehicle's location so that authorities could be promptly and accurately directed to retrieve the vehicle. Indeed, the tracking system could plot the getaway path of the thief.

For a company with hired drivers, it may be desirable to know the driver's whereabouts during the course of the day. Similarly, a rental car agency or other fleet operator, for example, may wish to know the whereabouts of its fleet of vehicles.

It may also be desirable to track the location of a vehicle as it is used throughout the course of a normal day. For parents of younger or older drivers, for example, knowledge of the vehicle's location may provide some assurance that the driver is at designated locations and following a prescribed route.

A number of patents disclose various systems and approaches to tracking vehicles. For example, U.S. Pat. No. 5,223,844 discloses a tracking system including a control center and a mobile unit installed in the vehicle. The mobile unit may send security warnings to the command center via a wireless transceiver. Position information for the vehicle is determined using a GPS receiver at the vehicle.

U.S. Pat. No. 5,515,043 discloses a similar system which may send one or more preprogrammed telephone messages to a user when away from the vehicle. The user may remotely access location information or cause certain commands to be carried out by entering a personal identification number (PIN).

The widespread availability and use of the Internet has prompted a number of vehicle tracking systems to also make use of the Internet. For example, TelEvoke, Inc. proposed such a system in combination with Clifford Electronics. The system was to provide notification, control and tracking services via the telephone or the Internet. Users could be notified via phone, e-mail, or pager of events such as a car alarm being triggered. Users could control the vehicle remote devices via phone, web, or PDA such as unlocking car doors. Additionally, users could track TelEvoke-enabled vehicles on the Internet or via the telephone. An Internet map could be viewed by the user showing the actual and prior vehicle locations. TelEvoke offered its services via a centralized fully automated Network Operations Center. To reduce the communications costs, it was proposed to use the control channel of the cellular telephone network.



There are, of course, a number of vehicles which come from the manufacturer with some form of security system already installed. In addition, a number of vehicles are also equipped with aftermarket security systems. Many conventional vehicle tracking units may not be readily installed in vehicles, particularly those vehicles already including a vehicle security system. In addition, complexity of installation may significantly increase the system costs.

## SUMMARY OF THE INVENTION

In view of the foregoing background, it is therefore an object of the present invention to provide a vehicle control system that provides vehicle tracking and function control capabilities.

This and other objects, features, and advantages in accordance with the present invention are provided by a vehicle control system including a tracking unit and a function unit cooperating therewith. The tracking unit may include a vehicle position determining device, a wireless communications device, and a tracking controller cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information to a user. Further, the function unit may include at least one uniquely coded transmitter to be carried by a user, a receiver at the vehicle for receiving signals from the at least one uniquely coded transmitter, and a function controller at the vehicle and connected to the receiver for learning the at least one uniquely coded transmitter to permit control of a vehicle function by the user. The function controller may advantageously cooperate with the wireless communications device of the tracking unit for sending an alert indication of whether at least one new uniquely coded transmitter has been learned.

More particularly, the vehicle control system may further include a local indicator connected to the function controller for providing a local indication of whether at least one uniquely coded transmitter has been learned. Also, the vehicle function may be associated with starting of a vehicle engine, vehicle door locks, and/or vehicle security.

The function controller may be switchable to a learning mode to permit learning of the at least one uniquely coded transmitter, and the function controller may cooperate with the wireless communications device for sending the alert indication when the learning mode has been entered. Moreover, the function controller may cooperate with the wireless communications device for sending the alert indication when the learning mode has last been entered.

Additionally, the function controller may cooperate with the wireless communications device for sending the alert indication for a passage of time since the learning mode has last been entered. Similarly, the function controller may cooperate with the wireless communications device for sending the alert indication for a number of learned uniquely coded transmitters, as well as for sending the alert indication for a change in a number of learned uniquely coded transmitters, and/or for sending the alert indication for a change in a code of at least one learned uniquely coded transmitter.

Further, the at least one uniquely coded transmitter may include at least one uniquely coded remote transmitter, as well as at least one uniquely coded transponder transmitter,

for example. The vehicle position determining device may be a Global Positioning System (GPS) device, and the wireless communications device may be a cellular telephone communications device, for example.

The function unit may also include a biometric characteristic sensor for sensing a unique biometric characteristic of a user, and a function controller at the vehicle and connected to the biometric characteristic sensor for learning the unique biometric characteristic to permit control of a vehicle function by the user. Moreover, the function controller may cooperate with the wireless communications device of the tracking unit for sending an alert indication of whether at least one new unique biometric characteristic has been learned.

A vehicle control method aspect of the invention for a vehicle including a vehicle tracking unit for sending vehicle position information to a user may include receiving signals from at least one uniquely coded transmitter at a receiver at the vehicle, and learning the at least one uniquely coded transmitter to permit control of a vehicle function by the user using a function controller at the vehicle and connected to the receiver. Furthermore, the method may also include sending an alert indication of whether at least one new uniquely coded transmitter has been learned using the vehicle tracking unit.

Similarly, a unique biometric characteristic of a user may be sensed using a biometric characteristic sensor at the vehicle, and the unique biometric characteristic may be learned to permit control of a vehicle function by the user using a function controller at the vehicle and connected to the biometric characteristic sensor. In addition, an alert indication may be sent of whether at least one new unique biometric characteristic has been learned using the vehicle tracking unit.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a simplified block diagram of a vehicle tracking system in accordance with the present invention.

FIG. **2** is a more detailed block diagram of the vehicle tracking unit as shown in FIG. **1**.

FIG. **3** is a more detailed block diagram of the monitoring station as shown in FIG. **1**.

FIG. **4** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle stolen alert.

FIGS. **5**A-**5**C are a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle alarm sounding alert.

FIG. **6** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle speeding alert.

FIG. **7** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating an unauthorized transmitter learned alert.

FIG. **8** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a low battery alert.

FIG. **9** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a GPS or cellular unit failure alert.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

Referring to FIGS. **1-3**, the vehicle tracking system **20** in accordance with the invention is now initially described. The vehicle system **20** illustratively includes a vehicle tracking unit **25** to be mounted in the vehicle **21** and a monitoring station **30** which is remote from the vehicle and which is typically in a fixed location. In the illustrated embodiment, the vehicle tracking unit **25** interfaces with various vehicle devices, such as may include security sensors, door locks, etc. as will be appreciated by those skilled in the art.

The vehicle tracking unit **25** is also illustratively connected to a separate vehicle security system **27** as may already be installed in the vehicle **21**, from the factory or installed as an aftermarket product. Those of skill in the art will appreciate that in some embodiments of the vehicle tracking system **20** a separate vehicle security system **27** may not be needed, and/or various features thereof can be readily incorporated in the vehicle tracking unit **25**.

The monitoring station **30** may typically service a number of subscribers **31**. As shown perhaps best in FIG. **3**, the monitoring station **30** may include a user interface, such as the schematically illustrated telephone network interface **33** and the internet interface **34** which are schematically coupled to a telephone **35**, and a computer **36**, respectively. Of course in other embodiments, other interfaces may be used and only one of the illustrated interfaces may be needed. Those of skill in the art will also recognize that messages may be sent to a subscriber or user via preprogrammed voice messages, e-mail messages, facsimile messages, pager alerts, etc. In addition commands or instructions from the subscriber can also be input to the monitoring station **30** via the telephone network interface. **33** and/or the internet interface **34**, from the subscribers telephone **35** or computer **36**.

The monitoring station **30** is illustratively connected to a cellular telephone tower **32** which, in turn, may communicate with the vehicle tracking unit **25** in some embodiments. Of course, in other embodiments other communications approaches are also contemplated, such as, for example, including satellite communications.

The monitoring station **30** may typically include the necessary modems, and other communications electronics, and computers for its functions which are described in greater detail below. The configuration of such components and their details will be readily apparent to those skilled in the art. Accordingly, no further discussion of these details is needed.

Referring now more specifically to FIG. **2**, additional details of the vehicle tracking unit **25** and devices at the vehicle are now further described. The vehicle tracking unit **25** illustratively includes a controller **40**, a vehicle position determining device **42**, and a wireless communications device **44** connected together. The vehicle position determining device **42** may be provided by a GPS receiver, for example. The GPS receiver typically operates by receiving multiple signals from spaced apart satellites **38** as will be appreciated by those skilled in the art.

In other embodiments, the vehicle position determining device **42** may be provided based upon communications with the cellular telephone network, or based upon other satellite transmissions, for example. As a particular example, time of arrival techniques are available based upon multiple reception paths to determine position via the cellular telephone network as will be appreciated by those skilled in the art. The vehicle position determining device **42** also illustratively includes an indicator **43** associated therewith, such as for indicating an

operating mode, or proper operation of the device as will be addressed in greater detail below.

The wireless communications device **44** may be provided by a cellular telephone transceiver configured to operate on a control channel of the cellular network. Such a control channel may provide nearly universal coverage for the tracking system **20** as will be appreciated by those skilled in the art. In addition, the control channel may offer relatively inexpensive communications between the monitoring station **30** and the vehicle tracking unit **25** as will be appreciated by those skilled in the art. The wireless communications device **44** also illustratively includes an optional status indicator **45** with a similar function as the indicator **43** for the vehicle position determining device.

The wireless communications device **44** in other embodiments, may transmit in the voiceband of the cellular network. Alternately, the wireless communications device may communicate over other networks, such as over satellite, or via wireless internet services, as will be appreciated by those skilled in the art.

The controller **40** illustratively includes a central processing unit (CPU) **50** or other logic circuitry which is connected to a clock signal generator **51** and a memory **52**. In other embodiments, the memory **52** may be an embedded memory in the CPU **50**. The controller **40** also includes schematically illustrated input/output circuitry **53** to interface with various vehicle devices. In particular the input/output circuitry **53** may provide dual polarity compatibility for one or more inputs or outputs as will be described in greater detail below. One or more of the terminals of the input/output circuitry **53** may also provide both input and output functions as will also be described in greater detail below. This may significantly simplify and accelerate installation of the vehicle tracking unit **25** in the vehicle **21**.

Also illustratively shown as part of the vehicle tracking unit **25** are a back-up battery **54**, and switch **55** connected thereto for selectively powering certain of the components based upon the controller **40**. Of course, the vehicle **21** also includes an electrical system including the vehicle battery **61**. Powering of the vehicle tracking unit **25** is described in greater detail below.

The vehicle **21** also includes a number of other components that may relate to vehicle tracking, security, and/or convenience features provided by the vehicle tracking system **20**. For example, the vehicle **21** may include one or more door lock actuators **62**, an optional remote starting device **63**, a starter interrupt device **66** and an alarm indicator **67**. For example, the alarm indicator may be provided by a vehicle horn or vehicle siren, and/or flashing of the lights.

The optional separate security system **27** illustratively includes a vehicle security controller **28** and a receiver **29** connected thereto. As is conventional, the vehicle security system **27** may be switched between armed and disarmed modes, for example, by one or more uniquely coded remote transmitters **60**. The vehicle security controller **28** may also be capable of learning a new uniquely coded remote transmitter **60** as will be appreciated by those skilled in the art. The vehicle security controller **28** also illustratively is connected to the starter interrupt device **66** and the alarm indicator **67**.

For ease of explanation, a number of the features of the vehicle tracking system **20** are now described. The vehicle tracking system **20** includes a number of features that may simplify installation and maintenance. For example, as shown in FIG. **2**, the vehicle tracking unit **25** may have a test switch **71** connected to the controller **40**.

In normal operation, the controller **40** may be called upon to operate at least one vehicle device. Of course, the controller **40** also cooperates with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. Moreover, the controller **40** may be switchable to a test mode for test operation of the at least one vehicle device responsive to activation of the test switch **71**.

In some embodiments, the at least one vehicle device may be a plurality of vehicle devices that are tested by operation in sequence. For example, the at least one vehicle device may comprise at least one door lock actuator **62**. The at least one vehicle device may also comprise the starter interrupt device **66**, or the engine remote starter **63** if remote starting is an implemented feature. The at least one vehicle device which is tested, may also be the alarm indicator **67**. Accordingly, an installer, for example, can quickly check that the tracking unit has been properly installed.

To further provide for ready determination of proper operation of the vehicle tracking unit **25**, one or both of the position determining and wireless communications devices **42**, **44** may include associated indicators **43**, **45** as mentioned briefly above, and which provide an indication relating to proper operation. Each indicator **43**, **45** may indicate a mode of operation of the device, its proper operation, or a partial or complete failure of the device.

Another aspect of the invention is that the controller **40** may provide a selectable polarity for the at least one vehicle device based upon sensing thereof. Accordingly, a predetermined activation of the test switch **71** may cause the controller **40** to sense and select the proper polarity. Pressing the test switch **71** for a predetermined time or in a predetermined pattern may sense and set the polarity.

Another feature of the vehicle tracking unit **25** and vehicle tracking system **20** relates to conservation of the number of codes or messages that need to be sent to the vehicle tracking unit. In particular, the controller **40** may have a plurality of different controller states and respond differently to a same message from the monitoring station **30** at different times depending upon the controller state at a given time. Accordingly, a number of codes or messages used by the system can be conserved. Various messages are described in greater detail below.

A controller state may change based upon several different occurrences or events. For example the controller may change states in response to a change in at least one vehicle device, or based upon a message received by the wireless communications device **44** from the monitoring station **30**, and/or based upon elapsed time. The controller states, for example, may include an alert sent state based upon an alert message being sent from the wireless communications device **44**. Thereafter, receipt of a predetermined message by the wireless communications device **44** when the controller **40** is in the alert sent state may confirm receipt of the alert message by the monitoring station.

Receipt of the predetermined message by the wireless communications device **44** when the controller **40** is in another state different than the alert sent state may thus cause a different response by the controller. The alert sent state may comprise at least one of a vehicle stolen alert sent state, a vehicle alarm sounding alert sent state, a vehicle speeding alert sent state, an unauthorized remote transmitter alert sent state, a low vehicle battery alert sent state, and a device malfunction alert sent state. The various alert messages and confirmation thereof are described in greater detail below.

The code or message conservation aspects of the vehicle tracking system **20** also permit sending a sequence of codes or messages within a predetermined time to also cause a different response at the vehicle tracking unit **25**. In other words,

the plurality of controller states may comprise a received first message state based upon a first message being received by the wireless communications device **44** from the monitoring station **30**. Receipt of a second message by the wireless communications device **44** when the controller **40** is in the received first message state, such as within a predetermined time window, for example, may thus cause a different response by the controller than does receipt of the second message when the controller is in another state than the received first message state.

The plurality of controller states may comprise a vehicle finder state sounding an audible signal via the alarm indicator **67** at the vehicle **21**. In this state the controller **40** would bypass sending a vehicle alarm sounding alert to the monitoring station **30**.

Another aspect of the vehicle tracking system **20** is the provision of certain power conservation and management techniques, such as to permit extended periods where the vehicle **21** is not in operation. During such extended periods, the vehicle battery **61** provides power to the vehicle tracking unit **25** as well as other vehicle devices. Accordingly, the voltage of the vehicle battery **61** drops over time. The vehicle tracking unit **25** may provide a significant drain on the vehicle battery **61** because of the power consumed by the wireless communications device **44** during transmission as will be appreciated by those skilled in the art.

The vehicle position determining device **42**, the wireless communications device **44** and the controller **40** may be considered as defining a power load of the vehicle tracking unit **25**. The controller **40** may operate the schematically illustrated power switch **55** to isolate the back-up battery **54** from the power load as a voltage of the vehicle battery **61** drops until reaching a threshold. After or below the threshold the controller **40** may cause the back-up battery **54** to selectively power only a first portion of the power load while a second portion of the power load remains powered by the vehicle battery.

For example, the wireless communications device **44** may have a higher operating voltage than the vehicle position determining device **42**. The first portion of the power load that is selectively powered despite the low vehicle battery voltage may thus be the wireless communications device **44**. In particular, the wireless communications device **44** may be powered for transmission. Accordingly, the back-up battery **54** can be saved for limited communication using the higher voltage wireless communications device **44**. This provides useful features even after an extended period during which the vehicle **21** is left unattended and the vehicle battery **61** gradually discharges.

To further conserve power, the controller **40** may reduce operation of the power load as vehicle battery voltage falls. Conversely, the controller **40** may restore operation of the power load based upon the voltage of the vehicle battery **61** rising again, such as upon being recharged.

Also relating to power consumption, the controller **40** further causes transmission of a low vehicle battery voltage alert to the monitoring station **30** based upon the voltage of the vehicle battery **61** falling below the threshold. The user or subscriber may cause the monitoring station **30** to issue a remote start command. The controller **40** may then generate a remote start output to the remote start device **63** to thereby start the engine and recharge the vehicle battery.

Another feature of the vehicle tracking system **20** is that the vehicle tracking unit **25** may be readily installed and connected to a vehicle **21**, such as in the illustrated embodiment where the vehicle includes a starter interrupt device **66** and a separate vehicle security controller **28**. More particularly, the controller **40** may switch between an armed mode and a disarmed mode based upon operation of the engine starter interrupt device **66**. The controller **40** when in the armed mode may cooperate with the wireless communications device **44** to send an alert message to the monitoring station **30** and including vehicle position information, for example, based upon the vehicle position determining device **42**. The controller **40** is also for selectively operating the engine starter interrupt device **66** to provide additional security features.

In one advantageous embodiment, the controller **40** preferably comprises a combination input and output terminal for connection to the engine starter interrupt device. This terminal is at the input/output circuitry **53** and is schematically illustrated by reference numeral **72**. The controller **40** may switch to the armed mode when in the disarmed mode and based upon the engine starter interrupt device **66** being operated to disable engine starting. Conversely, the controller **40** may switch to the disarmed mode based upon the engine starter interrupt device **66** being operated to enable engine starting. In other words, the vehicle tracking unit **25** can piggyback its arming and disarming off the existing vehicle security system **27**, for example.

The controller **40** may also selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. The controller **40** may selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. Alternately, or in addition thereto, the controller **40** may selectively operate the engine starter interrupt device **66** based upon the ignition switch **65**.

The following descriptive portions relate to various user or subscriber notifications and features provided by the vehicle tracking system **20**. Of course, the controller **40** preferably cooperates with the wireless communications device **44** to send an alert message. The monitoring station **30** may comprise a user interface, such as one or both of the telephone network or internet interfaces **33**, **34**, respectively (FIG. **3**), for generating a sequence of alert message notifications based upon receiving the alert message sent from the vehicle tracking unit **25**. More particularly, the monitoring station interface permits canceling any remaining alert message notification based upon a cancellation command response from a user or subscriber having already received the alert message notification. The user may send the cancellation response via the telephone **35** or computer **36** (FIG. **3**), for example. Thus, if the user may be reached at different telephone numbers or different users are desirably notified of the alert, this aspect of the vehicle tracking system **20** can make the notifications efficiently and without making unnecessary notifications.

The vehicle tracking system **20** may provide any of a number of very useful alerts, as discussed herein. For example, the alert message sent from the vehicle tracking unit may comprise at least one of a vehicle stolen alert message, and a vehicle alarm sounding alert message. The alert message may be one of a vehicle speeding alert message, and a vehicle acceleration alert message. In addition, the alert message may comprise an unauthorized remote transmitter alert message. Also, the alert message may be at least one of a low vehicle battery alert message, and a device malfunction alert message.

The speeding alert may be based upon exceeding a speed threshold for greater than a certain time, which may be user selectable. The acceleration alert may also be useful as such is also indicative of aggressive driving along with the speeding alert. The unauthorized remote transmitter alert increases overall security since a user will be notified if a would-be thief

learns an unauthorized transmitter to operate the controller. These alerts are described in greater detail below.

The vehicle tracking system **20** may be implemented as a service to a subscriber. In other words, the subscriber pays a monthly fee for the service. Accordingly, it may be important to encourage a user to register. Similar subscriber or registrations systems in the past have suffered revenue losses since some users would wait to activate the system until the vehicle was stolen. In other words, the user would only subscribe or register and pay a single month's fee.

In accordance with this aspect of the vehicle tracking system **20** prompt user registration is encouraged. In particular, the vehicle tracking unit **25** may include the user registration reminder indicator **56** and the controller **40** may be switchable from an unregistered mode to a registered mode. In the registered mode, the controller **40** may cooperate with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. In the unregistered mode, the controller **40** may activate the user registration reminder indicator **56** to encourage registration by the user.

The controller **40** may be switchable to the registered mode based upon an activation message from the monitoring station **30**. For example, when the registration payment has been received, the monitoring station can send one or more messages to the vehicle tracking unit **25** to stop activation of the registration reminder indicator **56**. The indicator **56** may be audible, visual or both. For example, the registration reminder indicator **56** could be a beeping sound generated by a small piezoelectric transducer every ten minutes or so when the ignition **65** is on.

In other words, the user registration reminder indicator **56** may provide a minor but irritating annoyance to the user to encourage registration. Upon successfully registering, the annoyance is abated. Accordingly, a relatively straightforward approach is provided to encourage user registration.

Along these lines, the controller **40** when in the unregistered mode may have reduced features compared to the registered mode. For example, the controller **40** when in the unregistered mode may be restricted or limited in sending messages with the wireless communications device **44**. Accordingly, usage of the wireless communications network may be reduced. Transmissions from the vehicle tracking unit **25** may also be beneficially suppressed during original installation, for example.

Returning again to features of the vehicle tracking unit **25** which facilitate installation, the controller **40** may send an alarm indication alert responsive to a continuous activation of the alarm indicator **67** for greater than a predetermined time. Alternately, or in addition thereto, the controller **40** may send an alarm indication alert responsive to a repetitive pattern of alarm indicator **67** activations. In other words, the controller may be configured to distinguish between normal operation of a vehicle horn by the driver, and activation of the horn by the security system **27**. As mentioned above, the controller **40** may also monitor signals of at least one of a first and second polarity. The controller **40** thus advantageously piggybacks off the alarm indication generated by the vehicle security system **27** to determine and send a vehicle alarm sounding alert to the monitoring station **30**.

In one variation, the controller **40** may monitor signals delivered directly to the vehicle alarm indicator by the vehicle security controller **28**. In another variation, the controller **40** monitors signals of voltage dips of the vehicle battery **61**. Circuitry is conventionally and readily available for both such functions, as will be readily appreciated by those skilled in the art.

The controller **40** may also include a dual polarity compatible output in the input/output circuitry **53** for a vehicle device, such as the vehicle alarm indicator **67**. The controller **40** may further monitor signals relating to activation of the vehicle alarm indicator **67** and send an alarm indication alert with position information from the vehicle position determining device and using the wireless communication device.

For the dual polarity output compatibility, the controller **40** may generate a first polarity output pulse followed by a second polarity output pulse. The controller **40** may also generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. In yet other embodiments, the controller **40** may sense an actual polarity of the device and thereafter use the actual polarity for the dual polarity compatible output.

Where the vehicle device is a vehicle horn, the controller **40** may typically be configured to generate a negative polarity output on the dual polarity compatible output. Conversely, wherein the vehicle device is a vehicle alarm indicator siren, the controller **40** may be configured to generate a positive polarity output on the dual polarity compatible output.

Another aspect of the vehicle tracking system **20** relates to conserving memory space and/or reducing transmission time over the communications network. In accordance with this advantageous feature, the controller **40** may determine the vehicle position information including a vehicle location and an associated stationary period for each occurrence of the vehicle remaining stationary for greater than a predetermined period. In one embodiment, the controller **40** may cooperate with the wireless transmission device **44** to send the vehicle position information to the monitoring station based upon each occurrence of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the monitoring station **30** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the monitoring station **30** may time stamp the received information.

In another embodiment, the controller **40** cooperates with the wireless transmission device **44** to send the vehicle position information to the monitoring station **30** for a plurality of occurrences of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the controller **40** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the controller time stamps the position and stationary period information.

As an example, the predetermined time which determines whether the vehicle **21** is stationary and the position should be determined, may be less than about three minutes. This time may filter out vehicle stops in normal traffic, but which will keep track of stops where the driver likely leaves the vehicle **21**. Accordingly, only the important information necessary to track the vehicle need be stored and/or transmitted thereby reducing the system costs. If the vehicle **21** is stationary overnight, for example, unnecessary position information need not be determined, stored, and/or transmitted to the monitoring station **30**.

The controller **40** may comprise the memory **52** for storing the vehicle position information therein. In one configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined schedule. In another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined event. In yet another configuration, the controller **40** downloads the vehicle position information from

the memory **52** to the monitoring station **30** based upon a predetermined percentage of memory usage.

Having now described certain general features and advantages of the vehicle tracking system **20**, this description now turns to additional specific details which are provided as examples. In particular, vehicle tracking system **20** preferably implements one or more of the following features:

a. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and then starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

b. Detects an optional vehicle security or alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

c. Detects an optional vehicle alarm system's remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

d. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the website. The vehicle would be equipped with a security system as disclosed in U.S. Pat. No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

e. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined maximum speed limit and duration thereof can be selected by the user.

f. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens. The time setting is preferably selectable by the user.

g. Detects the vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

h. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user or subscriber also preferably has access to an Internet site that will display a map and silently contact the vehicle to acquire its current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be quickly activated by a telephone call. No additional installation may be required.

Certain annual pre-pay package arrangements may be available. For example, up to 10 access entries per month can be provided on a low monthly billing. Up to 30 access entries could be provided also for a relatively low monthly fee.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the monitoring station internet site. The user may control various vehicle functions remotely via the telephone or the internet site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment and installation is relatively inexpensive. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4).

For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5).

For the Lock/Unlock vehicle doors feature: from any phone or computer a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low. Some further details of a specific embodiment of the vehicle tracking unit **25** are provided below as relating to use of red and green LED indicators as may be coupled to the controller **40** and operated thereby. Also various representative wires, designated by color, are provided as an example embodiment.

The red LED verifies the GPS receiving signal. With a yellow wire having positive 12 volts, the red LED blinking indicates searching GPS location, constant indicates found location, and off indicates no GPS signal found. With the yellow wire not having positive 12 volts, if the red LED is off, the LED is not functioning.

The green LED verifies receiving the cell tower signal. With the yellow wire having positive 12 volts, blinking indicates the cell control channel signal is detected, constant indicates sending a micro burst signal (LED stays on 5 seconds after each transmission), and off indicates no cell tower signal received. With the yellow wire not having positive 12 volts, off indicates the green LED is not functioning.

An example of representative DIP switch feature selection is as follows. A first switch may be used for adding the orange wire for controlling arm/disarming of the system. When on, the orange wire controls arm/disarm as follows: to arm, the orange wire is grounded and the yellow wire does not have 12

volts positive. To disarm, the orange wire is not grounded. When the first switch is off, then only the yellow wire controls arm/disarm as follows: to arm, the yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed. To disarm, the yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

a. The Red Wire is connected to the 12 vdc power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11 volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

b. The-black wire is connected to ground.

c. The yellow wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further: if the system is in an armed mode and the Lat/Long changes, then Alert "A" is given. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D". If the first DIP switch is in the off position then: if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues from the 500 ma ground, and if the yellow wire sees ground or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed.

d. The gray wire is for input and output, and can be connected to an alarm siren or horn positive terminal. In addition:

i. With the system armed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

ii. With system disarmed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

iii. With system disarmed and if the Gray wire detects 3 or more 12 volt positive-pulses within 2.5 seconds of yellow wire receiving +12 v and the gray wire by-pass not being activated, then alert warning "D" is given.

iv. The gray wire bypass operates as follows:

1. After alert warning "B" bypass all future alert "B" signals until system is disarmed.
2. After alert warning "C" bypass all future alert "C" signals until system is armed.
3. After alert warning "D" bypass all future alert "D" signals until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire having 12 volts.

v. With the system armed or disarmed. The Output: Internal +12 v, 1 amp transistor with pulses 1 second on and 1 seconds off to activate siren or honk car horn or flashing light relay.

1. Non-stop activation from (Command "4")
2. 30-second activation from (Command "5")

vi. Turn off the above alert "A" from (Command "1").

e. The orange wire is for the starter interrupt and arm/disarm system, and operates as follows:

i. If first DIP switch is in the:

1. On position and: the orange wire has 12 volts or neutral, the system switches to the disarmed mode; the orange wire is grounded, then the system is switched to the armed mode; and the starter interrupt output will not automatically operate. It can only be activated from "Command 4"
2. Off position and the orange wire does not effect the arming or disarming of the system; 30 seconds after system arms the orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.

ii. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

iii. After alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange-wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example. A green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6"). A red wire provides a constant 12 v output from the red power wire. A blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7"). A pink wire provides a 250 ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation test button may also be provided to work as follows. Pressing the button activates the orange wire for 10-seconds (starter interrupt), with these circuits in sequence. First, it activates the gray wire for 1-second (siren/horn). After the first stops, it activates the green wire for 1 second to lock the doors. After the second stops, it activates the blue wire for 1 second to unlock the doors. After the third stops, it activates the pink wire for 1 second to activate an optional item.

Representative warning alerts are as follows:

a. Alert Warning "A" (FIG. **4**): Automatic activation of "Command 8" and the vehicle unit contacts monitoring station to instantly call 3 phone numbers with the message "Your vehicle is stolen please confirm then call 911 to advise police of website and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" signals until the system is re-armed.

b. Alert Warning "B" (FIGS. **5**A-**5**C): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

c. Alert Warning "C" (FIG. **6**): the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###" and time limit of "##" seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS). This aspect is further understood with reference to the enclosed flowchart **84** of FIG. **6**.

d. Alert Warning "D" (FIG. **7**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Unauthorized remote transmitter was

just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of the yellow wire having seen 12 volts positive. All future alerts "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts. This aspect is further understood with reference to the enclosed flowchart **85** of FIG. **7**.

e. Alert Warning "E" (FIG. **8**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the red wire with lower than 11 volts for ## minutes. All future alerts "E" are bypassed until, first, more than 13.5 volts are detected on the red wire and, second, after the yellow wire stops having positive voltage the red wire then must detect more than 12 volts.

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) website to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

i. Gray wire to pulse 1 sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

ii. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250 ma negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a. With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i. Once instantly.

ii. Once in 1 hour if at the same location.

iii. Once in 6 hours if at the same location.

iv. Once in 12 hours if at the same location.

v. Once every 24 hours if at the same location.

vi. Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a. At a user selected predetermined time ## (01-24) of each day, or

b. At a predetermined memory fill level, such as full or near full.

In addition, each system event may contain one or more of the following:

a. Vehicle Location

b. Vehicle total time at location

c. Time of day

d. Mph traveling

e. Total time traveling above MPH

f. Direction traveling

g. Delta

h. Special Alert messages, if any, including:

i. GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include: while the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is the same then only update stationary total time. If the GPS antenna is not receiving any signal then enter last known GPS location and with an indication that this was the last known GPS location before the GPS signal stopped, how long no GPS signal was received, and the GPS location in the on-hold file, when the vehicle is traveling above ### MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These may include:

The user's vehicle has issued a stolen alert:

If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the website address and an identification number, such as the user's PIN, to allow the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmissions are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police

may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature may begin immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications

infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart **80** (FIG. **4**).

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition.

A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowcharts **81**-**83** (FIGS. **5**A-**5**C).

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and it can be determined whether it is greater than zero (e.g. greater than six volts) and less than a high value (e.g. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If the vehicle is being serviced and the battery is disconnected, this will cause the battery voltage to be equal to zero. Then, the low battery voltage transmission will not be communicated to the monitoring station. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. Again, false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart **86** (FIG. **8**).

Yet another advantageous feature of some embodiments of the invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated than a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or combinations thereof could be used to start the GPS receiver. This sensor could also be used to

trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Another aspect relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Turning now to the flowchart **87** of FIG. **9**, still another aspect relates to warning the user of an inoperable or malfunctioning GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once every 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

By way of example, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Yet another feature is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station. More particularly, a typical arrangement may provide eight basic codes and two Awildcard@ codes. The two wildcard codes are reserved for future or other uses. A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A-E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response (no alarm triggered) in the tracking device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

In accordance with another feature, the rate of sending the location or position data (or change in position data) from the vehicle may be varied to reduce system usage and thereby reduce expenses. More particularly, in one embodiment, the rate of sending may be based upon how long the vehicle has remained stationary. This time period may be selected by the user. For example, the selected time may be in the range of 15 minutes to six hours. If the vehicle has been stationary for the selected time period, then the rate of transmission may be reduced. This reduces or eliminates the need to send home position data and send all the over 15-minute stops made that day. Otherwise, that is when the vehicle is moving, the device

may send data at a faster rate. Of course, a system user would not likely be interested in quick updates, especially where the position information is not changing. Conversely, if the vehicle is being moved, it may be desirable to receive more frequent position updates.

Another variation of this transmission rate conservation feature bases the rate of transmission on the vehicle position. For example, a reduced rate of transmission may be selected if the vehicle is in a predetermined area where the user has a lesser interest in quickly updated position information. The user may also have a reduced interest in an area that can be defined outside of a predetermined distance from a reference point.

Yet another variation of the vehicle position transmission rate conservation feature is based upon the vehicle's speed, such as the vehicle's average or maximum speed, for example. Accordingly, if the vehicle is traveling above a preset speed, the rate of transmission may be increased.

In accordance with another aspect of the invention, the tracking device may send the alert indication a predetermined number of times without receiving an acknowledgment as described above, and then wait until the vehicle position has changed before trying again or the cell re-registers or its RSS (received signal strength) changes. Thus, power is conserved. When the vehicle has moved to a new position, any obstructions may no longer be present thereby increasing the likelihood of a successful communication. In addition, the change in position may be determined when the vehicle is sensed to be moving about a predetermined relatively small speed, such as greater than 1 mph, for example.

In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Pat. Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention.

Yet another aspect relates to efficient use of available codes on the cellular telephone control channel. In one particular example, ten codes may be available to be transmitted from the monitoring station to the vehicle trackers. The first eight or nine codes are command codes that will cause a specific action by the tracking device at the vehicle. The other one or two codes may be wildcard codes as mentioned above, that may set a stand-by mode for one or a group of vehicles, for example.

It may be desirable to provide more than eight commands at the vehicle responsive to the corresponding eight available codes. For example, it may be desirable to set a feature on or off, or to set a different feature setting or threshold. In accordance with this aspect of the invention, the commands at the tracker are determined based upon a series of different command codes being received within a predetermined time window.

For example, the monitoring station may send code 9 that switches the tracker in the car into a stand-by mode for a predetermined time and which causes the tracker to respond with an upstream confirmation code 7 or 9 indicating receiving code 9. During the predetermined time of the stand-by mode another code follows that causes a system programmable feature or setting to change. Note that the second code would otherwise cause a different function at the vehicle. Note that system might operate a function 9 if another code 1-9 is not received in the predetermined time. The following list is exemplary for features resulting from second codes 1-9:

Code 1—Tracker will turn off feature of upstream code caused by vehicle alert being detected.

Code 2—Tracker will turn on feature of upstream code caused by vehicle alert being detected.

Code 3—Tracker deactivates cell receiver from operating due to a non-paying customer for monitoring service. That phone number can then be allocated to another customer.

Code 4—Turn on audio buzzer feature that will sound once each 10 minutes. The monitoring station need only send the command to activate the feature, as the tracker will time the period and drive the buzzer thereafter. The monitoring station will normally not need to send this command because the tracker will be configured out of the box with this feature activated to sound the buzzer every 10 minutes until the next command is received.

Code 5—Turn off the audio buzzer. This is to be sent by the monitoring station after a user has successfully activated his account.

Code 6—Turn on the 80 mph speed limit reporting. This will normally not be sent as this feature will be the default setting of the tracker.

Code 7—Turn off the 80 mph speed limit reporting.

Code 8—Increase speed limit 5 mph and increase the time 5 minutes.

Code 9—Decrease speed limit 5 mph and decrease the time 5 minutes, and wait 5 minutes if another code number follows. It could operate this way to allow another set of codes to change more features.

In this example, in response to the tracker receiving the system code 1-9, the tracker sends an upstream code 7 to acknowledge receipt of the system code 1-9. Upon receipt of code 9 the tracker waits up to 5 minutes to determine if another system code is received. If no code is received, then the tracker performs the code 9 operation. Of course, in other embodiments other features or settings can be selected. In general, it may be preferred that the first code sent in a series of two codes, for example, be a code that causes only a minor function to be performed at the vehicle. This is so because if the second code is sent from the monitoring station, but not received at the tracker, only a minor function is performed. For example, the first code may switch between armed and disarmed modes. This is in contrast to using a remote engine starting code or engine shutdown code as the first code. The vehicle may be moving or positioned in a marginal reception area, and the second command may not be received by the tracker within the predetermined time window. As will be appreciated by those skilled in the art, this concept of multiple digit codes, can be extended beyond two digits to three or more.

To further conserve cellular transmissions and as described above, the tracker may be set to record a position based upon a determined event. Only this recorded position information may be downloaded either by user request or at set times. It is desired that such events be relatively few, but that the information still be helpful to the user.

For example, an event for recording of position may be determined based upon the vehicle being stopped for greater than a first time and less than a second time. For example, the first time may be 15 minutes and the second time may be 6 hours. Determination of the vehicle being stopped can be made based upon one or both of the GPS position or the vehicle ignition being turned off. The second time prevents the recording of position information when the vehicle is stopped at the owner's home during the evening, for example. Accordingly, the important information of the vehicle stops being made is recorded and made available to the user, while system communications resources are conserved.

In another example, if the mode is selected to send the vehicle's location every 10 min and the vehicle is in the same

location for greater than a set time, then no more vehicle locations are sent until the vehicle location has changed to start the every 10 min reporting again.

Other features relating to vehicle control systems are disclosed in copending patent applications entitled VEHICLE TRACKER INCLUDING STATIONARY TIME DETERMINATION AND ASSOCIATED METHODS, Ser. No. 09/859,727 filed May 17, 2001, now U.S. Pat. No. 6,512,465; VEHICLE TRACKER CONSERVING CODES AND RELATED METHODS, Ser. No. 09/859,673 filed May 17, 2001, now U.S. Pat. No. 6,522,267; VEHICLE TRACKER WITH POWER SAVING FEATURES AND RELATED METHODS, Ser. No. 09/859,728 filed May 17, 2001, now U.S. Pat. No. 6,512,466; VEHICLE TRACKER COOPERATING WITH A STARTER INTERRUPT AND RELATED METHODS, Ser. No. 09/859,973 filed May 17, 2001; VEHICLE TRACKER WITH USER NOTIFICATIONS AND ASSOCIATED METHODS, Ser. No. 09/859,733 filed May 17, 2001, now U.S. Pat. No. 6,509,868; VEHICLE TRACKER WITH USER REGISTRATION REMINDER AND RELATED METHODS, Ser. No. 09/859,971 filed May 17, 2001, now U.S. Pat. No. 6,507,786; VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS, Ser. No. 09/859,972 filed May 17, 2001, now U.S. Pat. No. 6,606,561; and VEHICLE TRACKER WITH TEST FEATURES AND RELATED METHODS, Ser. No. 09/859,729 filed May 17, 2001, now U.S. Pat. No. 6,809,659, the entire disclosures of which are incorporated herein by reference.

Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Accordingly, it is understood that the invention is not to be limited to the embodiments disclosed, and that other modifications and embodiments are intended to be included within the spirit and scope of the appended claims.

That which is claimed is:

**1**. A vehicle control system comprising:

a tracking unit and a function unit cooperating therewith, said tracking unit comprising a vehicle position determining device, a wireless communications device, and a tracking controller configured to cooperate with said vehicle position determining device and said wireless communications device to send vehicle position information to a user;

said function unit comprising at least one uniquely coded transmitter to be carried by a user, a receiver at the vehicle for receiving signals from said at least one uniquely coded transmitter, and a function controller at the vehicle and connected to said receiver for learning the at least one uniquely coded transmitter to permit control of a vehicle function by the user;

said function controller configured to cooperate with said wireless communications device of said tracking unit to send an alert indication of whether at least one new uniquely coded transmitter has been learned.

**2**. The vehicle control system according to claim **1** further comprising a local indicator connected to said function controller for providing a local indication of whether at least one uniquely coded transmitter has been learned.

**3**. The vehicle control system according to claim **1** wherein the vehicle function is associated with at least one of starting of a vehicle engine, vehicle door locks, and vehicle security.

**4**. The vehicle control system according to claim **1** wherein said function controller is configured to switch to a learning mode to permit learning of the at least one uniquely coded transmitter; and wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication when the learning mode has been entered.

**5**. The vehicle control system according to claim **1** wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication for a passage of time since the learning mode has last been entered.

**6**. The vehicle control system according to claim **1** wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication for a number of learned uniquely coded transmitters.

**7**. The vehicle control system according to claim **1** wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication for a change in a number of learned uniquely coded transmitters.

**8**. The vehicle control system according to claim **1** wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication for a change in a code of at least one learned uniquely coded transmitter.

**9**. The vehicle control system according to claim **1** wherein said at least one uniquely coded transmitter comprises at least one of a uniquely coded remote transmitter, and a uniquely coded transponder transmitter.

**10**. The vehicle control system according to claim **1** wherein said vehicle position determining device comprises a Global Positioning System (GPS) device; and wherein said wireless communications device comprises a cellular telephone communications device.

**11**. A vehicle control system comprising:

a tracking unit and a function unit cooperating therewith, said tracking unit comprising a vehicle position determining device, a wireless communications device, and a tracking controller configured to cooperate with said vehicle position determining device and said wireless communications device to send vehicle position information to a user;

said function unit comprising a biometric characteristic sensor for sensing a unique biometric characteristic of a user, and a function controller at the vehicle and connected to said biometric characteristic sensor for learning the unique biometric characteristic to permit control of a vehicle function by the user;

said function controller configured to cooperate with said wireless communications device of said tracking unit to send an alert indication of whether at least one new unique biometric characteristic has been learned.

**12**. The vehicle control system according to claim **11** further comprising a local indicator connected to said function controller for providing a local indication of whether the unique biometric characteristic has been learned.

**13**. The vehicle control system according to claim **11** wherein the vehicle function is associated with at least one of starting of a vehicle engine, vehicle door locks, and vehicle security.

**14**. The vehicle control system according to claim **11** wherein said function controller is configured to switch to a learning mode to permit learning of the unique biometric characteristic; and wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication when the learning mode has been entered.

**15**. The vehicle control system according to claim **11** wherein said function controller is configured to cooperate

with said wireless communications device for sending the alert indication for a passage of time since the learning mode has last been entered.

**16**. The vehicle control system according to claim **11** wherein said function controller is configured to cooperate with said wireless communications device for sending the alert indication for a change in a number of learned unique biometric characteristics.

**17**. The vehicle control system according to claim **11** wherein said vehicle position determining device comprises a Global Positioning System (GPS) device; and

wherein said wireless communications device comprises a cellular telephone communications device.

**18**. A vehicle control method for a vehicle comprising a vehicle tracking unit for sending vehicle position information to a user, the method comprising:

receiving signals from at least one uniquely coded transmitter at a receiver at the vehicle;

learning the at least one uniquely coded transmitter to permit control of a vehicle function by the user using a function controller at the vehicle and connected to the receiver; and

sending an alert indication of whether at least one new uniquely coded transmitter has been learned using the vehicle tracking unit.

**19**. The method according to claim **18** further comprising providing a local indication at the vehicle of whether at least one uniquely coded transmitter has been learned.

**20**. The method according to claim **18** wherein the vehicle function is associated with at least one of starting of a vehicle engine, vehicle door locks, and vehicle security.

**21**. The method according to claim **18** wherein the function controller is configured to switch to a learning mode to permit learning of the at least one uniquely coded transmitter; and wherein sending comprises sending the alert indication when the learning mode has been entered.

**22**. The method according to claim **18** wherein sending comprises sending the alert indication for a number of learned uniquely coded transmitters.

**23**. The method according to claim **18** wherein sending comprises sending the alert indication for a change in a number of learned uniquely coded transmitters.

**24**. The method according to claim **18** wherein sending comprises sending the alert indication for a change in a code of at least one learned uniquely coded transmitter.

**25**. A vehicle control method for a vehicle comprising a vehicle tracking unit for sending vehicle position information to a user, the method comprising:

sensing a unique biometric characteristic of a user using a biometric characteristic sensor at the vehicle;

learning the unique biometric characteristic to permit control of a vehicle function by the user using a function controller at the vehicle and connected to the biometric characteristic sensor; and

sending an alert indication of whether at least one new unique biometric characteristic has been learned using the vehicle tracking unit.

**26**. The method according to claim **25** further comprising providing a local indication of whether the unique biometric characteristic has been learned.

**27**. The method according to claim **25** wherein the vehicle function is associated with at least one of starting of a vehicle engine, vehicle door locks, and vehicle security.

**28**. The method according to claim **25** wherein the function controller is configured to switch to a learning mode to permit learning of the unique biometric characteristic; and wherein sending comprises sending the alert indication when the learning mode has been entered.

**29**. The method according to claim **25** wherein sending comprises sending the alert indication for a change in a number of learned unique biometric characteristics.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION



PATENT NO. : 7,720,597 B2
APPLICATION NO. : 11/076259
DATED : May 18, 2010
INVENTOR(S) : Flick et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

| | |
|---|---|
| Column 1, Line 13 | Delete: "flied"<br>Insert: --filed-- |
| Column 4, Line 35 | Delete: "."" |
| Column 8, Line 22 | Delete: "off"<br>Insert: --of-- |
| Column 19, Line 54 | Delete: "time ignition"<br>Insert: --time the ignition-- |

Signed and Sealed this

Seventeenth Day of August, 2010

David J. Kappos

David J. Kappos
*Director of the United States Patent and Trademark Office*

US007149623B2

(12) **United States Patent**
**Flick**

(10) **Patent No.: US 7,149,623 B2**
(45) **Date of Patent: Dec. 12, 2006**

(54) **VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS**

(75) Inventor: **Kenneth E. Flick**, Douglasville, GA (US)

(73) Assignee: **Omega Patents, L.L.C.**, Douglasville, GA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 277 days.

(21) Appl. No.: **10/383,496**

(22) Filed: **Mar. 7, 2003**

(65) **Prior Publication Data**

US 2003/0154027 A1 Aug. 14, 2003

**Related U.S. Application Data**

(63) Continuation of application No. 09/859,972, filed on May 17, 2001, now Pat. No. 6,606,561.

(60) Provisional application No. 60/264,811, filed on Jan. 29, 2001, provisional application No. 60/258,005, filed on Dec. 22, 2000, provisional application No. 60/251,552, filed on Dec. 6, 2000, provisional application No. 60/252,125, filed on Nov. 20, 2000, provisional application No. 60/246,463, filed on Nov. 7, 2000, provisional application No. 60/236,890, filed on Sep. 29, 2000, provisional application No. 60/222,777, filed on Aug. 3, 2000, provisional application No. 60/205,178, filed on May 17, 2000.

(51) **Int. Cl.**
***G01C 21/26*** (2006.01)

(52) **U.S. Cl.** ..... **701/207**; 340/506; 340/531; 340/500; 340/515

(58) **Field of Classification Search** ..... 701/213, 701/36, 211, 200, 207; 340/853.2, 901, 988, 340/989, 991, 992, 993, 425.5, 506, 531, 340/500, 515
See application file for complete search history.

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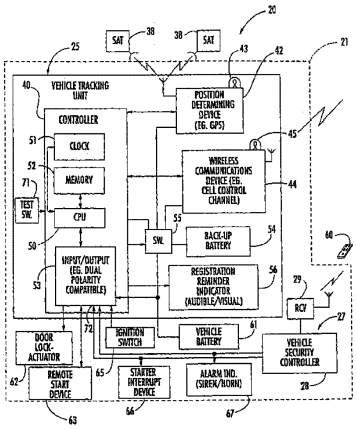
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(57) **ABSTRACT**

A tracking system includes a vehicle tracking unit for a vehicle of a type including an alarm indicator, and a monitoring station receiving the alarm indication alert from the vehicle tracking unit. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a controller connected to the wireless communications device and the vehicle position determining device. The controller may cooperate with the wireless communications device to send an alarm indication alert responsive to at least one of activation of the vehicle alarm indicator continuously for greater than a predetermined time and activation of the vehicle alarm indicator in a repetitive pattern. The controller may also include a dual polarity compatible output for a vehicle device, such as the vehicle alarm indicator.

**34 Claims, 10 Drawing Sheets**



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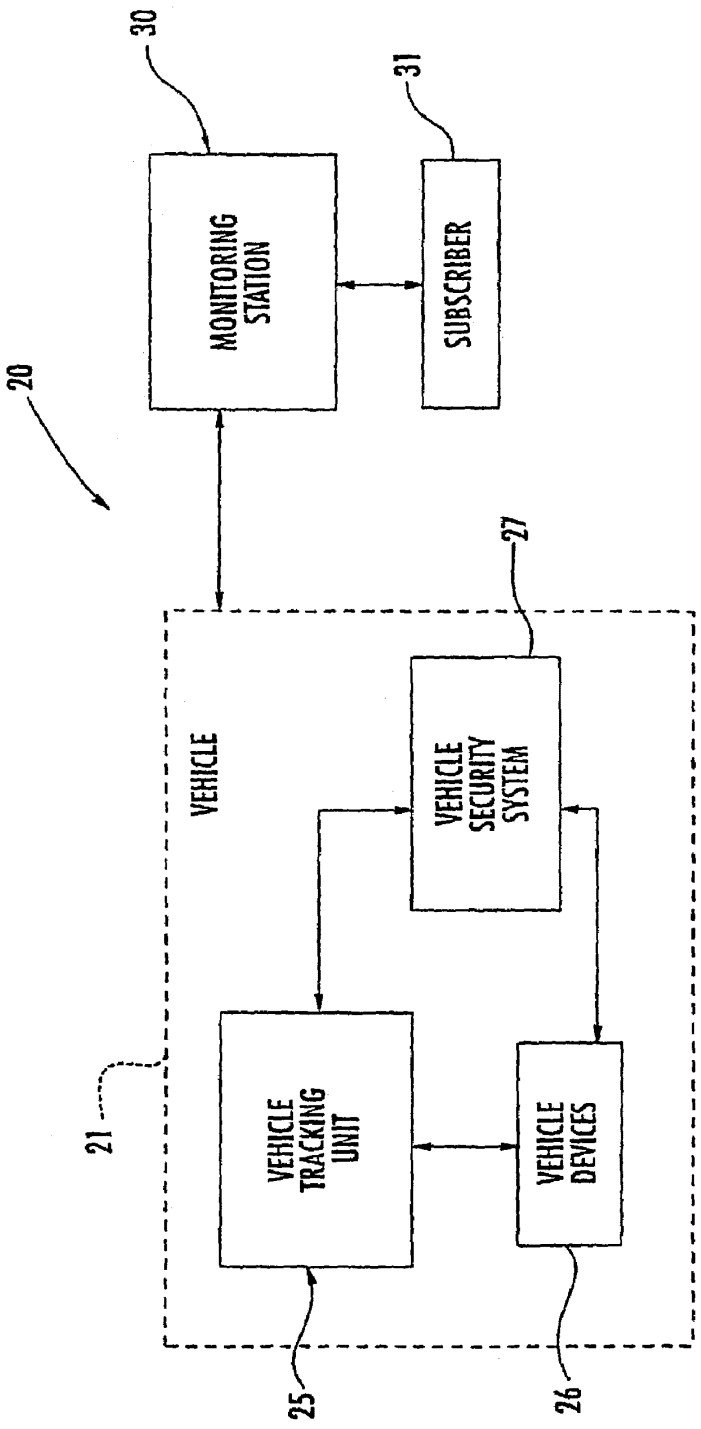



FIG. 1.

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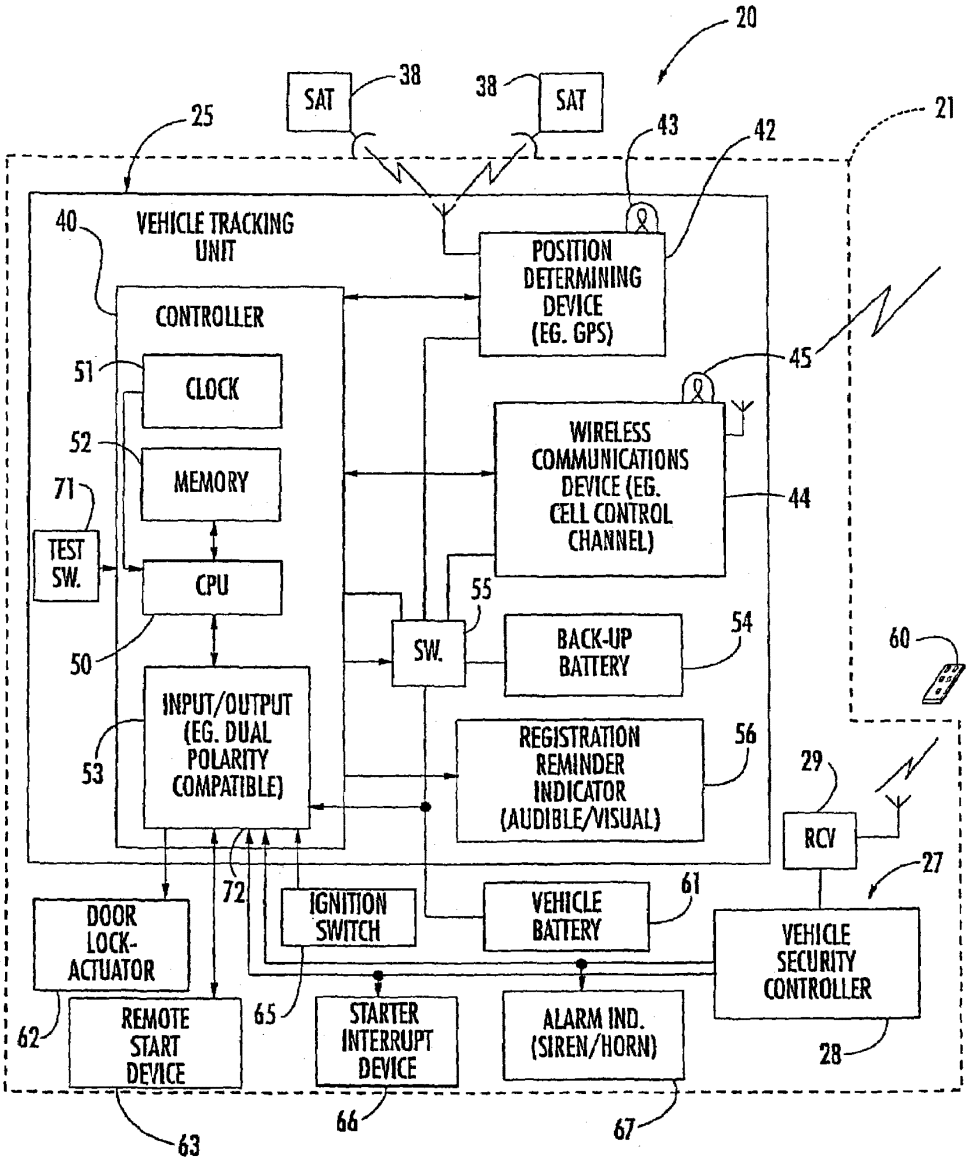

20
SAT
38
38
SAT
25
21
43
42
40
VEHICLE TRACKING UNIT
POSITION DETERMINING DEVICE (EG. GPS)
CONTROLLER
45
51
CLOCK
WIRELESS COMMUNICATIONS DEVICE (EG. CELL CONTROL CHANNEL)
52
MEMORY
44
71
TEST SW.
CPU
55
SW.
BACK-UP BATTERY
54
60
50
INPUT/OUTPUT (EG. DUAL POLARITY COMPATIBLE)
53
REGISTRATION REMINDER INDICATOR (AUDIBLE/VISUAL)
56
29
RCV
27
72
IGNITION SWITCH
VEHICLE BATTERY
61
DOOR LOCK-ACTUATOR
VEHICLE SECURITY CONTROLLER
62
65
REMOTE START DEVICE
STARTER INTERRUPT DEVICE
ALARM IND. (SIREN/HORN)
28
63
66
67

FIG. 2.

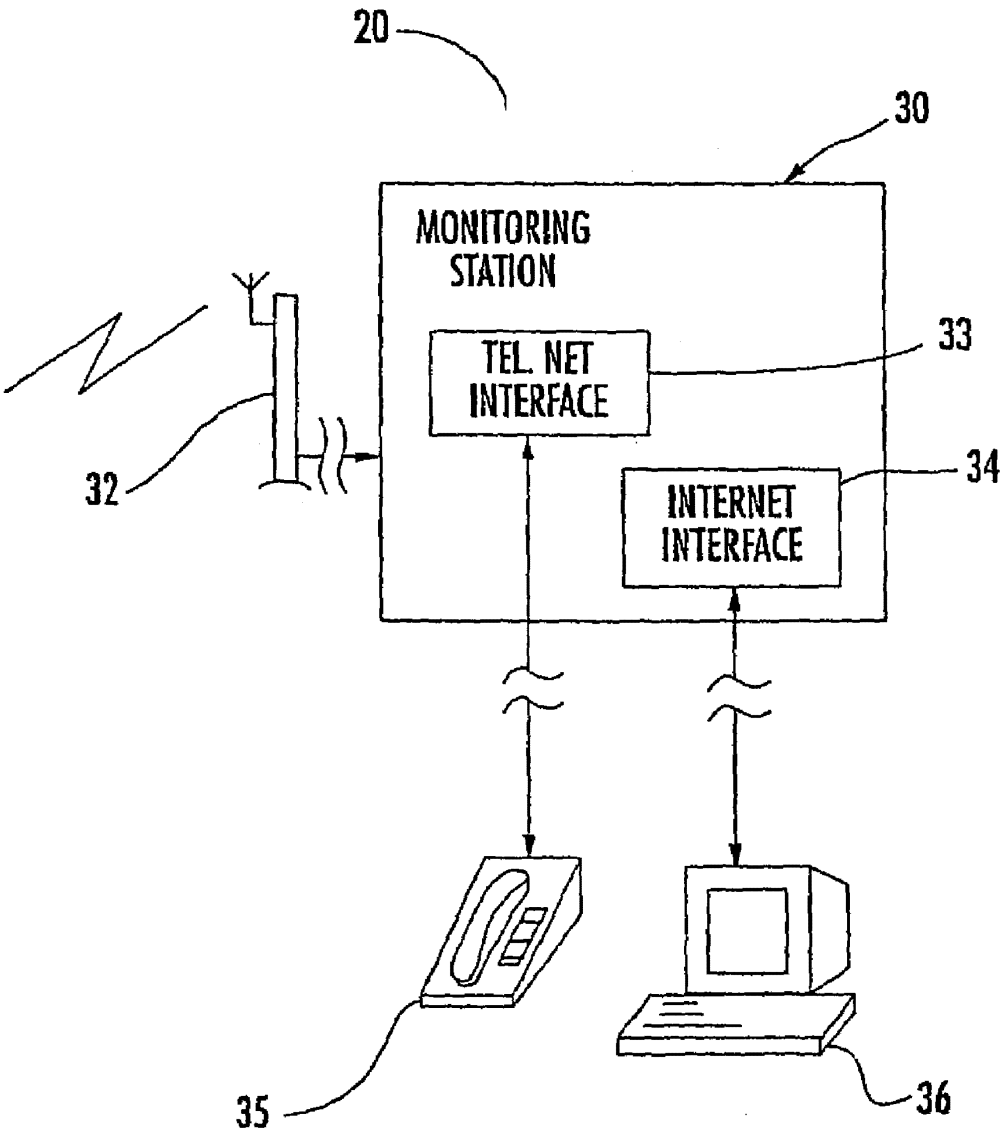

20
30
MONITORING STATION
TEL. NET INTERFACE
33
INTERNET INTERFACE
34
32
35
36

FIG. 3.

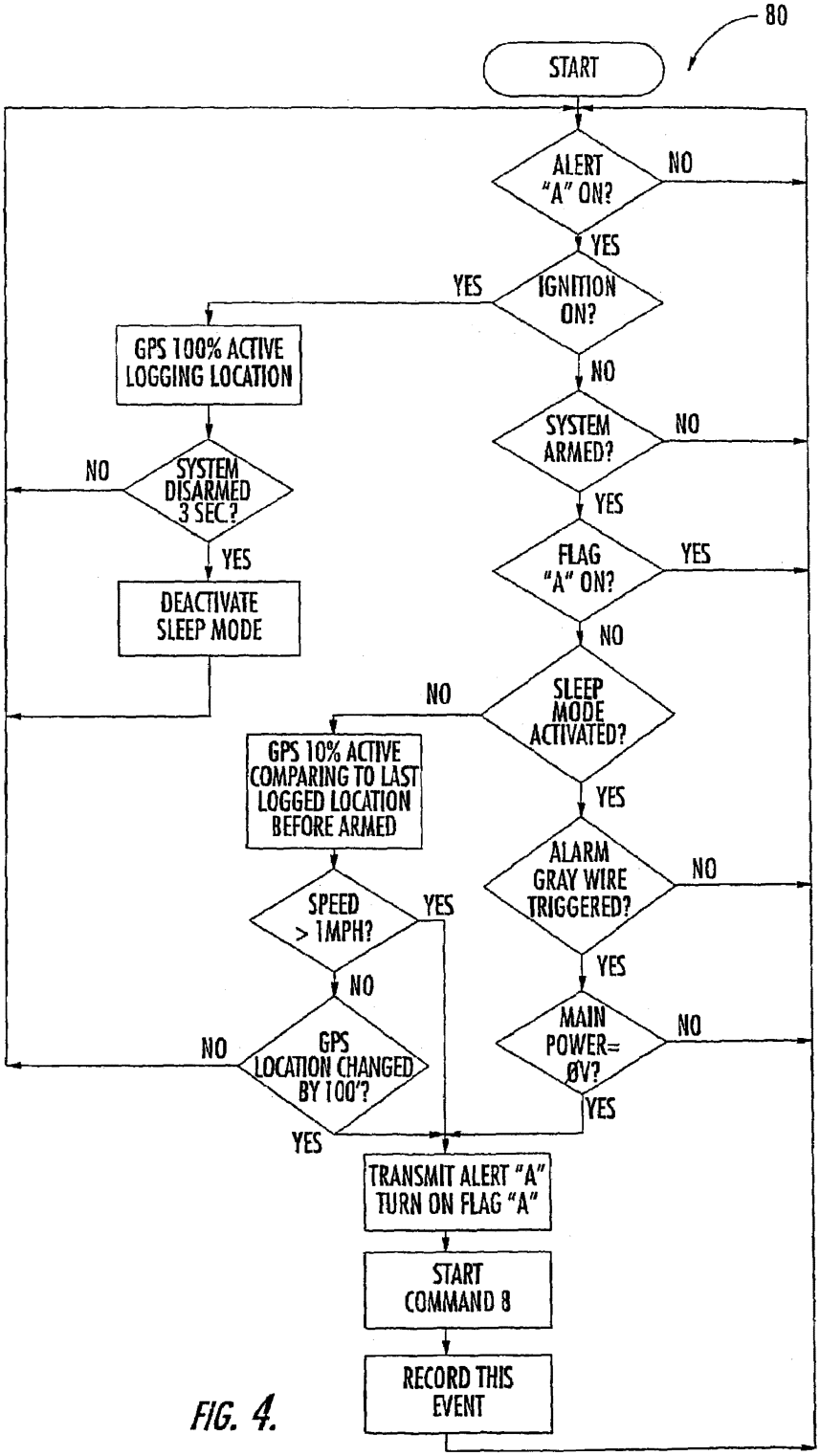

80
START
ALERT "A" ON?
NO
YES
IGNITION ON?
YES
GPS 100% ACTIVE LOGGING LOCATION
NO
SYSTEM ARMED?
NO
YES
SYSTEM DISARMED 3 SEC.?
NO
YES
DEACTIVATE SLEEP MODE
FLAG "A" ON?
YES
NO
SLEEP MODE ACTIVATED?
NO
GPS 10% ACTIVE COMPARING TO LAST LOGGED LOCATION BEFORE ARMED
YES
ALARM GRAY WIRE TRIGGERED?
NO
YES
SPEED > 1MPH?
YES
NO
MAIN POWER= ØV?
NO
YES
NO
GPS LOCATION CHANGED BY 100'?
YES
TRANSMIT ALERT "A" TURN ON FLAG "A"
START COMMAND 8
RECORD THIS EVENT

FIG. 4.

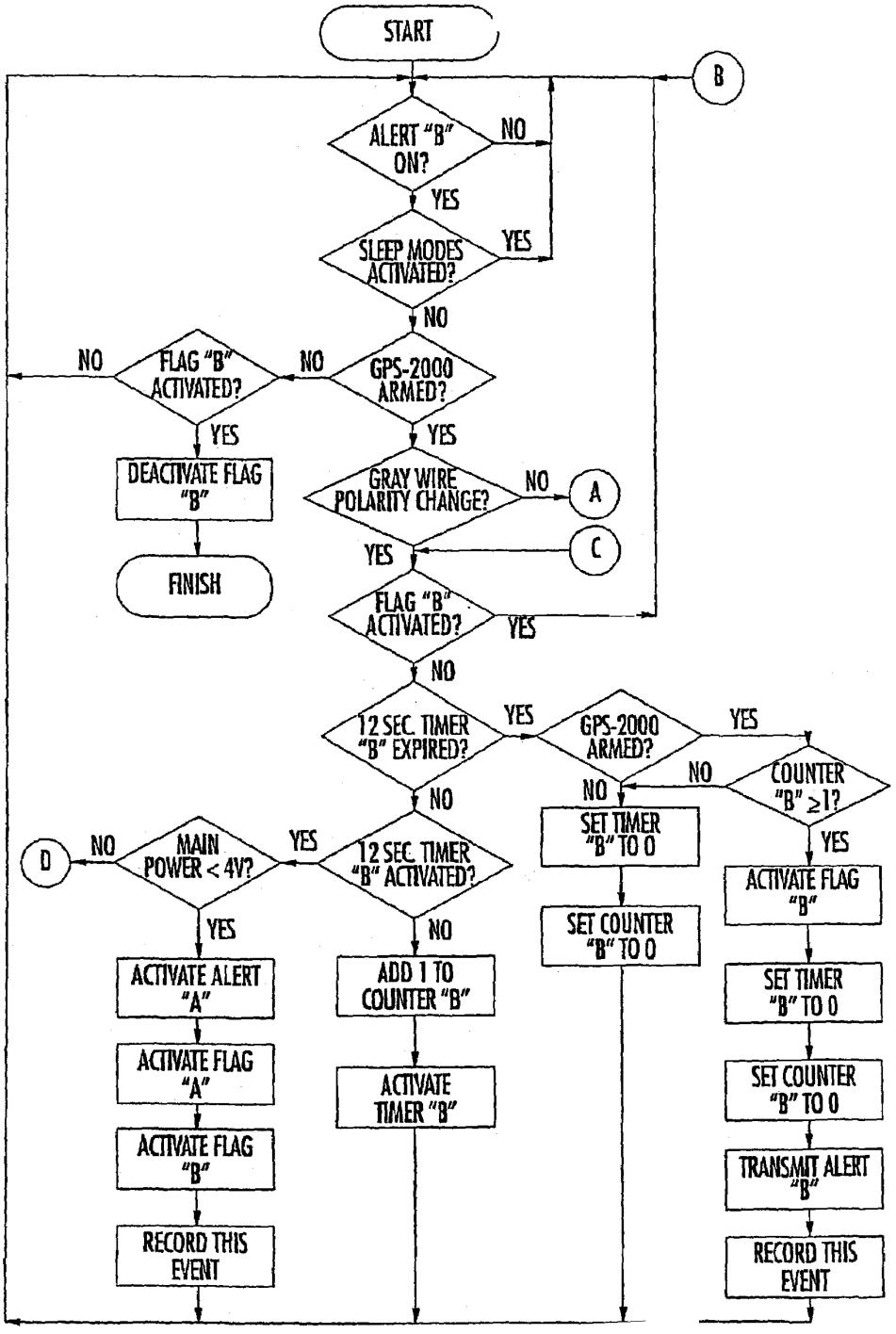

START
B
ALERT "B" ON?
NO
YES
SLEEP MODES ACTIVATED?
YES
NO
NO
FLAG "B" ACTIVATED?
NO
GPS-2000 ARMED?
YES
YES
DEACTIVATE FLAG "B"
GRAY WIRE POLARITY CHANGE?
NO
A
C
YES
FINISH
FLAG "B" ACTIVATED?
YES
NO
12 SEC. TIMER "B" EXPIRED?
YES
GPS-2000 ARMED?
YES
NO
NO
COUNTER "B" ≥1?
NO
D
MAIN POWER < 4V?
YES
12 SEC. TIMER "B" ACTIVATED?
SET TIMER "B" TO 0
YES
ACTIVATE FLAG "B"
YES
NO
SET COUNTER "B" TO 0
ACTIVATE ALERT "A"
ADD 1 TO COUNTER "B"
SET TIMER "B" TO 0
ACTIVATE FLAG "A"
ACTIVATE TIMER "B"
SET COUNTER "B" TO 0
ACTIVATE FLAG "B"
TRANSMIT ALERT "B"
RECORD THIS EVENT
RECORD THIS EVENT

FIG. 5A.

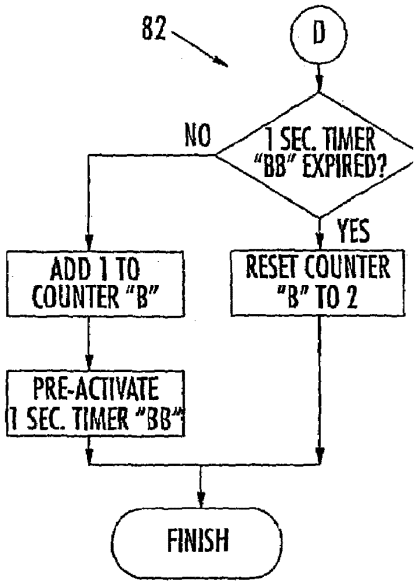

82
D
1 SEC. TIMER "BB" EXPIRED?
NO
YES
ADD 1 TO COUNTER "B"
RESET COUNTER "B" TO 2
PRE-ACTIVATE 1 SEC. TIMER "BB"
FINISH

FIG. 5B.

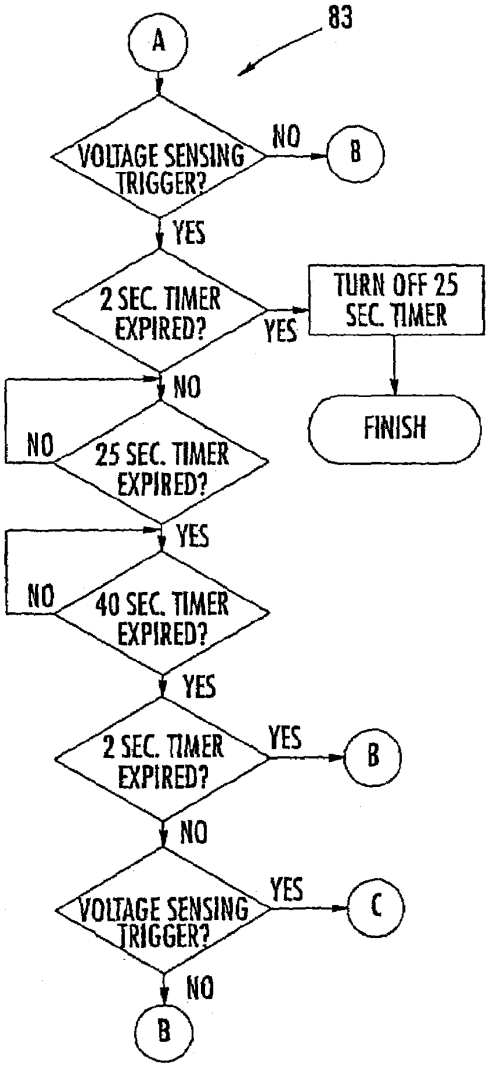

83
A
VOLTAGE SENSING TRIGGER?
NO
B
YES
2 SEC. TIMER EXPIRED?
YES
TURN OFF 25 SEC. TIMER
FINISH
NO
NO
25 SEC. TIMER EXPIRED?
YES
NO
40 SEC. TIMER EXPIRED?
YES
2 SEC. TIMER EXPIRED?
YES
B
NO
VOLTAGE SENSING TRIGGER?
YES
C
NO
B

FIG. 5C.

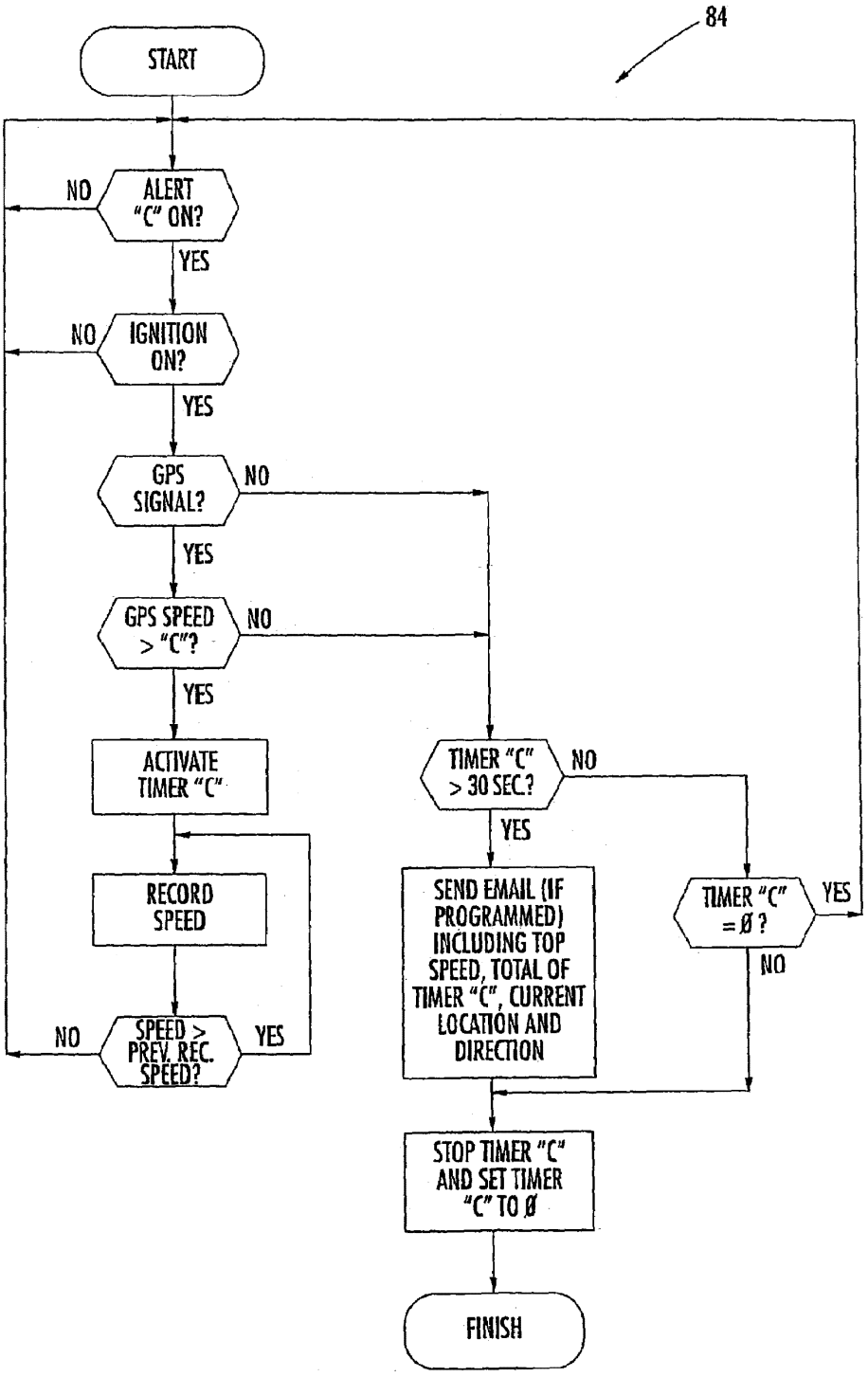

84
START
NO
ALERT "C" ON?
YES
NO
IGNITION ON?
YES
GPS SIGNAL?
NO
YES
GPS SPEED > "C"?
NO
YES
ACTIVATE TIMER "C"
RECORD SPEED
NO
SPEED > PREV. REC. SPEED?
YES
TIMER "C" > 30 SEC.?
NO
YES
SEND EMAIL (IF PROGRAMMED) INCLUDING TOP SPEED, TOTAL OF TIMER "C", CURRENT LOCATION AND DIRECTION
TIMER "C" = Ø ?
YES
NO
STOP TIMER "C" AND SET TIMER "C" TO Ø
FINISH

FIG. 6.

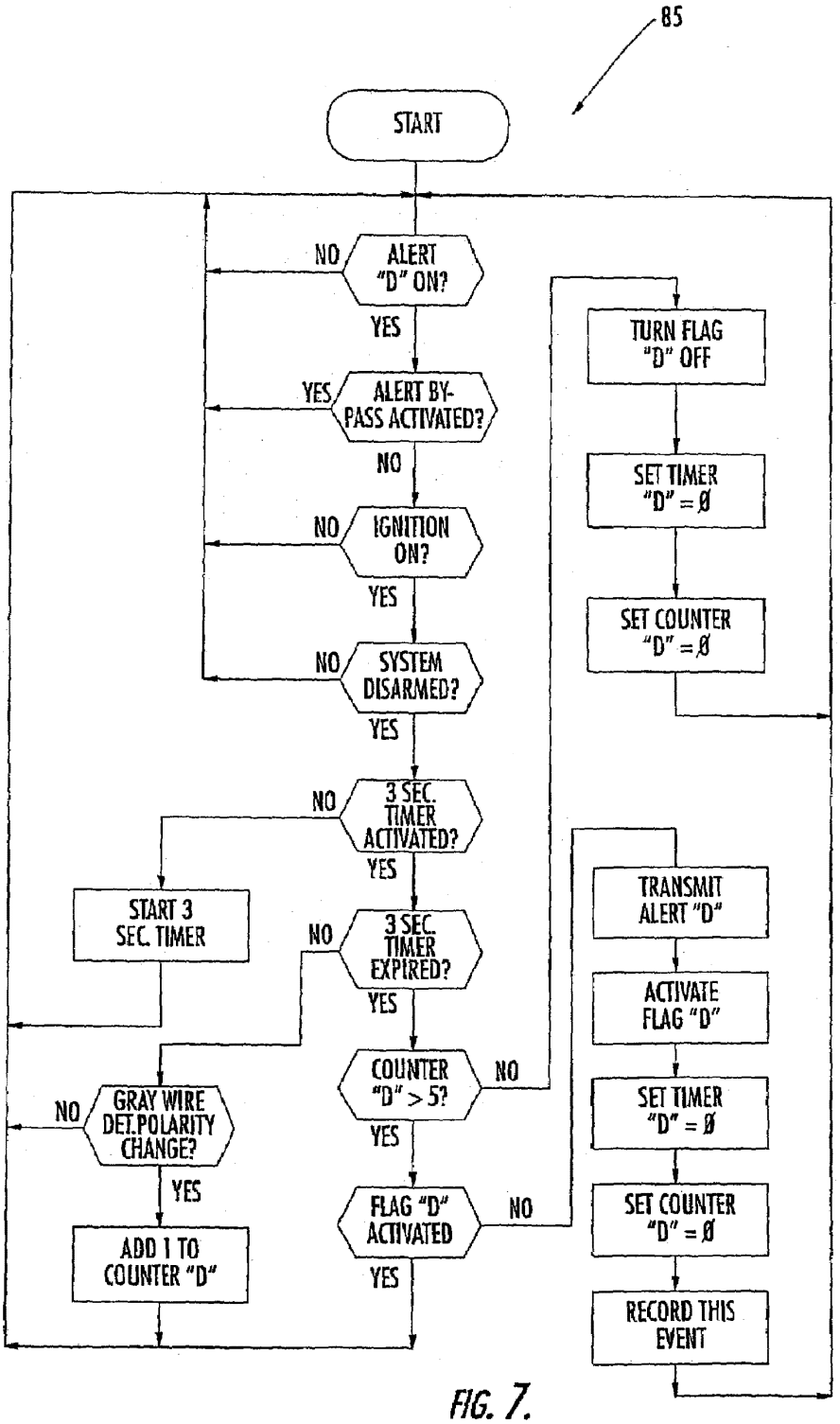

85
START
NO
ALERT "D" ON?
YES
YES
ALERT BY-PASS ACTIVATED?
NO
NO
IGNITION ON?
YES
NO
SYSTEM DISARMED?
YES
NO
3 SEC. TIMER ACTIVATED?
YES
START 3 SEC. TIMER
NO
3 SEC. TIMER EXPIRED?
YES
COUNTER "D" > 5?
NO
YES
NO
GRAY WIRE DET. POLARITY CHANGE?
YES
ADD 1 TO COUNTER "D"
FLAG "D" ACTIVATED
NO
YES
TURN FLAG "D" OFF
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
TRANSMIT ALERT "D"
ACTIVATE FLAG "D"
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
RECORD THIS EVENT

FIG. 7.

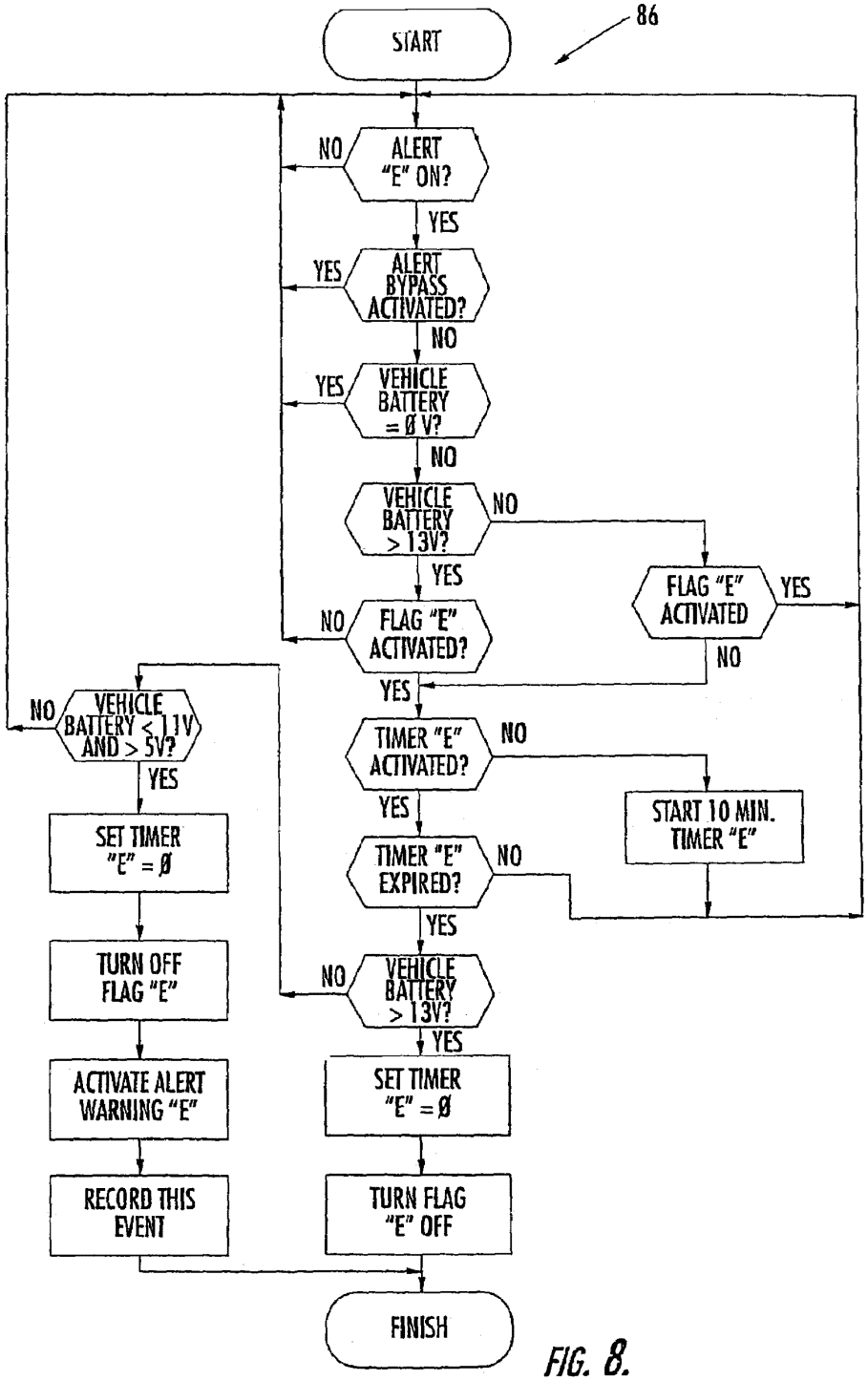

86
START
ALERT "E" ON?
NO
YES
ALERT BYPASS ACTIVATED?
YES
NO
VEHICLE BATTERY = Ø V?
YES
NO
VEHICLE BATTERY > 13V?
NO
YES
FLAG "E" ACTIVATED
YES
NO
FLAG "E" ACTIVATED?
NO
YES
VEHICLE BATTERY < 11V AND > 5V?
NO
YES
TIMER "E" ACTIVATED?
NO
YES
START 10 MIN. TIMER "E"
SET TIMER "E" = Ø
TIMER "E" EXPIRED?
NO
YES
TURN OFF FLAG "E"
VEHICLE BATTERY > 13V?
NO
YES
ACTIVATE ALERT WARNING "E"
SET TIMER "E" = Ø
RECORD THIS EVENT
TURN FLAG "E" OFF
FINISH

FIG. 8.

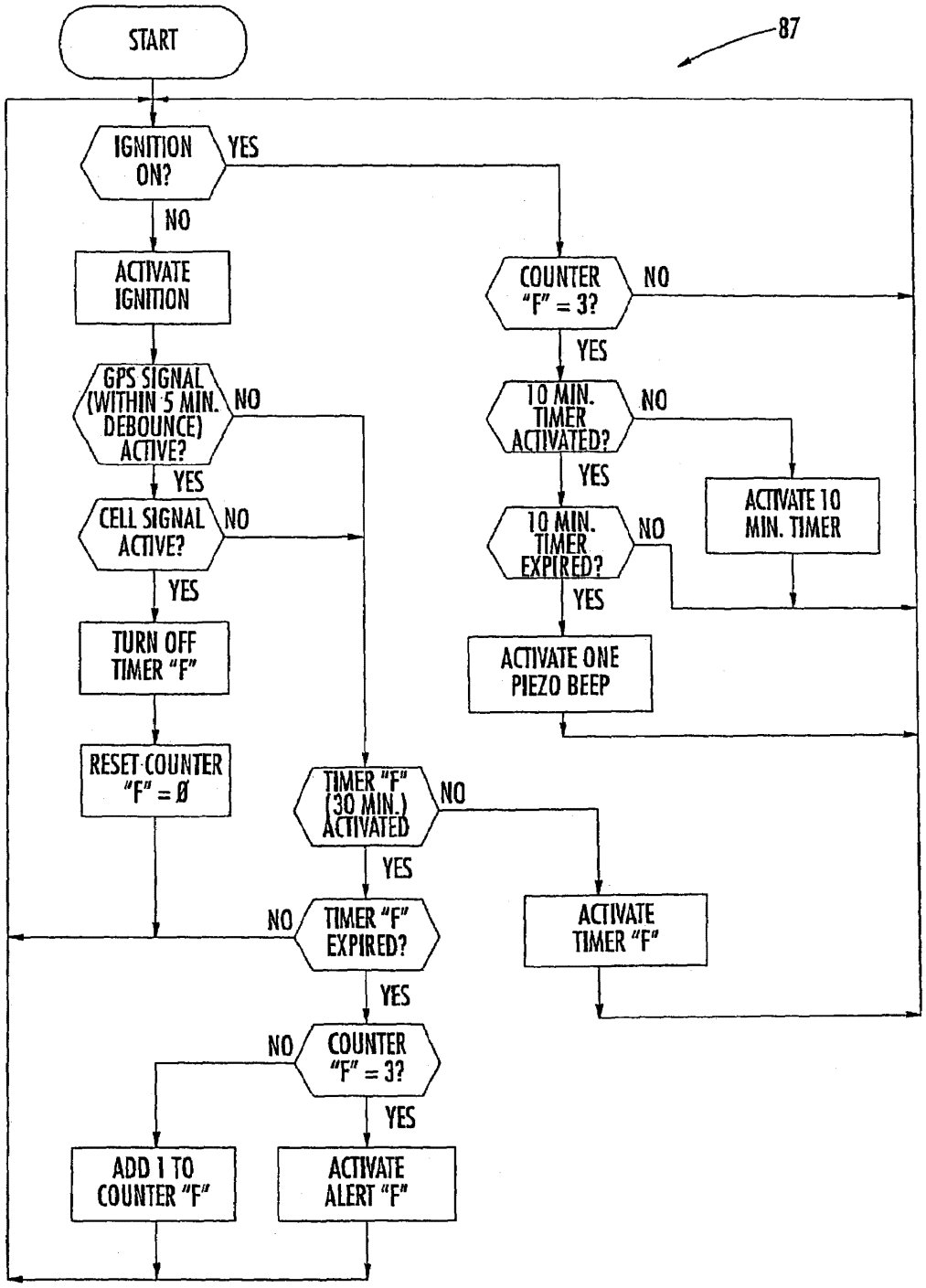

87
START
IGNITION ON?
YES
NO
ACTIVATE IGNITION
GPS SIGNAL (WITHIN 5 MIN. DEBOUNCE) ACTIVE?
NO
YES
CELL SIGNAL ACTIVE?
NO
YES
TURN OFF TIMER "F"
RESET COUNTER "F" = Ø
COUNTER "F" = 3?
NO
YES
10 MIN. TIMER ACTIVATED?
NO
YES
ACTIVATE 10 MIN. TIMER
10 MIN. TIMER EXPIRED?
NO
YES
ACTIVATE ONE PIEZO BEEP
TIMER "F" (30 MIN.) ACTIVATED
NO
YES
ACTIVATE TIMER "F"
NO
TIMER "F" EXPIRED?
YES
NO
COUNTER "F" = 3?
YES
ADD 1 TO COUNTER "F"
ACTIVATE ALERT "F"

FIG. 9.

# VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS

This application is a continuation of Ser. No. 09/859,972 filed on May 17, 2001.

## RELATED APPLICATIONS

The present application is based upon copending provisional application serial NOs. 60/264,811 filed on Jan. 29, 2001; 60/258,005, filed Dec. 22, 2000; 60/251,552, flied Dec. 6, 2000; 60/252,125, filed Nov. 20, 2000; 60/236,890, filed Sep. 29, 2000; 60/246,463, filed Nov. 7, 2000; 60/222,777, filed Aug. 3, 2000; and 60/205,178, filed May 17, 2000, the entire contents of each of which are incorporated herein by reference.

## FIELD OF THE INVENTION

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## BACKGROUND OF THE INVENTION

Motor vehicles, such as passenger cars, trucks, busses, fleet vehicles, etc. are widely used and knowing the locations of such vehicle is often desired. For example, should a vehicle be stolen, it would be beneficial to know the vehicle's location so that authorities could be promptly and accurately directed to retrieve the vehicle. Indeed, the tracking system could plot the getaway path of the thief.

For a company with hired drivers, it may desirable to know the driver's whereabouts during the course of the day. Similarly, a rental car agency or other fleet operator, for example, may wish to know the whereabouts of its fleet of vehicles.

It may also be desirable to track the location of a vehicle as it used throughout the course of a normal day. For parents of younger or older drivers, for example, knowledge of the vehicle's location may provide some assurance that the driver is at designated locations and following a prescribed route.

A number of patents disclose various systems and approaches to tracking vehicles. For example, U.S. Pat. No. 5,223,844 discloses a tracking system including a control center and a mobile unit installed in the vehicle. The mobile unit may send security warnings to the command center via a wireless transceiver. Position information for the vehicle is determined using a GPS receiver at the vehicle.

U.S. Pat. No. 5,515,043 discloses a similar system which may send one or more preprogrammed telephone messages to a user when away from the vehicle. The user may remotely access location information or cause certain commands to be carried out by entering a personal identification number (PIN).

The widespread availability and use of the Internet has prompted a number of vehicle tracking systems to also make use of the Internet. For example, TelEvoke, Inc. proposed such a system in combination with Clifford Electronics. The system was to provide notification, control and tracking services via the telephone or the Internet. Users could be notified via phone, e-mail, or pager of events such as a car alarm being triggered. Users could control the vehicle remote devices via phone, web, or PDA such as unlocking car doors. Additionally, users could track TelEvoke-enabled vehicles on the Internet or via the telephone. An Internet map could be viewed by the user showing the actual and prior vehicle locations. TelEvoke offered its services via a centralized fully automated Network Operations Center. To reduce the communications costs, it was proposed to use the control channel of the cellular telephone network.

There are, of course, a number of vehicles which come from the manufacturer with some form of security system already installed. In addition, a number of vehicles are also equipped with aftermarket security systems. Many conventional vehicle tracking units may not be readily installed in vehicles, particularly those vehicles already including a vehicle security system. In addition, complexity of installation may significantly increase the system costs.

## SUMMARY OF THE INVENTION

In view of the foregoing background, it is therefore an object of the invention to provide a vehicle tracking unit and related methods that permit ready interface to devices in the vehicle, such as those devices which may be part of an existing vehicle security system.

This and other objects, features and advantages in accordance with the present invention are provided by a vehicle tracking system comprising a vehicle tracking unit for a vehicle of a type including an alarm indicator, and a monitoring station receiving the alarm indication alert from the vehicle tracking unit. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a controller connected to the wireless communications device and the vehicle position determining device. The controller may monitor signals relating to activation of the vehicle alarm indicator and send an alarm indication alert, such as with position information from the vehicle position determining device, and using the wireless communication device.

More particularly, the controller may send an alarm indication alert responsive to a continuous activation of the alarm indicator for greater than a predetermined time. Alternately, or in addition thereto, the controller may send an alarm indication alert responsive to a repetitive pattern of alarm indicator activations. In other words, the controller may be configured to distinguish between normal operation of a vehicle horn by the driver, and activation of the horn by a security system. The controller may also monitor signals of at least one of a first and second polarity. Accordingly, the tracking unit may be readily interfaced to vehicles including security systems.

In one variation, the controller monitors signals to the vehicle alarm indicator. In another variation, the controller monitors signals of voltage dips of the vehicle battery. The vehicle alarm indicator may comprise a vehicle horn, and/or a vehicle siren.

The vehicle position determining device may include a Global Positioning System (GPS) device. The wireless communications device may comprise a cellular telephone communications device, such as operating over a cellular control channel.

The monitoring station may comprise a user interface for accepting at least one command from a user and sending at least one alert to the user. For example, the user interface may include an Internet interface, and/or a telephone network interface.

Another advantageous aspect of the invention relates to compatibility of the outputs of the vehicle tracking unit. More particularly, the controller may include a dual polarity compatible output for a vehicle device, such as the vehicle

alarm indicator. The controller may further monitor signals relating to activation of the vehicle alarm indicator and send an alarm indication alert with position information from the vehicle position determining device and using the wireless communication device.

The controller may generate a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. The controller may also generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. In yet other embodiments, the controller may sense an actual polarity of the device and thereafter use the actual polarity for the dual polarity compatible output.

Where the vehicle device is a vehicle horn, the controller may typically be configured to generate a negative polarity output on the dual polarity compatible output. Conversely, wherein the vehicle device is a vehicle alarm indicator siren, the controller may be configured to generate a positive polarity output on the dual polarity compatible output.

One method aspect of the invention is for operating a vehicle tracking unit for a vehicle of a type comprising a vehicle alarm indicator. The vehicle tracking unit may include a vehicle position determining device, and a wireless communications device. The method preferably includes determining position information of the vehicle using the vehicle position determining device, determining an alarm condition based upon at least one of activation of the vehicle alarm indicator continuously for greater than a predetermined time and activation of the vehicle alarm indicator in a repetitive pattern, and sending an alarm indication alert from the wireless communications device responsive to determining the alarm condition.

Another method aspect also relates to operating such a vehicle tracking device. The method preferably includes using the controller to generate a dual polarity compatible output for the vehicle device.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a simplified block diagrams of a vehicle tracking system in accordance with the present invention.

FIG. **2** is a more detailed block diagram of the vehicle tracking unit as shown in FIG. **1**.

FIG. **3** is more detailed block diagram of the monitoring station as shown in FIG. **1**.

FIG. **4** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle stolen alert.

FIG. **5** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle alarm sounding alert.

FIG. **6** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle speeding alert.

FIG. **7** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating an unauthorized transmitter learned alert.

FIG. **8** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a low battery alert.

FIG. **9** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a GPS or cellular unit failure alert.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

Referring to FIGS. **1–3**, the vehicle tracking system **20** in accordance with the invention is now initially described. The vehicle system **20** illustratively includes a vehicle tracking unit **25** to be mounted in the vehicle **21** and a monitoring station **30** which is remote from the vehicle and which is typically in a fixed location. In the illustrated embodiment, the vehicle tracking unit **25** interfaces with various vehicle devices, such as may include security sensors, door locks, etc. as will be appreciated by those skilled in the art.

The vehicle tracking unit **25** is also illustratively connected to a separate vehicle security system **27** as may already be installed in the vehicle **21**, from the factory or installed as an aftermarket product. Those of skill in the art will appreciate that in some embodiments of the vehicle tracking system **20** a separate vehicle security system **27** may not be needed, and/or various features thereof can be readily incorporated in the vehicle tracking unit **25**.

The monitoring station **30** may typically service a number of subscribers **31**. As shown perhaps best in FIG. **3**, the monitoring station **30** may include a user interface, such as the schematically illustrated telephone network interface **33** and the internet interface **34** which are schematically coupled to a telephone **35**, and a computer **36**, respectively. Of course in other embodiments, other interfaces may be used and only one of the illustrated interfaces may be needed. Those of skill in the art will also recognize that messages may be sent to a subscriber or user via preprogrammed voice messages, e-mail messages, facsimile messages, pager alerts, etc. In addition commands or instructions from the subscriber can also be input to the monitoring station **30** via the telephone network interface **33** and/or the internet interface **34**, from the subscribers telephone **35** or computer **36**.

The monitoring station **30** is illustrated connected to a cellular telephone tower **32** which, in turn, may communicate with the vehicle tracking unit **25** in some embodiments. Of course, in other embodiments other communications approaches are also contemplated, such as, for example, including satellite communications.

The monitoring station **30** may typically include the necessary modems, and other communications electronics, and computers for its functions which are described in greater detail below. The configuration of such components and their details will be readily apparent to those skilled in the art. Accordingly, no further discussion of these details is needed.

Referring now more specifically to FIG. **2**, additional details of the vehicle tracking unit **25** and devices at the vehicle are now further described. The vehicle tracking unit **25** illustratively includes a controller **40**, a vehicle position determining device **42**, and a wireless communications device **44** connected together. The vehicle position determining device **42** may be provided by a GPS receiver, for example. The GPS receiver typically operates by receiving multiple signals from spaced apart satellites **38** as will be appreciated by those skilled in the art.

In other embodiments, the vehicle position determining device **42** may be provided based upon communications with the cellular telephone network, or based upon other

satellite transmissions, for example. As a particular example, time of arrival techniques are available based upon multiple reception paths to determine position via the cellular telephone network as will be appreciated by those skilled in the art. The vehicle position determining device **42** also illustratively includes an indicator **43** associated therewith, such as for indicating an operating mode, or proper operation of the device as will be addressed in greater detail below.

The wireless communications device **44** may be provided by a cellular telephone transceiver configured to operate on a control channel of the cellular network. Such a control channel may provide nearly universal coverage for the tracking system **20** as will be appreciated by those skilled in the art. In addition, the control channel may offer relatively inexpensive communications between the monitoring station **30** and the vehicle tracking unit **25** as will be appreciated by those skilled in the art. The wireless communications device **44** also illustratively includes an optional status indicator **45** with a similar function as the indicator **43** for the vehicle position determining device.

The wireless communications device **44** in other embodiments, may transmit in the voiceband of the cellular network. Alternately, the wireless communications device may communicate over other networks, such as over satellite, or via wireless internet services, as will be appreciated by those skilled in the art.

The controller **40** illustratively includes a central processing unit (CPU) **50** or other logic circuitry which is connected to a clock signal generator **51** and a memory **52**. In other embodiments, the memory **52** may be embedded memory in the CPU **50**. The controller **40** also includes schematically illustrated input/output circuitry **53** to interface with various vehicle devices. In particular the input/output circuitry **53** may provide dual polarity compatibility for one or more inputs or outputs as will described in greater detail below. One or more of the terminals of the input/output circuitry **53** may also provide both input and output functions as will also be described in greater detail below. This may significantly simplify and accelerate installation of the vehicle tracking unit **25** in the vehicle **21**.

Also illustratively shown as part of the vehicle tracking unit **25** are a back-up battery **54**, and switch **55** connected thereto for selectively powering certain of the components based upon the controller **40**. Of course, the vehicle **21** also includes an electrical system including the vehicle battery **61**. Powering of the vehicle tracking unit **25** is described in greater detail below.

The vehicle **21** also includes a number of other components that may relate to vehicle tracking, security, and/or convenience features provided by the vehicle tracking system **20**. For example, the vehicle **21** may include one or more door lock actuators **62**, an optional remote starting device **63**, a starter interrupt device **66** and an alarm indicator **67**. For example, the alarm indicator may be provided by a vehicle horn or vehicle siren, and/or flashing of the lights.

The optional separate security system **27** illustratively includes a vehicle security controller **28** and a receiver **29** connected thereto. As is conventional, the vehicle security system **27** may be switched between armed and disarmed modes, for example, by one or more uniquely coded remote transmitters **60**. The vehicle security controller **28** may also be capable of learning a new uniquely coded remote transmitter **60** as will be appreciated by those skilled in the art. The vehicle security controller **28** also illustratively is connected to the starter interrupt device **66** and the alarm indicator **67**.

For ease of explanation, a number of the features of the vehicle tracking system **20** are now described. The vehicle tracking system **20** includes a number of features that may simplify installation and maintenance. For example, as shown in FIG. **2**, the vehicle tracking unit **25** may have a test switch **71** connected to the controller **40**.

In normal operation, the controller **40** may be called upon to operate at least one vehicle device. Of course, the controller **40** also cooperates with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. Moreover, the controller **40** may be switchable to a test mode for test operation of the at least one vehicle device responsive to activation of the test switch **71**.

In some embodiments, the at least one vehicle **15** device may be a plurality of vehicle devices that are tested by operation in sequence. For example, the at least one vehicle device may comprise at least one door lock actuator **62**. The at least one vehicle device may also comprise the starter interrupt device **66**, or the engine remote starter **63** if remote starting is an implemented feature. The at least one vehicle device which is tested, may also be the alarm indicator **67**. Accordingly, an installer, for example, can quickly check that the tracking unit has been properly installed.

To further provide for ready determination of proper operation of the vehicle tracking unit **25**, one or both of the position determining and wireless communications devices **42**, **44** may include associated indicators **43**, **45** as mentioned briefly above, and which provide an indication relating to proper operation. Each indicator **43**, **45** may indicate a mode of operation of the device, its proper operation, or a partial or complete failure of the device.

Another aspect of the invention is that the controller **40** may provide a selectable polarity for the at least one vehicle device based upon sensing thereof. Accordingly, a predetermined activation of the test switch **71** may cause the controller **40** to sense and select the proper polarity. Pressing the test switch **71** for a predetermined time or in a predetermined pattern may sense and set the polarity.

Another feature of the vehicle tracking unit **25** and vehicle tracking system **20** relates to conservation of the number of codes or messages that need to sent to the vehicle tracking unit. In particular, the controller **40** may have a plurality of different controller states and respond differently to a same message from the monitoring station **30** at different times depending upon the controller state at a given time. Accordingly, a number of codes or messages used by the system can be conserved. Various messages are described in greater detail below.

A controller state may change based upon several different occurrences or events. For example the controller may change states in response to a change in at least one vehicle device, or based upon a message received by the wireless communications device **44** from the monitoring station **30**, and/or based upon elapsed time. The controller states, for example, may include an alert sent state based upon an alert message being sent from the wireless communications device **44**. Thereafter, receipt of a predetermined message by the wireless communications device **44** when the controller **40** is in the alert sent state may confirm receipt of the alert message by the monitoring station.

Receipt of the predetermined message by the wireless communications device **44** when the controller **40** is in another state different than the alert sent state may thus cause a different response by the controller. The alert sent state may comprise at least one of an vehicle stolen alert sent state, a vehicle alarm sounding alert sent state, a vehicle

speeding alert sent state, an unauthorized remote transmitter alert sent state, a low vehicle battery alert sent state, and a device malfunction alert sent state. The various alert messages and confirmation thereof are described in greater detail below.

The code or message conservation aspects of the vehicle tracking system **20** also permit sending a sequence of codes or messages within a predetermined time to also cause a different response at the vehicle tracking unit **25**. In other words, the plurality of controller states may comprise a received first message state based upon a first message being received by the wireless communications device **44** from the monitoring station **30**. Receipt of a second message by the wireless communications device **44** when the controller **40** is in the received first message state, such as within a predetermined time window, for example, may thus cause a different response by the controller than does receipt of the second message when the controller is in another state than the received first message state.

The plurality of controller states may comprise a vehicle finder state sounding an audible signal via the alarm indicator **67** at the vehicle **21**. In this state the controller **40** would bypass sending a vehicle alarm sounding alert to the monitoring station **30**.

Another aspect of the vehicle tracking system **20** is the provision of certain power conservation and management techniques, such as to permit extended periods where the vehicle **21** is not operation. During such extended periods, the vehicle battery **61** provides power to the vehicle tracking unit **25** as well as other vehicle devices. Accordingly, the voltage of the vehicle battery **61** drops over time. The vehicle tracking unit **25** may provide a significant drain on the vehicle battery **61** because of the power consumed by the wireless communications device **44** during transmission as will be appreciated by those skilled in the art.

The vehicle position determining device **42**, the wireless communications device **44** and the controller **40** may be considered as defining a power load of the vehicle tracking unit **25**. The controller **40** may operate the schematically illustrated power switch **55** to isolate the back-up battery **54** from the power load as a voltage of the vehicle battery **61** drops until reaching a threshold. After or below the threshold the controller **40** may cause the back-up battery **54** to selectively power only a first portion of the power load while a second portion of the power load remains powered by the vehicle battery.

For example, the wireless communications device **44** may have a higher operating voltage than the vehicle position determining device **42**. The first portion of the power load that is selectively powered despite the low vehicle battery voltage may thus be the wireless communications device **44**. In particular, the wireless communications device **44** may be powered for transmission. Accordingly, the back-up battery **54** can be saved for limited communication using the higher voltage wireless communications device **44**. This provides useful features even after an extended period during which the vehicle **21** is left unattended and the vehicle battery **61** gradually discharges.

To further conserve power, the controller **40** may reduce operation of the power load as vehicle battery voltage falls. Conversely, the controller **40** may restore operation of the power load based upon the voltage of the vehicle battery **61** rising again, such as upon being recharged.

Also relating to power consumption, the controller **40** further cause transmission of a low vehicle battery voltage alert to the monitoring station **30** based upon the voltage of the vehicle battery **61** falling bellow the threshold. The user or subscriber may cause the monitoring station **30** to issue a remote start command. The controller **40** may then generate a remote start output to the remote start device **63** to thereby start the engine and recharge the vehicle battery.

Another feature of the vehicle tracking system **20** is that the vehicle tracking unit **25** may be readily installed and connected to a vehicle **21**, such as in the illustrated embodiment where the vehicle includes a starter interrupt device **66** and a separate vehicle security controller **28**. More particularly, the controller **40** may switch between an armed mode and a disarmed mode based upon operation of the engine starter interrupt device **66**. The controller **40** when in the armed mode may cooperate with the wireless communications device **44** to send an alert message to the monitoring station **30** and including vehicle position information, for example, based upon the vehicle position determining device **42**. The controller **40** is also for selectively operating the engine starter interrupt device **66** to provide additional security features.

In one advantageous embodiment, the controller **40** preferably comprises a combination input and output terminal for connection to the engine starter interrupt device. This terminal is at the input/output circuitry **53** and is schematically illustrated by reference numeral **72**. The controller **40** may switch to the armed mode when in the disarmed mode and based upon the engine starter interrupt device **66** being operated to disable engine starting. Conversely, the controller **40** may switch to the disarmed mode based upon the engine starter interrupt device **66** being operated to enable engine starting. In other words, the vehicle tracking unit **25** can piggyback its arming and disarming off the existing vehicle security system **27**, for example.

The controller **40** may also selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. The controller **40** may selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. Alternately, or in addition thereto, the controller **40** may selectively operate the engine starter interrupt device **66** based upon the ignition switch **65**.

The following descriptive portions relate to various user or subscriber notifications and features provided by the vehicle tracking system **20**. Of course, the controller **40** preferably cooperates with the wireless communications device **44** to send an alert message. The monitoring station **30** may comprise a user interface, such as one or both of the telephone network or internet interfaces **33**, **34**, respectively (FIG. **3**), for generating a sequence of alert message notifications based upon receiving the alert message sent from the vehicle tracking unit **25**. More particularly, the monitoring station interface permits canceling any remaining alert message notification based upon a cancellation command response from a user or subscriber having already received the alert message notification. The user may send the cancellation response via the telephone **35** or computer **36** (FIG. **3**), for example. Thus, if the user may be reached at different telephone numbers or different users are desirably notified of the alert, this aspect of the vehicle tracking system **20** can make the notifications efficiently and without making unnecessary notifications.

The vehicle tracking system **20** may provide any of a number of very useful alerts, as discussed herein. For example, the alert message sent from the vehicle tracking unit may comprise at least one of an vehicle stolen alert message, and a vehicle alarm sounding alert message. The alert message may be one a vehicle speeding alert message, and a vehicle acceleration alert message. In addition, the

alert message may comprise an unauthorized remote transmitter alert message. Also, the alert message may be at least one of a low vehicle battery alert message, and a device malfunction alert message.

The speeding alert may be based upon exceeding a speed threshold for greater than a certain time, which may be user selectable. The acceleration alert may also be useful as such is also indicative of aggressive driving along with the speeding alert. The unauthorized remote transmitter alert increases overall security since a user will be notified if a would-be thief learns an unauthorized transmitter to operate the controller. These alerts are described in greater detail below.

The vehicle tracking system **20** may be implemented as a service to a subscriber. In other words, the subscriber pays a monthly fee for the service. Accordingly, it may be important to encourage a user to register. Similar subscriber or registrations systems in the past have suffered revenue losses since some users would wait to activate the system until the vehicle was stolen. In other words, the user would only subscriber or register and pay a single month's fee.

In accordance with this aspect of the vehicle tracking system **20** prompt user registration is encouraged. In particular, the vehicle tracking unit **25** may include the user registration reminder indicator **56** and the controller **40** may be switchable from an unregistered mode to a registered mode. In the registered mode, the controller **40** may cooperate with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. In the unregistered mode, the controller **40** may activate the user registration reminder indicator **56** to encourage registration by the user.

The controller **40** may be switchable to the registered mode based upon an activation message from the monitoring station **30**. For example, when the registration payment has been received, the monitoring station can send one or more messages to the vehicle tracking unit **25** to stop activation of the registration reminder indicator **56**. The indicator **56** may be audible, visual or both. For example, the registration reminder indicator **56** could be a beeping sound generated by a small piezoelectric transducer every ten minutes or so when the ignition **65** is on.

In other words, the user registration reminder indicator **56** may provide a minor but irritating annoyance to the user to encourage registration. Upon successfully registering, the annoyance is abated. Accordingly, a relatively straightforward approach is provided to encourage user registration.

Along these lines, the controller **40** when in the unregistered mode may have reduced features compared to the registered mode. For example, the controller **40** when in the unregistered mode may be restricted or limited in sending messages with the wireless communications device **44**. Accordingly, usage of the wireless communications network may be reduced. Transmissions from the vehicle tracking unit **25** may be also be beneficially suppressed during original installation, for example.

Returning again to features of the vehicle tracking unit **25** which facilitate installation, the controller **40** may send an alarm indication alert responsive to a continuous activation of the alarm indicator **67** for greater than a predetermined time. Alternately, or in addition thereto, the controller **40** may send an alarm indication alert responsive to a repetitive pattern of alarm indicator **67** activations. In other words, the controller may be configured to distinguish between normal operation of a vehicle horn by the driver, and activation of the horn by the security system **27**. As mentioned above, the controller **40** may also monitor signals of at least one of a first and second polarity. The controller **40** thus advantageously piggybacks off the alarm indication generated by the vehicle security system **27** to determine and send a vehicle alarm sounding alert to the monitoring station **30**.

In one variation, the controller **40** may monitor signals delivered directly to the vehicle alarm indicator by the vehicle security controller **28**. In another variation, the controller **40** monitors signals of voltage dips of the vehicle battery **61**. Circuitry is conventionally and readily available for both such functions as be readily appreciated by those skilled in the art.

The controller **40** may also include a dual polarity compatible output in the input/output circuitry **53** for a vehicle device, such as the vehicle alarm indicator **67**. The controller **40** may further monitor signals relating to activation of the vehicle alarm indicator **67** and send an alarm indication alert with position information from the vehicle position determining device and using the wireless communication device.

For the dual polarity output compatibility, the controller **40** may generate a first polarity output pulse followed by a second polarity output pulse. The controller **40** may also generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. In yet other embodiments, the controller **40** may sense an actual polarity of the device and thereafter use the actual polarity for the dual polarity compatible output.

Where the vehicle device is a vehicle horn, the controller **40** may typically be configured to generate a negative polarity output on the dual polarity compatible output. Conversely, wherein the vehicle device is a vehicle alarm indicator siren, the controller **40** may be configured to generate a positive polarity output on the dual polarity compatible output.

Another aspect of the vehicle tracking system **20** relates to conserving memory space and/or reducing transmission time over the communications network. In accordance with this advantageous feature, the controller **40** may determine the vehicle position information including a vehicle location and an associated stationary period for each occurrence of the vehicle remaining stationary for greater than a predetermined period. In one embodiment, the controller **40** may cooperate with the wireless transmission device **44** to send the vehicle position information to the monitoring station based upon each occurrence of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the monitoring station **30** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the monitoring station **30** may time stamp the received information.

In another embodiment, the controller **40** cooperates with the wireless transmission device **44** to send the vehicle position information to the monitoring station **30** for a plurality of occurrences of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the controller **40** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the controller time stamps the position and stationary period information.

As an example, the predetermined time which determines whether the vehicle **21** is stationary and the position should be determined, may be less than about three minutes. This time may filter out vehicle stops in normal traffic, but which will keep track of stops where the driver likely leaves the

vehicle **21**. Accordingly, only the important information necessary to track the vehicle need be stored and/or transmitted thereby reducing the system costs. If the vehicle **21** is stationary overnight, for example, unnecessary position information need not be determined, stored, and/or transmitted to the monitoring station **30**.

The controller **40** may comprise the memory **52** for storing the vehicle position information therein. In one configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined schedule. In another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined event. In yet another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined percentage of memory usage.

Having now described certain general features and advantages of the vehicle tracking system **20**, this description now turns to additional specific details which are provided as examples. In particular, vehicle tracking system **20** preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and then starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle security or alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm system's remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Pat. No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined maximum speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to **3** predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is preferably selectable by the user.

7. Detects the vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user or subscriber also preferably has access to an Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be quickly activated by a telephone call. No additional installation may be required.

Certain annual pre-pay package arrangements may be available. For example, up to 10 access entries per month can be provided on a low monthly billing. Up to 30 access entries could be provided also for a relatively low monthly fee.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the monitoring station internet site. The user may control various vehicle functions remotely via the telephone or the internet site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment and installation is relatively inexpensive. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command **4**).

For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command **5**).

For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command **7**) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command **6**). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low. Some further details of a specific embodiment of the vehicle tracking unit **25** are provided below as relating to use of red and green LED indicators as may be coupled to the controller **40** and operated thereby. Also various representative wires, designated by color, are provided as an example embodiment.

The red LED verifies the GPS receiving signal. With a yellow wire having positive 12 volts, the red LED blinking indicates searching GPS location, constant indicates found

location, and off indicates no GPS signal found. With the yellow wire not having positive 12 volts, if the red LED is off, the LED is not functioning.

The green LED verifies receiving the cell tower signal. With the yellow wire having positive 12 volts, blinking indicates the cell control channel signal is detected, constant indicates sending a micro burst signal (LED stays on 5-seconds after each transmission, and off indicates no cell tower signal received. With yellow wire not having positive 12 volts, off indicates the green LED is not functioning.

An example of representative DIP switch feature selection is as follows. A first switch may be used for the adding orange wire for controlling arm/disarming of system. When on, the orange wire controls arm/disarm as follows: to arm, the orange wire is grounded and yellow wire does not have 12 volts positive. To disarm, the orange wire is not grounded. When the first switch is off, then only the yellow wire controls arm/disarm as follows: to arm, the yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed. To disarm, the yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

1. The Red Wire is connected to the 12 vdc power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than. ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

2. The black wire is connected to ground.

3. The yellow wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further: if the system is in an armed mode and the Lat/Long changes, then Alert "A" is given. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D". If the first DIP switch is in the off position then: if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues from the 500 ma ground, and if the yellow wire sees ground or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

4. The gray wire is for input and output, and can be connected to an alarm siren or horn positive terminal. In addition:

a. With system armed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

b. With system disarmed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

c. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.

d. The gray wire bypass operates as follows:

i. After alert warning "B" bypass all future alert "B" signals until system is disarmed.

ii. After alert warning "C" bypass all future Alert "C" signals until system is armed.

iii. After alert warning "D" bypass all future alert "D" signals until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire having 12 volts.

e. With system armed or disarmed. The Output: Internal +12 v, 1 amp transistor with pulses 1 second on and 1 seconds off to activate siren or honk car horn or flashing light relay.

i. Non-stop activation from (Command "**4**")

ii. 30-second activation from (Command "**5**")

f. Turn off the above alert "A" from (Command "**1**").

5. The orange wire is for the starter interrupt and arm/disarm system, and operates as follows:

a. If first DIP switch is in the:

i. On position and: the orange wire has 12 volts or neutral, the system switches to the disarmed mode; the orange wire is grounded, then the system is switched to the armed mode; and the starter interrupt output will not automatically operate. Can only be activated from "Command #**4**"

ii. Off position and the orange wire does not effect the arming or disarming of the system; 30 seconds after system arms the orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #**4**". Connect to Starter interrupt relay output.

b. Command **4** activates Orange wire to have 500 ma. negative until Command 1 is received.

c. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again **3** seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example. A green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "**6**"). A red wire provides a constant 12 v output from the red power wire. A blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "**7**"). A pink wire provides a 250 ma., negative 1 second pulse for remote Car Starter (Command "**2**").

An installation test button may also be provided to work as follows. Pressing the button activates the orange wire for 10-seconds (starter interrupt), with these circuits in sequence. First, activates gray wire for 1-second. (siren/horn). After the first stops, activates green wire for 1 second to lock the doors. After the second stops, activate the blue wire for 1 second to unlock the doors. After the third stops, activate the pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

1. Alert Warning "A" (FIG. **4**): Automatic activation of "Command **8**" and the vehicle unit contacts monitoring station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" signals until the system is re-armed.

2. Alert Warning "B" (FIG. **5**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

3. Alert Warning "C" (FIG. **6**): the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###" and time limit of "##" seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS).

4. Alert Warning "D" (FIG. **7**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

5. Alert Warning "E" (FIG. **8**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until, first, more than 13.5 volts are detected on the red wire and, second, after the yellow wire stops having positive voltage the red wire then must detect more than 12 volts.

The following are representative commands for use in the system:

Command **1**: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command **2**: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command **3**: (Vehicle Location) Web site to indicate present location and past events in memory.

Command **4**: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1 sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command **5**: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with **1** amp positive output.

Command **6**: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command **7**: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250 ma. negative.

Command **8**: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

1. With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

a. Once instantly.

b. Once in 1 hour if at the same location.

c. Once in 6 hours if at the same location.

d. Once in 12 hours if at the same location.

e. Once every 24 hours if at the same location.

f. Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01–24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command **1**: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command **2**: (Accessory activation)

ix) Command **3**: (Vehicle Location was retrieved)

x) Command **4**: (Hijack or Stolen mode activated)

xi) Command **5**: (Car Find mode activated)

xii) Command **6**: (Locked Doors)

xiii) Command **7**: (Unlocked Doors)

xiv) Command **8**: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include: while the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time. If the GPS antenna is not receiving any signal then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received, and enter GPS location in the on-hold file. When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These may include:

1. The user's vehicle has issued a stolen alert:

a. If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

b. If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

2. The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

3. The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature may begin immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert A" (FIG. **4**).

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition.

A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B" (FIG. **5**).

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

Yet another advantageous feature of some embodiments of invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated that a cold start position determination which takes longer, since the cold start posi-

tion determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Another aspect relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Still another aspect relates to warning the user of an inoperable or malfunctioning GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once ever 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45 minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

In examples, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Yet another feature is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station. More particularly, a typical arrangement may provide eight basic codes and two "wildcard" codes. The two wildcard codes are reserved for future or other uses. A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A–E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response

(no alarm triggered) in the tracking device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

In accordance with another feature, the rate of sending the location or position data (or change in position data) from the vehicle may be varied to reduce system usage and thereby reduce expenses. More particularly, in one embodiment, the rate of sending may be based upon how long the vehicle has remained stationary. This time period may be selected by the user. For example, the selected time may be in the range of 15 minutes to six hours. If the vehicle has been stationary for the selected time period, then the rate of transmission may be reduced. This reduces or eliminates the need to send home position data and send all the over 15-minute stops made that day. Otherwise, that is when the vehicle is moving, the device may send data at a faster rate. Of course, a system user would not likely be interested in quick updates, especially where the position information is not changing. Conversely, if the vehicle is being moved, it may be desirable to receive more frequent position updates.

Another variation of this transmission rate conservation feature, bases the rate of transmission on the vehicle position. For example, a reduced rate of transmission may be selected if the vehicle is in a predetermined area where the user has a lesser interest in quickly updated position information. The user may also have a reduced interest in an area that can be defined outside of a predetermined distance from a reference point.

Yet another variation of the vehicle position transmission rate conservation feature is based upon the vehicle's speed, such as the vehicle's average or maximum speed, for example. Accordingly, if the vehicle is traveling above a preset speed, the rate of transmission may be increased.

In accordance with another aspect of the invention, the tracking device may send the alert indication a predetermined number of times without receiving an acknowledgment as described above, and then wait until the vehicle position has changed before trying again or the cell re-registers or its RSS. (received signal strength) changes. Thus, power is conserved. When the vehicle has moved to a new position, any obstructions may no longer be present thereby increasing the likelihood of a successful communication. In addition, the change in position may be determined when the vehicle is sensed to be moving about a predetermined relatively small speed, such as greater than 1 mph, for example.

In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Pat. Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention.

Yet another aspect relates to efficient use of available codes on the cellular telephone control channel. In one particular example, ten codes may be available to be transmitted from the monitoring station to the vehicle trackers. The first eight or nine codes are command codes that will cause a specific action by the tracking device at the vehicle. The other one or two codes may be wildcard codes as mentioned above, that may set a stand-by mode for one or a group of vehicles, for example.

It may be desirable to provide more than eight commands at the vehicle responsive to the corresponding eight available codes. For example, it may be desirable to set a feature on or off, or to set a different feature setting or threshold. In accordance with this aspect of the invention, the commands at the tracker are determined based upon a series of different command codes being received within a predetermined time window.

For example, the monitoring station may send code **9** that switches the tracker in the car into a stand-by mode for a predetermined time and which causes the tracker to respond with an upstream confirmation code **7** or **9** indicating receiving code **9**. During the predetermined time of the stand-by mode another code follows that causes a system programmable feature or setting to change. Note that the second code would otherwise cause a different function at the vehicle. Note that system might operate a function **9** if another code **1**–**9** is not received in the predetermined time. The following list is exemplary for features resulting from second codes **1**–**9**:

(1) Code **1**—Tracker will turn off feature of upstream code caused by vehicle alert being detected.

(2) Code **2**—Tracker will turn on feature of upstream code caused by vehicle alert being detected.

(3) Code **3**—Tracker deactivates cell receiver from operating due to a non-paying customer for monitoring service. That phone number can then be allocated to another customer.

(4) Code **4**—Turn on audio buzzer feature that will sound once each 10 minutes. The monitoring station need only send the command to activate the feature, as the tracker will time the period and drive the buzzer thereafter. The monitoring station will normally not need to send this command because the tracker will be configured out of the box with this feature activated to sound the buzzer every 10 minutes until the next command is received.

(5) Code **5**—Turn off the audio buzzer. This is to be sent by the monitoring station after a user has successfully activated his account.

(6) Code **6**—Turn on the 80 mph speed limit reporting. This will normally not be sent as this feature will be the default setting of the tracker.

(7) Code **7**—Turn off the 80 mph speed limit reporting.

(8) Code **8**—Increase speed limit 5 mph and increase the time 5 minutes.

(9) Code **9**—Decrease speed limit 5 mph and decrease the time 5 minutes, and wait 5 minutes if another code number follows. It could operate this way to allow another set of codes to change more features.

In this example, in response to the tracker receiving the system code **1**–**9**, the tracker sends an upstream code **7** to acknowledge receipt of the system code **1**–**9**. Upon receipt of code **9** the tracker waits up to 5 minutes to determine if another system code is received. If no code is received, then the tracker performs the code **9** operation. Of course, in other embodiments other features or settings can be selected.

In general, it may be preferred that the first code sent in a series of two codes, for example, be a code that causes only a minor function to be performed at the vehicle. This so because if the second code is sent from the monitoring station, but not received at the tracker, only a minor function is performed. For example, the first code may switch between armed and disarmed modes. This is in contrast to using a remote engine starting code or engine shutdown code as the first code. The vehicle may be moving or positioned in a marginal reception area, and the second command may not be received by the tracker within the predetermined time window. As will be appreciated by those skilled in the art, this concept of multiple digit codes, can be extended beyond two digits to three or more.

To further conserve cellular transmissions and as described above, the tracker may be set to record a position

based upon a determined event. Only this recorded position information may be downloaded either by user request or at set times. It is desired that such events be relatively few, but that the information still be helpful to the user.

For example, an event for recording of position may be determined based upon the vehicle being stopped for greater than a first time and less than a second time. For example, the first time may be 15 minutes and the second time may be 6 hours. Determination of the vehicle being stopped can be made based upon one or both of the GPS position or the vehicle ignition being turned off. The second time prevents the recording of position information when the vehicle is stopped at the owner's home during the evening, for example. Accordingly, the important information of the vehicle stops being made is recorded and made available to the user, while system communications resources are conserved.

In another example, if the mode is selected to send the vehicles location every 10 min and the vehicle is in the same location for greater than a set time, then no more vehicle locations are sent until the vehicle location has changed to start the every 10 min reporting again.

Other features relating to vehicle control systems are disclosed in copending patent applications entitled VEHICLE TRACKER INCLUDING STATIONARY TIME DETERMINATION AND ASSOCIATED METHODS, Ser. No. 09/859727, VEHICLE TRACKER CONSERVING CODES AND RELATED METHODS, Ser. No. 09/859673; VEHICLE TRACKER WITH POWER SAVING FEATURES AND RELATED METHODS, Ser. No. 09/859728; VEHICLE TRACKER COOPERATING WITH A STARTER INTERRUPT AND RELATED METHODS, Ser. No. 09/859973; VEHICLE TRACKER WITH USER NOTIFICATIONS AND ASSOCIATED METHODS, Ser. No. 09/859733; VEHICLE TRACKER WITH USER REGISTRATION REMINDER AND RELATED METHODS, Ser. No. 09/859971; VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS, Ser. No. 09/859972; and VEHICLE TRACKER WITH TEST FEATURES AND RELATED METHODS, Ser. No. 09/859729, the entire disclosures of which are incorporated herein by reference.

Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Accordingly, it is understood that the invention is not to be limited to the embodiments disclosed, and that other modifications and embodiments are intended to be included within the spirit and scope of the appended claims.

That which is claimed is:

**1**. A vehicle tracking system comprising a vehicle tracking unit for a vehicle of a type comprising a vehicle alarm indicator, said vehicle tracking unit comprising

a vehicle position determining device,

a wireless communications device, and

a controller connected to said wireless communications device and said vehicle position determining device;

said controller cooperating with said wireless communications device to send an alarm indication alert based upon at least one of an activation of the vehicle alarm indicator continuously for greater than a predetermined time and an activation of the vehicle alarm indicator in a repetitive pattern; and

a monitoring station receiving the alarm indication alert from said vehicle tracking unit.

**2**. A vehicle tracking system according to claim **1** wherein said controller also cooperates with said vehicle position determining device and said wireless communications device to send vehicle position messages.

**3**. A vehicle tracking system according to claim **1** wherein said controller monitors drive signals to the vehicle alarm indicator.

**4**. A vehicle tracking system according to claim **1** wherein the drive signals have at least one of a first and second polarity.

**5**. A vehicle tracking system according to claim **1** wherein the vehicle alarm indicator comprises at least one of a vehicle horn, and a vehicle siren.

**6**. A vehicle tracking system according to claim **1** wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

**7**. A vehicle tracking system according to claim **1** wherein said wireless communications device comprises a cellular telephone communications device.

**8**. A vehicle tracking system according to claim **7** wherein said cellular telephone communications device communicates over a cellular control channel.

**9**. A vehicle tracking system according to claim **1** wherein said monitoring station comprises a user interface for accepting at least one command from a user and sending at least one alert to the user.

**10**. A vehicle tracking system according to claim **9** wherein said user interface comprises an Internet interface.

**11**. A vehicle tracking system according to claim **9** wherein said user interface comprises a telephone network interface.

**12**. A vehicle tracking unit for use with a vehicle comprising a vehicle alarm indicator, the vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device; and

a controller connected to said wireless communications device and said vehicle position determining device;

said controller cooperating with said wireless communications device to send an alarm indication alert responsive to an activation of the vehicle alarm indicator continuously for greater than a predetermined time.

**13**. A vehicle tracking unit according to claim **12** wherein said controller further sends an alarm indication alert responsive to activation of the vehicle alarm indicator in a repetitive pattern.

**14**. A vehicle tracking unit according to claim **12** wherein said controller monitors drive signals to the vehicle alarm indicator.

**15**. A vehicle tracking unit according to claim **14** wherein the drive signals have at least one of a first and second polarity.

**16**. A vehicle tracking unit according to claim **12** wherein the vehicle alarm indicator comprises at least one of a vehicle horn, and a vehicle siren.

**17**. A vehicle tracking unit according to claim **12** wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

**18**. A vehicle tracking unit according to claim **12** wherein said wireless communications device comprises a cellular telephone communications device.

**19**. A vehicle tracking unit according to claim **18** wherein said cellular telephone communications device communicates over a cellular control channel.

**20**. A vehicle tracking unit for use with a vehicle comprising a vehicle alarm indicator, the vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device; and

a controller connected to said wireless communications device and said vehicle position determining device;

said controller cooperating with said wireless communications device to send an alarm indication alert responsive to an activation of the vehicle alarm indicator in a repetitive pattern.

**21**. A vehicle tracking unit according to claim **20** wherein said controller monitors drive signals to the vehicle alarm indicator.

**22**. A vehicle tracking unit according to claim **21** wherein the drive signals have at least one of a first and second polarity.

**23**. A vehicle tracking unit according to claim **20** wherein the vehicle alarm indicator comprises at least one of a vehicle horn, and a vehicle siren.

**24**. A vehicle tracking unit according to claim **20** wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

**25**. A vehicle tracking unit according to claim **20** wherein said wireless communications device comprises a cellular telephone communications device.

**26**. A vehicle tracking unit according to claim **25** wherein said cellular telephone communications device communicates over a cellular control channel.

**27**. A method for operating a vehicle tracking unit for a vehicle of a type comprising a vehicle alarm indicator, the vehicle tracking unit comprising a vehicle position determining device, and a wireless communications device, the method comprising:

determining position information of the vehicle using the vehicle position determining device;

determining an alarm condition based upon at least one of an activation of the vehicle alarm indicator continuously for greater than a predetermined time and an activation of the vehicle alarm indicator in a repetitive pattern; and

sending an alarm indication alert from the wireless communications device responsive to determining the alarm condition and including vehicle position information.

**28**. A method according to claim **27** wherein determining the alarm condition comprises monitoring drive signals to the vehicle alarm indicator.

**29**. A method according to claim **28** wherein the drive signals have at least one of a first and second polarity.

**30**. A method according to claim **27** wherein the vehicle includes a vehicle battery; and wherein determining the alarm condition comprises monitoring voltage dips of the vehicle battery.

**31**. A method according to claim **27** wherein the vehicle alarm indicator comprises at least one of a vehicle horn, and a vehicle siren.

**32**. A method according to claim **27** wherein the vehicle position determining device comprises a Global Positioning System (GPS) device.

**33**. A method according to claim **27** wherein the wireless communications device comprises a cellular telephone communications device.

**34**. A method according to claim **33** wherein the cellular telephone communications device communicates over a cellular control channel.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION

PATENT NO. : 7,149,623 B2
APPLICATION NO. : 10/383496
DATED : December 12, 2006
INVENTOR(S) : Flick



It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

| | |
|---|---|
| Column 1, Line 40 | Delete: "it used"<br>Insert: --it is used-- |
| Column 3, Line 40 | Delete: "diagrams"<br>Insert: --diagram-- |
| Column 4, Line 42 | Delete: "illustrated"<br>Insert: --illustratively-- |
| Column 5, Line 35 | Delete: "will described"<br>Insert: --will be described-- |
| Column 6, Line 66 | Delete: "of an vehicle"<br>Insert: --of a vehicle-- |
| Column 7, Line 28 | Delete: "not operation"<br>Insert: --not in operation-- |
| Column 7, Line 65 | Delete: "cause"<br>Insert: --causes-- |

Signed and Sealed this

Seventh Day of August, 2007



JON W. DUDAS
*Director of the United States Patent and Trademark Office*

US008032278C1

(12) EX PARTE REEXAMINATION CERTIFICATE (11018th)
United States Patent
Flick

(10) Number: US 8,032,278 C1
(45) Certificate Issued: Dec. 28, 2016

(54) **VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS**

(75) Inventor: **Kenneth E. Flick**, Douglasville, GA (US)

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**Reexamination Request:**
No. 90/013,587, Sep. 14, 2015

**Reexamination Certificate for:**
Patent No.: **8,032,278**
Issued: **Oct. 4, 2011**
Appl. No.: **11/773,272**
Filed: **Jul. 3, 2007**

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 11/076,259, filed on Mar. 9, 2005, now Pat. No. 7,720,597, which is a continuation of application No. 10/383,496, filed on Mar. 7, 2003, now Pat. No. 7,149,623, which is a continuation of application No. 09/859,972, filed on May 17, 2001, now Pat. No. 6,606,561.

(60) Provisional application No. 60/264,811, filed on Jan. 29, 2001, provisional application No. 60/258,005, filed on Dec. 22, 2000, provisional application No. 60/251,552, filed on Dec. 6, 2000, provisional application No. 60/252,125, filed on Nov. 20, 2000, provisional application No. 60/236,890, filed on Sep. 29, 2000, provisional application No. 60/246,463, filed on Nov. 7, 2000, provisional application No. 60/222,777, filed on Aug. 3, 2000, provisional application No. 60/205,178, filed on May 17, 2000.

(51) **Int. Cl.**

| | |
|---|---|
| ***G01C 21/00*** | (2006.01) |
| ***B60R 25/04*** | (2013.01) |
| ***G07C 5/00*** | (2006.01) |
| ***B60R 25/102*** | (2013.01) |
| ***B60R 25/104*** | (2013.01) |
| ***G08G 1/00*** | (2006.01) |
| ***B60R 25/045*** | (2013.01) |
| ***G08G 1/127*** | (2006.01) |
| ***B60R 25/33*** | (2013.01) |

(52) **U.S. Cl.**
CPC ..... ***B60R 25/04*** (2013.01); ***B60R 25/045*** (2013.01); ***B60R 25/102*** (2013.01); ***B60R 25/104*** (2013.01); ***B60R 25/33*** (2013.01); ***G07C 5/008*** (2013.01); ***G08G 1/127*** (2013.01); ***G08G 1/20*** (2013.01); ***G08G 1/205*** (2013.01); *B60R 2325/202* (2013.01); *B60R 2325/205* (2013.01); *B60W 2550/402* (2013.01)

(58) **Field of Classification Search**
CPC ..... B60R 25/04
See application file for complete search history.

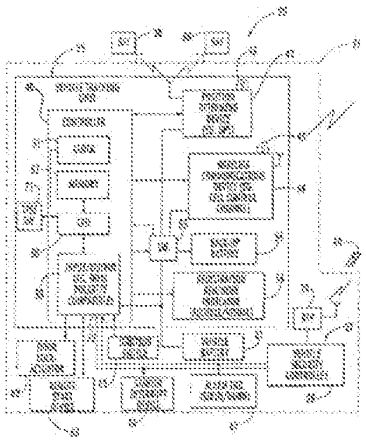
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*Primary Examiner* — Matthew C Graham

(57) **ABSTRACT**

A multi-vehicle compatible tracking unit is for a vehicle including a vehicle data bus extending throughout the vehicle. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a multi-vehicle compatible controller for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The multi-vehicle compatible controller may be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles. A downloading interface may be included for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller.



# EX PARTE
# REEXAMINATION CERTIFICATE

NO AMENDMENTS HAVE BEEN MADE TO THE PATENT

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1-22** is confirmed.

* * * * *

US006606561B2

(12) **United States Patent**
**Flick**

(10) **Patent No.: US 6,606,561 B2**
(45) **Date of Patent: Aug. 12, 2003**

(54) **VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS**

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(73) Assignee: **Omega Patents, L.L.C.**, Douglasville, GA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 42 days.

(21) Appl. No.: **09/859,972**

(22) Filed: **May 17, 2001**

(65) **Prior Publication Data**

US 2002/0016673 A1 Feb. 7, 2002

**Related U.S. Application Data**

(60) Provisional application No. 60/264,811, filed on Jan. 29, 2001, provisional application No. 60/258,005, filed on Dec. 22, 2000, provisional application No. 60/251,552, filed on Dec. 6, 2000, provisional application No. 60/252,125, filed on Nov. 20, 2000, provisional application No. 60/246,463, filed on Nov. 7, 2000, provisional application No. 60/236,890, filed on Sep. 29, 2000, provisional application No. 60/222,777, filed on Aug. 3, 2000, and provisional application No. 60/205,178, filed on May 17, 2000.

(51) **Int. Cl.**[7] ..... **G01C 21/00**
(52) **U.S. Cl.** ..... **701/213**; 340/988
(58) **Field of Search** ..... 701/213, 207, 701/209, 24, 33, 35, 36; 340/901, 989, 988, 991, 992, 993

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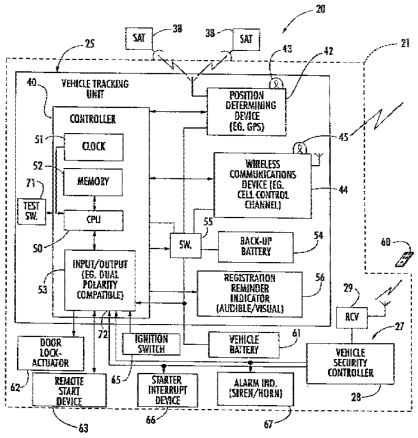
Omega Research and Development, Inc., Installation Instructions for ATV–1000 Model Car Alarm, 2002 This patent has been sold in U.S. for approximately five years.

*Primary Examiner*—William A. Cuchlinski, Jr.
*Assistant Examiner*—Olga Hernandez
(74) *Attorney, Agent, or Firm*—Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A tracking system includes a vehicle tracking unit for a vehicle of a type including an alarm indicator, and a monitoring station receiving the alarm indication alert from the vehicle tracking unit. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a controller connected to the wireless communications device and the vehicle position determining device. The controller may cooperate with the wireless communications device to send an alarm indication alert responsive to at least one of activation of the vehicle alarm indicator continuously for greater than a predetermined time and activation of the vehicle alarm indicator in a repetitive pattern. The controller may also include a dual polarity compatible output for a vehicle device, such as the vehicle alarm indicator.

**53 Claims, 10 Drawing Sheets**



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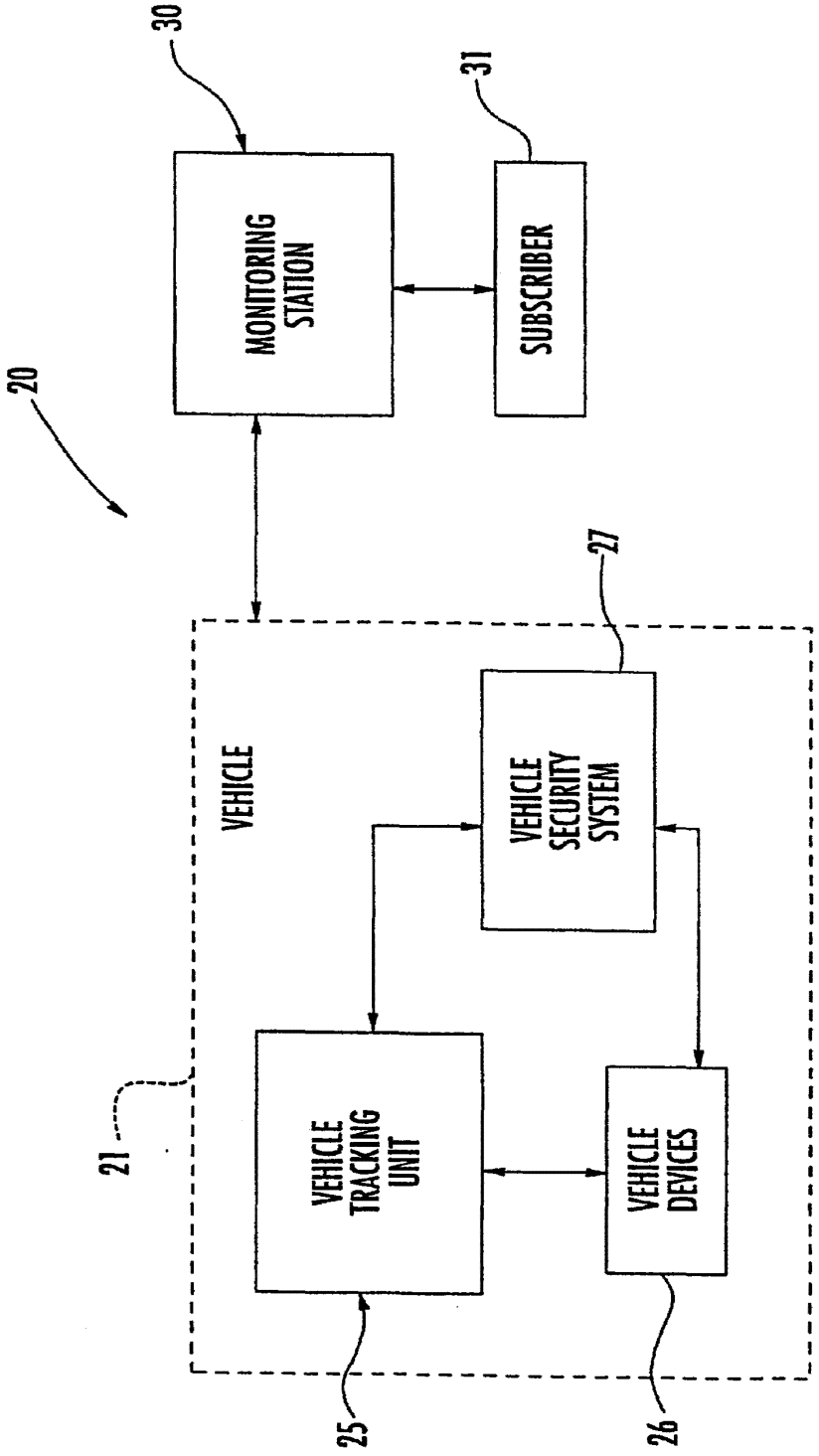

30
31
MONITORING STATION
SUBSCRIBER
20
27
VEHICLE
VEHICLE SECURITY SYSTEM
21
VEHICLE TRACKING UNIT
VEHICLE DEVICES
25
26

FIG. 1.

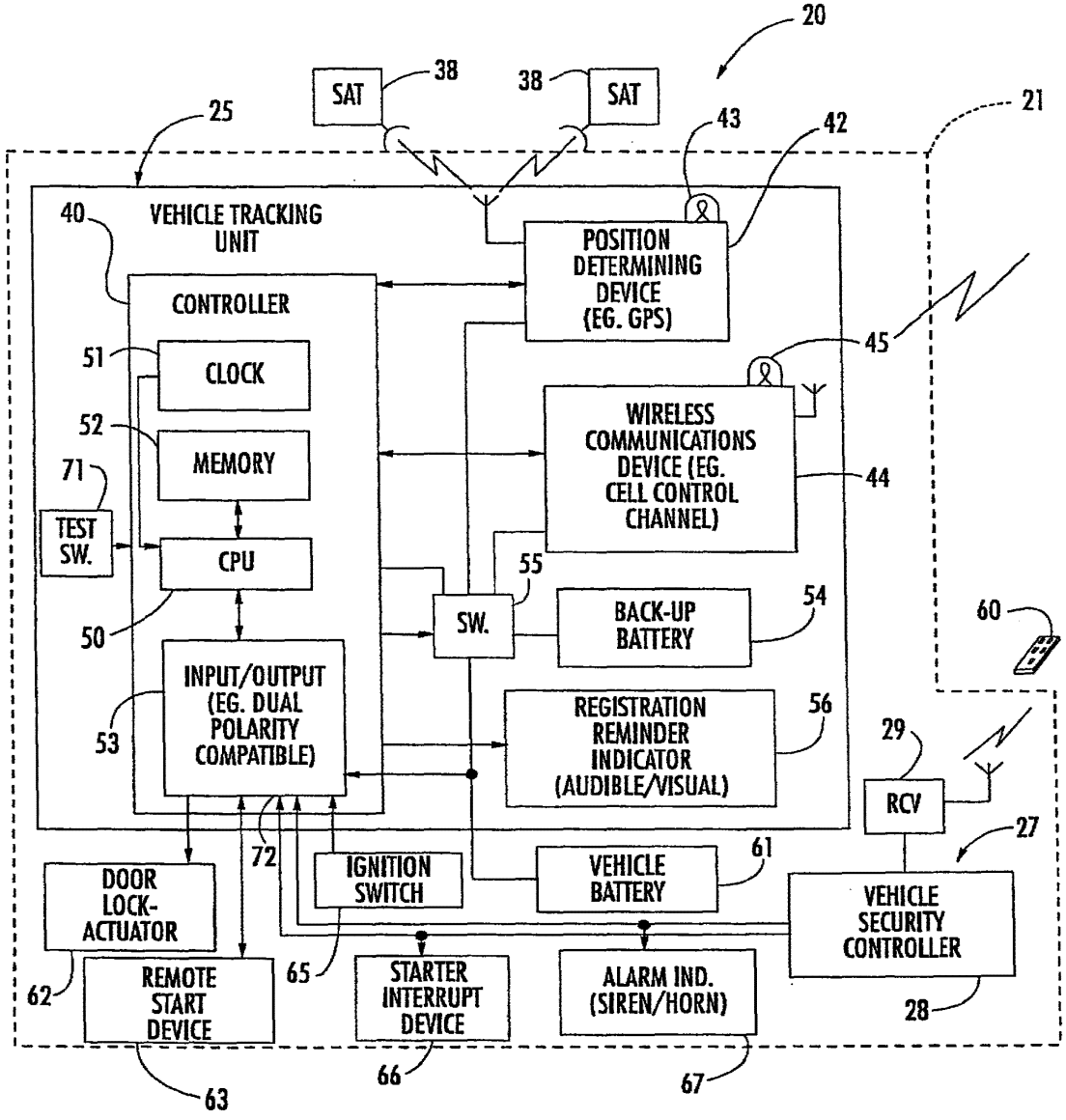

20
SAT
38
38
SAT
25
21
43
42
40
VEHICLE TRACKING UNIT
POSITION DETERMINING DEVICE (EG. GPS)
CONTROLLER
45
51
CLOCK
WIRELESS COMMUNICATIONS DEVICE (EG. CELL CONTROL CHANNEL)
52
MEMORY
44
71
TEST SW.
CPU
55
SW.
BACK-UP BATTERY
54
60
50
INPUT/OUTPUT (EG. DUAL POLARITY COMPATIBLE)
53
REGISTRATION REMINDER INDICATOR (AUDIBLE/VISUAL)
56
29
RCV
27
72
IGNITION SWITCH
VEHICLE BATTERY
61
DOOR LOCK-ACTUATOR
VEHICLE SECURITY CONTROLLER
62
REMOTE START DEVICE
65
STARTER INTERRUPT DEVICE
ALARM IND. (SIREN/HORN)
28
63
66
67

FIG. 2.

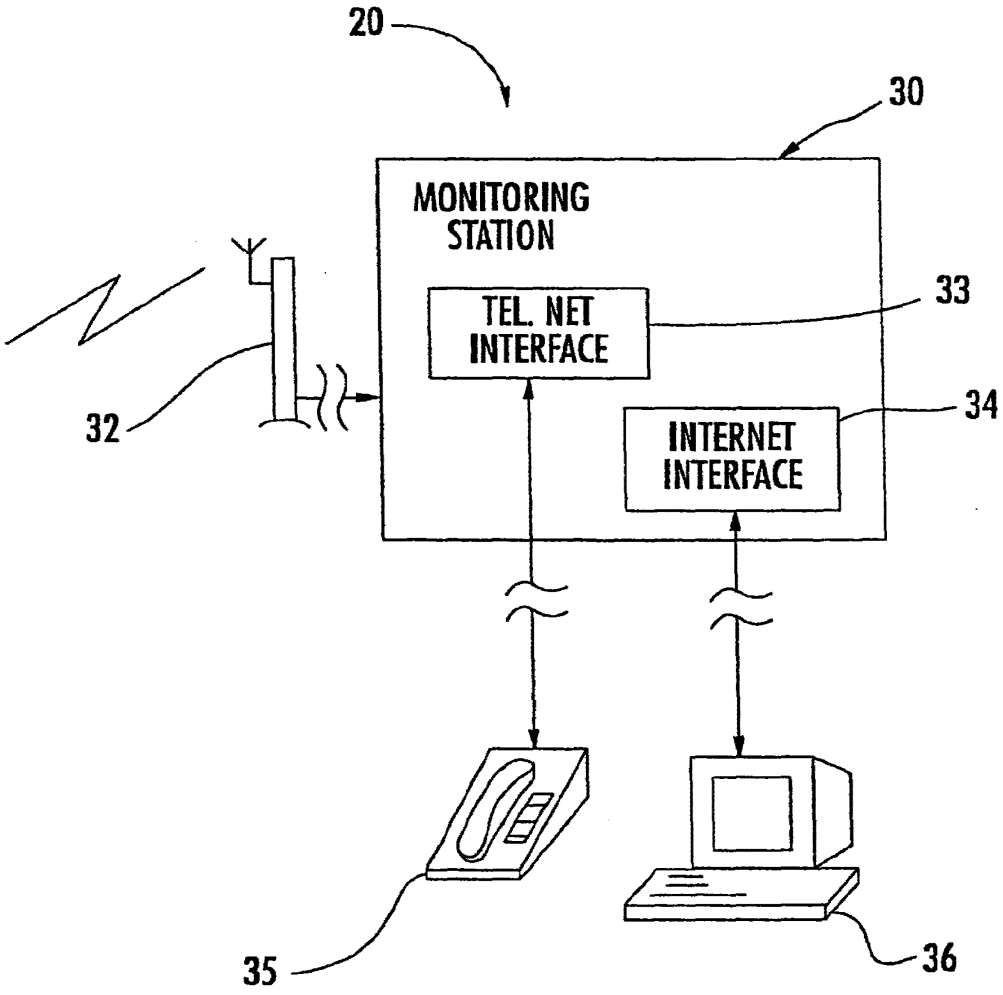

20
30
MONITORING STATION
TEL. NET INTERFACE
33
INTERNET INTERFACE
34
32
35
36

FIG. 3.

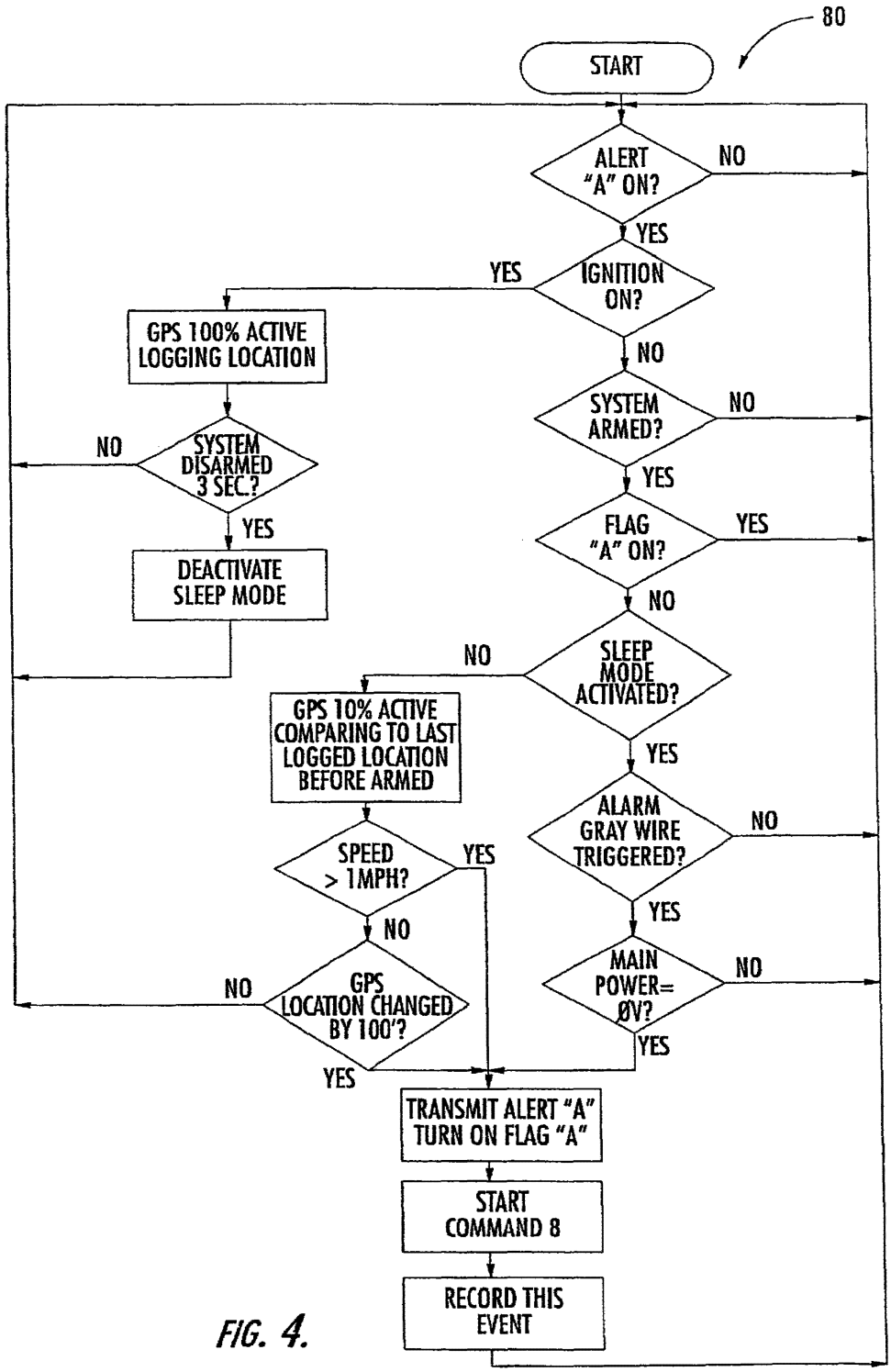

80
START
ALERT "A" ON?
NO
YES
IGNITION ON?
YES
GPS 100% ACTIVE LOGGING LOCATION
NO
SYSTEM ARMED?
NO
YES
SYSTEM DISARMED 3 SEC.?
NO
YES
DEACTIVATE SLEEP MODE
FLAG "A" ON?
YES
NO
SLEEP MODE ACTIVATED?
NO
YES
GPS 10% ACTIVE COMPARING TO LAST LOGGED LOCATION BEFORE ARMED
ALARM GRAY WIRE TRIGGERED?
NO
YES
SPEED > 1MPH?
YES
NO
MAIN POWER= ØV?
NO
YES
GPS LOCATION CHANGED BY 100'?
NO
YES
TRANSMIT ALERT "A" TURN ON FLAG "A"
START COMMAND 8
RECORD THIS EVENT

FIG. 4.

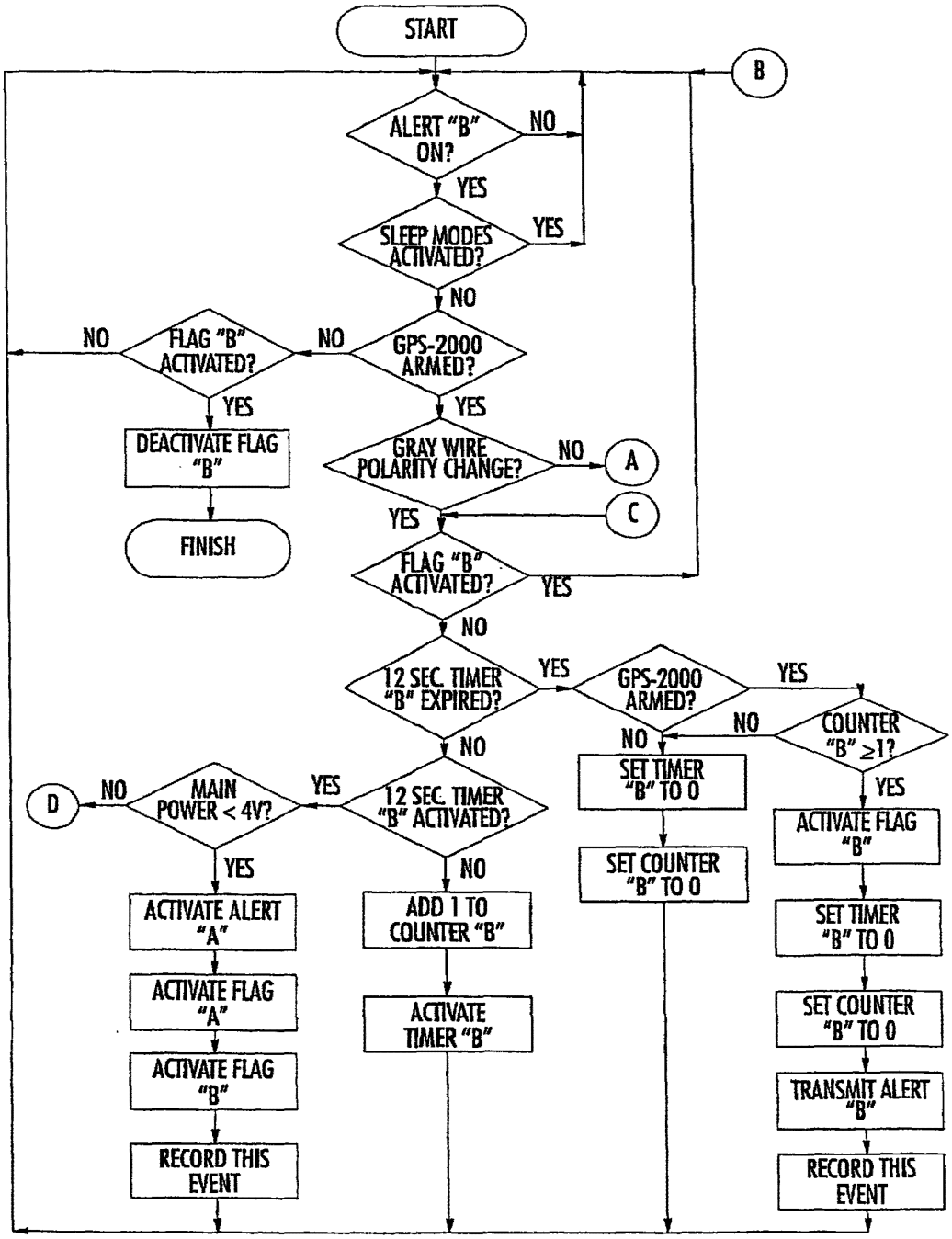

START
B
ALERT "B" ON?
NO
YES
SLEEP MODES ACTIVATED?
YES
NO
NO
FLAG "B" ACTIVATED?
NO
GPS-2000 ARMED?
YES
YES
DEACTIVATE FLAG "B"
GRAY WIRE POLARITY CHANGE?
NO
A
C
YES
FINISH
FLAG "B" ACTIVATED?
YES
NO
12 SEC. TIMER "B" EXPIRED?
YES
GPS-2000 ARMED?
YES
NO
NO
COUNTER "B" ≥1?
NO
YES
D
NO
MAIN POWER < 4V?
YES
12 SEC. TIMER "B" ACTIVATED?
YES
SET TIMER "B" TO 0
ACTIVATE FLAG "B"
NO
NO
SET COUNTER "B" TO 0
SET TIMER "B" TO 0
ACTIVATE ALERT "A"
ADD 1 TO COUNTER "B"
SET COUNTER "B" TO 0
ACTIVATE FLAG "A"
ACTIVATE TIMER "B"
TRANSMIT ALERT "B"
ACTIVATE FLAG "B"
RECORD THIS EVENT
RECORD THIS EVENT

FIG. 5A.

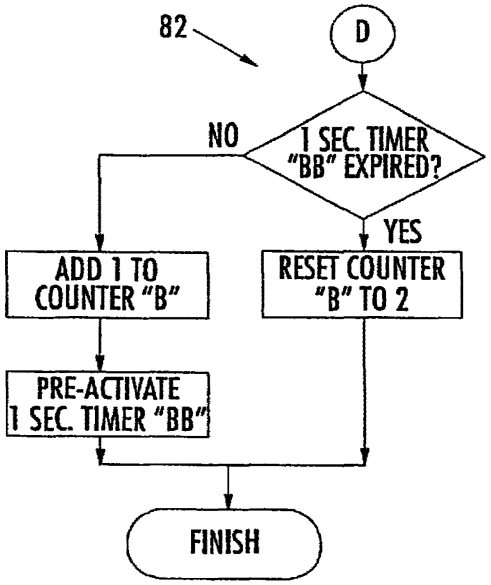

82
D
1 SEC. TIMER "BB" EXPIRED?
NO
YES
ADD 1 TO COUNTER "B"
RESET COUNTER "B" TO 2
PRE-ACTIVATE 1 SEC. TIMER "BB"
FINISH

FIG. 5B.

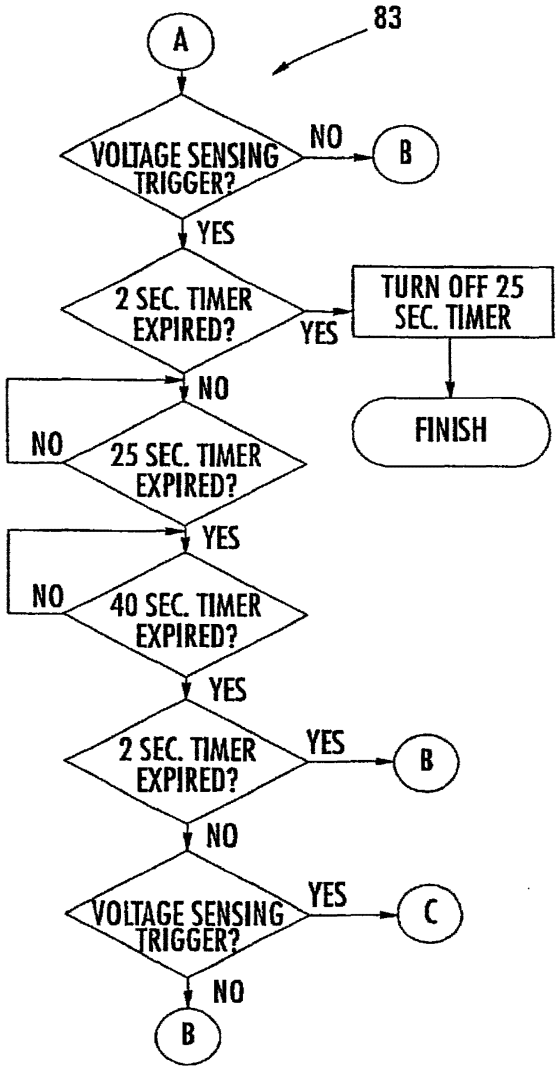

83
A
VOLTAGE SENSING TRIGGER?
NO
B
YES
2 SEC. TIMER EXPIRED?
YES
TURN OFF 25 SEC. TIMER
FINISH
NO
NO
25 SEC. TIMER EXPIRED?
YES
NO
40 SEC. TIMER EXPIRED?
YES
2 SEC. TIMER EXPIRED?
YES
B
NO
VOLTAGE SENSING TRIGGER?
YES
C
NO
B

FIG. 5C.

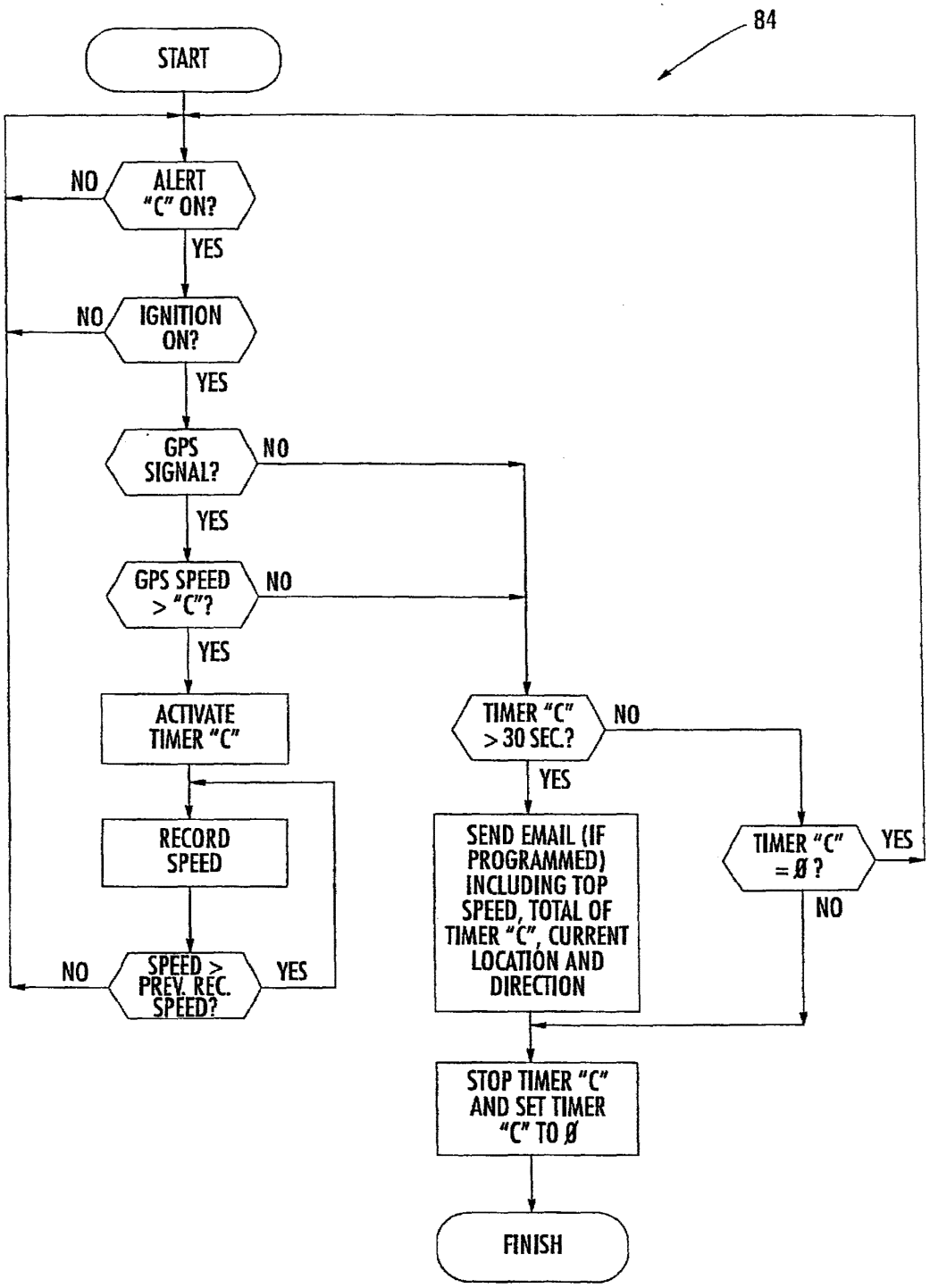

84
START
ALERT "C" ON?
NO
YES
IGNITION ON?
NO
YES
GPS SIGNAL?
NO
YES
GPS SPEED > "C"?
NO
YES
ACTIVATE TIMER "C"
RECORD SPEED
SPEED > PREV. REC. SPEED?
NO
YES
TIMER "C" > 30 SEC.?
NO
YES
SEND EMAIL (IF PROGRAMMED) INCLUDING TOP SPEED, TOTAL OF TIMER "C", CURRENT LOCATION AND DIRECTION
TIMER "C" = Ø ?
YES
NO
STOP TIMER "C" AND SET TIMER "C" TO Ø
FINISH

FIG. 6.

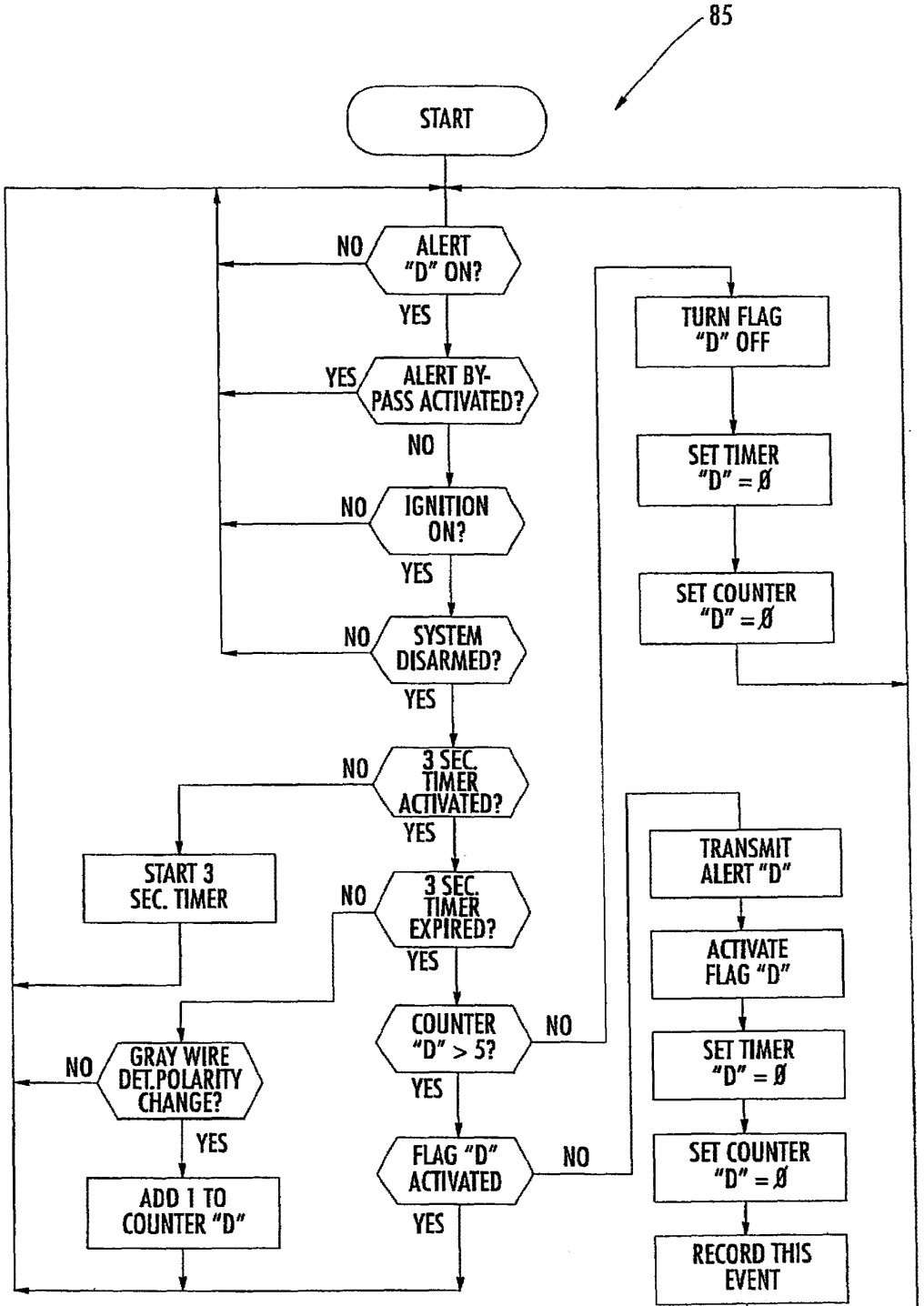

85
START
NO
ALERT "D" ON?
YES
YES
ALERT BY-PASS ACTIVATED?
NO
NO
IGNITION ON?
YES
NO
SYSTEM DISARMED?
YES
NO
3 SEC. TIMER ACTIVATED?
YES
START 3 SEC. TIMER
NO
3 SEC. TIMER EXPIRED?
YES
COUNTER "D" > 5?
NO
YES
NO
GRAY WIRE DET.POLARITY CHANGE?
YES
ADD 1 TO COUNTER "D"
FLAG "D" ACTIVATED
NO
YES
TURN FLAG "D" OFF
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
TRANSMIT ALERT "D"
ACTIVATE FLAG "D"
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
RECORD THIS EVENT

FIG. 7.

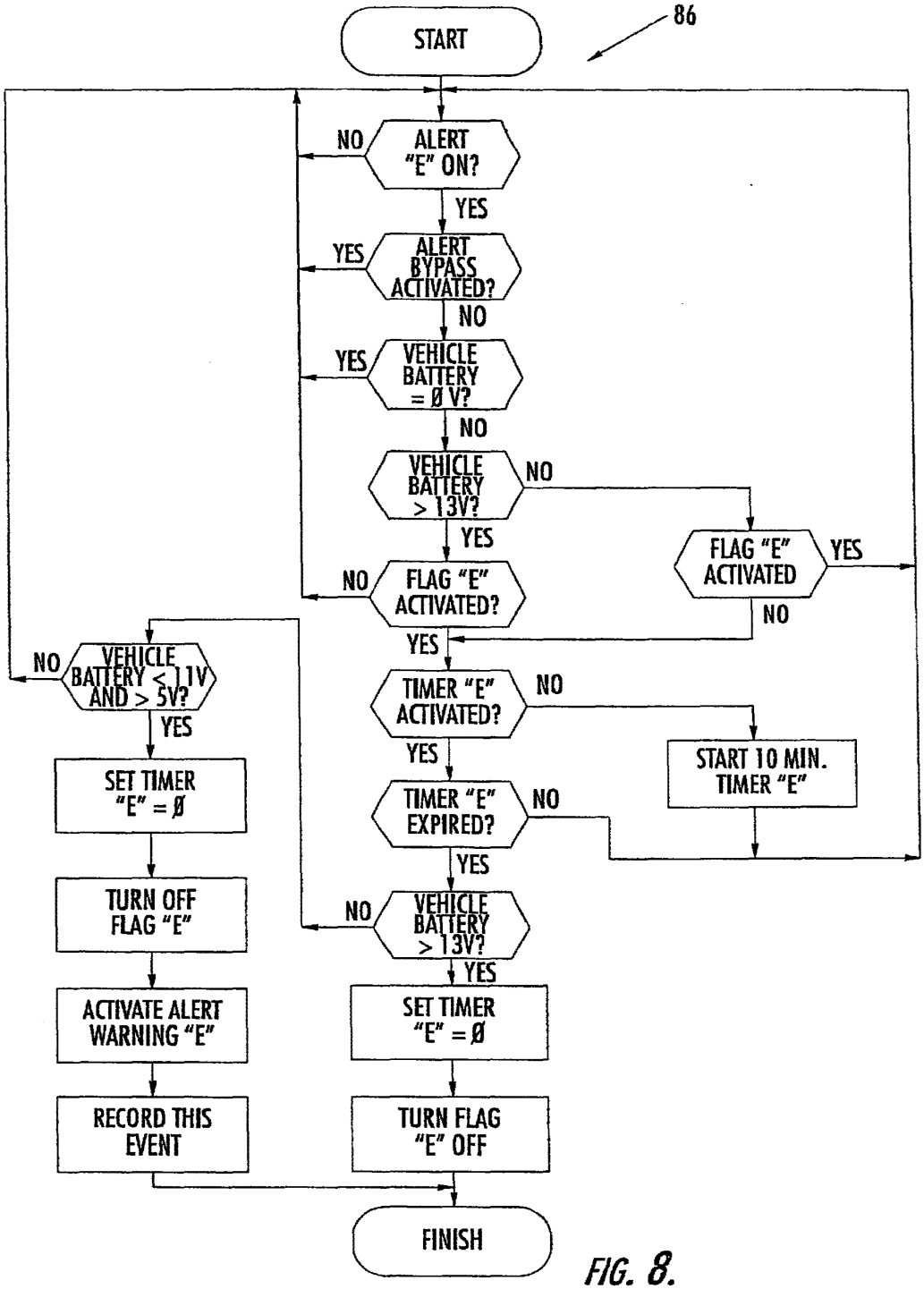

86
START
ALERT "E" ON?
NO
YES
ALERT BYPASS ACTIVATED?
YES
NO
VEHICLE BATTERY = Ø V?
YES
NO
VEHICLE BATTERY > 13V?
NO
YES
FLAG "E" ACTIVATED
YES
NO
FLAG "E" ACTIVATED?
NO
YES
VEHICLE BATTERY ≤ 11V AND > 5V?
NO
YES
TIMER "E" ACTIVATED?
NO
YES
START 10 MIN. TIMER "E"
SET TIMER "E" = Ø
TIMER "E" EXPIRED?
NO
YES
TURN OFF FLAG "E"
VEHICLE BATTERY > 13V?
NO
YES
ACTIVATE ALERT WARNING "E"
SET TIMER "E" = Ø
RECORD THIS EVENT
TURN FLAG "E" OFF
FINISH

FIG. 8.

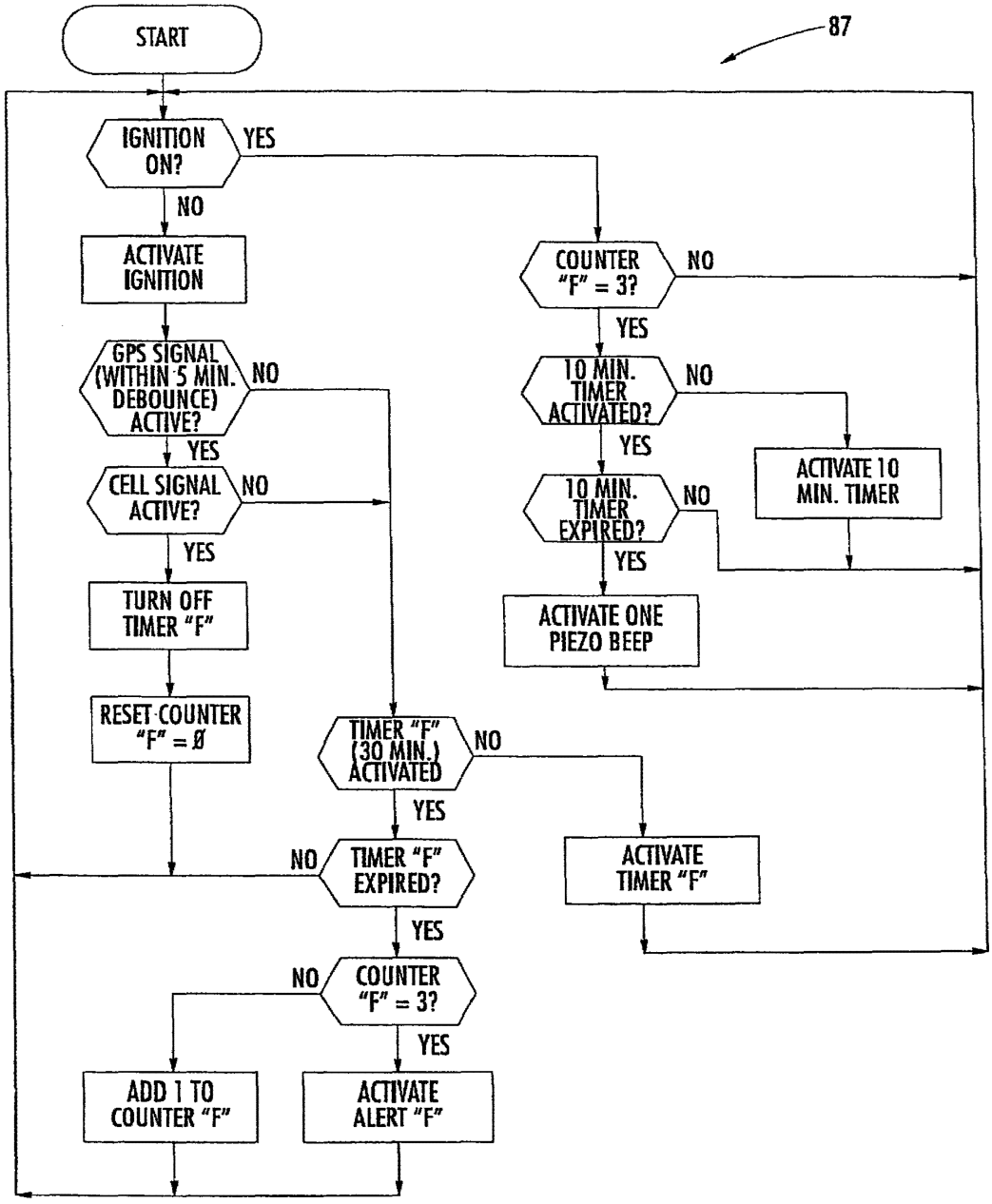

87
START
IGNITION ON?
YES
NO
ACTIVATE IGNITION
GPS SIGNAL (WITHIN 5 MIN. DEBOUNCE) ACTIVE?
NO
YES
CELL SIGNAL ACTIVE?
NO
YES
TURN OFF TIMER "F"
RESET COUNTER "F" = Ø
COUNTER "F" = 3?
NO
YES
10 MIN. TIMER ACTIVATED?
NO
YES
ACTIVATE 10 MIN. TIMER
10 MIN. TIMER EXPIRED?
NO
YES
ACTIVATE ONE PIEZO BEEP
TIMER "F" (30 MIN.) ACTIVATED
NO
YES
ACTIVATE TIMER "F"
NO
TIMER "F" EXPIRED?
YES
NO
COUNTER "F" = 3?
YES
ADD 1 TO COUNTER "F"
ACTIVATE ALERT "F"

FIG. 9.

# VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS

## RELATED APPLICATIONS

The present application is based upon copending provisional application serial nos. 60/264,811 filed on Jan. 29, 2001; Ser. No. 60/258,005, filed Dec. 22, 2000; Ser. No. 60/251,552, filed Dec. 6, 2000; Ser. No. 60/252,125, filed Nov. 20, 2000; Ser. No. 60/236,890, filed Sep. 29, 2000; Ser. No. 60/246,463, filed Nov. 7, 2000; Ser. No. 60/222,777, filed Aug. 3, 2000; and Ser. No. 60/205,178, filed May 17, 2000, the entire contents of each of which are incorporated herein by reference.

## FIELD OF THE INVENTION

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## BACKGROUND OF THE INVENTION

Motor vehicles, such as passenger cars, trucks, busses, fleet vehicles, etc. are widely used and knowing the locations of such vehicles is often desired. For example, should a vehicle be stolen, it would be beneficial to know the vehicle's location so that authorities could be promptly and accurately directed to retrieve the vehicle. Indeed, the tracking system could plot the getaway path of the thief.

For a company with hired drivers, it may desirable to know the driver's whereabouts during the course of the day. Similarly, a rental car agency or other fleet operator, for example, may wish to know the whereabouts of its fleet of vehicles.

It may also be desirable to track the location of a vehicle as it is used throughout the course of a normal day. For parents of younger or older drivers, for example, knowledge of the vehicle's location may provide some assurance that the driver is at designated locations and following a prescribed route.

A number of patents disclose various systems and approaches to tracking vehicles. For example, U.S. Pat. No. 5,223,844 discloses a tracking system including a control center and a mobile unit installed in the vehicle. The mobile unit may send security warnings to the command center via a wireless transceiver. Position information for the vehicle is determined using a GPS receiver at the vehicle.

U.S. Pat. No. 5,515,043 discloses a similar system which may send one or more preprogrammed telephone messages to a user when away from the vehicle. The user may remotely access location information or cause certain commands to be carried out by entering a personal identification number (PIN).

The widespread availability and use of the Internet has prompted a number of vehicle tracking systems to also make use of the Internet. For example, TelEvoke, Inc. proposed such a system in combination with Clifford Electronics. The system was to provide notification, control and tracking services via the telephone or the Internet. Users could be notified via phone, e-mail, or pager of events such as a car alarm being triggered. Users could control the vehicle remote devices via phone, web, or PDA such as unlocking car doors. Additionally, users could track TelEvoke-enabled vehicles on the Internet or via the telephone. An Internet map could be viewed by the user showing the actual and prior vehicle locations. TelEvoke offered its services via a centralized fully automated Network Operations Center. To reduce the communications costs, it was proposed to use the control channel of the cellular telephone network.



There are, of course, a number of vehicles which come from the manufacturer with some form of security system already installed. In addition, a number of vehicles are also equipped with aftermarket security systems. Many conventional vehicle tracking units may not be readily installed in vehicles, particularly those vehicles already including a vehicle security system. In addition, complexity of installation may significantly increase the system costs.

## SUMMARY OF THE INVENTION

In view of the foregoing background, it is therefore an object of the invention to provide a vehicle tracking unit and related methods that permit ready interface to devices in the vehicle, such as those devices which may be part of an existing vehicle security system.

This and other objects, features and advantages in accordance with the present invention are provided by a vehicle tracking system comprising a vehicle tracking unit for a vehicle of a type including an alarm indicator, and a monitoring station receiving the alarm indication alert from the vehicle tracking unit. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a controller connected to the wireless communications device and the vehicle position determining device. The controller may monitor signals relating to activation of the vehicle alarm indicator and send an alarm indication alert, such as with position information from the vehicle position determining device, and using the wireless communication device.

More particularly, the controller may send an alarm indication alert responsive to a continuous activation of the alarm indicator for greater than a predetermined time. Alternately, or in addition thereto, the controller may send an alarm indication alert responsive to a repetitive pattern of alarm indicator activations. In other words, the controller may be configured to distinguish between normal operation of a vehicle horn by the driver, and activation of the horn by a security system. The controller may also monitor signals of at least one of a first and second polarity. Accordingly, the tracking unit may be readily interfaced to vehicles including security systems.

In one variation, the controller monitors signals to the vehicle alarm indicator. In another variation, the controller monitors signals of voltage dips of the vehicle battery. The vehicle alarm indicator may comprise a vehicle horn, and/or a vehicle siren.

The vehicle position determining device may include a Global Positioning System (GPS) device. The wireless communications device may comprise a cellular telephone communications device, such as operating over a cellular control channel.

The monitoring station may comprise a user interface for accepting at least one command from a user and sending at least one alert to the user. For example, the user interface may include an Internet interface, and/or a telephone network interface.

Another advantageous aspect of the invention relates to compatibility of the outputs of the vehicle tracking unit. More particularly, the controller may include a dual polarity compatible output for a vehicle device, such as the vehicle alarm indicator. The controller may further monitor signals relating to activation of the vehicle alarm indicator and send an alarm indication alert with position information from the

vehicle position determining device and using the wireless communication device.

The controller may generate a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. The controller may also generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. In yet other embodiments, the controller may sense an actual polarity of the device and thereafter use the actual polarity for the dual polarity compatible output.

Where the vehicle device is a vehicle horn, the controller may typically be configured to generate a negative polarity output on the dual polarity compatible output. Conversely, wherein the vehicle device is a vehicle alarm indicator siren, the controller may be configured to generate a positive polarity output on the dual polarity compatible output.

One method aspect of the invention is for operating a vehicle tracking unit for a vehicle of a type comprising a vehicle alarm indicator. The vehicle tracking unit may include a vehicle position determining device, and a wireless communications device. The method preferably includes determining position information of the vehicle using the vehicle position determining device, determining an alarm condition based upon at least one of activation of the vehicle alarm indicator continuously for greater than a predetermined time and activation of the vehicle alarm indicator in a repetitive pattern, and sending an alarm indication alert from the wireless communications device responsive to determining the alarm condition.

Another method aspect also relates to operating such a vehicle tracking device. The method preferably includes using the controller to generate a dual polarity compatible output for the vehicle device.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a simplified block diagrams of a vehicle tracking system in accordance with the present invention.

FIG. **2** is a more detailed block diagram of the vehicle tracking unit as shown in FIG. **1**.

FIG. **3** is more detailed block diagram of the monitoring station as shown in FIG. **1**.

FIG. **4** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle stolen alert.

FIGS. **5**A–**5**C are a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle alarm sounding alert.

FIG. **6** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle speeding alert.

FIG. **7** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating an unauthorized transmitter learned alert.

FIG. **8** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a low battery alert.

FIG. **9** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a GPS or cellular unit failure alert.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

Referring to FIGS. **1–3**, the vehicle tracking system **20** in accordance with the invention is now initially described. The vehicle system **20** illustratively includes a vehicle tracking unit **25** to be mounted in the vehicle **21** and a monitoring station **30** which is remote from the vehicle and which is typically in a fixed location. In the illustrated embodiment, the vehicle tracking unit **25** interfaces with various vehicle devices, such as may include security sensors, door locks, etc. as will be appreciated by those skilled in the art.

The vehicle tracking unit **25** is also illustratively connected to a separate vehicle security system **27** as may already be installed in the vehicle **21**, from the factory or installed as an aftermarket product. Those of skill in the art will appreciate that in some embodiments of the vehicle tracking system **20** a separate vehicle security system **27** may not be needed, and/or various features thereof can be readily incorporated in the vehicle tracking unit **25**.

The monitoring station **30** may typically service a number of subscribers **31**. As shown perhaps best in FIG. **3**, the monitoring station **30** may include a user interface, such as the schematically illustrated telephone network interface **33** and the internet interface **34** which are schematically coupled to a telephone **35**, and a computer **36**, respectively. Of course in other embodiments, other interfaces may be used and only one of the illustrated interfaces may be needed. Those of skill in the art will also recognize that messages may be sent to a subscriber or user via preprogrammed voice messages, e-mail messages, facsimile messages, pager alerts, etc. In addition commands or instructions from the subscriber can also be input to the monitoring station **30** via the telephone network interface **33** and/or the internet interface **34**, from the subscribers telephone **35** or computer **36**.

The monitoring station **30** is illustrated connected to a cellular telephone tower **32** which, in turn, may communicate with the vehicle tracking unit **25** in some embodiments. Of course, in other embodiments other communications approaches are also contemplated, such as, for example, including satellite communications.

The monitoring station **30** may typically include the necessary modems, and other communications electronics, and computers for its functions which are described in greater detail below. The configuration of such components and their details will be readily apparent to those skilled in the art. Accordingly, no further discussion of these details is needed.

Referring now more specifically to FIG. **2**, additional details of the vehicle tracking unit **25** and devices at the vehicle are now further described. The vehicle tracking unit **25** illustratively includes a controller **40**, a vehicle position determining device **42**, and a wireless communications device **44** connected together. The vehicle position determining device **42** may be provided by a GPS receiver, for example. The GPS receiver typically operates by receiving multiple signals from spaced apart satellites **38** as will be appreciated by those skilled in the art.

In other embodiments, the vehicle position determining device **42** may be provided based upon communications with the cellular telephone network, or based upon other satellite transmissions, for example. As a particular example,

time of arrival techniques are available based upon multiple reception paths to determine position via the cellular telephone network as will be appreciated by those skilled in the art. The vehicle position determining device **42** also illustratively includes an indicator **43** associated therewith, such as for indicating an operating mode, or proper operation of the device as will be addressed in greater detail below.

The wireless communications device **44** may be provided by a cellular telephone transceiver configured to operate on a control channel of the cellular network. Such a control channel may provide nearly universal coverage for the tracking system **20** as will be appreciated by those skilled in the art. In addition, the control channel may offer relatively inexpensive communications between the monitoring station **30** and the vehicle tracking unit **25** as will be appreciated by those skilled in the art. The wireless communications device **44** also illustratively includes an optional status indicator **45** with a similar function as the indicator **43** for the vehicle position determining device.

The wireless communications device **44** in other embodiments, may transmit in the voiceband of the cellular network. Alternately, the wireless communications device may communicate over other networks, such as over satellite, or via wireless internet services, as will be appreciated by those skilled in the art.

The controller **40** illustratively includes a central processing unit (CPU) **50** or other logic circuitry which is connected to a clock signal generator **51** and a memory **52**. In other embodiments, the memory **52** may be an embedded memory in the CPU **50**. The controller **40** also includes schematically illustrated input/output circuitry **53** to interface with various vehicle devices. In particular the input/output circuitry **53** may provide dual polarity compatibility for one or more inputs or outputs as will described in greater detail below. One or more of the terminals of the input/output circuitry **53** may also provide both input and output functions as will also be described in greater detail below. This may significantly simplify and accelerate installation of the vehicle tracking unit **25** in the vehicle **21**.

Also illustratively shown as part of the vehicle tracking unit **25** are a back-up battery **54**, and switch **55** connected thereto for selectively powering certain of the components based upon the controller **40**. Of course, the vehicle **21** also includes an electrical system including the vehicle battery **61**. Powering of the vehicle tracking unit **25** is described in greater detail below.

The vehicle **21** also includes a number of other components that may relate to vehicle tracking, security, and/or convenience features provided by the vehicle tracking system **20**. For example, the vehicle **21** may include one or more door lock actuators **62**, an optional remote starting device **63**, a starter interrupt device **66** and an alarm indicator **67**. For example, the alarm indicator may be provided by a vehicle horn or vehicle siren, and/or flashing of the lights.

The optional separate security system **27** illustratively includes a vehicle security controller **28** and a receiver **29** connected thereto. As is conventional, the vehicle security system **27** may be switched between armed and disarmed modes, for example, by one or more uniquely coded remote transmitters **60**. The vehicle security controller **28** may also be capable of learning a new uniquely coded remote transmitter **60** as will be appreciated by those skilled in the art. The vehicle security controller **28** also illustratively is connected to the starter interrupt device **66** and the alarm indicator **67**.

For ease of explanation, a number of the features of the vehicle tracking system **20** are now described. The vehicle tracking system **20** includes a number of features that may simplify installation and maintenance. For example, as shown in FIG. **2**, the vehicle tracking unit **25** may have a test switch **71** connected to the controller **40**.

In normal operation, the controller **40** may be called upon to operate at least one vehicle device. Of course, the controller **40** also cooperates with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. Moreover, the controller **40** may be switchable to a test mode for test operation of the at least one vehicle device responsive to activation of the test switch **71**.

In some embodiments, the at least one vehicle device may be a plurality of vehicle devices that are tested by operation in sequence. For example, the at least-one vehicle device may comprise at least one door lock actuator **62**. The at least one vehicle device may also comprise the starter interrupt device **66**, or the engine remote starter **63** if remote starting is an implemented feature. The at least one vehicle device which is tested, may also be the alarm indicator **67**. Accordingly, an installer, for example, can quickly check that the tracking unit has been properly installed.

To further provide for ready determination of proper operation of the vehicle tracking unit **25**, one or both of the position determining and wireless communications devices **42**, **44** may include associated indicators **43**, **45** as mentioned briefly above, and which provide an indication relating to proper operation. Each indicator **43**, **45** may indicate a mode of operation of the device, its proper operation, or a partial or complete failure of the device.

Another aspect of the invention is that the controller **40** may provide a selectable polarity for the at least one vehicle device based upon sensing thereof. Accordingly, a predetermined activation of the test switch **71** may cause the controller **40** to sense and select the proper polarity. Pressing the test switch **71** for a predetermined time or in a predetermined pattern may sense and set the polarity.

Another feature of the vehicle tracking unit **25** and vehicle tracking system **20** relates to conservation of the number of codes or messages that need to be sent to the vehicle tracking unit. In particular, the controller **40** may have a plurality of different controller states and respond differently to a same message from the monitoring station **30** at different times depending upon the controller state at a given time. Accordingly, a number of codes or messages used by the system can be conserved. Various messages are described in greater detail below.

A controller state may change based upon several different occurrences or events. For example the controller may change states in response to a change in at least one vehicle device, or based upon a message received by the wireless communications device **44** from the monitoring station **30**, and/or based upon elapsed time. The controller states, for example, may include an alert sent state based upon an alert message being sent from the wireless communications device **44**. Thereafter, receipt of a predetermined message by the wireless communications device **44** when the controller **40** is in the alert sent state may confirm receipt of the alert message by the monitoring station.

Receipt of the predetermined message by the wireless communications device **44** when the controller **40** is in another state different than the alert sent state may thus cause a different response by the controller. The alert sent state may comprise at least one of a vehicle stolen alert sent state,

a vehicle alarm sounding alert sent state, a vehicle speeding alert sent state, an unauthorized remote transmitter alert sent state, a low vehicle battery alert sent state, and a device malfunction alert sent state. The various alert messages and confirmation thereof are described in greater detail below.

The code or message conservation aspects of the vehicle tracking system **20** also permit sending a sequence of codes or messages within a predetermined time to also cause a different response at the vehicle tracking unit **25**. In other words, the plurality of controller states may comprise a received first message state based upon a first message being received by the wireless communications device **44** from the monitoring station **30**. Receipt of a second message by the wireless communications device **44** when the controller **40** is in the received first message state, such as within a predetermined time window, for example, may thus cause a different response by the controller than does receipt of the second message when the controller is in another state than the received first message state.

The plurality of controller states may comprise a vehicle finder state sounding an audible signal via the alarm indicator **67** at the vehicle **21**. In this state the controller **40** would bypass sending a vehicle alarm sounding alert to the monitoring station **30**.

Another aspect of the vehicle tracking system **20** is the provision of certain power conservation and management techniques, such as to permit extended periods where the vehicle **21** is not operation. During such extended periods, the vehicle battery **61** provides power to the vehicle tracking unit **25** as well as other vehicle devices. Accordingly, the voltage of the vehicle battery **61** drops over time. The vehicle tracking unit **25** may provide a significant drain on the vehicle battery **61** because of the power consumed by the wireless communications device **44** during transmission as will be appreciated by those skilled in the art.

The vehicle position determining device **42**, the wireless communications device **44** and the controller **40** may be considered as defining a power load of the vehicle tracking unit **25**. The controller **40** may operate the schematically illustrated power switch **55** to isolate the back-up battery **54** from the power load as a voltage of the vehicle battery **61**.drops until reaching a threshold. After or below the threshold the controller **40** may cause the back-up battery **54** to selectively power only a first portion of the power load while a second portion of the power load remains powered by the vehicle battery.

For example, the wireless communications device **44** may have a higher operating voltage than the vehicle position determining device **42**. The first portion of the power load that is selectively powered despite the low vehicle battery voltage may thus be the wireless communications device **44**. In particular, the wireless communications device **44** may be powered for transmission. Accordingly, the back-up battery **54** can be saved for limited communication using the higher voltage wireless communications device **44**. This provides useful features even after an extended period during which the vehicle **21** is left unattended and the vehicle battery **61** gradually discharges.

To further conserve power, the controller **40** may reduce operation of the power load as vehicle battery voltage falls. Conversely, the controller **40** may restore operation of the power load based upon the voltage of the vehicle battery **61** rising again, such as upon being recharged.

Also relating to power consumption, the controller **40** further causes transmission of a low vehicle battery voltage alert to the monitoring station **30** based upon the voltage of the vehicle battery **61** falling below the threshold. The user or subscriber may cause the monitoring station **30** to issue a remote start command. The controller **40** may then generate a remote start output to the remote start device **63** to thereby start the engine and recharge the vehicle battery.

Another feature of the vehicle tracking system **20** is that the vehicle tracking unit **25** may be readily installed and connected to a vehicle **21**, such as in the illustrated embodiment where the vehicle includes a starter interrupt device **66** and a separate vehicle security controller **28**. More particularly, the controller **40** may switch between an armed mode and a disarmed mode based upon operation of the engine starter interrupt device **66**. The controller **40** when in the armed mode may cooperate with the wireless communications device **44** to send an alert message to the monitoring station **30** and including vehicle position information, for example, based upon the vehicle position determining device **42**. The controller **40** is also for selectively operating the engine starter interrupt device **66** to provide additional security features.

In one advantageous embodiment, the controller **40** preferably comprises a combination input and output terminal for connection to the engine starter interrupt device. This terminal is at the input/output circuitry **53** and is schematically illustrated by reference numeral **72**. The controller **40** may switch to the armed mode when in the disarmed mode and based upon the engine starter interrupt device **66** being operated to disable engine starting. Conversely, the controller **40** may switch to the disarmed mode based upon the engine starter interrupt device **66** being operated to enable engine starting. In other words, the vehicle tracking unit **25** can piggyback its arming and disarming off the existing vehicle security system **27**, for example.

The controller **40** may also selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. The controller **40** may selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. Alternately, or in addition thereto, the controller **40** may selectively operate the engine starter interrupt device **66** based upon the ignition switch **65**.

The following descriptive portions relate to various user or subscriber notifications and features provided by the vehicle tracking system **20**. Of course, the controller **40** preferably cooperates with the wireless communications device **44** to send an alert message. The monitoring station **30** may comprise a user interface, such as one or both of the telephone network or internet interfaces **33**, **34**, respectively (FIG. **3**), for generating a sequence of alert message notifications based upon receiving the alert message sent from the vehicle tracking unit **25**. More particularly, the monitoring station interface permits canceling any remaining alert message notification based upon a cancellation command response from a user or subscriber having already received the alert message notification. The user may send the cancellation response via the telephone **35** or computer **36** (FIG. **3**), for example. Thus, if the user may be reached at different telephone numbers or different users are desirably notified of the alert, this aspect of the vehicle tracking system **20** can make the notifications efficiently and without making unnecessary notifications.

The vehicle tracking system **20** may provide any of a number of very useful alerts, as discussed herein. For example, the alert message sent from the vehicle tracking unit may comprise at least one of a vehicle stolen alert message, and a vehicle alarm sounding alert message. The

alert message may be one of a vehicle speeding alert message, and a vehicle acceleration alert message. In addition, the alert message may comprise an unauthorized remote transmitter alert message. Also, the alert message may be at least one of a low vehicle battery alert message, and a device malfunction alert message.

The speeding alert may be based upon exceeding a speed threshold for greater than a certain time, which may be user selectable. The acceleration alert may also be useful as such is also indicative of aggressive driving along with the speeding alert. The unauthorized remote transmitter alert increases overall security since a user will be notified if a would-be thief learns an unauthorized transmitter to operate the controller. These alerts are described in greater detail below.

The vehicle tracking system **20** may be implemented as a service to a subscriber. In other words, the subscriber pays a monthly fee for the service. Accordingly, it may be important to encourage a user to register. Similar subscriber or registrations systems in the past have suffered revenue losses since some users would wait to activate the system until the vehicle was stolen. In other words, the user would only subscribe or register and pay a single month's fee.

In accordance with this aspect of the vehicle tracking system **20** prompt user registration is encouraged. In particular, the vehicle tracking unit **25** may include the user registration reminder indicator **56** and the controller **40** may be switchable from an unregistered mode to a registered mode. In the registered mode, the controller **40** may cooperate with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. In the unregistered mode, the controller **40** may activate the user registration reminder indicator **56** to encourage registration by the user.

The controller **40** may be switchable to the registered mode based upon an activation message from the monitoring station **30**. For example, when the registration payment has been received, the monitoring station can send one or more messages to the vehicle tracking unit **25** to stop activation of the registration reminder indicator **56**. The indicator **56** may be audible, visual or both. For example, the registration reminder indicator **56** could be a beeping sound generated by a small piezoelectric transducer every ten minutes or so when the ignition **65** is on.

In other words, the user registration reminder indicator **56** may provide a minor but irritating annoyance to the user to encourage registration. Upon successfully registering, the annoyance is abated. Accordingly, a relatively straightforward approach is provided to encourage user registration.

Along these lines, the controller **40** when in the unregistered mode may have reduced features compared to the registered mode. For example, the controller **40** when in the unregistered mode may be restricted or limited in sending messages with the wireless communications device **44**. Accordingly, usage of the wireless communications network may be reduced. Transmissions from the vehicle tracking unit **25** may also be beneficially suppressed during original installation, for example.

Returning again to features of the vehicle tracking unit **25** which facilitate installation, the controller **40** may send an alarm indication alert responsive to a continuous activation of the alarm indicator **67** for greater than a predetermined time. Alternately, or in addition thereto, the controller **40** may send an alarm indication alert responsive to a repetitive pattern of alarm indicator **67** activations. In other words, the controller may be configured to distinguish between normal operation of a vehicle horn by the driver, and activation of the horn by the security system **27**. As mentioned above, the controller **40** may also monitor signals of at least one of a first and second polarity. The controller **40** thus advantageously piggybacks off the alarm indication generated by the vehicle security system **27** to determine and send a vehicle alarm sounding alert to the monitoring station **30**.

In one variation, the controller **40** may monitor signals delivered directly to the vehicle alarm indicator by the vehicle security controller **28**. In another variation, the controller **40** monitors signals of voltage dips of the vehicle battery **61**. Circuitry is conventionally and readily available for both such functions, as will be readily appreciated by those skilled in the art.

The controller **40** may also include a dual polarity compatible output in the input/output circuitry **53** for a vehicle device, such as the vehicle alarm indicator **67**. The controller **40** may further monitor signals relating to activation of the vehicle alarm indicator **67** and send an alarm indication alert with position information from the vehicle position determining device and using the wireless communication device.

For the dual polarity output compatibility, the controller **40** may generate a first polarity output pulse followed by a second polarity output pulse. The controller **40** may also generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. In yet other embodiments, the controller **40** may sense an actual polarity of the device and thereafter use the actual polarity for the dual polarity compatible output.

Where the vehicle device is a vehicle horn, the controller **40** may typically be configured to generate a negative polarity output on the dual polarity compatible output. Conversely, wherein the vehicle device is a vehicle alarm indicator siren, the controller **40** may be configured to generate a positive polarity output on the dual polarity compatible output.

Another aspect of the vehicle tracking system **20** relates to conserving memory space and/or reducing transmission time over the communications network. In accordance with this advantageous feature, the controller **40** may determine the vehicle position information including a vehicle location and an associated stationary period for each occurrence of the vehicle remaining stationary for greater than a predetermined period. In one embodiment, the controller **40** may cooperate with the wireless transmission device **44** to send the vehicle position information to the monitoring station based upon each occurrence of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the monitoring station **30** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the monitoring station **30** may time stamp the received information.

In another embodiment, the controller **40** cooperates with the wireless transmission device **44** to send the vehicle position information to the monitoring station **30** for a plurality of occurrences of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the controller **40** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the controller time stamps the position and stationary period information.

As an example, the predetermined time which determines whether the vehicle **21** is stationary and the position should be determined, may be less than about three minutes. This time may filter out vehicle stops in normal traffic, but which will keep track of stops where the driver likely leaves the vehicle **21**. Accordingly, only the important information necessary to track the vehicle need be stored and/or transmitted thereby reducing the system costs. If the vehicle **21** is stationary overnight, for example, unnecessary position information need not be determined, stored, and/or transmitted to the monitoring station **30**.

The controller **40** may comprise the memory **52** for storing the vehicle position information therein. In one configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined schedule. In another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined event. In yet another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined percentage of memory usage.

Having now described certain general features and advantages of the vehicle tracking system **20**, this description now turns to additional specific details which are provided as examples. In particular, vehicle tracking system **20** preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and then starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.
2. Detects an optional vehicle security or alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.
3. Detects an optional vehicle alarm system's remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.
4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Pat. No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.
5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined maximum speed limit and duration thereof can be selected by the user.
6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is preferably selectable by the user.
7. Detects the vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.
8. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user or subscriber also preferably has access to an Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be quickly activated by a telephone call. No additional installation may be required.

Certain annual pre-pay package arrangements may be available. For example, up to 10 access entries per month can be provided on a low monthly billing. Up to 30 access entries could be provided also for a relatively low monthly fee.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the monitoring station internet site. The user may control various vehicle functions remotely via the telephone or the internet site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment and installation is relatively inexpensive. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4).

For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5).

For the Lock/Unlock vehicle doors feature: from any phone or computer a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for

remote starting may be relatively low. Some further details of a specific embodiment of the vehicle tracking unit **25** are provided below as relating to use of red and green LED indicators as may be coupled to the controller **40** and operated thereby. Also various representative wires, designated by color, are provided as an example embodiment.

The red LED verifies the GPS receiving signal. With a yellow wire having positive 12 volts, the red LED blinking indicates searching GPS location, constant indicates found location, and off indicates no GPS signal found. With the yellow wire not having positive 12 volts, if the red LED is off, the LED is not functioning.

The green LED verifies receiving the cell tower signal. With the yellow wire having positive 12 volts, blinking indicates the cell control channel signal is detected, constant indicates sending a micro burst signal (LED stays on 5 seconds after each transmission, and off indicates no cell tower signal received. With the yellow wire not having positive 12 volts, off indicates the green LED is not functioning.

An example of representative DIP switch feature selection is as follows. A first switch may be used for adding the orange wire for controlling arm/disarming of system. When on, the orange wire controls arm/disarm as follows: to arm, the orange wire is grounded and the yellow wire does not have 12 volts positive. To disarm, the orange wire is not grounded. When the first switch is off, then only the yellow wire controls arm/disarm as follows: to arm, the yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed. To disarm, the yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

1. The Red Wire is connected to the 12 vdc power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11 volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.
2. The black wire is connected to ground.
3. The yellow wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further: if the system is in an armed mode and the Lat/Long changes, then Alert "A" is given. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D". If the first DIP switch is in the off position then: if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues from the 500 ma ground, and if the yellow wire sees ground or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed
4. The gray wire is for input and output, and can be connected to an alarm siren or horn positive terminal. In addition:
   a. With the system armed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.
   b. With system disarmed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.
   c. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.
   d. The gray wire bypass operates as follows:
      i. After alert warning "B" bypass all future alert "B" signals until system is disarmed.
      ii. After alert warning "C" bypass all future Alert "C" signals until system is armed.
      iii. After alert warning "D" bypass all future alert "D" signals until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire having 12 volts.
   e. With the system armed or disarmed. The Output: Internal +12 v, 1 amp transistor with pulses 1 second on and 1 seconds off to activate siren or honk car horn or flashing light relay.
      i. Non-stop activation from (Command "4")
      ii. 30-second activation from (Command "5")
   f. Turn off the above alert "A" from (Command "1").
5. The orange wire is for the starter interrupt and arm/disarm system, and operates as follows:
   a. If first DIP switch is in the:
      i. On position and: the orange wire has 12 volts or neutral, the system switches to the disarmed mode; the orange wire is grounded, then the system is switched to the armed mode; and the starter interrupt output will not automatically operate. It can only be activated from "Command #4"
      ii. Off position and the orange wire does not effect the arming or disarming of the system; 30 seconds after system arms the orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.
   b. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.
   c. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example. A green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6"). A red wire provides a constant 12 v output from the red power wire. A blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "**7**"). A pink wire provides a 250 ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation test button may also be provided to work as follows. Pressing the button activates the orange wire for 10-seconds (starter interrupt), with these circuits in sequence. First, it activates the gray wire for 1-second (siren/horn). After the first stops, it activates the green wire for 1 second to lock the doors. After the second stops, it activates the blue wire for 1 second to unlock the doors. After the third stops, it activates the pink wire for 1 second to activate an optional item.

Representative warning alerts are as follows:

1. Alert Warning "A" (FIG. **4**): Automatic activation of "Command 8" and the vehicle unit contacts monitoring

station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" signals until the system is re-armed.

2. Alert Warning "B" (FIGS. **5**A–**5**C): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.
3. Alert Warning "C" (FIG. **6**): the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###" and time limit of "##" seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS). This aspect is further understood with reference to the enclosed flowchart **84** of FIG. **6**.
4. Alert Warning "D" (FIG. **7**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of the yellow wire having seen 12 volts positive. All future alerts "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts. This aspect is further understood with reference to the enclosed flowchart **85** of FIG. **7**.
5. Alert Warning "E" (FIG. **8**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alerts "E" are bypassed until, first, more than 13.5 volts are detected on the red wire and, second, after the yellow wire stops having positive voltage the red wire then must detect more than 12 volts.

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1 sec on/1 sec off with 1 amp positive output and which continues until receive command #1.

b. Orange wire to have 500 ma ground and which continues until receive command #1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250 ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

1. With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:
   a. Once instantly.
   b. Once in 1 hour if at the same location.
   c. Once in 6 hours if at the same location.
   d. Once in 12 hours if at the same location.
   e. Once every 24 hours if at the same location.
   f. Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01–24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location
b) Vehicle total time at location
c) Time of day
d) Mph traveling
e) Total time traveling above MPH
f) Direction traveling
g) Delta
h) Special Alert messages, if any, including:
   i) GPS signal not received for longer than 5 minutes.
   ii) Traveling above ###MPH for ## minutes.
   iii) Vehicle is stolen.
   iv) Alarm activated.
   v) Unauthorized remote transmitter alert.
   vi) Battery saver mode activated
   vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.
   viii) Command 2: (Accessory activation)
   ix) Command 3: (Vehicle Location was retrieved)
   x) Command 4: (Hijack or Stolen mode activated)
   xi) Command 5: (Car Find mode activated)
   xii) Command 6: (Locked Doors)
   xiii) Command 7: (Unlocked Doors)
   xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include: while the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is the same then only update stationary total time. If the GPS antenna is not receiving any signal

then enter last known GPS location and with an indication that this was the last known GPS location before the GPS signal stopped, how long no GPS signal was received, and the GPS location in the on-hold file, when the vehicle is traveling above ### MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These may include:

1. The user's vehicle has issued a stolen alert:
   a. If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allow the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.
   b. If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.
2. The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.
3. The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this-alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature may begin immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also, to prevent additional alerts, this message is prevented from being transmitting again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart **80** (FIG. **4**).

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition.

A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key.

This aspect is further understood with reference to the enclosed flowcharts **81**–**83** (FIGS. **5**A–**5**C).

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and it can be determined whether it is greater than zero (e.g. greater than six volts) and less than a high value (e.g. eleven or twelve volts),

and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If the vehicle is being serviced and the battery is disconnected, this will cause the battery voltage to be equal to zero. Then, the low battery voltage transmission will not be communicated to the monitoring station. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. Again, false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart **86** (FIG. **8**).

Yet another advantageous feature of some embodiments of the invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated than a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature relates to permitting ore colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Another aspect relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Turning now to the flowchart **87** of FIG. **9**, still another aspect relates to warning the user of an inoperable or malfunctioning GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once ever 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

By way of example, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell

signal information to the central monitoring station, to thereby alert the user.

Yet another feature is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station. More particularly, a typical arrangement may provide eight basic codes and two "wildcard" codes. The two wildcard codes are reserved for future or other uses. A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A–E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response (no alarm triggered) in the tracking device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

In accordance with another feature, the rate of sending the location or position data (or change in position data) from the vehicle may be varied to reduce system usage and thereby reduce expenses. More particularly, in one embodiment, the rate of sending may be based upon how long the vehicle has remained stationary. This time period may be selected by the user. For example, the selected time may be in the range of 15 minutes to six hours. If the vehicle has been stationary for the selected time period, then the rate of transmission may be reduced. This reduces or eliminates the need to send home position data and send all the over 15-minute stops made that day. Otherwise, that is when the vehicle is moving, the device may send data at a faster rate. Of course, a system user would not likely be interested in quick updates, especially where the position information is not changing. Conversely, if the vehicle is being moved, it may be desirable to receive more frequent position updates.

Another variation of this transmission rate conservation feature, bases the rate of transmission on the vehicle position. For example, a reduced rate of transmission may be selected if the vehicle is in a predetermined area where the user has a lesser interest in quickly updated position information. The user may also have a reduced interest in an area that can be defined outside of a predetermined distance from a reference point.

Yet another variation of the vehicle position transmission rate conservation feature is based upon the vehicle's speed, such as the vehicle's average or maximum speed, for example. Accordingly, if the vehicle is traveling above a preset speed, the rate of transmission may be increased.

In accordance with another aspect of the invention, the tracking device may send the alert indication a predetermined number of times without receiving an acknowledgment as described above, and hen wait until the vehicle position has changed before trying again or the cell re-registers or its RSS (received signal strength) changes. Thus, power is conserved. When the vehicle has moved to a new position, any obstructions may no longer be present thereby increasing the likelihood of a successful communication. In addition, the change in position may be determined when the vehicle is sensed to be moving about a predetermined relatively small speed, such as greater than 1 mph, for example.

In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Pat. Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention.

Yet another aspect relates to efficient use of available codes on the cellular telephone control channel. In one particular example, ten codes may be available to be transmitted from the monitoring station to the vehicle trackers. The first eight or nine codes are command codes that will cause a specific action by the tracking device at the vehicle. The other one or two codes may be wildcard codes as mentioned above, that may set a stand-by mode for one or a group of vehicles, for example.

It may be desirable to provide more than eight commands at the vehicle responsive to the corresponding eight available codes. For example, it may be desirable to set a feature on or off, or to set a different feature setting or threshold. In accordance with this aspect of the invention, the commands at the tracker are determined based upon a series of different command codes being received within a predetermined time window.

For example, the monitoring station may send code 9 that switches the tracker in the car into a stand-by mode for a predetermined time and which causes the tracker to respond with an upstream confirmation code 7 or 9 indicating receiving code 9. During the predetermined time of the stand-by mode another code follows that causes a system programmable feature or setting to change. Note that the second code would otherwise cause a different function at the vehicle. Note that system might operate a function 9 if another code 1–9 is not received in the predetermined time. The following list is exemplary for features resulting from second codes 1–9:

(1) Code 1—Tracker will turn off feature of upstream code caused by vehicle alert being detected.

(2) Code 2—Tracker will turn on feature of upstream code caused by vehicle alert being detected.

(3) Code 3—Tracker deactivates cell receiver from operating due to a non-paying customer for monitoring service. That phone number can then be allocated to another customer.

(4) Code 4—Turn on audio buzzer feature that will sound once each 10 minutes. The monitoring station need only send the command to activate the feature, as the tracker will time the period and drive the buzzer thereafter. The monitoring station will normally not need to send this command because the tracker will be configured out of the box with this feature activated to sound the buzzer every 10 minutes until the next command is received.

(5) Code 5—Turn off the audio buzzer. This is to be sent by the monitoring station after a user has successfully activated his account.

(6) Code 6—Turn on the 80 mph speed limit reporting. This will normally not be sent as this feature will be the default setting of the tracker.

(7) Code 7—Turn off the 80 mph speed limit reporting.

(8) Code 8—Increase speed limit 5 mph and increase the time 5 minutes.

(9) Code 9—Decrease speed limit 5 mph and decrease the time 5 minutes, and wait 5 minutes if another code number follows. It could operate this way to allow another set of codes to change more features.

In this example, in response to the tracker receiving the system code 1–9, the tracker sends an upstream code 7 to acknowledge receipt of the system code 1–9. Upon receipt of code 9 the tracker waits up to 5 minutes to determine if another system code is received. If no code is received, then the tracker performs the code 9 operation. Of course, in other embodiments other features or settings can be selected.

In general, it may be preferred that the first code sent in a series of two codes; for example, be a code that causes only a minor function to be performed at the vehicle. This so because if the second code is sent from the monitoring station, but not received at the tracker, only a minor function is performed. For example, the first code may switch between armed and disarmed modes. This is in contrast to using a remote engine starting code or engine shutdown code as the first code. The vehicle may be moving or positioned in a marginal reception area, and the second command may not be received by the tracker within the predetermined time window. As will be appreciated by those skilled in the art, this concept of multiple digit codes, can be extended beyond two digits to three or more.

To further conserve cellular transmissions and as described above, the tracker may be set to record a position based upon a determined event. Only this recorded position information may be downloaded either by user request or at set times. It is desired that such events be relatively few, but that the information still be helpful to the user.

For example, an event for recording of position may be determined based upon the vehicle being stopped for greater than a first time and less than a second time. For example, the first time may be 15 minutes and the second time may be 6 hours. Determination of the vehicle being stopped can be made based upon one or both of the GPS position or the vehicle ignition being turned off. The second time prevents the recording of position information when the vehicle is stopped at the owner's home during the evening, for example. Accordingly, the important information of the vehicle stops being made is recorded and made available to the user, while system communications resources are conserved.

In another example, if the mode is selected to send the vehicles location every 10 min and the vehicle is in the same location for greater than a set time, then no more vehicle locations are sent until the vehicle location has changed to start the every 10 min reporting again.

Other features relating to vehicle control systems are disclosed in copending patent applications entitled VEHICLE TRACKER INCLUDING STATIONARY TIME DETERMINATION AND ASSOCIATED METHODS, application Ser. No. 09/859,727; VEHICLE TRACKER CONSERVING CODES AND RELATED METHODS, application Ser. No. 09/859,673; VEHICLE TRACKER WITH POWER SAVING FEATURES AND RELATED METHODS, application Ser. No. 09/859,728; VEHICLE TRACKER COOPERATING WITH A STARTER INTERRUPT AND RELATED METHODS, application Ser. No. 09/859,973; VEHICLE TRACKER WITH USER NOTIFICATIONS AND ASSOCIATED METHODS, application Ser. No. 09/859,733; VEHICLE TRACKER WITH USER REGISTRATION REMINDER AND RELATED METHODS, application Ser. No. 09/859,971; and VEHICLE TRACKER WITH TEST FEATURES AND RELATED METHODS, application Ser. No. 09/859,729, the entire disclosures of which are incorporated herein by reference.

Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Accordingly, it is understood that the invention is not to be limited to the embodiments disclosed, and that other modifications and embodiments are intended to be included within the spirit and scope of the appended claims.

That which is claimed is:

**1**. A vehicle tracking system comprising:

a vehicle tracking unit for a vehicle of a type comprising a vehicle alarm indicator, said vehicle tracking unit comprising

a vehicle position determining device,

a wireless communications device, and

a controller connected to said wireless communications device and said vehicle position determining device;

said controller cooperating with said wireless communications device to send an alarm indication alert based upon at least one of an activation of the vehicle alarm indicator continuously for greater than a predetermined time and an activation of the vehicle alarm indicator in a repetitive pattern; and

a monitoring station receiving the alarm indication alert from said vehicle tracking unit.

**2**. A vehicle tracking system according to claim **1** wherein said controller also cooperates with said vehicle position determining device and said wireless communications device to send vehicle position messages.

**3**. A vehicle tracking system according to claim **1** wherein said controller monitors drive signals to the vehicle alarm indicator.

**4**. A vehicle tracking system according to claim **3** wherein the drive signals have at least one of a first and second polarity.

**5**. A vehicle tracking system according to claim **1** wherein the vehicle alarm indicator comprises at least one of a vehicle horn, and a vehicle siren.

**6**. A vehicle tracking system according to claim **1** wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

**7**. A vehicle tracking system according to claim **1** wherein said wireless communications device comprises a cellular telephone communications device.

**8**. A vehicle tracking system according to claim **7** wherein said cellular telephone communications device communicates over a cellular control channel.

**9**. A vehicle tracking system according to claim **1** wherein said monitoring station comprises a user interface for accepting at least one command from a user and sending at least one alert to the user.

**10**. A vehicle tracking system according to claim **9** wherein said user interface comprises an Internet interface.

**11**. A vehicle tracking system according to claim **9** wherein said user interface comprises a telephone network interface.

**12**. A vehicle tracking unit for use with a vehicle comprising a vehicle alarm indicator, the vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device; and

a controller connected to said wireless communications device and said vehicle position determining device;

said controller cooperating with said wireless communications device to send an alarm indication alert responsive to an activation of the vehicle alarm indicator continuously for greater than a predetermined time.

13. A vehicle tracking unit according to claim 12 wherein said controller further sends an alarm indication alert responsive to activation of the vehicle alarm indicator in a repetitive pattern.

14. A vehicle tracking unit according to claim 12 wherein said controller monitors drive signals to the vehicle alarm indicator.

15. A vehicle tracking unit according to claim 14 wherein the drive signals have at least one of a first and second polarity.

16. A vehicle tracking unit according to claim 12 wherein the vehicle alarm indicator comprises at least one of a vehicle horn, and a vehicle siren.

17. A vehicle tracking unit according to claim 12 wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

18. A vehicle tracking unit according to claim 12 wherein said wireless communications device comprises a cellular telephone communications device.

19. A vehicle tracking unit according to claim 18 wherein said cellular telephone communications device communicates over a cellular control channel.

20. A vehicle tracking unit for use with a vehicle comprising a vehicle alarm indicator, the vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device; and

a controller connected to said wireless communications device and said vehicle position determining device;

said controller cooperating with said wireless communications device to send an alarm indication alert responsive to an activation of the vehicle alarm indicator in a repetitive pattern.

21. A vehicle tracking unit according to claim 20 wherein said controller monitors drive signals to the vehicle alarm indicator.

22. A vehicle tracking unit according to claim 21 wherein the drive signals have at least one of a first and second polarity.

23. A vehicle tracking unit according to claim 20 wherein the vehicle alarm indicator comprises at least a vehicle horn, and a vehicle siren.

24. A vehicle tracking unit according to claim 20 wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

25. A vehicle tracking unit according to claim 20 wherein said wireless communications device comprises a cellular telephone communications device.

26. A vehicle tracking unit according to claim 25 wherein said cellular telephone communications device communicates over a cellular control channel.

27. A vehicle tracking system comprising:

a vehicle tracking unit for a vehicle of a type comprising a vehicle device, said vehicle tracking unit comprising:

a vehicle position determining device,

a wireless communications device, and

a controller connected to said wireless communications device and said vehicle position determining device for sending messages relating to vehicle position;

said controller comprising a dual polarity compatible output for the vehicle device; and

a monitoring station communicating with said vehicle tracking unit.

28. A vehicle tracking system according to claim 27 wherein the vehicle device comprises a vehicle alarm indicator; and wherein said controller further monitors signals relating to activation of the vehicle alarm indicator and sends an alarm indication alert with position information from said vehicle position determining device and using said wireless communication device.

29. A vehicle tracking system according to claim 27 wherein said controller generates a first polarity output pulse followed by a second polarity output pulse on said dual polarity compatible output.

30. A vehicle tracking system according to claim 27 wherein said controller generates a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on said dual polarity compatible output.

31. A vehicle tracking system according to claim 27 wherein said controller senses an actual polarity of the device and uses the actual polarity for the dual polarity compatible output.

32. A vehicle tracking system according to claim 27 wherein the vehicle device comprises a vehicle horn; and wherein said controller generates a negative polarity output on said dual polarity compatible output.

33. A vehicle tracking system according to claim 27 wherein the vehicle device comprises a vehicle alarm indicator siren; and wherein said controller generates a positive polarity output on said dual polarity compatible output.

34. A vehicle tracking system according to claim 27 wherein said vehicle position determining device comprises a Global Positioning System (GPS) device.

35. A vehicle tracking system according to claim 27 wherein said wireless communications device comprises a cellular telephone communications device.

36. A vehicle tracking system according to claim 35 wherein said cellular telephone communications device communicates over a cellular control channel.

37. A vehicle tracking system according to claim 27 wherein said monitoring station comprises a user interface for accepting at least one command from a user and sending at least one alert to the user.

38. A vehicle tracking system according to claim 37 wherein said user interface comprises an Internet interface.

39. A vehicle tracking system according to claim 27 wherein said user interface comprises a telephone network interface.

40. A vehicle tracking unit for a vehicle of a type comprising a vehicle device, the vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device; and

a controller connected to said wireless communications device and said vehicle position determining device for sending messages relating to vehicle position;

said controller comprising a dual polarity compatible output for the vehicle device.

41. A vehicle tracking unit according to claim 40 wherein the vehicle device comprises a vehicle alarm indicator; and wherein said controller further monitors signals relating to activation of the vehicle alarm indicator and sends an alarm indication alert with position information from said vehicle position determining device and using said wireless communication device.

42. A vehicle tracking unit according to claim 40 wherein said controller generates a first polarity output pulse followed by a second polarity output pulse on said dual polarity compatible output.

43. A vehicle tracking unit according to claim 40 wherein said controller generates a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on said dual polarity compatible output.

44. A vehicle tracking unit according to claim **40** wherein said controller senses an actual polarity of the device and uses the actual polarity for the dual polarity compatible output.

45. A vehicle tracking unit according to claim **40** wherein the vehicle device comprises a vehicle horn; and wherein said controller generates a negative polarity output on said dual polarity compatible output.

46. A vehicle tracking unit according to claim **40** wherein the vehicle device comprises a vehicle alarm indicator siren; and wherein said controller generates a positive polarity output on said dual polarity compatible output.

47. A method for operating a vehicle tracking-unit for a vehicle of a type comprising a vehicle device, the vehicle tracking unit comprising a vehicle position determining device, a wireless communications device, and a controller connected to the wireless communications device and the vehicle position determining device, the method comprising:

using the controller to generate a dual polarity compatible output for the vehicle device.

48. A method according to claim **47** wherein the vehicle device comprises a vehicle alarm indicator; and wherein using the controller comprises using the controller to monitor signals relating to an activation of the vehicle alarm indicator and to send an alarm indication alert with position information from the vehicle position determining device and using the wireless communication device.

49. A method according to claim **47** wherein using the controller comprises using the controller to generate a first polarity output pulse followed by a second polarity output pulse as the dual polarity compatible output.

50. A method according to claim **47** wherein using the controller comprises using the controller to generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse as the dual polarity compatible output.

51. A method according to claim **47** wherein using the controller comprises using the controller to sense an actual polarity of the device and to use the actual polarity as the dual polarity compatible output.

52. A method according to claim **47** wherein the vehicle device comprises a vehicle horn; and wherein using the controller comprises using the controller to generate a negative polarity output as the dual polarity compatible output.

53. A method according to claim **47** wherein the vehicle device comprises a vehicle alarm indicator siren; and wherein using the controller comprises using the controller to generate a positive polarity output as the dual polarity compatible output.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION

PATENT NO. : 6,606,561 B2
DATED : August 12, 2003
INVENTOR(S) : Kenneth E. Flick



It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page,
Item [56], **References Cited**, OTHER PUBLICATIONS, insert -- * -- between "2002" and "This"

Column 3,
Line 37, delete "diagrams" insert -- diagram --
Line 41, insert -- a -- between "is" and "more"

Column 4,
Line 41, delete "illustrated" insert -- illustratively --

Column 5,
Line 35, insert -- be -- between "will" and "described"

Column 7,
Line 28, insert -- in -- between "not" and "operation"
Line 43, delete "61." insert -- 61 --

Column 16,
Line 34, delete "contains" insert -- contain --

Column 17,
Line 28, delete "this-alert" insert -- this alert --
Line 34, delete "transmission" insert -- transmissions --

Column 18,
Line 20, delete "transmitting" insert -- transmitted --
Line 58, delete "This aspect is further understood with reference to the enclosed flowcharts **81-83**(FIGS. 5A-5C)." insert at the end of line 57 -- This aspect is further understood with reference to the enclosed flowcharts **81-83**(FIGS. 5A-5C). --

Column 19,
Line 35, delete "ore" insert -- more --

Column 20,
Line 31, delete "ever" insert -- every --

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PATENT NO. : 6,606,561 B2
DATED : August 12, 2003
INVENTOR(S) : Kenneth E. Flick



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Column 24,
Line 12, insert -- and a vehicle battery -- after "indicator"
Line 23, insert -- said controller monitoring voltage dips of the vehicle battery; and -- after "and"
Line 58, insert -- and a vehicle battery -- after "indicator"
Line 67, delete "time." insert -- time, and for monitoring voltage dips of the vehicle battery. --

Column 25,
Line 24, insert -- and a vehicle battery -- after "indicator"
Line 33, delete "pattern." insert -- pattern, and for monitoring voltage dips the vehicle battery. --
Line 42, insert -- one of -- between "least" and "a"
Line 55, delete ":"
Line 57, delete "and"

Column 27,
Line 13, delete "tracking-unit" insert -- tracking unit --

Signed and Sealed this

Twenty-third Day of December, 2003



JAMES E. ROGAN
*Director of the United States Patent and Trademark Office*

UNITED STATES PATENT AND TRADEMARK OFFICE

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Column 19,
Line 35, delete "ore" insert -- more --

Column 20,
Line 31, delete "ever" insert -- every --

Column 21,
Line 64, delete "hen" and insert -- then --.

UNITED STATES PATENT AND TRADEMARK OFFICE

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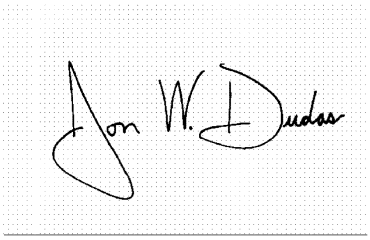
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Line 42, insert -- one of -- between "least" and "a"
Line 55, delete ":"
Line 57, delete "and"

Column 27,
Line 13, delete "tracking-unit" insert -- tracking unit --

This certificate supersedes Certificate of Correction issued December 23, 2003.

Signed and Sealed this

Thirteenth Day of July, 2004



JON W. DUDAS
*Acting Director of the United States Patent and Trademark Office*

01-30-01 A/Prov

jc944 U.S. PTO 01/29/01

# PROVISIONAL APPLICATION COVER SHEET

**This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)**

jc714 U.S. PTO 60/264811 01/29/01

| Docket No. | 58092 | Type (+) --- [+] |
|---|---|---|

INVENTOR(s)/APPLICANT(s)

| LAST NAME | FIRST NAME | MID. INIT. | RESIDENCE (CITY/STATE OR COUNTRY) |
|---|---|---|---|
| FLICK | Kenneth | E. | 981 Burnt Hickory Road<br>Douglasville, GA 30134 |

TITLE OF THE INVENTION (280 Characters Max)

**VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION**

CORRESPONDENCE ADDRESS

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| STATE | Florida | ZIP CODE | 32802-3791 | COUNTRY | U.S. |
|---|---|---|---|---|---|

ENCLOSED APPLICATION PARTS *(check all that apply)*

| | | | | | |
|---|---|---|---|---|---|
| ✓ | Specification | *Number of Pages* | 38 | ✓ | Applicant qualifies as a Small Entity under 35 CFR under §§1.19 and 1.27 |
| ✓ | Drawing(s) | *Number of Sheets* | 6 | | Other (specify) _____ |

METHOD OF PAYMENT

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[ ] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
[✓] No. [ ] Yes

Respectfully Submitted,

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Date: January 29, 2001

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# VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

## Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.
2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.
3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.
4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the

vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal. Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts

positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.
2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D".
3. If the DIP switch 1 is in the Off position then:
   a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.
   b. if the yellow wire sees grounded or neutral, then the system is

armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.
2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.
3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.
4. The Gray wire bypass operates as follows:

a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.

b. After Alert warning "C" bypass all future Alert "C" until system is armed.

c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.

5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or honk car horn or flashing light relay.

a. Non-stop activation from (Command "4")

b. 30-second activation from (Command "5")

6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically

operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6").

Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7")

Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)

After first stops: Activates Green wire for 1 second to lock the doors.

After second stops: Activate Blue wire for 1 second to unlock the doors.

After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated

please confirm". This is with system disarmed and detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and
2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it

until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator,

such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

The device or unit may be initially manufactured and shipped without all of the features being fully functional. One advantage of this is to prevent the unit at will from sending messages when being initially installed and tested in the vehicle, thereby reducing potential false alarms and burdens on the communications system, as well as potential charges to the user. After the unit is fully installed, a communication or transmission from the monitoring center may be sent to the unit enabling one or more selected features, such as during registration during which information is conveyed to the monitoring center and payment is made or authorized by the user.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain

security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key.

This aspect is further understood with reference to the enclosed flowchart labeled "Alert A".

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition. A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the

ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B".

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

Yet another advantageous feature of some embodiments of invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes,

this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated that a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature of the invention relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some

embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Yet another advantageous feature of the invention relates to interfacing with a factory-installed security system. In accordance with this aspect of the invention, the purpose is to detect when the factory security or alarm system is triggered so that the user can be notified when away from the vehicle using the capabilities of the tracking and security system described herein. The tracking system would include a voltage and/or current sensing circuit connected to detect repetitive battery spikes based upon an electrical item being turned on and off at the vehicle.

More particularly, with the with the GPS-2000 tracking system armed and the ignition key in the off condition, if the vehicle factory alarm becomes triggered, it causes the car horn and lights to flash and/or the horn to honk. Accordingly, the detector circuit can detect these indications as either dips in

the voltage or increases in current flow from the vehicle battery. If these electrical events are detected for a predetermined minimum time of about 30 seconds, for example, and not longer than a predetermined maximum time of about 63 seconds, for example, the GPS-2000 tracker will send the vehicle alarm activated message.

The circuitry for detecting a voltage dip, for example, is of a type commonly included in other conventional vehicle security systems for other purposes, such as detecting tampering, for example. This detection circuitry needs no further description herein.

As will be readily appreciated by those skilled in the art, the reason for the minimum and maximum times is to avoid false alarms. For example, a similar electrical condition can be generated as the car radiator fan cycles on and off after the engine is turned off. By waiting the predetermined minimum time of about 30 seconds, the tracker would not falsely determine this to be operation of the factory security system. Opening and closing of the car doors could also create a similar electrical system drain, but would be unlikely to extend for 30 seconds. Accordingly, the minimum time would also avoid a false alarm in this instance of opening and closing the vehicle doors.

The maximum predetermined time could be implemented to avoid flashing operation of the hazard lights, for example, from causing a false alarm. A typical factory alarm would flash the lights and/or honk the horn for about 60 seconds before stopping. Flashing of the hazard lights would likely be for more than about 63 seconds, for example. Accordingly, a

false alarm indication based on operation of the hazard lights would also be avoided by the invention.

As will also be appreciated by those skilled in the art, different values for the minimum and maximum times are contemplated by the invention. In addition, in some embodiments only one of the minimum or maximum times may be used.

Another aspect of the invention relates to a user's ability to cancel further sequential notifications. More particularly, in response to an alarm alert, sequential notifications are typically given by sequentially calling a series of telephone numbers. In accordance with this aspect of the invention, the user who receives the call, may cancel any further notifications. In other words, the user can be prompted by voice messages to make a certain keypad entry to thereby cancel further notifications if desired. This can avoid additional telephone or system usage charges, and also reduces the possible nuisance of unnecessary calls to other persons.

Stopping further notifications upon merely determining that the telephone has been answered may be ineffective, since oftentimes an answering machine may receive the call. Accordingly, it may be preferred to have the user actively cancel further notifications, in contrast to merely stopping further calls upon determining that the telephone call has been completed.

Another aspect of the invention relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting

the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect of the invention relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Still another aspect of the invention relates to warning the user of an inoperable or malfunctioning GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once ever 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

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As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

In examples, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central

monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Another aspect of the invention relates to having the capability to interface the tracker device with a siren and/or the vehicle horn. Typically the siren is locally connected to ground, such as in the engine compartment, and the output of the tracker unit would provide a positive supply voltage, eg. 12 volts, to drive the siren. Also typically, the vehicle horn is connected to the positive voltage supply, and pressing the horn switch connects the horn to the vehicle ground to thereby complete the circuit and sound the horn. In accordance with this aspect of the invention, the output drive of the tracker unit can be a single wire with pulses of alternating polarity.

More particularly, the output terminal or wire, eg. the gray wire as described above, supplies pulses of alternating polarity. For example, a first pulse can be at the positive supply voltage, and a second pulse can be at the vehicle ground. Each pulse can be about one-half to one second long. The pulses can alternate in a series and with a slight spacing between adjacent pulses. In other security type systems, an intervening relay may be provided to provide for dual polarity capability. However, the tracker unit desirably monitors activation of the horn wire to determine whether the factory or aftermarket security controller is sounding an alarm. The intervening relay would prevent such a determination. Accordingly, the circuitry for providing the

alternating polarity pulses of the invention provides the dual compatibility and also permits sensing of the horn activation as described above. Thus, the invention provides the dual compatibility with a single output wire or terminal, and requires no special installation.

Yet another aspect of the invention relates to power conservation and extending the protection period provided by the tracking device when the vehicle is not being used. The GPS receiver of the device may operate down to a supply voltage of about 3 volts, while the cellular radio portion may require a voltage of at least about 11 volts or 11.2 volts. The device will also typically include a back-up battery. The back-up battery may provide power when the vehicle battery is disconnected, such as by a would-be thief, or otherwise.

Typical vehicle security systems, for example, connect the back-up battery in parallel with the vehicle electrical system. Of course when the vehicle is operating, the vehicle battery and back-up battery are being charged by the alternator, which, in turn, is driven by the vehicle engine. When the vehicle is not used for a relatively long period of time, the voltage of both the back-up battery and the vehicle battery will gradually decay, such as based upon the receiver in the security system continuing to operate. Fortunately, however, the conventional vehicle security system may operate down to a voltage of about 6 volts. Accordingly, although the back-up battery voltage has decayed (along with the parallel connected vehicle battery), the relatively low operating voltage fo the security system is still

typically sufficient to permit proper operation for a relatively long period of time.

The tracking device in accordance with the invention will typically include the cellular radio portion which requires a relatively high 11 volts or so to continue to operate. The tracking unit, despite various other power conserving features discussed herein, will still draw current. Accordingly, the voltage of the vehicle battery will also decay over time as the user is away from the vehicle. In accordance with this aspect of the invention, the back-up battery, however, is not continuously connected in parallel with the vehicle battery. Instead, the back-up battery is connected in parallel when the ignition key is on, for example, which will provide for charging of the back-up battery. Initially, when the vehicle is turned off, and the system armed, the back-up battery is not connected. Rather, the vehicle battery alone supplies the device initially. The back-up battery thus remains fully charged as it is not being drained by the load of the tracking device.

In one embodiment, if sufficient time passes, then the voltage of the battery will decay below a predetermined value, such as about 11.5 or 11.2 volts, for example. At this point, the back-up battery will be connected to the tracking device, and the vehicle battery will be disconnected. These voltage sensing and switching functions can be readily implemented using conventional circuits in the tracking device as will be appreciated by those skilled in the art. Accordingly, the tracking device can continue to operate normally for an additional period and at a sufficiently high voltage to permit the cellular radio to operate. Of course, as will be appreciated by those

skilled in the art, this feature can be extended to other areas as well, especially where a vehicle device or circuit may require a relatively high operating voltage.

In other embodiments, if sufficient time passes, then the voltage of the battery will decay below a predetermined value, such as about 11.5 to 4-volts, for example. At this point, the back-up battery will stay disconnected from the tracking device, and the vehicle battery will stay connected. This allows the cellular radio to sleep at 11.5 volts and the GPS and other circuits to still operate from the vehicle battery to as low as 3-volts. Once an alert is detected from GPS or other circuits then the cellular radio is awakened and operates from the back-up battery, still at about 12-volts. These voltage sensing and switching functions can be readily implemented using conventional circuits in the tracking device as will be appreciated by those skilled in the art. Accordingly, the tracking device can continue to operate normally for alerts to be sent to the monitoring station for an additional period and at a sufficiently high voltage to permit the cellular radio to operate. Of course, as will be appreciated by those skilled in the art, this feature can be extended to other areas as well, especially where a vehicle device or circuit may require a relatively high operating voltage.

Yet another feature of the invention is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station. More particularly, a typical arrangement may provide eight basic codes and two "wildcard" codes. The two wildcard codes are reserved for future or other uses.

A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature of the invention, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A-E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response (no alarm triggered) in the tracking device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

In accordance with another feature of the invention, the rate of sending the location or position data (or change in position data) from the vehicle may be varied to reduce system usage and thereby reduce expenses. More particularly, in one embodiment, the rate of sending may be based upon how long the vehicle has remained stationary. This time period may be selected by the user. For example, the selected time may be in the range of 15 minutes to six hours. If the

vehicle has been stationary for the selected time period, then the rate of transmission may be reduced. This reduces or eliminates the need to send home position data and send all the over 15-minute stops made that day. Otherwise, that is when the vehicle is moving, the device may send data at a faster rate. Of course, a system user would not likely be interested in quick updates, especially where the position information is not changing. Conversely, if the vehicle is being moved, it may be desirable to receive more frequent position updates.

Another variation of this transmission rate conservation feature, bases the rate of transmission on the vehicle position. For example, a reduced rate of transmission may be selected if the vehicle is in a predetermined area where the user has a lesser interest in quickly updated position information. The user may also have a reduced interest in an area that can be defined outside of a predetermined distance from a reference point.

Yet another variation of the vehicle position transmission rate conservation feature is based upon the vehicle's speed, such as the vehicle's average or maximum speed, for example. Accordingly, if the vehicle is traveling above a preset speed, the rate of transmission may be increased.

In accordance with another aspect of the invention, an alert may be generated based upon the vehicle detecting an acceleration beyond a predetermined level. The vehicle acceleration could readily be determined by a relatively inexpensive acceleration sensor as will be appreciated by those skilled in the art. The acceleration could also be calculated by speedometer information. Decelerations,

or negative accelerations, could also be used to trigger an alert. The acceleration generated alert could be used to reduce wear and tear on the vehicle or to discourage aggressive driving and especially Drag Racing . The acceleration alert need not be generated and sent immediately, but could be sent with position information, since a user may not need realtime notification of the acceleration limit being exceeded.

Yet another aspect of the invention is directed to ensuring that car owners will activate the monitoring service from the beginning and not wait months or years until the vehicle is stolen, for example, to then activation the system in an attempt to avoid monthly service charges. When power is initially connected to the device it will communicate with the cellular equipment. Unfortunately, it may be virtually impossible to sort out all of the communications traffic to determine when someone has obtained a vehicle with the unit, but has not fully registered or subscribed to the service. In accordance with this aspect of the invention, a driver annoyance may be triggered to encourage the driver or owner to register the unit and begin paying the monthly service fees. For example, an annoying chirp could be generated every ten minutes when the vehicle ignition is on. Alternately or additionally a visual annoyance could also be provided. The audio chirp could be readily provided by a small piezoelectric indicator carried by the device.

In accordance with another aspect of the invention, the tracking device may send the alert indication a predetermined number of times without receiving an acknowledgment as described above, and then wait until the vehicle position has changed before

trying again or the cell re-registers or its RSS (received signal strength) changes. Thus, power is conserved. When the vehicle has moved to a new position, any obstructions may no longer be present thereby increasing the likelihood of a successful communication. In addition, the change in position may be determined when the vehicle is sensed to be moving about a predetermined relatively small speed, such as greater than 1 mph, for example.

In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Patent Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention.

Yet another aspect of the invention relates to efficient use of available codes on the cellular telephone control channel. In one particular example, ten codes may be available to be transmitted from the monitoring station to the vehicle trackers. The first eight or nine codes are command codes that will cause a specific action by the tracking device at the vehicle. The other one or two codes may be wildcard codes as mentioned above, that may set a stand-by mode for one or a group of vehicles, for example.

It may be desirable to provide more than eight commands at the vehicle responsive to the corresponding eight available codes. For example, it may be desirable to set a feature on or off, or to set a different feature setting or threshold. In accordance with this aspect of the invention, the commands at the tracker are determined based upon a

series of different command codes being received within a predetermined time window.

For example, the monitoring station may send code 9 that switches the tracker in the car into a stand-by mode for a predetermined time and which causes the tracker to respond with an upstream confirmation code 7 or 9 indicating receiving code 9. During the predetermined time of the stand-by mode another code follows that causes a system programmable feature or setting to change. Note that the second code would otherwise cause a different function at the vehicle. Note that system might operate a function 9 if another code 1-9 is not received in the predetermined time. The following list is exemplary for features resulting from second codes 1-9:

(1) Code 1 -- Tracker will turn off feature of upstream code caused by vehicle alert being detected.

(2) Code 2 -- Tracker will turn on feature of upstream code caused by vehicle alert being detected.

(3) Code 3 -- Tracker deactivates cell receiver from operating due to a non-paying customer for monitoring service. That phone number can then be allocated to another customer.

(4) Code 4 -- Turn on audio buzzer feature that will sound once each 10 minutes. The monitoring station need only send the command to activate the feature, as the tracker will time the period and drive the buzzer thereafter. The monitoring station will normally not need to send this command because the tracker will be configured out of the box with this feature activated to sound the buzzer every 10 minutes until the next command is received.

(5) Code 5 -- Turn off the audio buzzer. This is to be sent by the monitoring station after a user has successfully activated his account.

(6) Code 6 -- Turn on the 80 mph speed limit reporting. This will normally not be sent as this feature will be the default setting of the tracker.

(7) Code 7 -- Turn off the 80 mph speed limit reporting.

(8) Code 8 -- Increase speed limit 5mph and increase the time 5 minutes.

(9) Code 9 -- Decrease speed limit 5 mph and decrease the time 5 minutes, and wait 5 minutes if another code number follows. It could operate this way to allow another set of codes to change more features.

In this example, in response to the tracker receiving the system code 1-9, the tracker sends an upstream code 7 to acknowledge receipt of the system code 1-9. Upon receipt of code 9 the tracker waits up to 5 minutes to determine if another system code is received. If no code is received, then the tracker performs the code 9 operation. Of course, in other embodiments other features or settings can be selected.

In general, it may be preferred that the first code sent in a series of two codes, for example, be a code that causes only a minor function to be performed at the vehicle. This so because if the second code is sent from the monitoring station, but not received at the tracker, only a minor function is performed. For example, the first code may switch between armed and disarmed modes. This is in contrast to using a remote engine starting code or engine shutdown code as the first code. The vehicle may be moving or positioned in a marginal reception area, and the second command may not be received by the tracker within the predetermined time window. As will be appreciated by those skilled in the art, this concept

of multiple digit codes, can be extended beyond two digits to three or more.

To further conserve cellular transmissions and as described above, the tracker may be set to record a position based upon a determined event. Only this recorded position information may be downloaded either by user request or at set times. It is desired that such events be relatively few, but that the information still be helpful to the user.

For example, an event for recording of position may be determined based upon the vehicle being stopped for greater than a first time and less than a second time. For example, the first time may be 15 minutes and the second time may be 6 hours. Determination of the vehicle being stopped can be made based upon one or both of the GPS position or the vehicle ignition being turned off. The second time prevents the recording of position information when the vehicle is stopped at the owner's home during the evening, for example. Accordingly, the important information of the vehicle stops being made is recorded and made available to the user, while system communications resources are conserved.

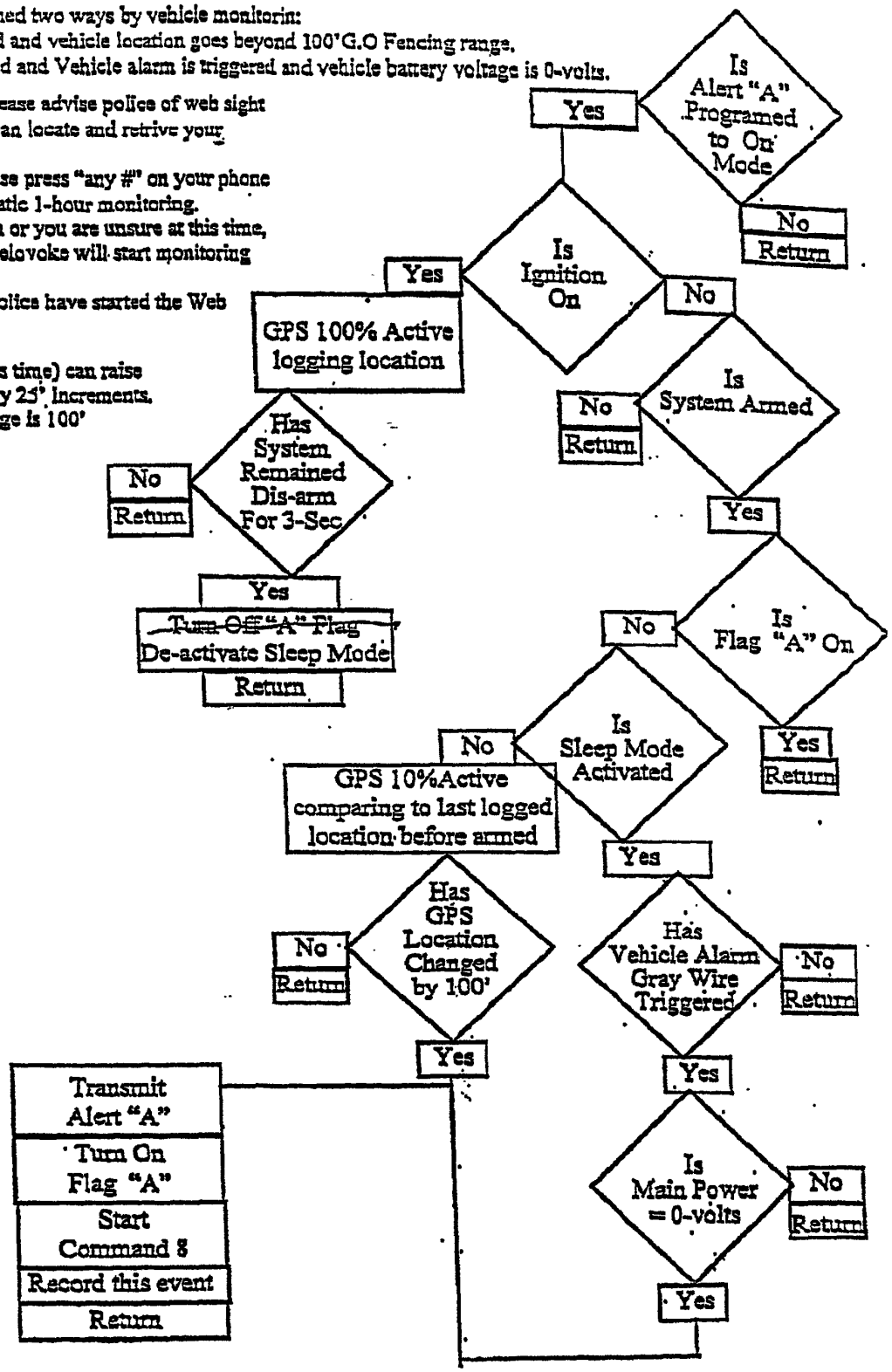
In another example, if the mode is selected to send the vehicles location every 10 min and the vehicle is in the same location for greater than a set time, then no more vehicle locations are sent until the vehicle location has changed to start the every 10 min reporting again.

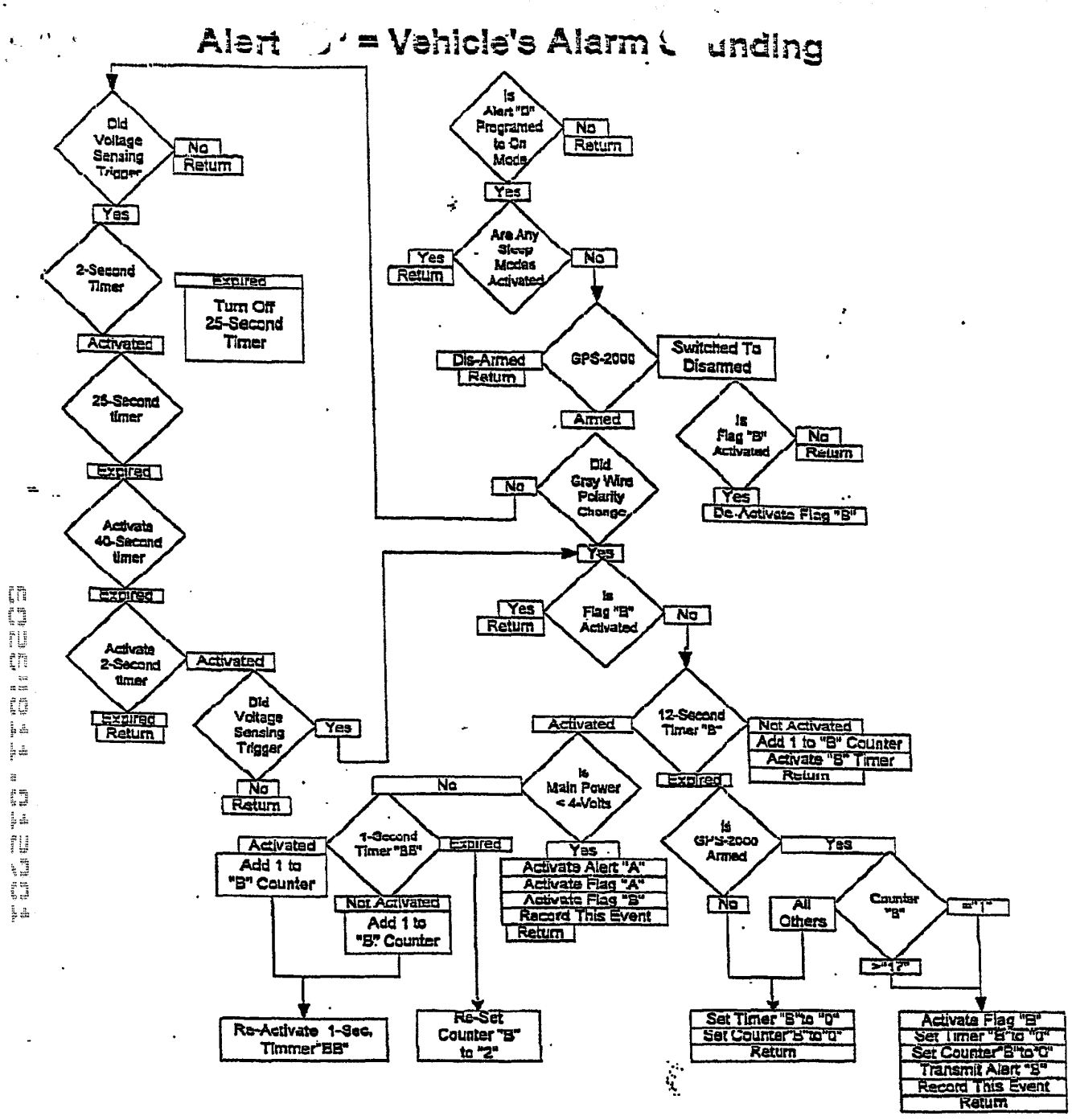
# Alert "A" = Vehicle Stolen Alert

Vehicle stolen is determined two ways by vehicle monitorin:
1. Tracking system armed and vehicle location goes beyond 100'G.O Fencing range.
2. Tracking system Armed and Vehicle alarm is triggered and vehicle battery voltage is 0-volts.

Your vehicle is stolen, please advise police of web sight and your pin# so police can locate and retrive your vehicle.
If this is a false alert please press "any #" on your phone now to deactivate automatic 1-hour monitoring.
If vehicle has been stolen or you are unsure at this time, hang up an call police. Televoke will start monitoring for upto
1-hour vehicle or until police have started the Web monitoring.

Televoke (not user at this time) can raise or lower G.O.Fencing by 25' Increments.
G.O Fencing default range is 100'






Your vehicle alarm activated is detected by counting the pularity changes within a set time.

One change = a siren was latched on for the set time of 12 seconds.

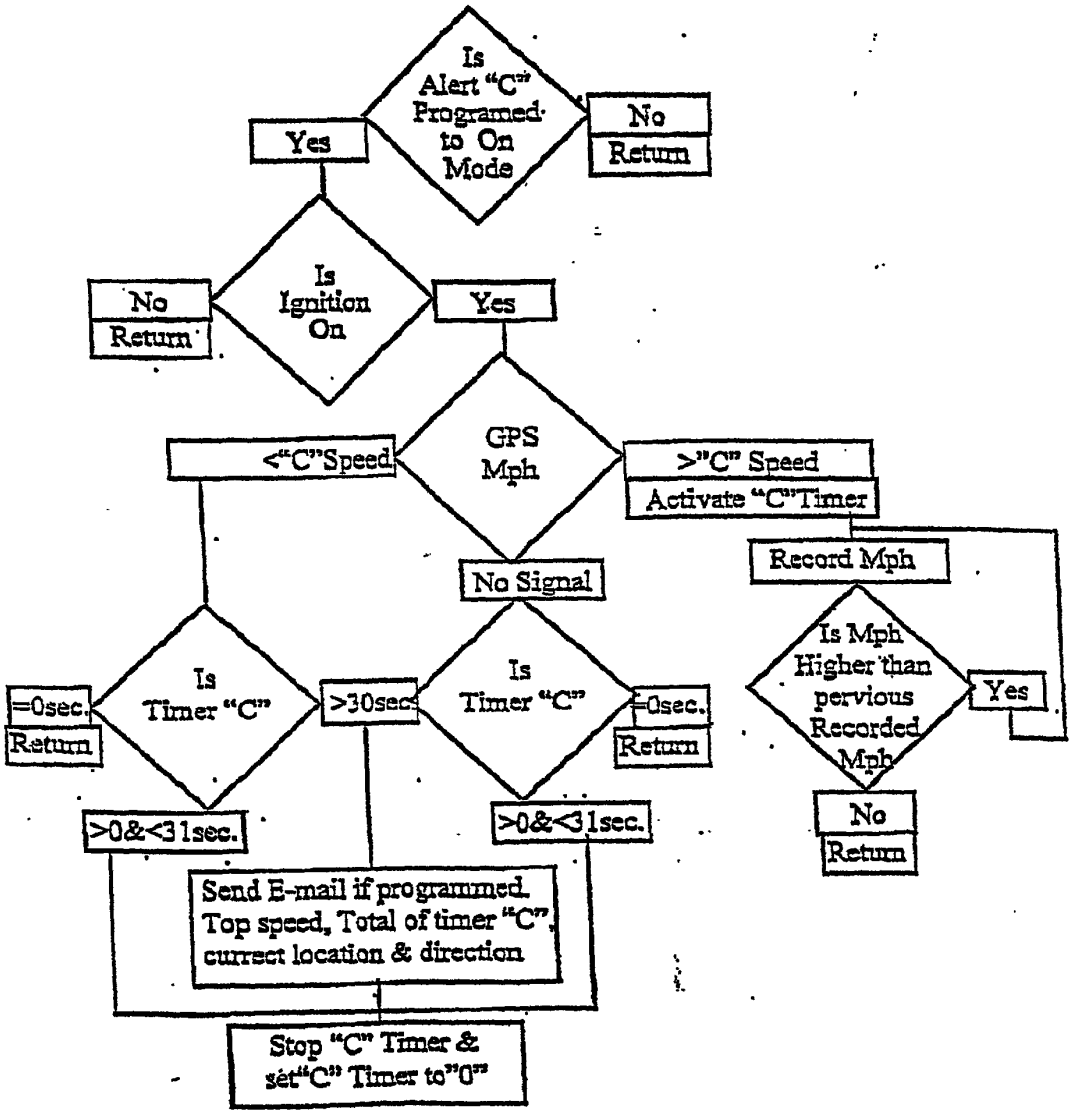
>17 changes = a car horn was pulsing on/off each time in less than one-second and after 12-seconds continues honking of 18 times = 9 horn hons no more than 1-second apart.

If the car batery power is removed during the 12-seconds then alert "A" is sent to inform the vehicle is being stolen.

One alert B is transmitted then GPS-200 will not send another alert till the GPS-2000 is disarmed and rearmed.

# Alert "C" = Speeding Too Long Of Time

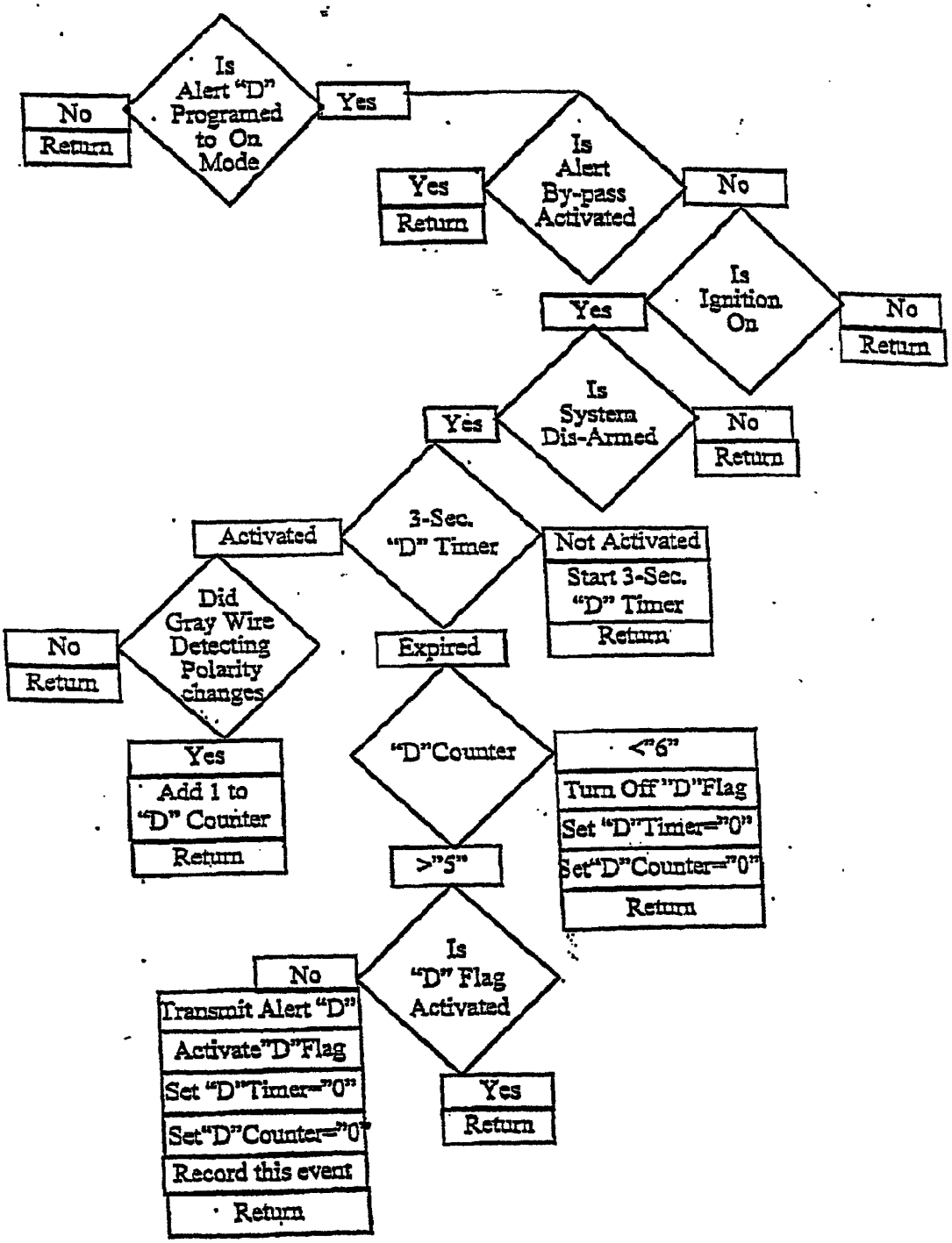
Vehicle was traveling faster than 80 m.p.h. for a longer time than 30 seconds. GPS indicates the speed.
If pre-programed to do so, records this as an event and will send e-mail instantly of Top speed, total time, direction and location speeding had stopped.
Alert "C" operation an be turned on or off by user
80 M.p.h. is default speed. Televoke (not user at this time) can raise or lower the speed by 5 m.p.h. increments.
30-seconds time is default. Televoke (not user at this time) can raise or lower the time by 5 minutes increments.



# Alert "D" = Unauthorized Transmitter Alert

Your vehicle was programmed to operate from a new ignition key or remote transmitter. Please take proper action. This alert will not be sent again till the vehicles alert signal stops.

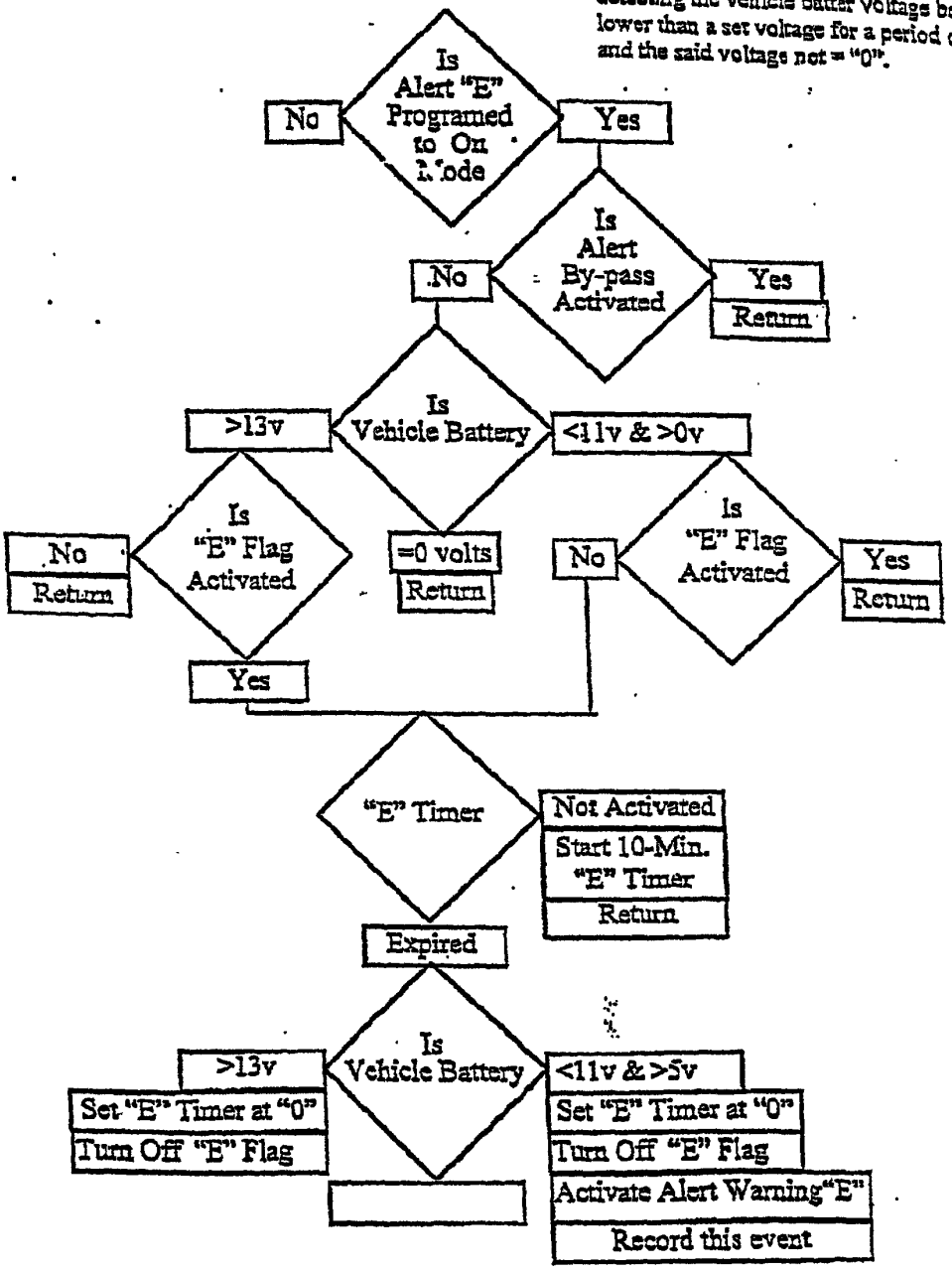
Unauthorized Transmitter Alert is activated when ignition key is turned on and detects a plurality of polarity changes on Gray wire within a set time. This Alert is prevented from activated again until said circuit returns to normal.



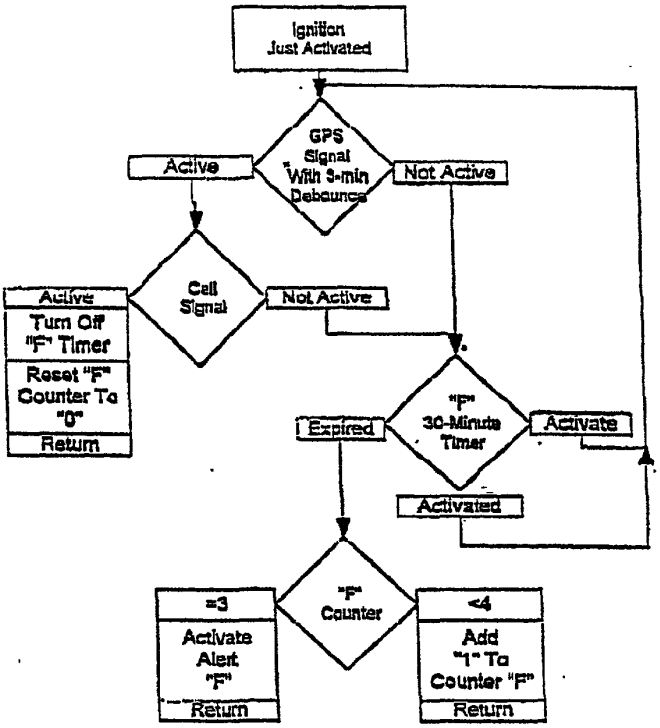
# Alert "E" = Low Car Battery Power

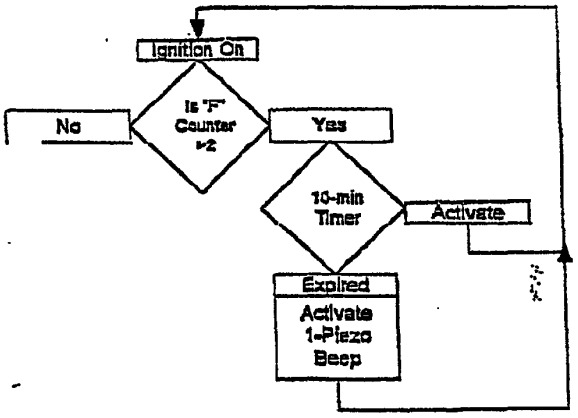
Your vehicle has a low battery voltage indication. Please take proper action. This alert will not be sent again until your vehicles battery has retained the proper voltage.

Low battery power Alert is activated by detecting the vehicle batter voltage being lower than a set voltage for a period of time and the said voltage not = "0".



# Alert "F" = GPS / Cell not active Alert



12-27-00 A/Prov

# PROVISIONAL APPLICATION COVER SHEET

**This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)**

| Docket No. | 58089 | Type (+) --→ [+] |
|---|---|---|

| INVENTOR(s)/APPLICANT(s) | | | |
|---|---|---|---|
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TITLE OF THE INVENTION (280 Characters Max)

**VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION**

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|---|---|---|---|---|---|

ENCLOSED APPLICATION PARTS *(check all that apply)*

| | | | | | |
|---|---|---|---|---|---|
| ✓ | Specification | *Number of Pages* | 35 | ✓ | Applicant qualifies as a Small Entity under 35 CFR under §§1.19 and 1.27 |
| ✓ | Drawing(s) | *Number of Sheets* | 6 | | Other (specify) _____ |

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# VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

## Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

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4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3

predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable. The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated

by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The

unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal.

Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

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An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.
2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive

pulses the system activates Alert "D".

3. If the DIP switch 1 is in the Off position then:

a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.

b. if the yellow wire sees grounded or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

DECISION - APPEAL

3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.

4. The Gray wire bypass operates as follows:

a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.

b. After Alert warning "C" bypass all future Alert "C" until system is armed.

c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.

5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or honk car horn or flashing light relay.

a. Non-stop activation from (Command "4")

b. 30-second activation from (Command "5")

6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

DOCKET ALARM

a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6"). Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7") Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)

After first stops: Activates Green wire for 1 second to lock the doors.

After second stops: Activate Blue wire for 1 second to unlock the doors.

After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system

armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated please confirm". This is with system disarmed and detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and

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2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

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iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

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The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

SUBSTITUTE SHEET (RULE 26)

The device or unit may be initially manufactured and shipped without all of the features being fully functional. One advantage of this is to prevent the unit at will from sending messages when being initially installed and tested in the vehicle, thereby reducing potential false alarms and burdens on the communications system, as well as potential charges to the user. After the unit is fully installed, a communication or transmission from the monitoring center may be sent to the unit enabling one or more selected features, such as during registration during which information is conveyed to the monitoring center and payment is made or authorized by the user.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as

the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert A".

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition. A number of other vehicle security systems provide a series of

pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B".

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being

transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

Yet another advantageous feature of some embodiments of invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated that a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or

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combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature of the invention relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Yet another advantageous feature of the invention relates to interfacing with a factory-installed security system. In accordance with this aspect of the invention, the purpose is to detect when the factory security or alarm system is triggered so

that the user can be notified when away from the vehicle using the capabilities of the tracking and security system described herein. The tracking system would include a voltage and/or current sensing circuit connected to detect repetitive battery spikes based upon an electrical item being turned on and off at the vehicle.

More particularly, with the with the GPS-2000 tracking system armed and the ignition key in the off condition, if the vehicle factory alarm becomes triggered, it causes the car horn and lights to flash and/or the horn to honk. Accordingly, the detector circuit can detect these indications as either dips in the voltage or increases in current flow from the vehicle battery. If these electrical events are detected for a predetermined minimum time of about 30 seconds, for example, and not longer than a predetermined maximum time of about 63 seconds, for example, the GPS-2000 tracker will send the vehicle alarm activated message.

The circuitry for detecting a voltage dip, for example, is of a type commonly included in other conventional vehicle security systems for other purposes, such as detecting tampering, for example. This detection circuitry needs no further description herein.

As will be readily appreciated by those skilled in the art, the reason for the minimum and maximum times is to avoid false alarms. For example, a similar electrical condition can be generated as the car radiator fan cycles on and off after the engine is turned off. By waiting the predetermined minimum time of about 30 seconds, the tracker would not falsely determine this to be operation of the factory security

system. Opening and closing of the car doors could also create a similar electrical system drain, but would be unlikely to extend for 30 seconds. Accordingly, the minimum time would also avoid a false alarm in this instance of opening and closing the vehicle doors.

The maximum predetermined time could be implemented to avoid flashing operation of the hazard lights, for example, from causing a false alarm. A typical factory alarm would flash the lights and/or honk the horn for about 60 seconds before stopping. Flashing of the hazard lights would likely be for more than about 63 seconds, for example. Accordingly, a false alarm indication based on operation of the hazard lights would also be avoided by the invention.

As will also be appreciated by those skilled in the art, different values for the minimum and maximum times are contemplated by the invention. In addition, in some embodiments only one of the minimum or maximum times may be used.

Another aspect of the invention relates to a user's ability to cancel further sequential notifications. More particularly, in response to an alarm alert, sequential notifications are typically given by sequentially calling a series of telephone numbers. In accordance with this aspect of the invention, the user who receives the call, may cancel any further notifications. In other words, the user can be prompted by voice messages to make a certain keypad entry to thereby cancel further notifications if desired. This can avoid additional telephone or system usage charges, and also reduces the possible nuisance of unnecessary calls to other persons.

Declassified per E.O. 13526

Stopping further notifications upon merely determining that the telephone has been answered may be ineffective, since oftentimes an answering machine may receive the call. Accordingly, it may be preferred to have the user actively cancel further notifications, in contrast to merely stopping further calls upon determining that the telephone call has been completed.

Another aspect of the invention relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect of the invention relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Still another aspect of the invention relates to warning the user of an inoperable or malfunctioning

Declaration of Benjamin Bowman

GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once ever 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal

SCRAM-1020

is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

In examples, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Another aspect of the invention relates to having the capability to interface the tracker device with a siren and/or the vehicle horn. Typically the siren is locally connected to ground, such as in the engine compartment, and the output of the tracker unit would provide a positive supply voltage, eg. 12 volts, to drive the siren. Also typically, the vehicle horn is connected to the positive voltage supply, and pressing the horn switch connects the horn to the vehicle ground to thereby complete the circuit and sound the horn. In accordance with this aspect of the invention, the output drive of the tracker unit can be a single wire with pulses of alternating polarity.

More particularly, the output terminal or wire, eg. the gray wire as described above, supplies

SPECIMEN - PENDING

pulses of alternating polarity. For example, a first pulse can be at the positive supply voltage, and a second pulse can be at the vehicle ground. Each pulse can be about one-half to one second long. The pulses can alternate in a series and with a slight spacing between adjacent pulses. In other security type systems, an intervening relay may be provided to provide for dual polarity capability. However, the tracker unit desirably monitors activation of the horn wire to determine whether the factory or aftermarket security controller is sounding an alarm. The intervening relay would prevent such a determination. Accordingly, the circuitry for providing the alternating polarity pulses of the invention provides the dual compatibility and also permits sensing of the horn activation as described above. Thus, the invention provides the dual compatibility with a single output wire or terminal, and requires no special installation.

Yet another aspect of the invention relates to power conservation and extending the protection period provided by the tracking device when the vehicle is not being used. The GPS receiver of the device may operate down to a supply voltage of about 3 volts, while the cellular radio portion may require a voltage of at least about 11 volts or 11.2 volts. The device will also typically include a back-up battery. The back-up battery may provide power when the vehicle battery is disconnected, such as by a would-be thief, or otherwise.

Typical vehicle security systems, for example, connect the back-up battery in parallel with the vehicle electrical system. Of course when the vehicle is operating, the vehicle battery and back-up

SUBSTITUTE SHEET (RULE 26)

battery are being charged by the alternator, which, in turn, is driven by the vehicle engine. When the vehicle is not used for a relatively long period of time, the voltage of both the back-up battery and the vehicle battery will gradually decay, such as based upon the receiver in the security system continuing to operate. Fortunately, however, the conventional vehicle security system may operate down to a voltage of about 6 volts. Accordingly, although the back-up battery voltage has decayed (along with the parallel connected vehicle battery), the relatively low operating voltage fo the security system is still typically sufficient to permit proper operation for a relatively long period of time.

The tracking device in accordance with the invention will typically include the cellular radio portion which requires a relatively high 11 volts or so to continue to operate. The tracking unit, despite various other power conserving features discussed herein, will still draw current. Accordingly, the voltage of the vehicle battery will also decay over time as the user is away from the vehicle. In accordance with this aspect of the invention, the back-up battery, however, is not continuously connected in parallel with the vehicle battery. Instead, the back-up battery is connected in parallel when the ignition key is on, for example, which will provide for charging of the back-up battery. Initially, when the vehicle is turned off, and the system armed, the back-up battery is not connected. Rather, the vehicle battery alone supplies the device initially. The back-up battery thus remains fully charged as it is not being drained by the load of the tracking device.

In one embodiment, if sufficient time passes, then the voltage of the battery will decay below a predetermined value, such as about 11.5 or 11.2 volts, for example. At this point, the back-up battery will be connected to the tracking device, and the vehicle battery will be disconnected. These voltage sensing and switching functions can be readily implemented using conventional circuits in the tracking device as will be appreciated by those skilled in the art. Accordingly, the tracking device can continue to operate normally for an additional period and at a sufficiently high voltage to permit the cellular radio to operate. Of course, as will be appreciated by those skilled in the art, this feature can be extended to other areas as well, especially where a vehicle device or circuit may require a relatively high operating voltage.

In other embodiments, if sufficient time passes, then the voltage of the battery will decay below a predetermined value, such as about 11.5 to 4-volts, for example. At this point, the back-up battery will stay disconnected from the tracking device, and the vehicle battery will stay connected. This allows the cellular radio to sleep at 11.5 volts and the GPS and other circuits to still operate from the vehicle battery to as low as 3-volts. Once an alert is detected from GPS or other circuits then the cellular radio is awakened and operates from the back-up battery, still at about 12-volts. These voltage sensing and switching functions can be readily implemented using conventional circuits in the tracking device as will be appreciated by those skilled in the art. Accordingly, the tracking device can continue to operate normally for alerts to be sent to the monitoring station for an additional period and at a sufficiently high voltage to permit the

cellular radio to operate. Of course, as will be appreciated by those skilled in the art, this feature can be extended to other areas as well, especially where a vehicle device or circuit may require a relatively high operating voltage.

Yet another feature of the invention is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station. More particularly, a typical arrangement may provide eight basic codes and two "wildcard" codes. The two wildcard codes are reserved for future or other uses. A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature of the invention, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A-E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response (no alarm triggered) in the tracking

device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

In accordance with another feature of the invention, the rate of sending the location or position data (or change in position data) from the vehicle may be varied to reduce system usage and thereby reduce expenses. More particularly, in one embodiment, the rate of sending may be based upon how long the vehicle has remained stationary. This time period may be selected by the user. For example, the selected time may be in the range of 15 minutes to six hours. If the vehicle has been stationary for the selected time period, then the rate of transmission may be reduced. This reduces or eliminates the need to send home position data and send all the over 15-minute stops made that day. Otherwise, that is when the vehicle is moving, the device may send data at a faster rate. Of course, a system user would not likely be interested in quick updates, especially where the position information is not changing. Conversely, if the vehicle is being moved, it may be desirable to receive more frequent position updates.

Another variation of this transmission rate conservation feature, bases the rate of transmission on the vehicle position. For example, a reduced rate of transmission may be selected if the vehicle is in a predetermined area where the user has a lesser interest in quickly updated position information. The user may also have a reduced interest in an area that can be defined outside of a predetermined distance from a reference point.

Yet another variation of the vehicle position transmission rate conservation feature is based upon

the vehicle's speed, such as the vehicle's average or maximum speed, for example. Accordingly, if the vehicle is traveling above a preset speed, the rate of transmission may be increased.

In accordance with another aspect of the invention, an alert may be generated based upon the vehicle detecting an acceleration beyond a predetermined level. The vehicle acceleration could readily be determined by a relatively inexpensive acceleration sensor as will be appreciated by those skilled in the art. The acceleration could also be calculated by speedometer information. Decelerations, or negative accelerations, could also be used to trigger an alert. The acceleration generated alert could be used to reduce wear and tear on the vehicle or to discourage aggressive driving and especially Drag Racing . The acceleration alert need not be generated and sent immediately, but could be sent with position information, since a user may not need realtime notification of the acceleration limit being exceeded.

Yet another aspect of the invention is directed to ensuring that car owners will activate the monitoring service from the beginning and not wait months or years until the vehicle is stolen, for example, to then activation the system in an attempt to avoid monthly service charges. When power is initially connected to the device it will communicate with the cellular equipment. Unfortunately, it may be virtually impossible to sort out all of the communications traffic to determine when someone has obtained a vehicle with the unit, but has not fully registered or subscribed to the service. In accordance with this aspect of the invention, a driver annoyance may be triggered to encourage the driver or owner to register

the unit and begin paying the monthly service fees. For example, an annoying chirp could be generated every ten minutes when the vehicle ignition is on. Alternately or additionally a visual annoyance could also be provided. The audio chirp could be readily provided by a small piezoelectric indicator carried by the device.

In accordance with another aspect of the invention, the tracking device may send the alert indication a predetermined number of times without receiving an acknowledgment as described above, and then wait until the vehicle position has changed before trying again or the cell re-registers or its RSS (received signal strength) changes. Thus, power is conserved. When the vehicle has moved to a new position, any obstructions may no longer be present thereby increasing the likelihood of a successful communication. In addition, the change in position may be determined when the vehicle is sensed to be moving about a predetermined relatively small speed, such as greater than 1 mph, for example.

In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Patent Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention.

SUBSTITUTE SHEET (RULE 26)

# Alert "A" = Vehicle Stolen Alert

Vehicle stolen is determined two ways by vehicle monitorin:
1. Tracking system armed and vehicle location goes beyond 100'G.O Fencing range.
2. Tracking system Armed and Vehicle alarm is triggered and vehicle battery voltage is 0-volts.

Your vehicle is stolen, please advise police of web sight and your pin# so police can locate and retrive your vehicle.
If this is a false alert please press "any #" on your phone now to deactivate automatic 1-hour monitoring.
If vehicle has been stolen or you are unsure at this time, hang up an call police. Televoke will start monitoring for upto
1-hour vehicle or until police have started the Web monitoring.

Televoke (not user at this time) can raise or lower G.O.Fencing by 25' increments.
G.O Fencing default range is 100'

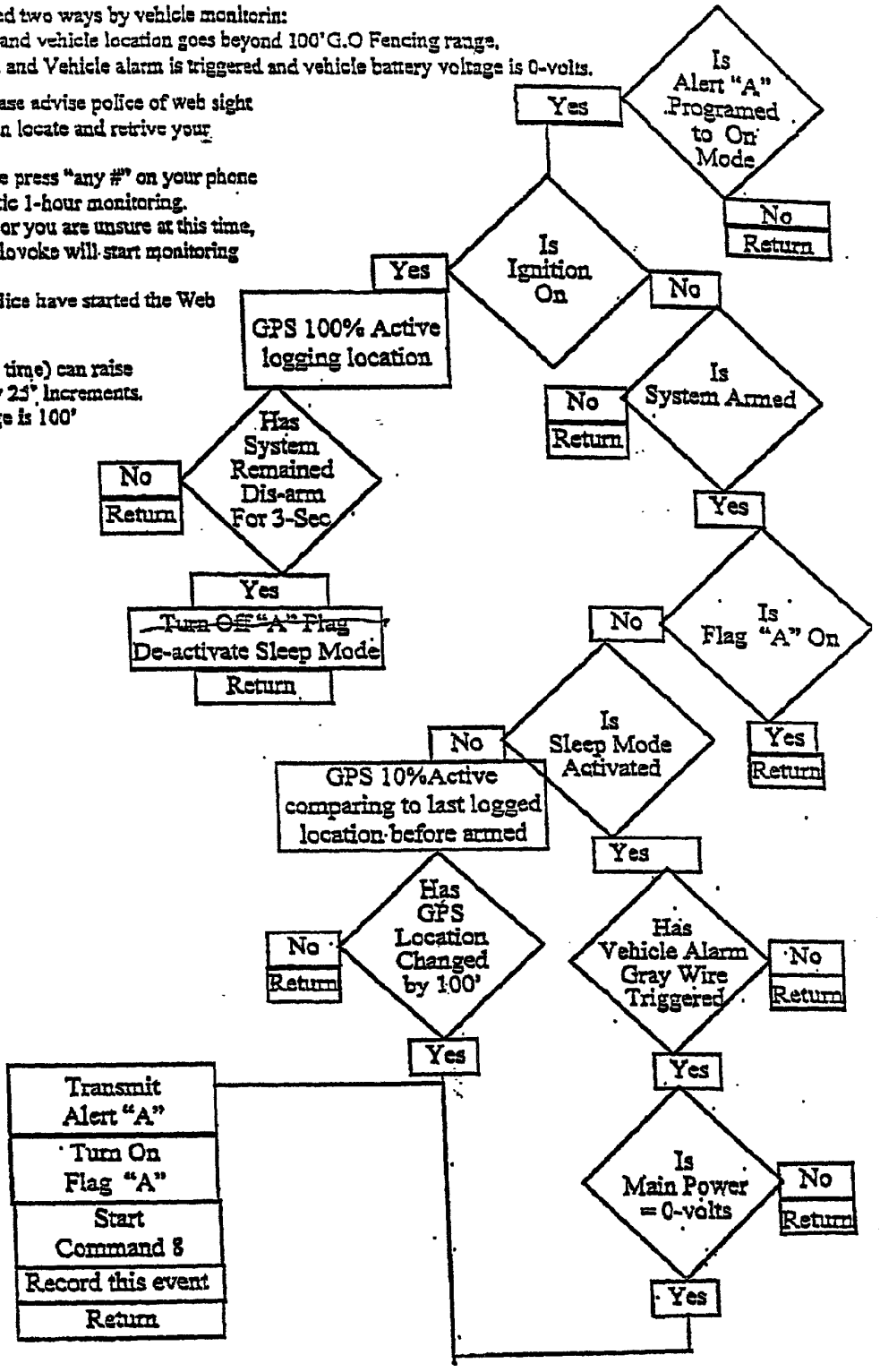
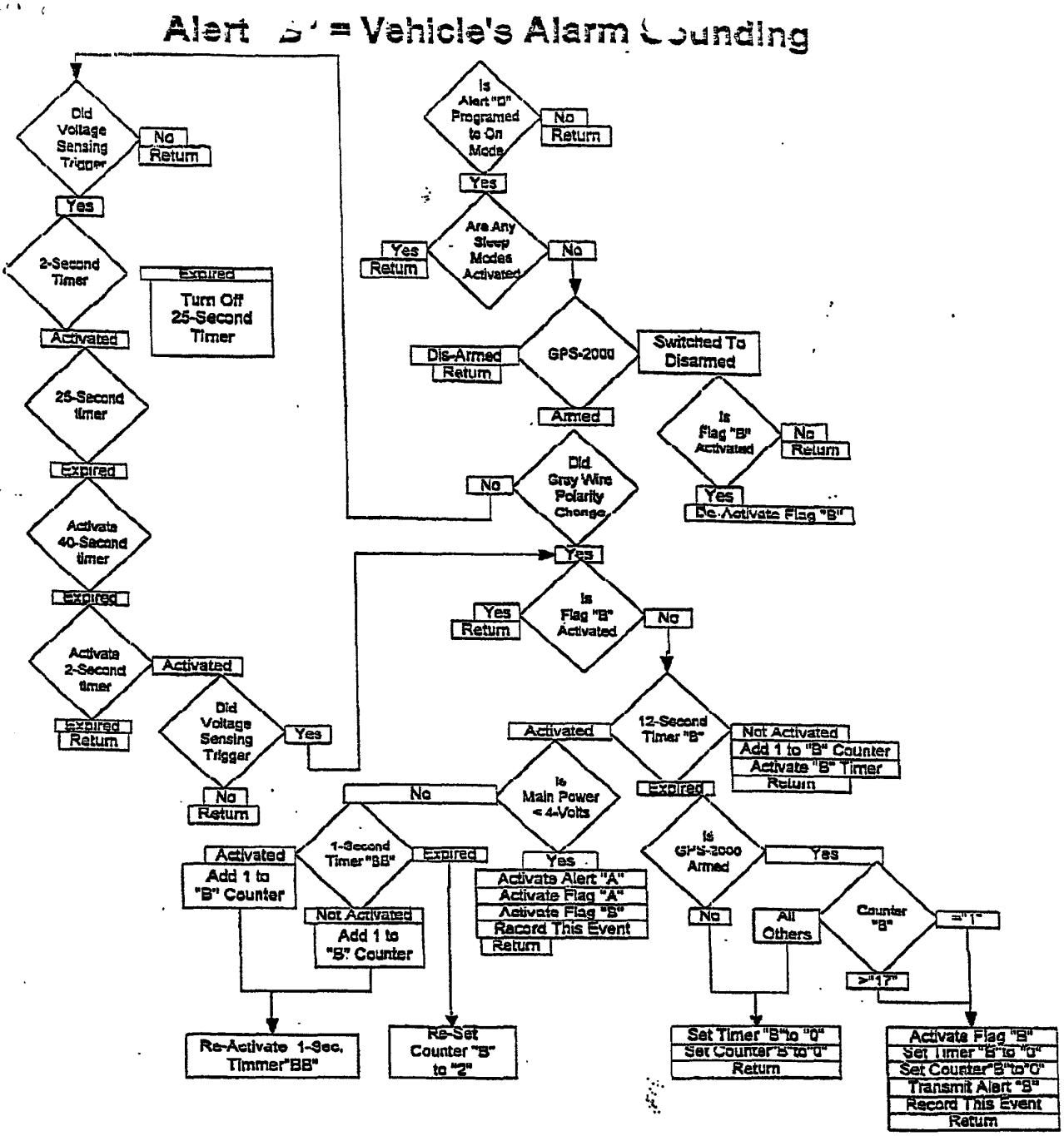



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Your vehicle alarm activated is detected by counting the pularity changes within a set time.

One change = a siren was latched on for the set time of 12 seconds.

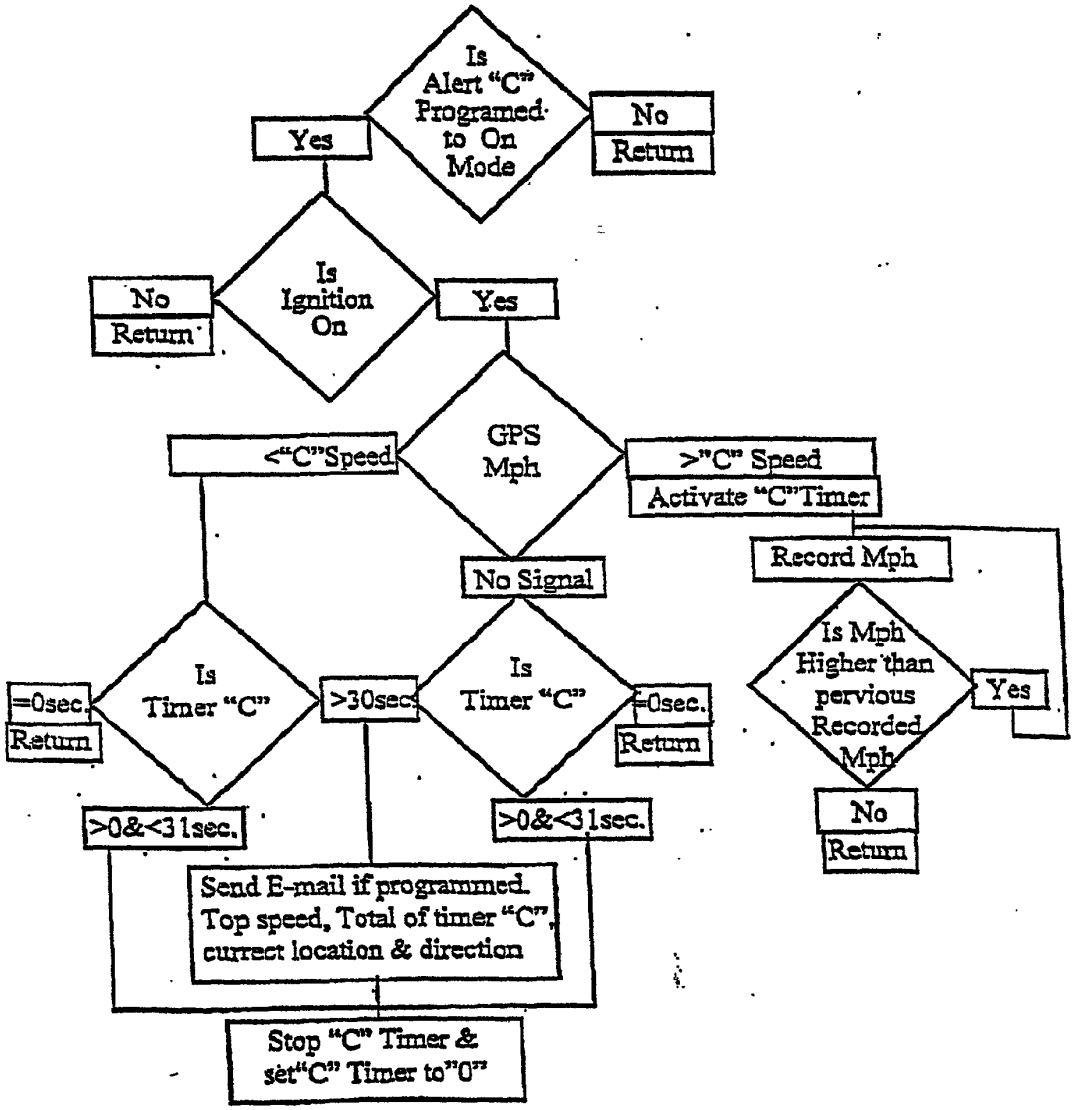
>17 changes = a car horn was pulsing on/off each time in less than one-second and after 12-seconds continues honking of 18 times = 9 horn hons no more than 1-second apart.

If the car batery power is removed during the 12-seconds then alert "A" is sent to inform the vehicle is being stolen.

One alert B is transmitted then GPS-200 will not send another alert till the GPS-2000 is disarmed and rearmed.

# Alert "C" = Speeding Too Long Of Time

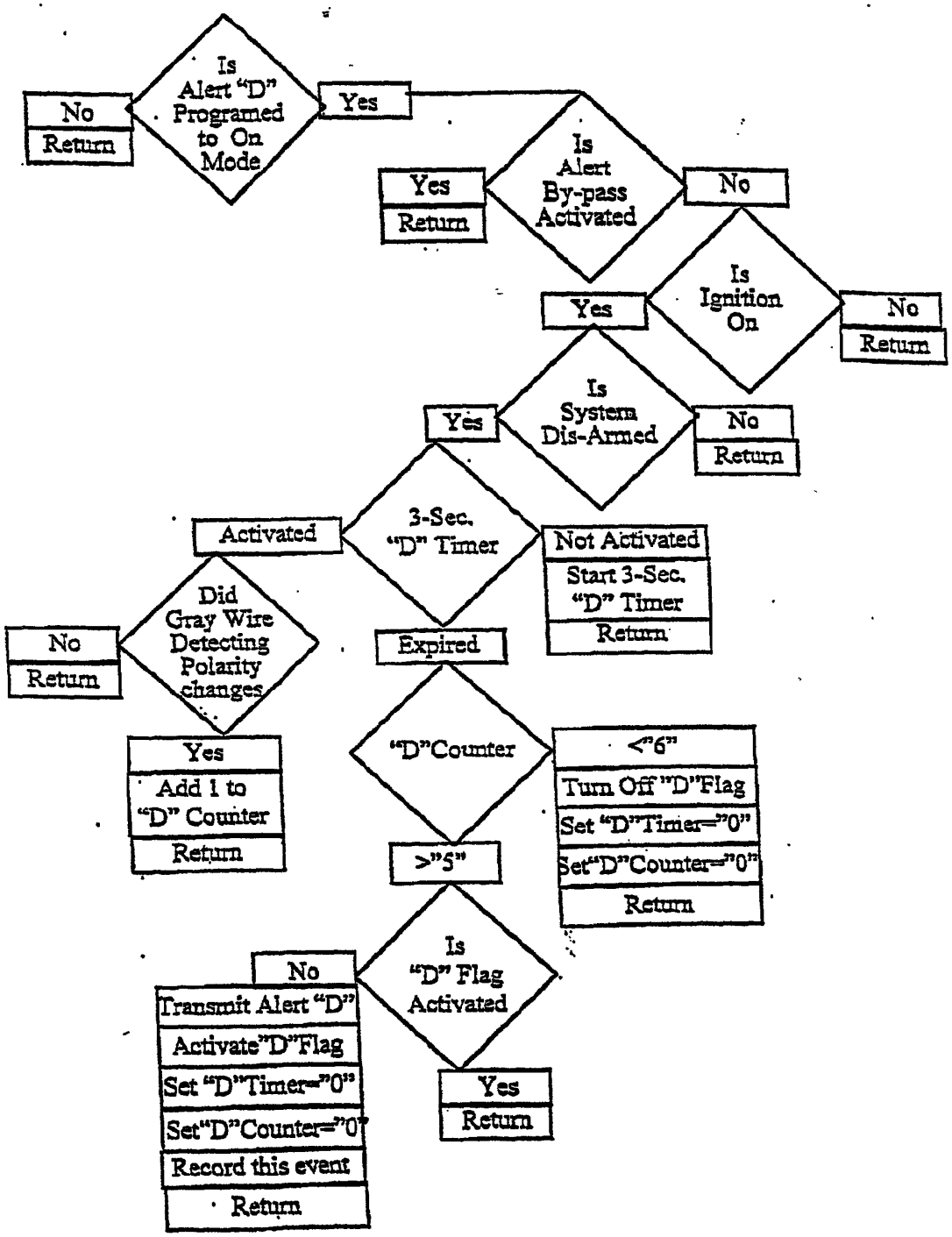
Vehicle was traveling faster than 80 m.p.h. for a longer time than 30 seconds. GPS indicates the speed.
If pre-programed to do so, records this as an event and will send e-mail instantly of Top speed, total time, direction and location speeding had stopped.
Alert "C" operation an be turned on or off by user
80 M.p.h. is default speed. Televoke (not user at this time) can raise or lower the speed by 5 m.p.h. increments.
30-seconds time is default. Televoke (not user at this time) can raise or lower the time by 5 minutes increments.



# Alert "D" = Unauthorized Transmitter Alert

Your vehicle was programmed to operate from a new ignition key or remote transmitter. Please take proper action. This alert will not be sent again till the vehicles alert signal stops.

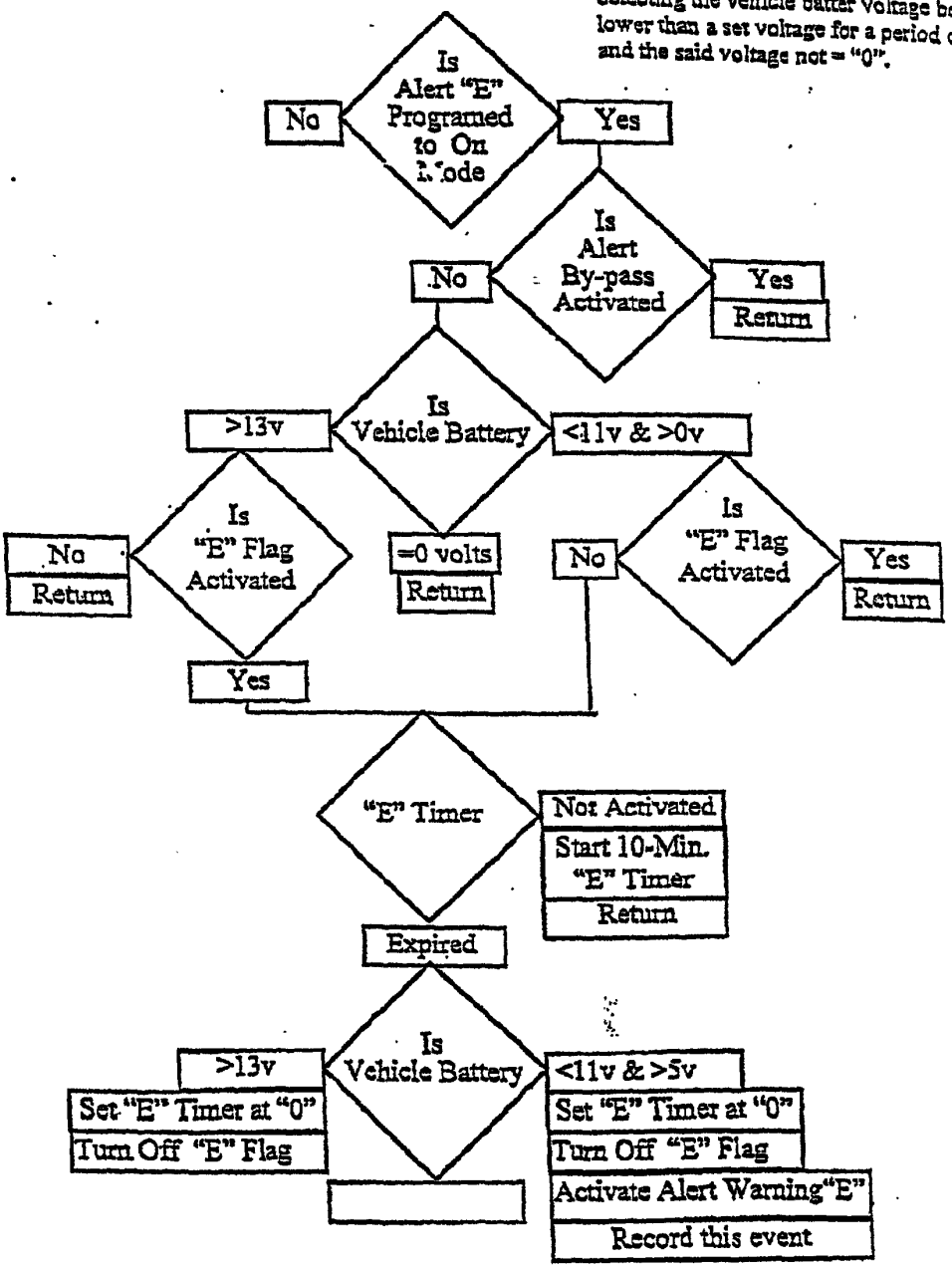
Unauthorized Transmitter Alert is activated when ignition key is turned on and detects a plurality of polarity changes on Gray wire within a set time. This Alert is prevented from activated again until said circuit returns to normal.



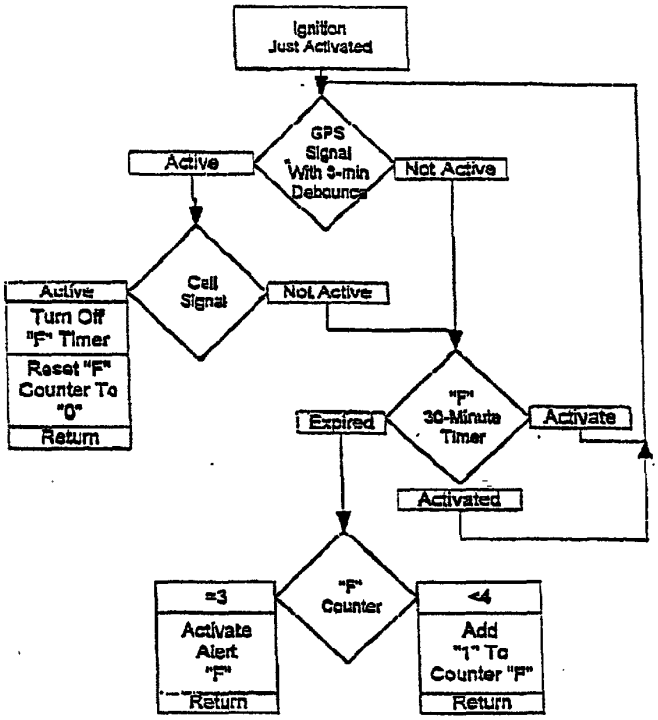
# Alert "E" = Low Car Battery Power

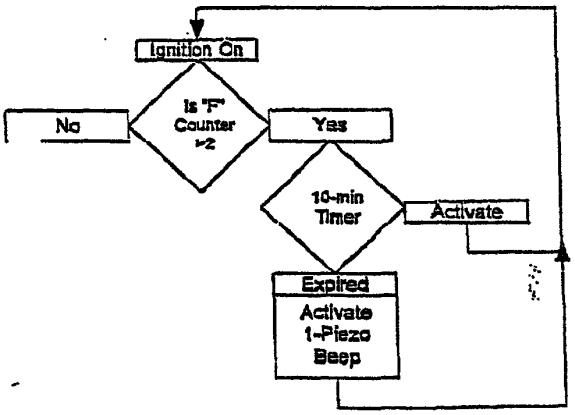
Your vehicle has a low battery voltage indication. Please take proper action. This alert will not be sent again until your vehicles battery has retained the proper voltage.

Low battery power Alert is activated by detecting the vehicle batter voltage being lower than a set voltage for a period of time and the said voltage not = "0".



# Alert "F" = GPS / Cell not active Alert




Petitioner's Exhibit 1008

12-07-00

A/prov

# PROVISIONAL APPLICATION COVER SHEET

**This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)**

12/06/00 jc961 U.S. PTO

jc714 U.S. PTO 60/251552 12/06/00

| Docket No. | 58082 | Type (+) --> [+] |
|---|---|---|

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TITLE OF THE INVENTION (280 Characters Max)

**VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION**

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ENCLOSED APPLICATION PARTS *(check all that apply)*

| | | | | | | |
|---|---|---|---|---|---|---|
| ✓ | Specification | *Number of Pages* | 33 | | ✓ | Applicant qualifies as a Small Entity under 35 CFR under §§1.19 and 1.27 |
| ✓ | Drawing(s) | *Number of Sheets* | 6 | | | Other (specify) _____ |

METHOD OF PAYMENT

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| | A check or money order is enclosed to cover the Provisional Filing Fees | | PROVISIONAL FILING FEE AMOUNT ($) | **$75.00** |
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[ ] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
[✓] No. [ ] Yes

Respectfully Submitted,

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# VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

## Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

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4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3

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predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable. The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated

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by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The

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unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal. Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

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An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.
2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive

EXHIBIT 1008

pulses the system activates Alert "D".

3. If the DIP switch 1 is in the Off position then:

a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.

b. if the yellow wire sees grounded or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

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3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.

4. The Gray wire bypass operates as follows:

a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.

b. After Alert warning "C" bypass all future Alert "C" until system is armed.

c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.

5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or honk car horn or flashing light relay.

a. Non-stop activation from (Command "4")

b. 30-second activation from (Command "5")

6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

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a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

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Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6"). Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7") Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)

After first stops: Activates Green wire for 1 second to lock the doors.

After second stops: Activate Blue wire for 1 second to unlock the doors.

After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system

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armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated please confirm". This is with system disarmed and detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and

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2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

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b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

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iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

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vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

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The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

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The device or unit may be initially manufactured and shipped without all of the features being fully functional. One advantage of this is to prevent the unit at will from sending messages when being initially installed and tested in the vehicle, thereby reducing potential false alarms and burdens on the communications system, as well as potential charges to the user. After the unit is fully installed, a communication or transmission from the monitoring center may be sent to the unit enabling one or more selected features, such as during registration during which information is conveyed to the monitoring center and payment is made or authorized by the user.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as

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the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert A".

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition. A number of other vehicle security systems provide a series of

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pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B".

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being

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transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

Yet another advantageous feature of some embodiments of invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated that a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or

Ex. 1008 - Page 612

combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature of the invention relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Yet another advantageous feature of the invention relates to interfacing with a factory-installed security system. In accordance with this aspect of the invention, the purpose is to detect when the factory security or alarm system is triggered so

that the user can be notified when away from the vehicle using the capabilities of the tracking and security system described herein. The tracking system would include a voltage and/or current sensing circuit connected to detect repetitive battery spikes based upon an electrical item being turned on and off at the vehicle.

More particularly, with the with the GPS-2000 tracking system armed and the ignition key in the off condition, if the vehicle factory alarm becomes triggered, it causes the car horn and lights to flash and/or the horn to honk. Accordingly, the detector circuit can detect these indications as either dips in the voltage or increases in current flow from the vehicle battery. If these electrical events are detected for a predetermined minimum time of about 30 seconds, for example, and not longer than a predetermined maximum time of about 63 seconds, for example, the GPS-2000 tracker will send the vehicle alarm activated message.

The circuitry for detecting a voltage dip, for example, is of a type commonly included in other conventional vehicle security systems for other purposes, such as detecting tampering, for example. This detection circuitry needs no further description herein.

As will be readily appreciated by those skilled in the art, the reason for the minimum and maximum times is to avoid false alarms. For example, a similar electrical condition can be generated as the car radiator fan cycles on and off after the engine is turned off. By waiting the predetermined minimum time of about 30 seconds, the tracker would not falsely determine this to be operation of the factory security

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system. Opening and closing of the car doors could also create a similar electrical system drain, but would be unlikely to extend for 30 seconds. Accordingly, the minimum time would also avoid a false alarm in this instance of opening and closing the vehicle doors.

The maximum predetermined time could be implemented to avoid flashing operation of the hazard lights, for example, from causing a false alarm. A typical factory alarm would flash the lights and/or honk the horn for about 60 seconds before stopping. Flashing of the hazard lights would likely be for more than about 63 seconds, for example. Accordingly, a false alarm indication based on operation of the hazard lights would also be avoided by the invention.

As will also be appreciated by those skilled in the art, different values for the minimum and maximum times are contemplated by the invention. In addition, in some embodiments only one of the minimum or maximum times may be used.

Another aspect of the invention relates to a user's ability to cancel further sequential notifications. More particularly, in response to an alarm alert, sequential notifications are typically given by sequentially calling a series of telephone numbers. In accordance with this aspect of the invention, the user who receives the call, may cancel any further notifications. In other words, the user can be prompted by voice messages to make a certain keypad entry to thereby cancel further notifications if desired. This can avoid additional telephone or system usage charges, and also reduces the possible nuisance of unnecessary calls to other persons.

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Stopping further notifications upon merely determining that the telephone has been answered may be ineffective, since oftentimes an answering machine may receive the call. Accordingly, it may be preferred to have the user actively cancel further notifications, in contrast to merely stopping further calls upon determining that the telephone call has been completed.

Another aspect of the invention relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect of the invention relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Still another aspect of the invention relates to warning the user of an inoperable or malfunctioning

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GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once ever 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal

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is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

In examples, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Another aspect of the invention relates to having the capability to interface the tracker device with a siren and/or the vehicle horn. Typically the siren is locally connected to ground, such as in the engine compartment, and the output of the tracker unit would provide a positive supply voltage, eg. 12 volts, to drive the siren. Also typically, the vehicle horn is connected to the positive voltage supply, and pressing the horn switch connects the horn to the vehicle ground to thereby complete the circuit and sound the horn. In accordance with this aspect of the invention, the output drive of the tracker unit can be a single wire with pulses of alternating polarity.

More particularly, the output terminal or wire, eg. the gray wire as described above, supplies

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pulses of alternating polarity. For example, a first pulse can be at the positive supply voltage, and a second pulse can be at the vehicle ground. Each pulse can be about one-half to one second long. The pulses can alternate in a series and with a slight spacing between adjacent pulses. In other security type systems, an intervening relay may be provided to provide for dual polarity capability. However, the tracker unit desirably monitors activation of the horn wire to determine whether the factory or aftermarket security controller is sounding an alarm. The intervening relay would prevent such a determination. Accordingly, the circuitry for providing the alternating polarity pulses of the invention provides the dual compatibility and also permits sensing of the horn activation as described above. Thus, the invention provides the dual compatibility with a single output wire or terminal, and requires no special installation.

Yet another aspect of the invention relates to power conservation and extending the protection period provided by the tracking device when the vehicle is not being used. The GPS receiver of the device may operate down to a supply voltage of about 3 volts, while the cellular radio portion may require a voltage of at least about 11 volts or 11.2 volts. The device will also typically include a back-up battery. The back-up battery may provide power when the vehicle battery is disconnected, such as by a would-be thief, or otherwise.

Typical vehicle security systems, for example, connect the back-up battery in parallel with the vehicle electrical system. Of course when the vehicle is operating, the vehicle battery and back-up

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battery are being charged by the alternator, which, in turn, is driven by the vehicle engine. When the vehicle is not used for a relatively long period of time, the voltage of both the back-up battery and the vehicle battery will gradually decay, such as based upon the receiver in the security system continuing to operate. Fortunately, however, the conventional vehicle security system may operate down to a voltage of about 6 volts. Accordingly, although the back-up battery voltage has decayed (along with the parallel connected vehicle battery), the relatively low operating voltage fo the security system is still typically sufficient to permit proper operation for a relatively long period of time.

The tracking device in accordance with the invention will typically include the cellular radio portion which requires a relatively high 11 volts or so to continue to operate. The tracking unit, despite various other power conserving features discussed herein, will still draw current. Accordingly, the voltage of the vehicle battery will also decay over time as the user is away from the vehicle. In accordance with this aspect of the invention, the back-up battery, however, is not continuously connected in parallel with the vehicle battery. Instead, the back-up battery is connected in parallel when the ignition key is on, for example, which will provide for charging of the back-up battery. Initially, when the vehicle is turned off, and the system armed, the back-up battery is not connected. Rather, the vehicle battery alone supplies the device initially. The back-up battery thus remains fully charged as it is not being drained by the load of the tracking device.

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In one embodiment, if sufficient time passes, then the voltage of the battery will decay below a predetermined value, such as about 11.5 or 11.2 volts, for example. At this point, the back-up battery will be connected to the tracking device, and the vehicle battery will be disconnected. These voltage sensing and switching functions can be readily implemented using conventional circuits in the tracking device as will be appreciated by those skilled in the art. Accordingly, the tracking device can continue to operate normally for an additional period and at a sufficiently high voltage to permit the cellular radio to operate. Of course, as will be appreciated by those skilled in the art, this feature can be extended to other areas as well, especially where a vehicle device or circuit may require a relatively high operating voltage.

In other embodiments, if sufficient time passes, then the voltage of the battery will decay below a predetermined value, such as about 11.5 to 4-volts, for example. At this point, the back-up battery will stay disconnected from the tracking device, and the vehicle battery will stay connected. This allows the cellular radio to sleep at 11.5 volts and the GPS and other circuits to still operate from the vehicle battery to as low as 3-volts. Once an alert is detected from GPS or other circuits then the cellular radio is awakened and operates from the back-up battery, still at about 12-volts. These voltage sensing and switching functions can be readily implemented using conventional circuits in the tracking device as will be appreciated by those skilled in the art. Accordingly, the tracking device can continue to operate normally for alerts to be sent to the monitoring station for an additional period and at a sufficiently high voltage to permit the

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cellular radio to operate. Of course, as will be appreciated by those skilled in the art, this feature can be extended to other areas as well, especially where a vehicle device or circuit may require a relatively high operating voltage.

Yet another feature of the invention is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station. More particularly, a typical arrangement may provide eight basic codes and two "wildcard" codes. The two wildcard codes are reserved for future or other uses. A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature of the invention, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A-E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response (no alarm triggered) in the tracking

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device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

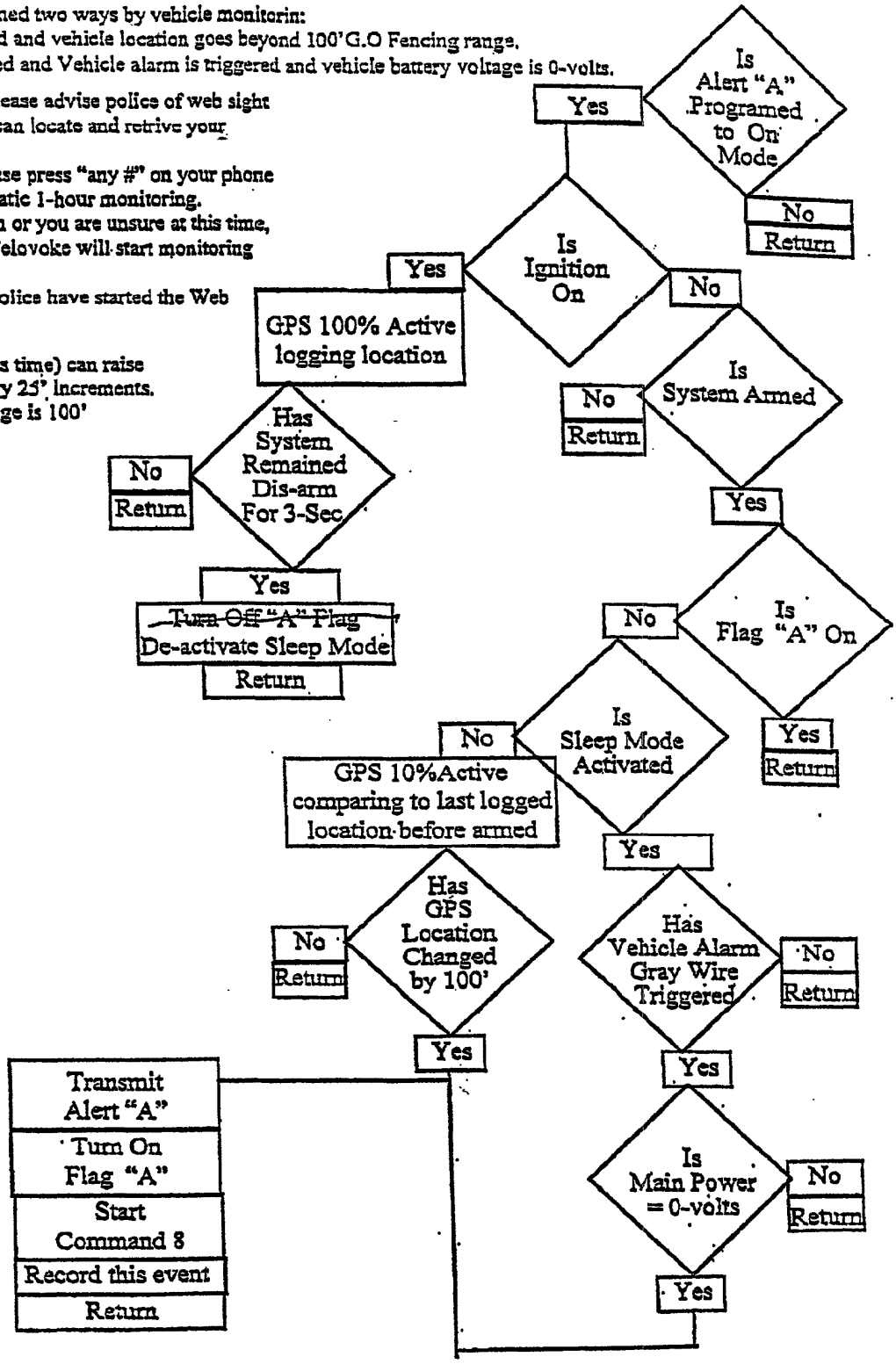
Document 1008

# Alert "A" = Vehicle Stolen Alert

Vehicle stolen is determined two ways by vehicle monitorin:
1. Tracking system armed and vehicle location goes beyond 100'G.O Fencing range.
2. Tracking system Armed and Vehicle alarm is triggered and vehicle battery voltage is 0-volts.

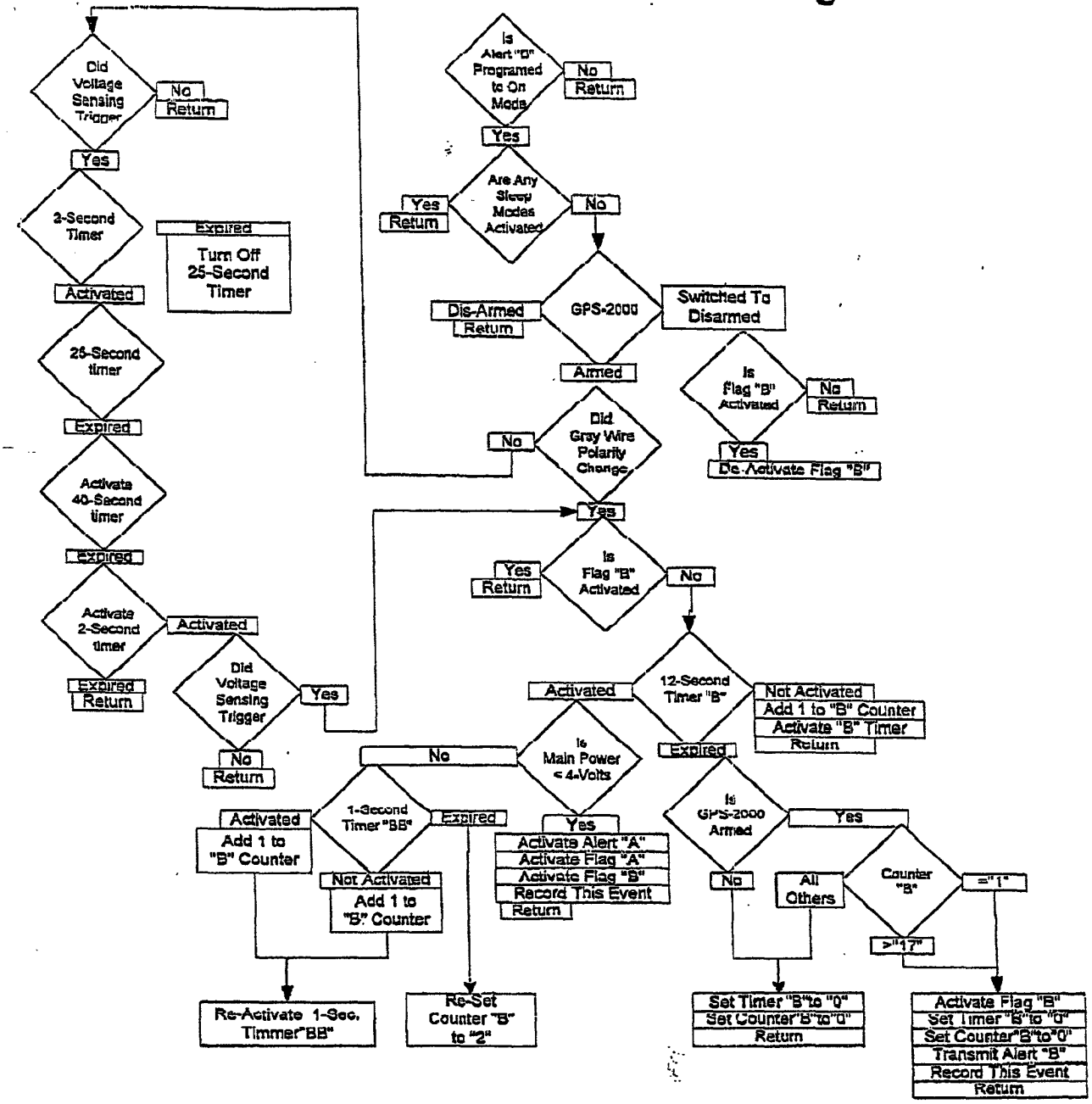
Your vehicle is stolen, please advise police of web sight and your pin# so police can locate and retrive your vehicle.
If this is a false alert please press "any #" on your phone now to deactivate automatic 1-hour monitoring.
If vehicle has been stolen or you are unsure at this time, hang up an call police. Televoke will start monitoring for upto
1-hour vehicle or until police have started the Web monitoring.

Televoke (not user at this time) can raise or lower G.O.Fencing by 25' increments.
G.O Fencing default range is 100'




Document 2551.pdf

# Alert "B" = Vehicle's Alarm Sounding

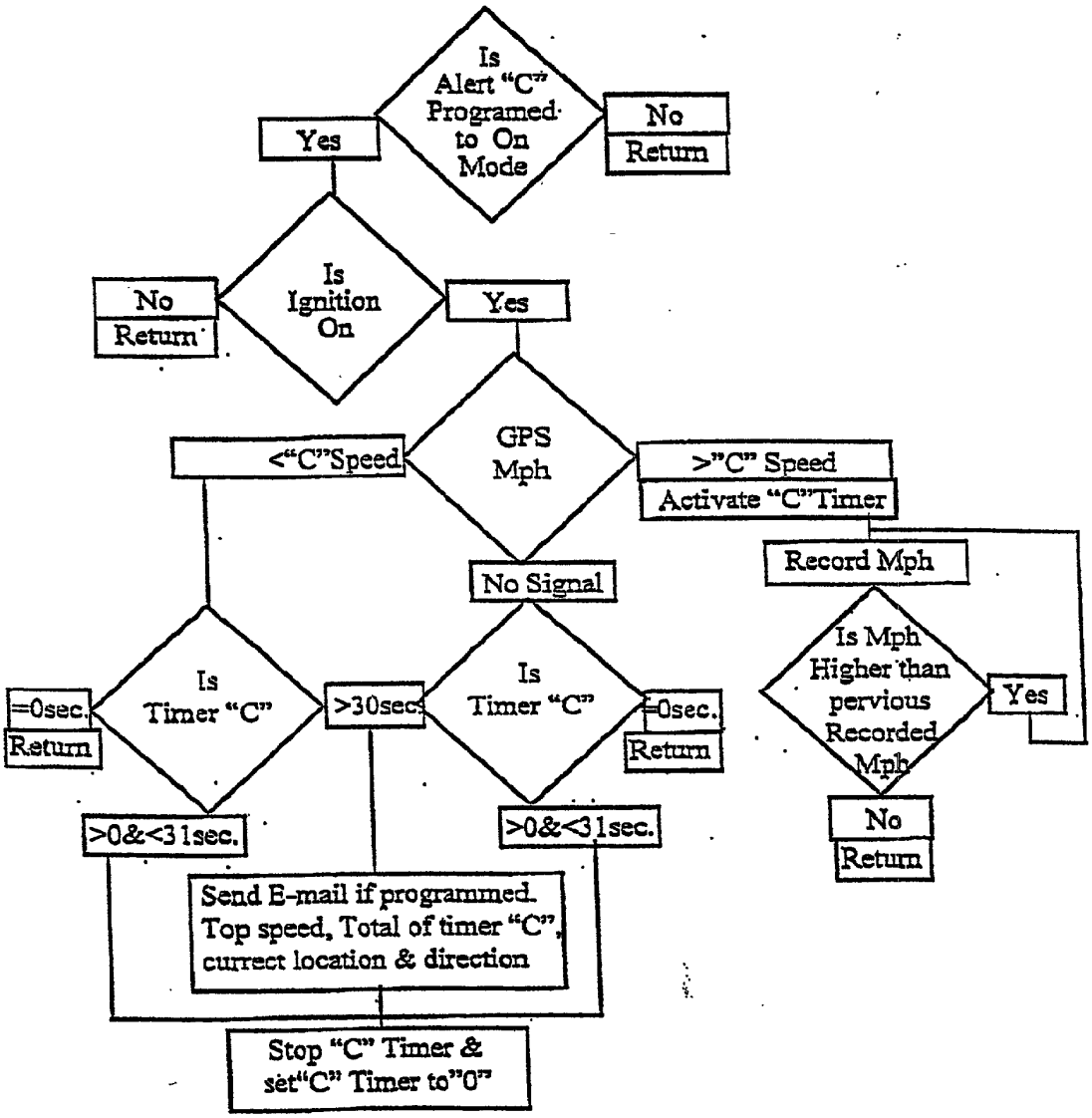



Your vehicle alarm activated is detected by counting the pularity changes within a set time.
One change = a siren was latched on for the set time of 12 seconds.
>17 changes = a car horn was pulsing on/off each time in less than one-second and after 12-seconds continues honking of 18 times = 9 horn hons no more than 1-second apart.
If the car batery power is removed during the 12-seconds then alert "A" is sent to inform the vehicle is being stolen.
One alert B is transmitted then GPS-200 will not send another alert till the GPS-2000 is disarmed and rearmed.

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# Alert "C" = Speeding Too Long Of Time

Vehicle was traveling faster than 80 m.p.h. for a longer time than 30 seconds. GPS indicates the speed.
If pre-programed to do so, records this as an event and will send e-mail instantly of Top speed, total time,direction and location speeding had stopped.
Alert "C" operation an be turned on or off by user
80 M.p.h. is default speed. Televoke (not user at this time) can raise or lower the speed by 5 m.p.h. increments.
30-seconds time is default. Televoke (not user at this time) can raise or lower the time by 5 minutes increments.

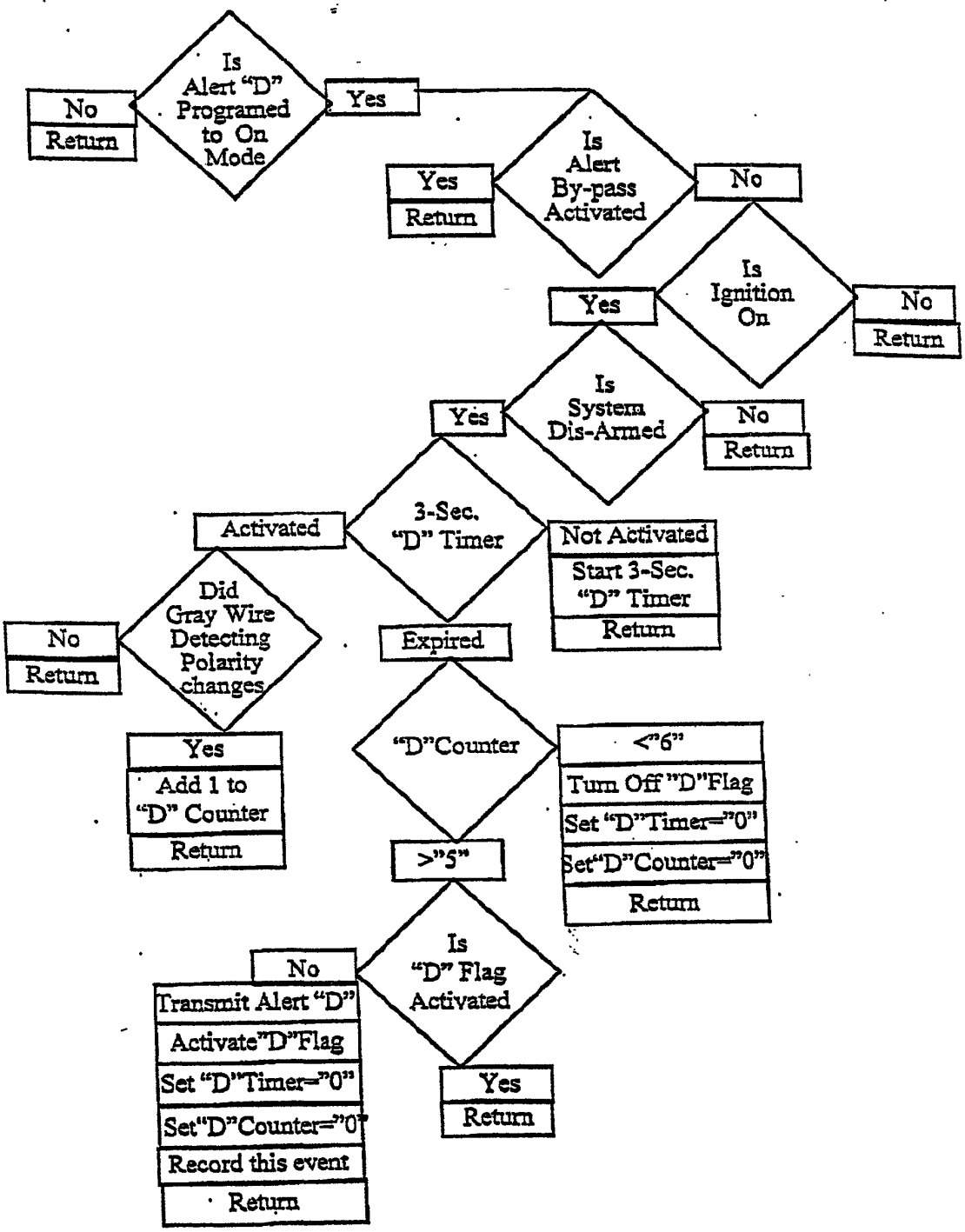



DOCKET ALARM

# Alert "D" = Unauthorized Transmitter Alert

Your vehicle was programmed to operate from a new ignition key or remote transmitter. Please take proper action. This alert will not be sent again till the vehicles alert signal stops.

Unauthorized Transmitter Alert is activated when ignition key is turned on and detects a plurality of polarity changes on Gray wire within a set time. This Alert is prevented from activated again until said circuit returns to normal.

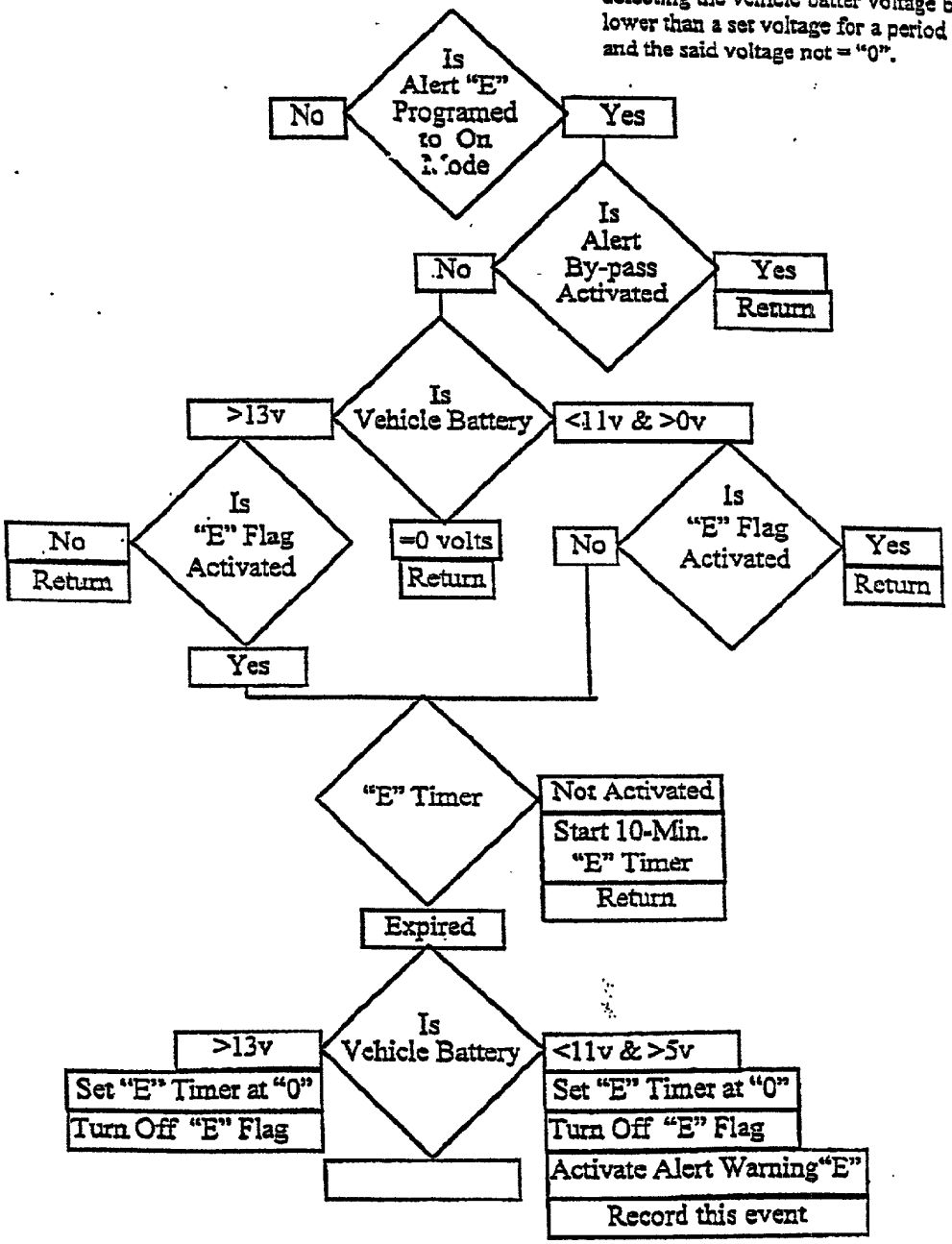



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# Alert "E" = Low Car Battery Power

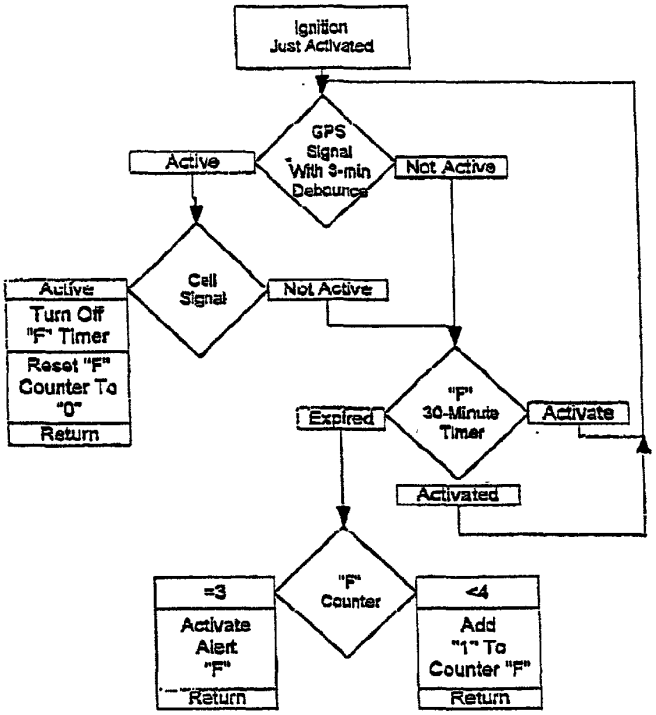
Your vehicle has a low battery voltage indication. Please take proper action. This alert will not be sent again until your vehicles battery has retained the proper voltage.

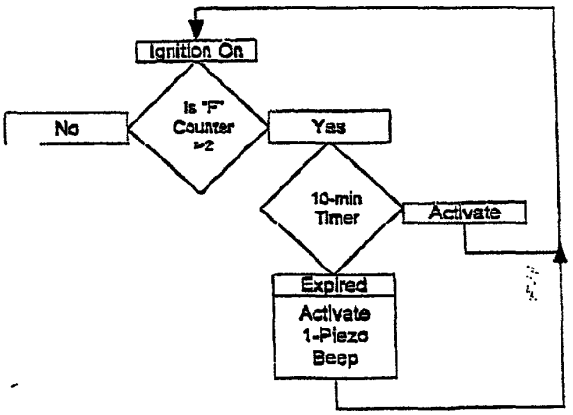
Low battery power Alert is activated by detecting the vehicle batter voltage being lower than a set voltage for a period of time and the said voltage not = "0".




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# Alert "F" = GPS / Cell not active Alert




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A/PROV

# PROVISIONAL APPLICATION COVER SHEET

**This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)**

JC867 U.S. PTO 11/20/00

JC813 U.S. PTO 60/252125 11/20/00

| Docket No. | 58080 | Type (+) ---→ [+] |
|---|---|---|

INVENTOR(s)/APPLICANT(s)

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TITLE OF THE INVENTION (280 Characters Max)

**VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION**

CORRESPONDENCE ADDRESS

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|---|---|---|---|---|---|

ENCLOSED APPLICATION PARTS *(check all that apply)*

| | | | | | |
|---|---|---|---|---|---|
| ✓ | Specification | *Number of Pages* | 29 | ✓ | Applicant qualifies as a Small Entity under 35 CFR under §§1.19 and 1.27 |
| ✓ | Drawing(s) | *Number of Sheets* | 6 | | Other (specify) _____ |

METHOD OF PAYMENT

| | | | | |
|---|---|---|---|---|
| ✓ | A check or money order is enclosed to cover the Provisional Filing Fees | | PROVISIONAL FILING FEE AMOUNT ($) | **$75.00** |
| ✓ | The Commissioner is hereby authorized to charge or credit any discrepancies in fee amounts to Deposit Account No.: | **01-0484** | | |

[ ] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[✓] No. [ ] Yes

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(SIGNATURE OF PERSON MAILING PAPER OR FEE)

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# VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

## Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3

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predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable. The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated

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by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The

Declaration

unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal.

Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.
2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive

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pulses the system activates Alert "D".

3. If the DIP switch 1 is in the Off position then:

a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.

b. if the yellow wire sees grounded or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

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3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.
4. The Gray wire bypass operates as follows:
   a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.
   b. After Alert warning "C" bypass all future Alert "C" until system is armed.
   c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.
5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or honk car horn or flashing light relay.
   a. Non-stop activation from (Command "4")
   b. 30-second activation from (Command "5")
6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

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a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

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Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6"). Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7") Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)

After first stops: Activates Green wire for 1 second to lock the doors.

After second stops: Activate Blue wire for 1 second to unlock the doors.

After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system

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armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated please confirm". This is with system disarmed and detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and

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2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

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b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

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iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

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vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

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The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

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The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

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The device or unit may be initially manufactured and shipped without all of the features being fully functional. One advantage of this is to prevent the unit at will from sending messages when being initially installed and tested in the vehicle, thereby reducing potential false alarms and burdens on the communications system, as well as potential charges to the user. After the unit is fully installed, a communication or transmission from the monitoring center may be sent to the unit enabling one or more selected features, such as during registration during which information is conveyed to the monitoring center and payment is made or authorized by the user.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as

the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert A".

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition. A number of other vehicle security systems provide a series of

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pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B".

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being

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transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

Yet another advantageous feature of some embodiments of invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated that a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or

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combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature of the invention relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Yet another advantageous feature of the invention relates to interfacing with a factory-installed security system. In accordance with this aspect of the invention, the purpose is to detect when the factory security or alarm system is triggered so

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that the user can be notified when away from the vehicle using the capabilities of the tracking and security system described herein. The tracking system would include a voltage and/or current sensing circuit connected to detect repetitive battery spikes based upon an electrical item being turned on and off at the vehicle.

More particularly, with the with the GPS-2000 tracking system armed and the ignition key in the off condition, if the vehicle factory alarm becomes triggered, it causes the car horn and lights to flash and/or the horn to honk. Accordingly, the detector circuit can detect these indications as either dips in the voltage or increases in current flow from the vehicle battery. If these electrical events are detected for a predetermined minimum time of about 30 seconds, for example, and not longer than a predetermined maximum time of about 63 seconds, for example, the GPS-2000 tracker will send the vehicle alarm activated message.

The circuitry for detecting a voltage dip, for example, is of a type commonly included in other conventional vehicle security systems for other purposes, such as detecting tampering, for example. This detection circuitry needs no further description herein.

As will be readily appreciated by those skilled in the art, the reason for the minimum and maximum times is to avoid false alarms. For example, a similar electrical condition can be generated as the car radiator fan cycles on and off after the engine is turned off. By waiting the predetermined minimum time of about 30 seconds, the tracker would not falsely determine this to be operation of the factory security

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system. Opening and closing of the car doors could also create a similar electrical system drain, but would be unlikely to extend for 30 seconds. Accordingly, the minimum time would also avoid a false alarm in this instance of opening and closing the vehicle doors.

The maximum predetermined time could be implemented to avoid flashing operation of the hazard lights, for example, from causing a false alarm. A typical factory alarm would flash the lights and/or honk the horn for about 60 seconds before stopping. Flashing of the hazard lights would likely be for more than about 63 seconds, for example. Accordingly, a false alarm indication based on operation of the hazard lights would also be avoided by the invention.

As will also be appreciated by those skilled in the art, different values for the minimum and maximum times are contemplated by the invention. In addition, in some embodiments only one of the minimum or maximum times may be used.

Another aspect of the invention relates to a user's ability to cancel further sequential notifications. More particularly, in response to an alarm alert, sequential notifications are typically given by sequentially calling a series of telephone numbers. In accordance with this aspect of the invention, the user who receives the call, may cancel any further notifications. In other words, the user can be prompted by voice messages to make a certain keypad entry to thereby cancel further notifications if desired. This can avoid additional telephone or system usage charges, and also reduces the possible nuisance of unnecessary calls to other persons.

Doc. No. 5,917,405

Stopping further notifications upon merely determining that the telephone has been answered may be ineffective, since oftentimes an answering machine may receive the call. Accordingly, it may be preferred to have the user actively cancel further notifications, in contrast to merely stopping further calls upon determining that the telephone call has been completed.

Another aspect of the invention relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect of the invention relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Still another aspect of the invention relates to warning the user of an inoperable or malfunctioning

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GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once ever 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal

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is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

In examples, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Another aspect of the invention relates to having the capability to interface the tracker device with a siren and/or the vehicle horn. Typically the siren is locally connected to ground, such as in the engine compartment, and the output of the tracker unit would provide a positive supply voltage, eg. 12 volts, to drive the siren. Also typically, the vehicle horn is connected to the positive voltage supply, and pressing the horn switch connects the horn to the vehicle ground to thereby complete the circuit and sound the horn. In accordance with this aspect of the invention, the output drive of the tracker unit can be a single wire with pulses of alternating polarity.

More particularly, the output terminal or wire, eg. the gray wire as described above, supplies

Google Exhibit 1008

pulses of alternating polarity. For example, a first pulse can be at the positive supply voltage, and a second pulse can be at the vehicle ground. Each pulse can be about one-half to one second long. The pulses can alternate in a series and with a slight spacing between adjacent pulses. In other security type systems, an intervening relay may be provided to provide for dual polarity capability. However, the tracker unit desirably monitors activation of the horn wire to determine whether the factory or aftermarket security controller is sounding an alarm. The intervening relay would prevent such a determination. Accordingly, the circuitry for providing the alternating polarity pulses of the invention provides the dual compatibility and also permits sensing of the horn activation as described above. Thus, the invention provides the dual compatibility with a single output wire or terminal, and requires no special installation.

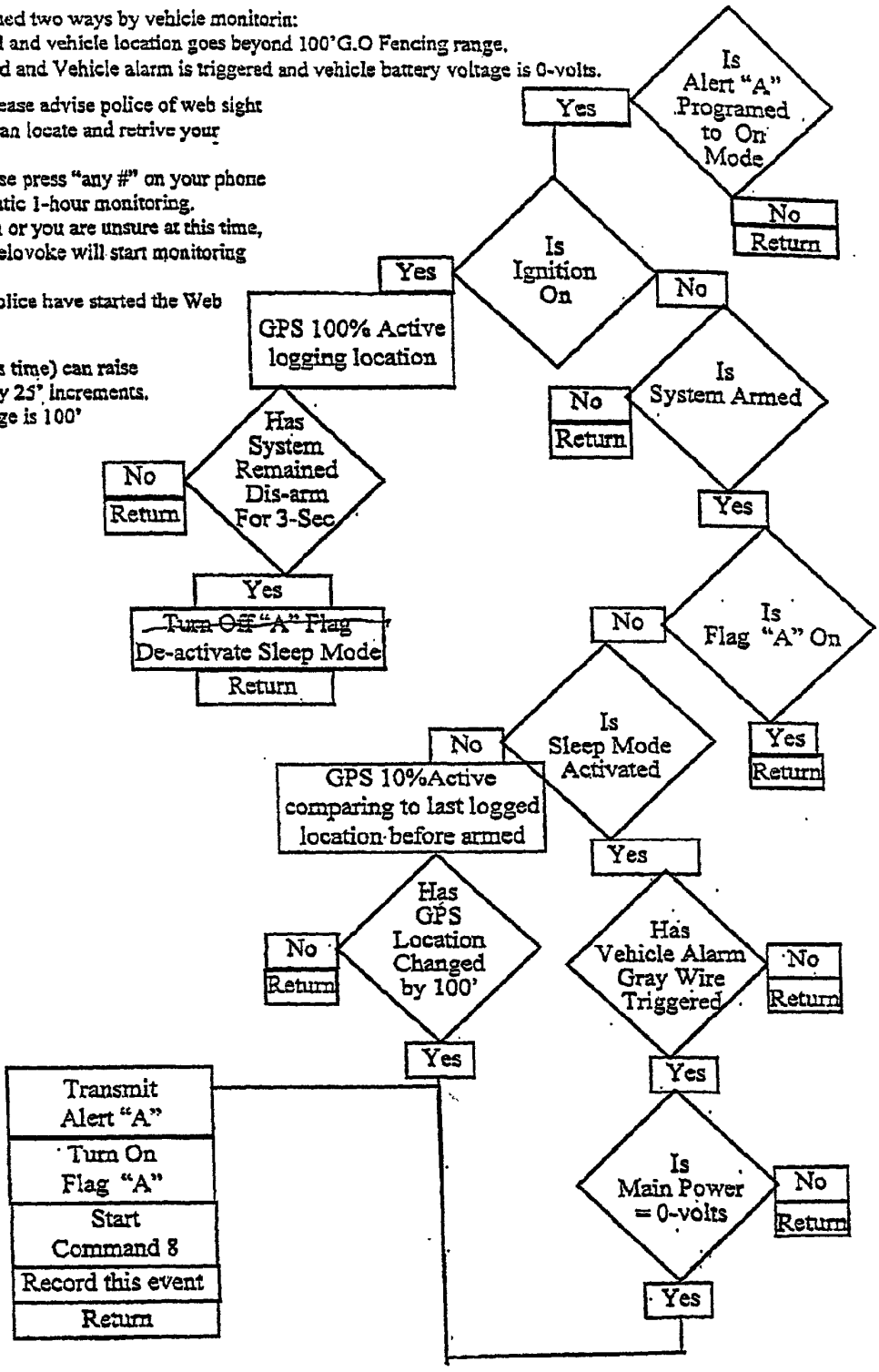
Declaration - Page 659

# Alert "A" = Vehicle Stolen Alert

Vehicle stolen is determined two ways by vehicle monitorin:
1. Tracking system armed and vehicle location goes beyond 100'G.O Fencing range.
2. Tracking system Armed and Vehicle alarm is triggered and vehicle battery voltage is 0-volts.

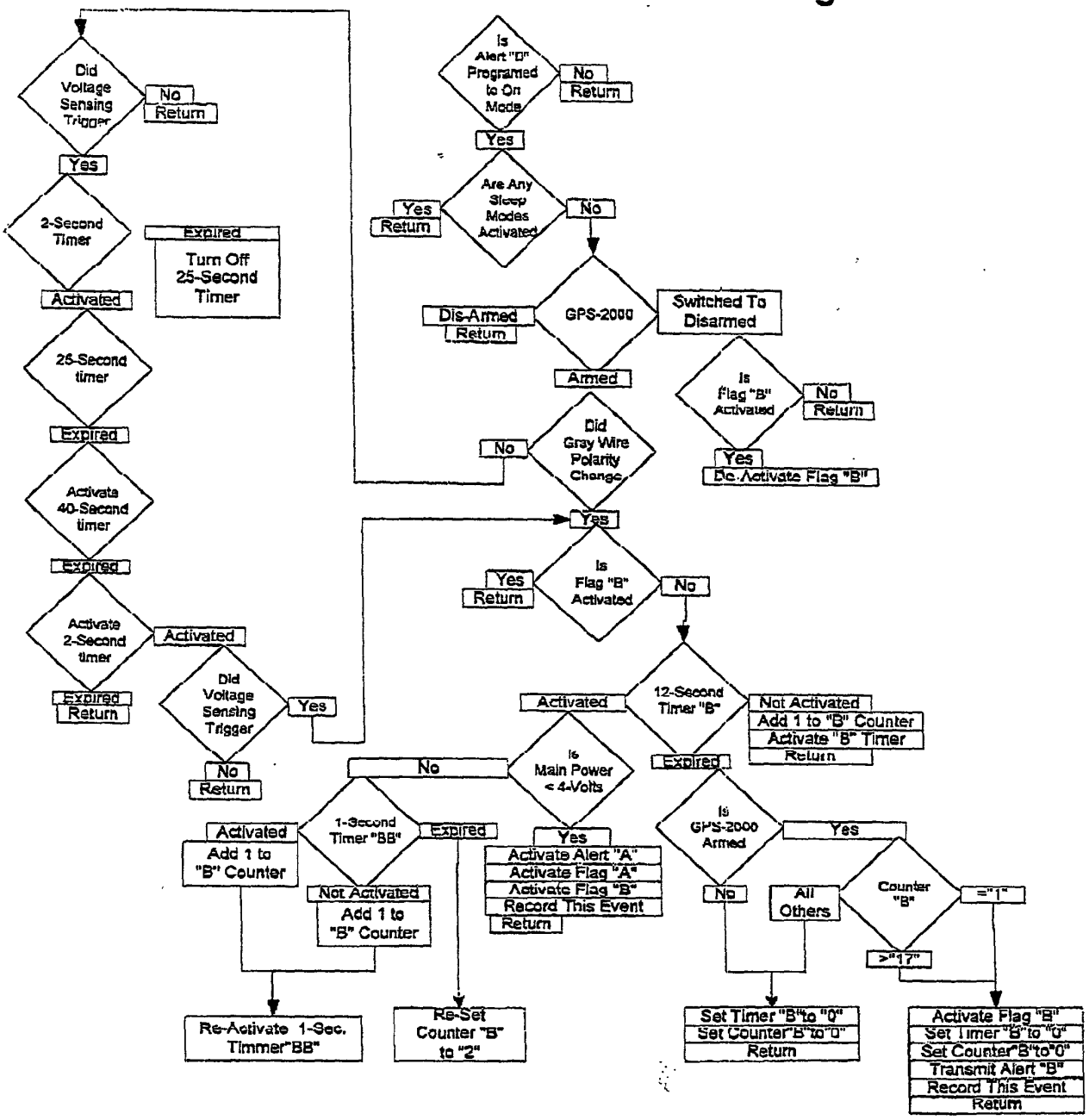
Your vehicle is stolen, please advise police of web sight and your pin# so police can locate and retrive your vehicle.
If this is a false alert please press "any #" on your phone now to deactivate automatic 1-hour monitoring.
If vehicle has been stolen or you are unsure at this time, hang up an call police. Telovoke will start monitoring for upto
1-hour vehicle or until police have started the Web monitoring.

Televoke (not user at this time) can raise or lower G.O.Fencing by 25' increments.
G.O Fencing default range is 100'




DS2SE-E 2008

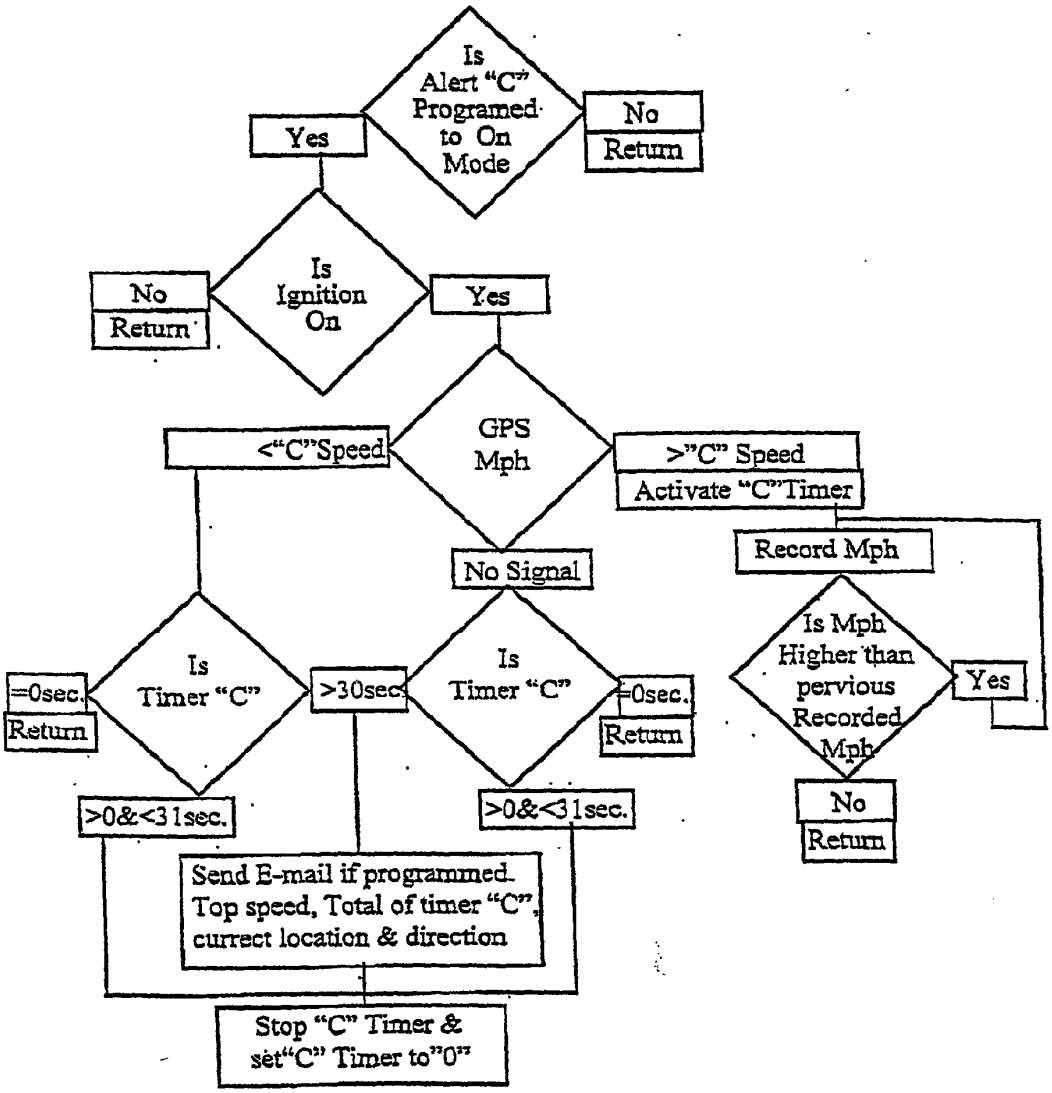
# Alert "B" = Vehicle's Alarm Sounding




Your vehicle alarm activated is detected by counting the pularity changes within a set time.
One change = a siren was latched on for the set time of 12 seconds.
>17 changes = a car horn was pulsing on/off each time in less than one-second and after 12-seconds continues honking of 18 times = 9 horn hons no more than 1-second apart.
If the car batery power is removed during the 12-seconds then alert "A" is sent to inform the vehicle is being stolen.
One alert B is transmitted then GPS-200 will not send another alert till the GPS-2000 is disarmed and rearmed.

# Alert "C" = Speeding Too Long Of Time

Vehicle was traveling faster than 80 m.p.h. for a longer time than 30 seconds. GPS indicates the speed.
If pre-programed to do so, records this as an event and will send e-mail instantly of Top speed, total time,direction and location speeding had stopped.
Alert "C" operation an be turned on or off by user
80 M.p.h. is default speed. Televoke (not user at this time) can raise or lower the speed by 5 m.p.h. increments.
30-seconds time is default. Televoke (not user at this time) can raise or lower the time by 5 minutes increments.

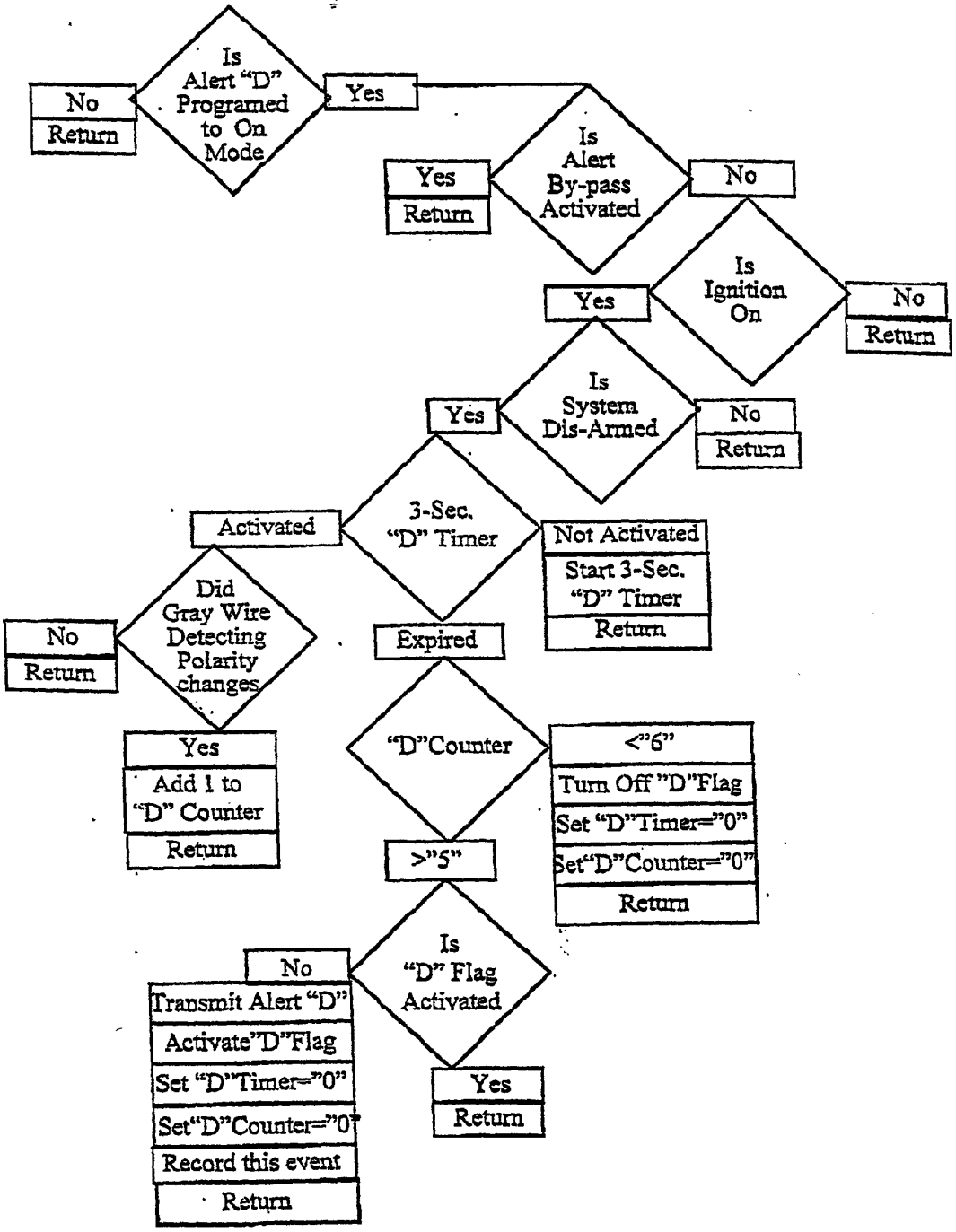



6025225-112005

# Alert "D" = Unauthorized Transmitter Alert

Your vehicle was programmed to operate from a new ignition key or remote transmitter. Please take proper action. This alert will not be sent again till the vehicles alert signal stops.

Unauthorized Transmitter Alert is activated when ignition key is turned on and detects a plurality of polarity changes on Gray wire within a set time. This Alert is prevented from activated again until said circuit returns to normal.

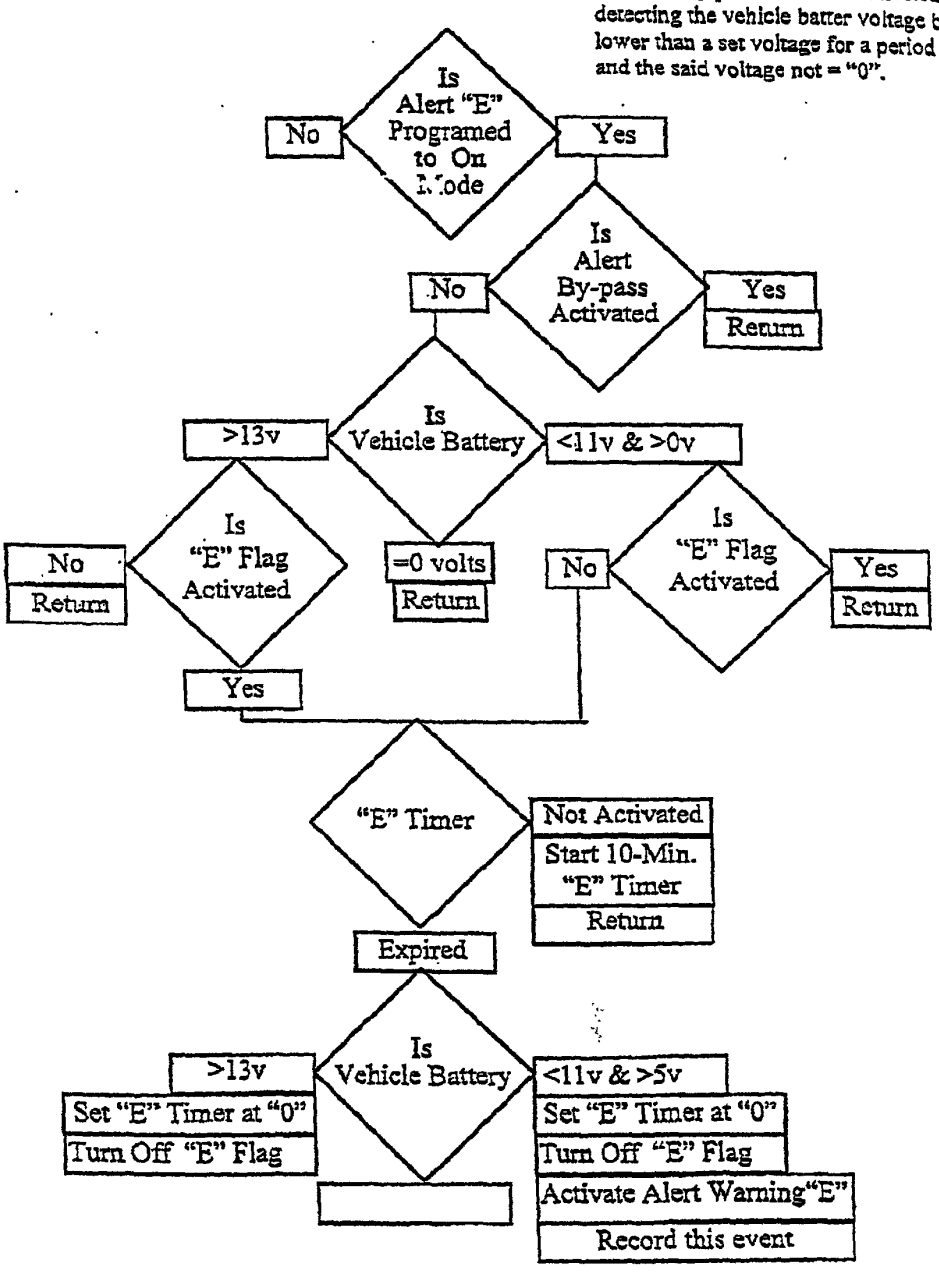



5,053,743 - 5,252,962

# Alert "E" = Low Car Battery Power

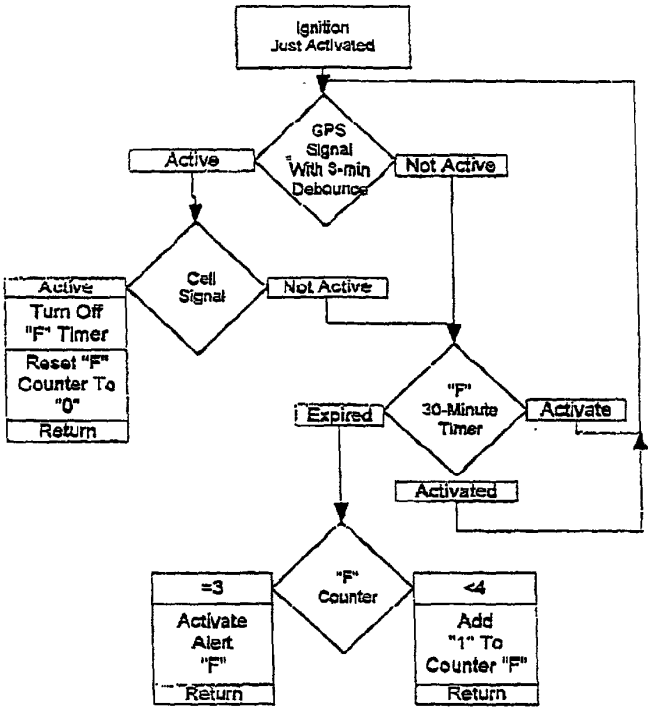
Your vehicle has a low battery voltage indication. Please take proper action. This alert will not be sent again until your vehicles battery has retained the proper voltage.

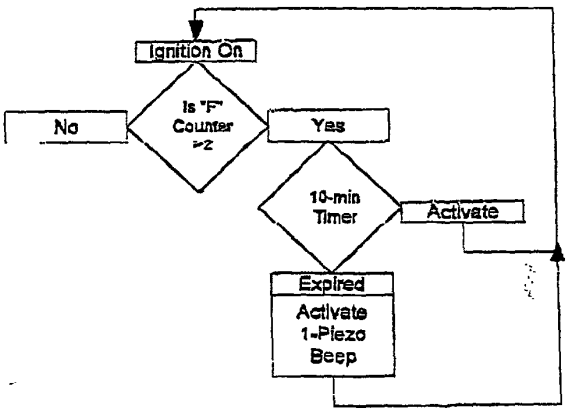
Low battery power Alert is activated by detecting the vehicle batter voltage being lower than a set voltage for a period of time and the said voltage not = "0".




Docket: 35264.0

# Alert "F" = GPS / Cell not active Alert




8,805,414 B2

10-02-00 Approv

# PROVISIONAL APPLICATION COVER SHEET

**This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)**

| Docket No. | 58076 | Type (+) --→ [+] |
|---|---|---|

| INVENTOR(s)/APPLICANT(s) | | | |
|---|---|---|---|
| LAST NAME | FIRST NAME | MID. INIT. | RESIDENCE (CITY/STATE OR COUNTRY) |
| FLICK | Kenneth | E. | Douglasville, GA |

TITLE OF THE INVENTION (280 Characters Max)

**VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION**

CORRESPONDENCE ADDRESS

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|---|---|---|---|---|---|

ENCLOSED APPLICATION PARTS *(check all that apply)*

| | | | | | | |
|---|---|---|---|---|---|---|
| ✓ | Specification | *Number of Pages* | 24 | | | Small Entity Statement |
| ✓ | Drawing(s) | *Number of Sheets* | 5 | | | Other (specify) _____ |

METHOD OF PAYMENT

| | | | | |
|---|---|---|---|---|
| ✓ | A check or money order is enclosed to cover the Provisional Filing Fees | | PROVISIONAL FILING FEE AMOUNT ($) | **$75.00** |
| ✓ | The Commissioner is hereby authorized to charge the filing fee and/or any discrepancies to Deposit Account No.: | **01-0484** | | |

[ ] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
[✓] No. [ ] Yes

Respectfully Submitted,

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Date: September 29, 2000

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Applicant: | Kenneth E. FLICK |
| Serial: | Not Yet Assigned |
| Attorney's Docket No.: | 58076 |
| Filed: | Herewith |

For: **VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION**

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled: **VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION** described in:

(x) the specification filed herewith
( ) application serial no. _____ filed _____
( ) patent no. _____ issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

(x) no such person, concern, or organization
( ) persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME KENNETH E FLICK

ADDRESS 5326 PRESLEY PLACE

( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Kenneth E. Flick
NAME OF INVENTOR

SIGNATURE OF INVENTOR

9-28-00
DATE

# VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

## Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

## Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3

predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple

locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle

doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal. Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.

2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D".

3. If the DIP switch 1 is in the Off position then:
a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.
b. if the yellow wire sees grounded or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.

4. The Gray wire bypass operates as follows:
   a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.
   b. After Alert warning "C" bypass all future Alert "C" until system is armed.
   c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.

5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or

honk car horn or flashing light relay.

a. Non-stop activation from (Command "4")

b. 30-second activation from (Command "5")

6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to

Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6").

Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7")

Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)
After first stops: Activates Green wire for 1 second to lock the doors.
After second stops: Activate Blue wire for 1 second to unlock the doors.
After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated please confirm". This is with system disarmed and

detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and
2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds

pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond

to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in

turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

The device or unit may be initially manufactured and shipped without all of the features being fully functional. One advantage of this is to prevent the unit at will from sending messages when being initially installed and tested in the vehicle, thereby reducing potential false alarms and burdens on the communications system, as well as potential charges to the user. After the unit is fully installed, a communication or transmission from the monitoring center may be sent to the unit enabling one or more selected features, such as during registration during which information is conveyed to the monitoring center and payment is made or authorized by the user.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert A".

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission

to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition. A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B".

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user

when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

Yet another advantageous feature of some embodiments of invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated that a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period.

Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

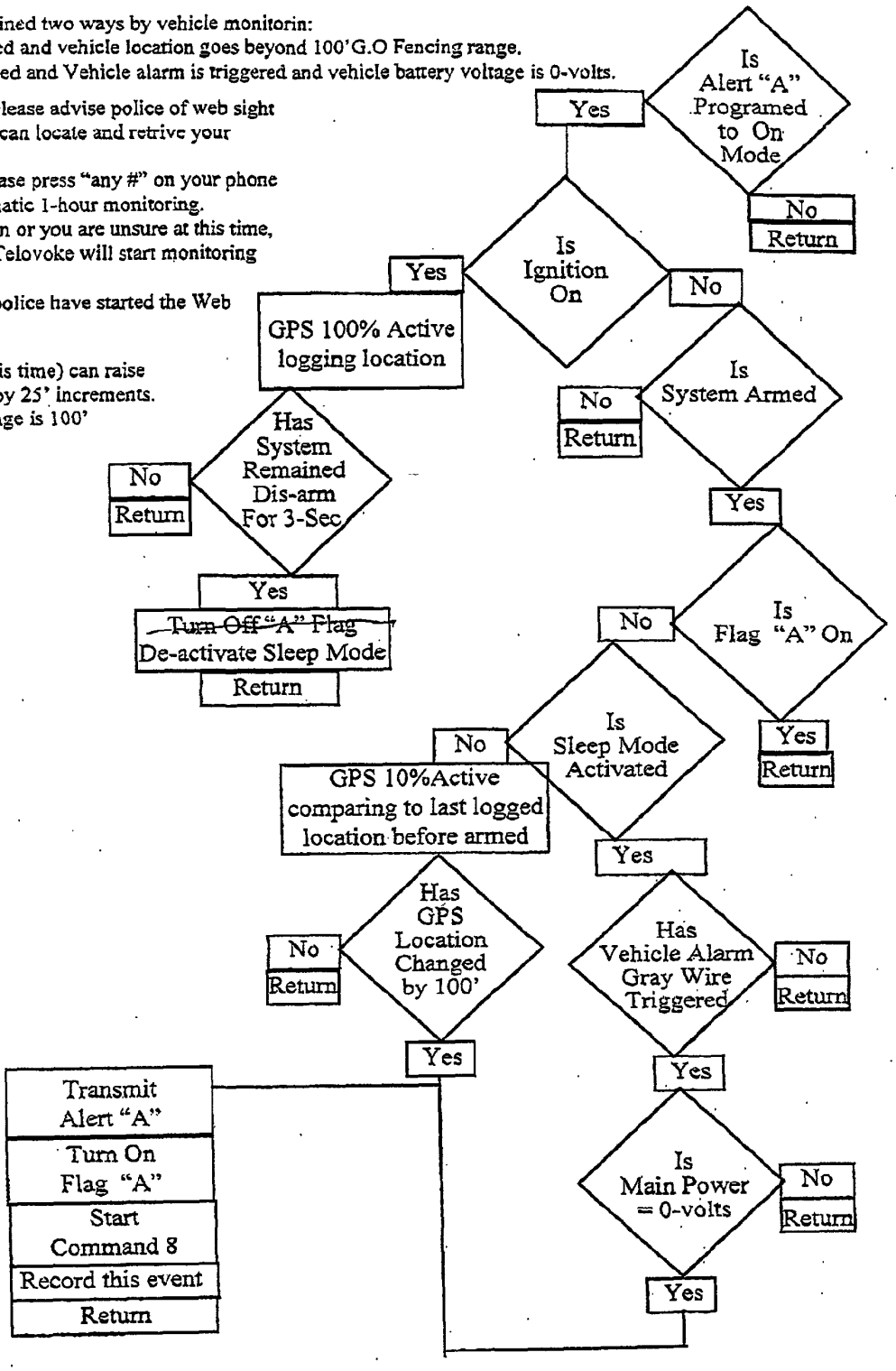
Yet another feature of the invention relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

# Alert "A" = Vehicle Stolen Alert

Vehicle stolen is determined two ways by vehicle monitorin:
1. Tracking system armed and vehicle location goes beyond 100'G.O Fencing range.
2. Tracking system Armed and Vehicle alarm is triggered and vehicle battery voltage is 0-volts.

Your vehicle is stolen, please advise police of web sight and your pin# so police can locate and retrive your vehicle.
If this is a false alert please press "any #" on your phone now to deactivate automatic 1-hour monitoring.
If vehicle has been stolen or you are unsure at this time, hang up an call police. Telovoke will start monitoring for upto
1-hour vehicle or until police have started the Web monitoring.

Televoke (not user at this time) can raise or lower G.O.Fencing by 25' increments.
G.O Fencing default range is 100'

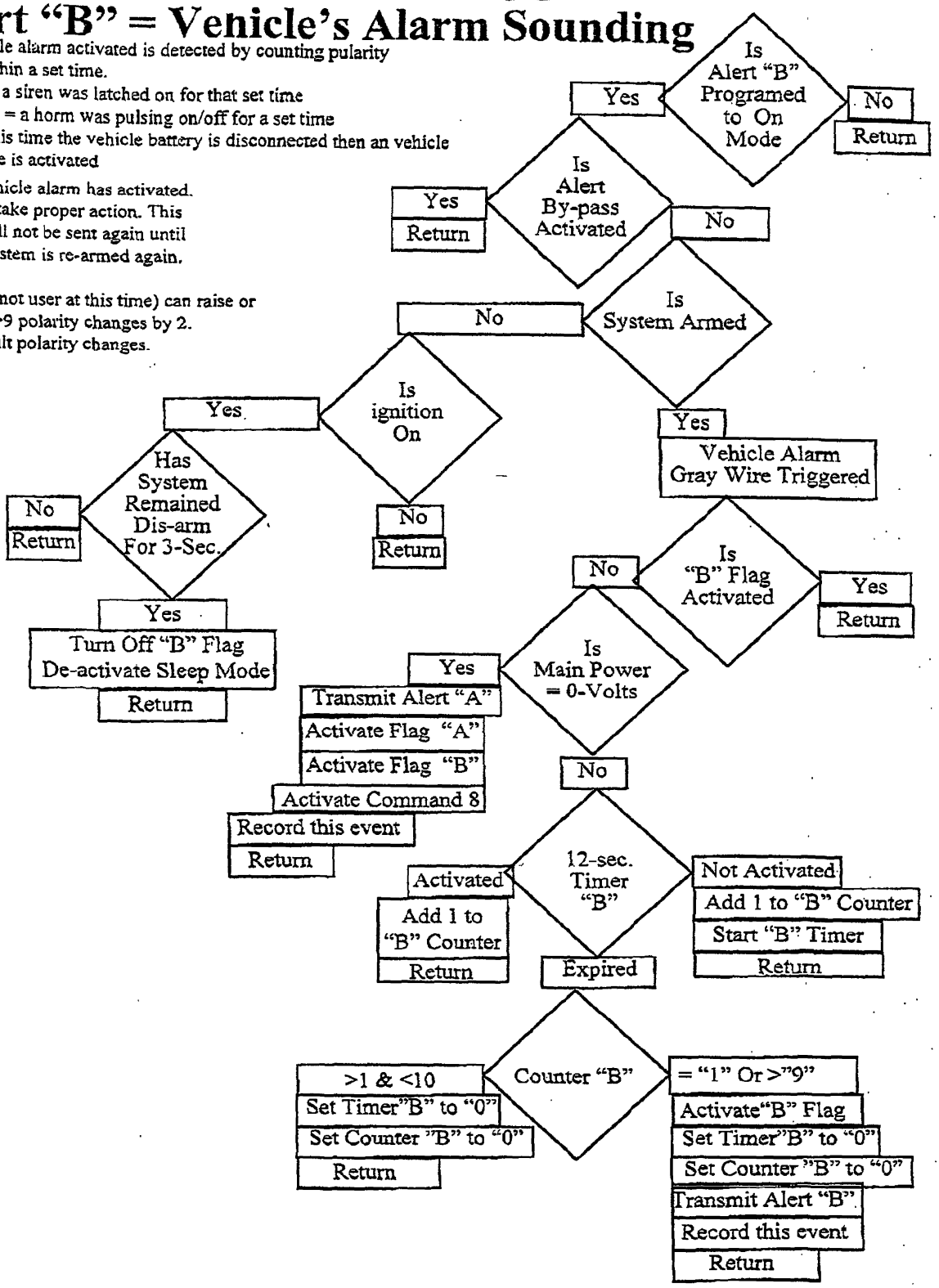


# Alert "B" = Vehicle's Alarm Sounding

Your vehicle alarm activated is detected by counting pularity changeswithin a set time.
1 change = a siren was latched on for that set time
>9 changes = a horn was pulsing on/off for a set time
If during this time the vehicle battery is disconnected then an vehicle stolen mode is activated

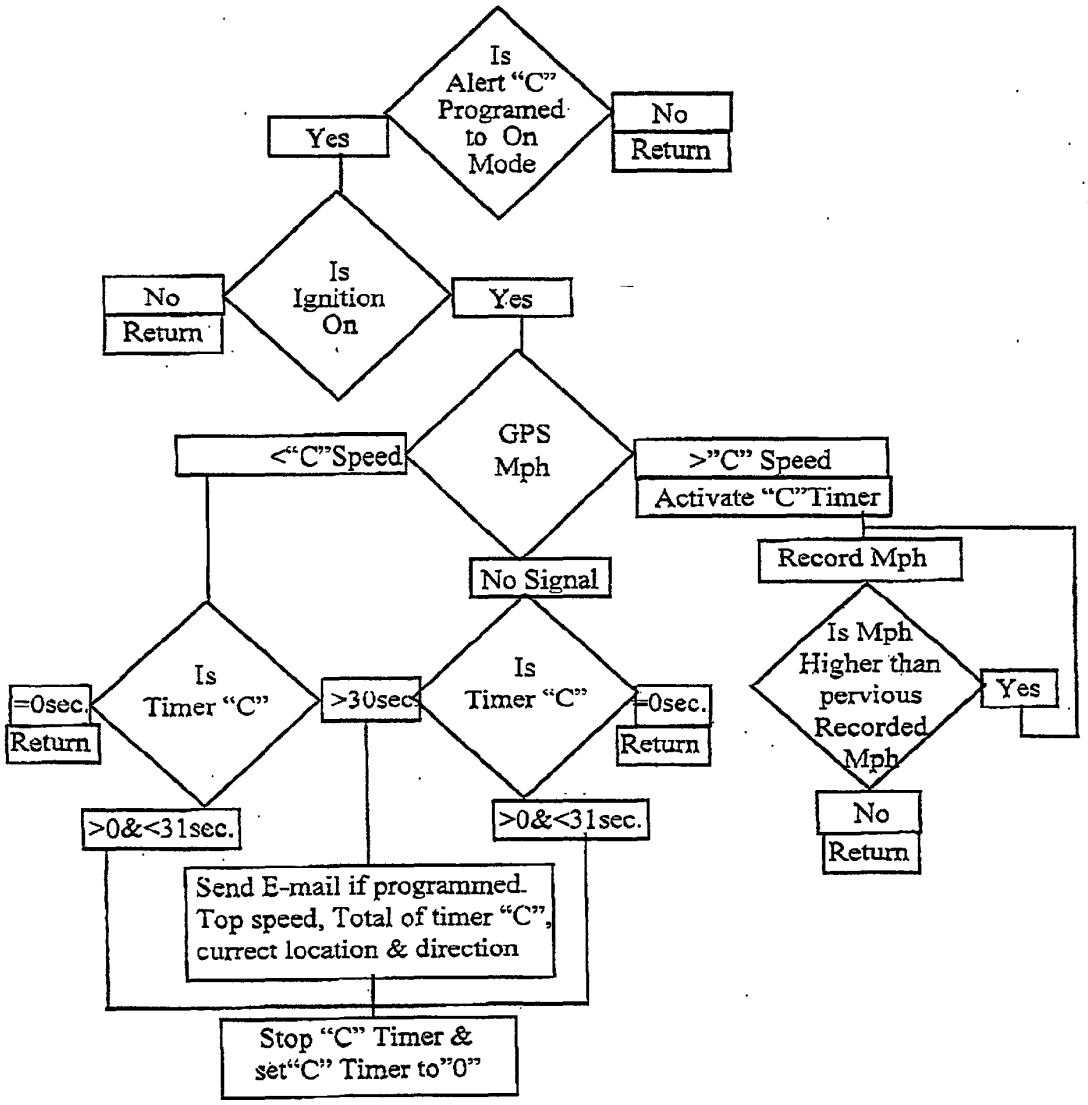
Your vehicle alarm has activated. Please take proper action. This alert will not be sent again until your system is re-armed again.

Televoke (not user at this time) can raise or lower the >9 polarity changes by 2.
>9 is default polarity changes.



# Alert "C" = Speeding Too Long Of Time

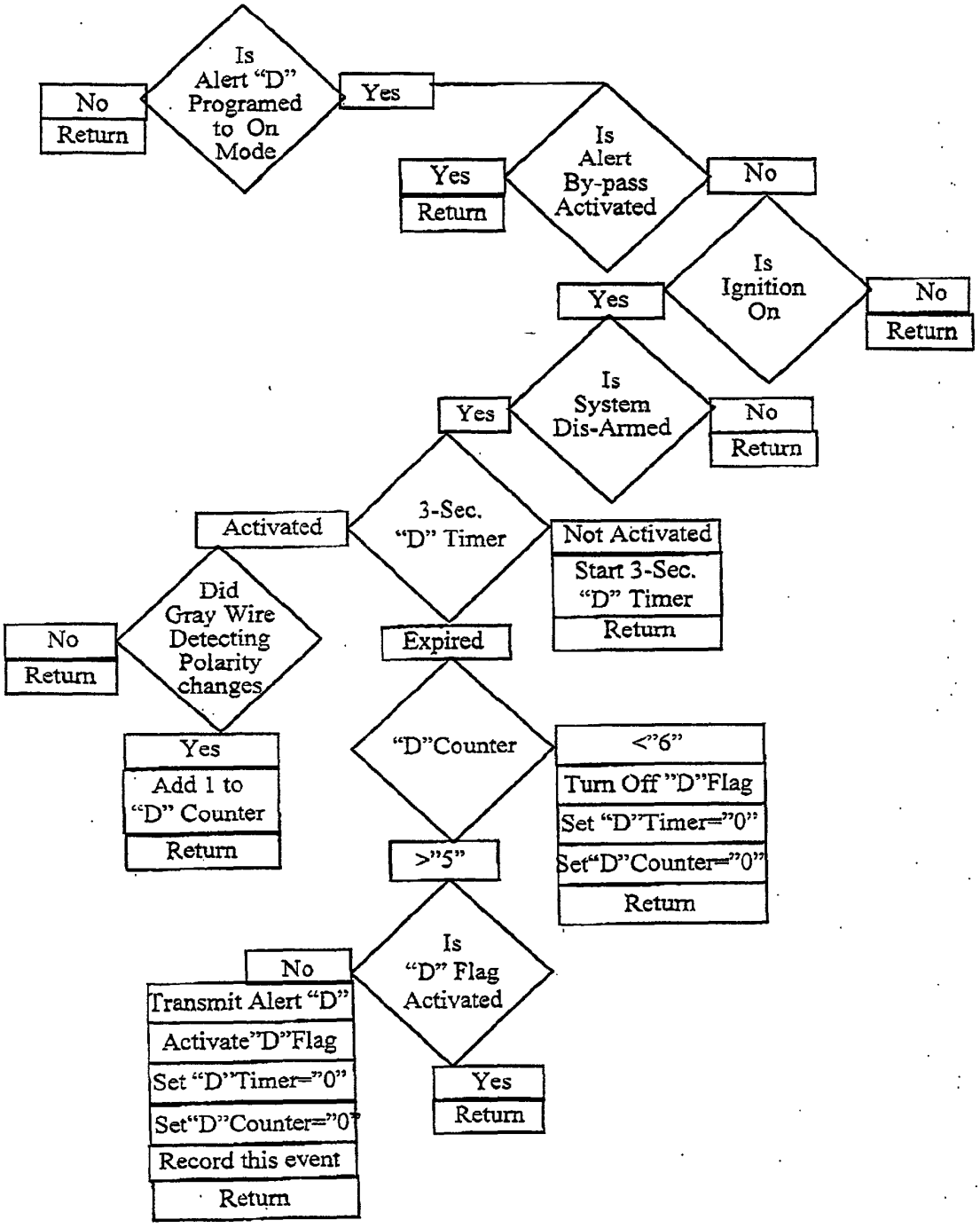
Vehicle was traveling faster than 80 m.p.h. for a longer time than 30 seconds. GPS indicates the speed.
If pre-programed to do so, records this as an event and will send e-mail instantly of Top speed, total time,direction and location speeding had stopped.
Alert "C" operation an be turned on or off by user
80 M.p.h. is default speed. Televoke (not user at this time) can raise or lower the speed by 5 m.p.h. increments.
30-seconds time is default. Televoke (not user at this time) can raise or lower the time by 5 minutes increments.



# Alert "D" = Unauthorized Transmitter Alert

Your vehicle was programmed to operate from a new ignition key or remote transmitter. Please take proper action. This alert will not be sent again till the vehicles alert signal stops.

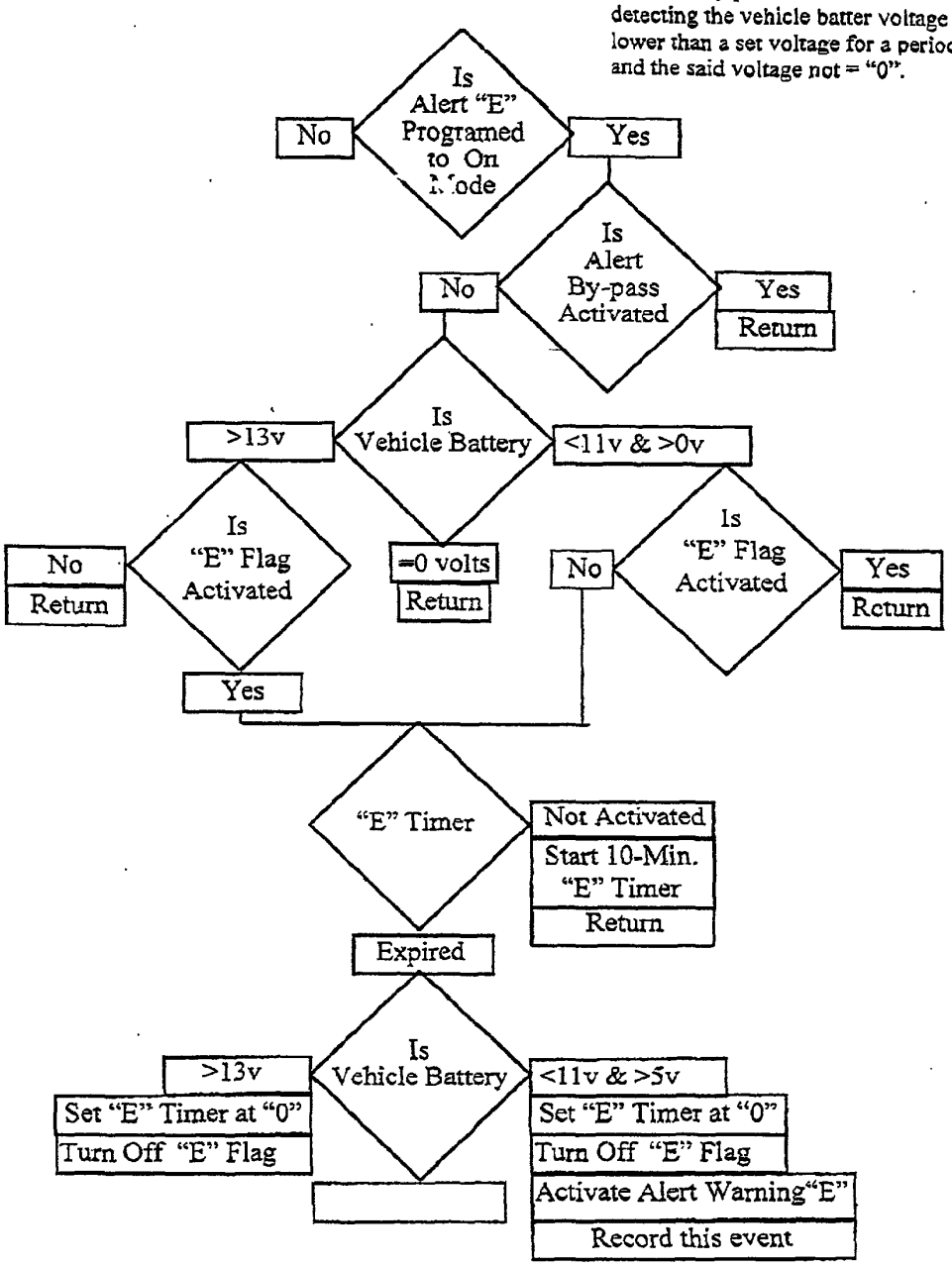
Unauthorized Transmitter Alert is activated when ignition key is turned on and detects a plurality of polarity changes on Gray wire within a set time. This Alert is prevented from activated again until said circuit returns to normal.



# Alert "E" = Low Car Battery Power

Your vehicle has a low battery voltage indication. Please take proper action. This alert will not be sent again until your vehicles battery has retained the proper voltage.

Low battery power Alert is activated by detecting the vehicle batter voltage being lower than a set voltage for a period of time and the said voltage not = "0".



# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | |
| **Filing Date:** | |
| **Title of Invention:** | Vehicle Tracking Unit with Downloadable Codes and Associated Methods |
| **First Named Inventor/Applicant Name:** | KENETH E. FLICK |
| **Filer:** | Mark B. Garred/Andrea Levine |
| **Attorney Docket Number:** | CAAMP-001X |

Filed as Small Entity

**Filing Fees for ex parte reexam**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| EX PARTE REEXAMINATION (1.510(A)) NON-STREAMLINED | 2812 | 1 | 6000 | 6000 |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **6000** |

| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 38001874 |
| **Application Number:** | 90014419 |
| **International Application Number:** | |
| **Confirmation Number:** | 8770 |
| **Title of Invention:** | Vehicle Tracking Unit with Downloadable Codes and Associated Methods |
| **First Named Inventor/Applicant Name:** | KENETH E. FLICK |
| **Customer Number:** | 7663 |
| **Filer:** | Mark B. Garred/Andrea Levine |
| **Filer Authorized By:** | Mark B. Garred |
| **Attorney Docket Number:** | CAAMP-001X |
| **Receipt Date:** | 11-DEC-2019 |
| **Filing Date:** | |
| **Time Stamp:** | 16:56:18 |
| **Application Type:** | Reexam (Third Party) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $6000 |
| RAM confirmation Number | E2019BAG56595049 |
| Deposit Account | 194330 |
| Authorized User | Andrea Levine |
| The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:<br>37 CFR 1.16 (National application filing, search, and examination fees)<br>37 CFR 1.17 (Patent application and reexamination processing fees) | |

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Appeal Brief - Third Party Requester | Reexam_Request_Brief_11Dec 2019.pdf | 350644<br>e9ef552558589f0d08a3dd014050bd75387 09efd | no | 60 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-A-US8032278-Flick.pdf | 2882575<br>e02a3ed72227103c09439d9e3efb02684e5 6f06e | no | 29 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-C-US8032278-851-Reexam-Cert.pdf | 279977<br>4b167c51ad5538918c35ecdba9673d6b83 1c2255 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit_D_ClaimChart-551_Flic k_103_12_11.pdf | 492381<br>ea364282031fc7d2158af170f72235dc69fb 12a2 | no | 17 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit_E_ClaimChart-551_Flic k_Double_Patenting12_11.pdf | 165464<br>7784cc09806cefdd02312adae48be9849ab ebe2c | no | 15 |
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| **Information:** | | | | | |
| 6 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-F-US7720597-Flick.pdf | 2719440<br>440a06e70633f0e54c5f314c580efef62abac a96 | no | 27 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 7 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-G-US7149623-Flick.pdf | 2587119<br>cd839fdc4a38f70a761abd54943f72b4229eed08 | no | 26 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | ExhibitB-US8032278-587-ReexamCert_PDF.pdf | 155316<br>3d2f5b5788e695d3ad40ce136ad6846bc661ab6c | no | 2 |
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| **Information:** | | | | | |
| 9 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-H-US6606561-Flick.pdf | 2762344<br>f00f1fcb567e297a9afd65b00b8a3010754a130a | no | 30 |
| **Warnings:** | | | | | |
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| 10 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-I-60264811-Flick.pdf | 1871796<br>2d7c859afae621dcaf772bb334bbbae5253e29b7 | no | 45 |
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| **Information:** | | | | | |
| 11 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-J-60258005-Flick.pdf | 1711935<br>4e75658825dd12afca477bf7b1ba87401b164d86 | no | 42 |
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| **Information:** | | | | | |
| 12 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-K-60251552-Flick.pdf | 1587152<br>16328d36b62ad4e88ff2b05a2a0961b025a18580 | no | 40 |
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| 13 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-L-60252125-Flick.pdf | 1406356<br>71cb0d6e01f3e6e9f63e4517abfda0e8e3de2530 | no | 36 |
| **Warnings:** | | | | | |
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| 14 | Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party | Exhibit-M-60236890-Flick.pdf | 1166215<br>5827692f3e675ce71ecf341df874f45a45f5ad6f | no | 32 |
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| **Information:** | | | | | |
| 15 | Fee Worksheet (SB06) | fee-info.pdf | 30256<br>fedc6471b59c9b6c00e596d68ae57f9d73a010bf | no | 2 |
| **Warnings:** | | | | | |
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| | | **Total Files Size (in bytes):** | 20168970 | | |

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**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent No. 8,032,278

| | | | |
|---|---|---|---|
| Issued: | October 4, 2011 | Reexamination Control No.: | Not Yet Assigned |
| Filed: | July 3, 2007 | Examiner: | Nguyen, Cuong H. |
| Applicant: | Omega Patents, L.L.C. | Art Unit: | 3661 |
| Title: | Vehicle Tracking Unit with Downloadable Codes and Associated Methods | | |

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**Request for *Ex Parte* Reexamination of U.S. Patent 8,032,278**

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## I. INTRODUCTION

Innova Electronics Corporation (hereinafter, "Requester") requests (hereinafter, "this Request") reexamination under 35 U.S.C. §§ 301-307 and 37 C.F.R. § 1.510 *et seq.* of claims 1 through 22 of U.S. Patent No. 8,032,278 (hereinafter, "Flick '278 patent"), a copy of which is attached as Exhibit A. The Flick '278 patent was filed July 3, 2007, and issued on October 4, 2011. Therefore, the Flick '278 patent falls within the pre-AIA statutory provisions[1]. The Flick '278 patent lists Kenneth E. Flick as the sole inventor, and is believed to be currently assigned to Omega Patents, L.L.C. (hereinafter, "Patent Owner"). The Flick '278 patent has been the subject of previous reexaminations. *See ex parte* Reexamination No. 90/013,587 (filed September 14, 2015 and concluding with a Reexamination Certificate being issued on December 28, 2016) (hereinafter, the "'278 First Reexam"); *ex parte* Reexamination No. 90/013,851 (filed October 28, 2016 and concluding with a Reexamination Certificate being issued on February 6, 2019) (hereinafter, the "'278 Second Reexam"); *ex parte* Reexamination No. 90/014,309 (filed May 24, 2019) (hereinafter, the "'278 Third Reexam").

Requestor sells multivehicle compatible scan tools adapted to interface with vehicle diagnostic systems. See www.innova.com

The use of position determining devices in combination with Innova scan tools, e.g., for fleet services applications, is an application that could be implemented by adaption of Requestor products. However, the patents at issue represent a possible obstacle to Requestor, which appears to be unwarranted, given the state of the prior art, as described below.

[1] All references to statutory language in this Request shall reference pre-AIA versions unless explicitly noted.

Simply stated, and for the reasons articulated in detail below, Requester believes the scope of the Flick '278 patent does not rise to the level of being patentable over the state of the prior art, including prior art owned by Patent Owner, at the time the invention was made, and therefore has filed this Request.

This Request presents obviousness and double patenting arguments based on U.S. Patent No. 5,719,551 to Flick (hereinafter, "Flick '551 patent") and prior art references showing the state of the art. The Flick '278 patent and the Flick '551 patent both name the same sole inventor and were commonly owned at the time of their patent application filings, but the Flick '551 patent is not part of the priority chain of the Flick '278 patent. As set forth in more detail below, Requester submits that the Flick '551 patent discloses all claim limitations of the Flick '278 patent except for a vehicle position determining device. A variety of prior art references establish that at the time of the filing of both the Flick '278 and Flick '551 patent applications, vehicle position determining devices were already well known in the art. In particular, vehicle position determining devices (such as GPS) were well known to be included in vehicle security and tracking systems (see, e.g., Brinkmeyer, Monroe, Drori references from the Flick '278 and Flick '551 patent file histories). It was also well known that vehicle position determining devices could be connected to multi-vehicle compatible controllers and vehicle buses (see, e.g., Flick '278 Third Reexam, citing the Cell Port Labs Press Release (with its inherent disclosures of Spelt and the SAE Manuals) and Jones). The Flick '551 patent and these prior art references are now presented in this Request after further investigation.

In particular, Requester notes that the "Background of the Invention" section of the Flick '278 patent acknowledges that the "multi-vehicle compatible controller" and "downloading interface for permitting downloading of enabling data" recited in the claims of the Flick '278 patent

were known at the time of the filing of the Flick '278 patent. Specifically, U.S. Patent No. 5,719,551, which issued February 17, 1998 is identified as Applicant Admitted Prior Art disclosing the features associated with the claimed "multivehicle compatible controller" and "downloading interface." The novelty of the Flick '278 patent is asserted as being the incorporation of these prior art techniques into vehicle tracking units:

> "A number of patents disclose various security and control systems that address data bus interoperability. For example, **U.S. Pat No. 5,719,551, assigned to Omega Patents, LLC, the assignee of the present invention, discloses a vehicle security system for a vehicle including a data bus connecting a plurality of vehicle devices. A signal enabling circuit enables the alarm controller to operate using a set of desired signals selected from a plurality of possible sets for different vehicles. U.S. Pat. No. 6,011,460, assigned to Omega Patents, LLC, discloses a similar system where the set of desired signals from the plurality of different sets of signals for different vehicles is obtained, such as by connection and communication with a downloading device**. Additionally, **U.S. Pat. No. 6,756,885, also assigned to Omega Patents, LLC, discloses a multi-vehicle control system whereby a multi-vehicle compatible controller stores a set of device codes for a given vehicle device for a plurality of different vehicles.** Device codes are read from the data communications bus, and a match between a read device code and the stored device codes is determined to provide compatibility with different vehicles.
>
> **Unfortunately, such advanced techniques for dealing with multiple device codes for a vehicle having a data communications bus have not yet been developed for vehicle tracking units**."

Flick '278 patent, col. 2, lines 17-41 (emphasis added).

Requester submits that the Flick '278 patent, when viewed against the claims in the Flick '551 patent, is invalid for double-patenting. Not only does the Flick '278 patent admit that the Flick '551 patent discloses multi-vehicle compatibility and a downloading interface, these features are included in the language of the claims of the Flick '551 patent. As viewed against the Flick '551 patent, the claims of the Flick '278 patent only add the feature of "a vehicle position determining device." Upon a closer examination of the Flick '278 claims, the vehicle position determining device is essentially recited as an additional component, where the position data

obtained by the vehicle position device is not utilized for any purpose in the claims. *See, e.g.*, Flick '278 patent, claim 1.

As stated earlier, vehicle position determining devices such as GPS were already known to be included with vehicle security and tracking systems prior to the Flick '278 patent. *See, e.g.*, Brinkmeyer, Monroe, and Drori references. Additionally, the features of the Flick '278 patent claims that were utilized to differentiate from the prior art of record during the Flick '278 prosecution history (i.e., a multi-vehicle compatible controller and a downloading interface for downloading enabling data, *see* Exhibit X, Office Action dated January 5, 2011, p. 2- 3; Exhibit Y, Patent Owner's response filed April 5, 2011 at p. 9 of 12 through p. 11 of 12) are duplicative of the features recited in the claims of the Flick '551 patent. *See, e.g.*, Flick '551 patent, claims 21, 23, and 24. Thus, one of ordinary skill in the art would consider it an obvious variant of the Flick '551 patent to incorporate into the disclosed system a vehicle position determining device such as a GPS, as GPS devices were known in the art prior to the Flick '278 patent as demonstrated by prior art references showing the state of the art and even prior art references cited during prosecution of the Flick '551 patent.

Finally, previous reexaminations have found that the Flick '278 patent is not entitled to the benefit of its claimed priority date. For the reasons set out below (and which have been relied upon by the Patent Office in said previous reexaminations), the earliest priority date the Flick '278 patent is entitled to is July 3, 2007.

## II. THE CLAIMS OF THE FLICK '278 PATENT ARE NOT ENTITLED TO THE BENEFIT OF EARLIER PRIORITY DATES

Before discussing newly identified prior art references that raise additional substantial new questions of patentability with respect to claims 1 - 22 of the Flick '278 patent, Requester

observes that claims 1 through 22 of the Flick '278 patent are not entitled to the benefit of the priority dates of any of the applications to which the Flick '278 claims priority.

The Patent Office has previously determined that the priority date of the Flick '278 patent is July 3, 2007 in the '278 First Reexam. *See* Reexam – Non-Final Action, dated May 6, 2016, p. 2 ("The Flick '278 Patent is a continuation in part of application 11/076,259. This parent application did not disclose or claim the multi-vehicle capability and the bus extending throughout the vehicle as described and claimed in the Flick '278. Accordingly, the earliest effective filing date for Flick '278 is July 3, 2007."). This determination of priority date by the Patent Office does not appear to have been disputed by the Patent Owner in any later events in the '278 First Reexam. Subsequently, the Patent Office reaffirmed this priority date in the '278 Second Reexam. *See* Determination – Reexam Ordered, dated December 15, 2016, p. 5 ("The earliest effective filing date the '278 patent is entitled to is July 3, 2007 (see paragraph 2 of the 5/6/2016 non-final rejection of the 90/013,587 discussed infra)."). Accordingly, for the reasons set forth by the Patent Office in the previous related reexaminations, as well as for reasons set forth below, Requester respectfully asserts that the priority date of the Flick '278 patent is July 3, 2007.

### A. ***New Material Added and Claimed in the Flick '278 Patent***

MPEP § 201.08 states "[a] continuation-in-part is an application filed during the lifetime of an earlier nonprovisional application, repeating some substantial portion or all of the earlier nonprovisional application and adding matter not disclosed in the said earlier nonprovisional application." MPEP § 211.05(B) states "[o]nly the claims of the continuation-in-part application that are disclosed in the manner provided by 35 U.S.C. § 112(a) in the prior-filed application are entitled to the benefit of the filing date of the prior-filed application. If there is a continuous chain

of copending nonprovisional applications, each copending application must disclose the claimed invention of the later-filed application in the manner provided by 35 U.S.C. § 112(a) in order for the later-filed application to be entitled to the benefit of the earliest filing date." Priority is claimed in the Flick '278 patent as follows (notations added in parenthesis):

> "The present application is a continuation-in-part of U.S. patent application Ser. No. 11/076,259 filed Mar. 9, 2005 now U.S. Pat. No. 7,720,597 (the Flick '597 patent, Exhibit F), which is a continuation of U.S. patent application Ser. No. 10/383,496 filed Mar. 7, 2003 now U.S. Pat. No. 7,149,623 (the Flick '623 patent, Exhibit G), which is a continuation of U.S. patent application Ser. No. 09/859,972 filed on May 17, 2001 now U.S. Pat. No. 6,606,561 (the Flick '561 patent, Exhibit H) which, in turn, was based upon provisional patent application Ser. Nos. 60/264,811 filed on Jan. 29, 2001 (the Flick '811 provisional, Exhibit I); 60/258,005, filed Dec. 22, 2000 (the Flick '005 provisional, Exhibit J); 60/251,552, filed Dec. 6, 2000 (the Flick '552 provisional, Exhibit K); 60/252, 125, filed Nov. 20, 2000 (the Flick '125 provisional, Exhibit L); 60/236,890, filed Sep. 29, 2000 (the Flick '890 provisional, Exhibit M); 60/246,463, filed Nov. 7, 2000 (the Witham provisional, Exhibit N); 60/222,777, filed Aug. 3, 2000 (the Flick '777 provisional, Exhibit O); and 60/205,178, filed May 17, 2000 (the Flick '178 provisional, Exhibit P), the entire contents of each of which are incorporated herein by reference."

Requester notes that FIGS. 10 - 15 and the accompanying discussion beginning on col. 23, line 41 first appear in the Flick '278 patent. Furthermore, claim 1 of the Flick '278 patent requires a "multi-vehicle compatible controller to be coupled to the vehicle data bus **for communication thereover with at least one vehicle device using at least one corresponding vehicle device code** from among a plurality thereof for different vehicles" and further requires "a downloading interface for permitting downloading of **enabling data related to the at least one corresponding vehicle device code** for use by said multi-vehicle compatible controller." Flick '278 patent, claim 1 (emphasis added). Similar language appears in independent claims 13 and 18 of the Flick '278 patent. Requester notes that support for the cited aspects of claim 1 first appear in FIGS. 10 - 15 and col. 24, line 41 through col. 25, line 13

of the Flick '278 patent. None of the supporting figures or the associated disclosure appears in any of the applications to which the Flick '278 patent claims priority.

**B. *Failure of the Flick '005 Provisional to Disclose Claims 1-22***

The Flick '005 provisional (filed Dec. 22, 2000) contains the following disclosure (notations added in parenthesis):

> "In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Patent Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention." (Flick '005 provisional, p. 35, lines 22 - 29).

To the extent Patent Owner may attempt to utilize the disclosure of the Flick '551 patent or the Flick '460 patent to support the cited claim language, Requester respectfully notes that MPEP § 608.01 states:

> "Mere reference to another application, patent, or publication is not an incorporation of anything therein into the application containing such reference for the purpose of the disclosure required by 35 U.S.C. 112. In re de Seversky, 474 F.2d 671, 177 USPQ 144 (CCPA 1973). 37 CFR 1.57(c)(1) limits a proper incorporation by reference (except as provided in 37 CFR 1.57(b)) to instances only where the perfecting words "incorporated by reference" or the root of the words "incorporate" (e.g., incorporating, incorporated) and "reference" (e.g., referencing) appear."

Accordingly, the disclosures of the Flick '551 patent and the Flick '460 patent do not form part of the disclosure of the Flick '005 provisional. The Flick '005 provisional does not make any statements attempting to incorporate the disclosure of either the Flick '551 patent or the Flick '460 patent by reference in a manner satisfying the requirements of 37 CFR § 1.57.

Despite generally referencing that "the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus," Requestor respectfully submits that the Flick '005 provisional does not provide written description support for claims 1 -

22 of the Flick '278 patent. Specifically, the Flick '005 provisional fails to disclose a "multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles" and "a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller." Accordingly, for at least the reason that the Patent Owner failed to properly integrate any disclosures of the Flick '551 patent and/or the Flick '460 patent into the disclosure of the Flick '005 provisional, claims 1 - 22 of the Flick '278 patent are not entitled to the benefit of the filing date of the Flick '005 provisional.

### C. ***Failure of the Flick '811 Provisional to Disclose Claims 1-22***

The Flick '811 provisional (filed Jan. 29, 2001) makes the following statement regarding communicating via a vehicle data communication bus, similar to that made in the Flick '005 provisional:

> "In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are 15 described in U.S. Patent Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention." (Flick '811 provisional, p. 35, lines 10 - 16).

For reasons including those stated above with respect to the Flick '005 provisional, Requester respectfully submits that the Flick '811 provisional fails to provide written description support for claims 1 - 22 of the Flick '278 patent. Specifically, the Flick '811 provisional does not disclose a "multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device **using at least one corresponding vehicle device code from among a plurality thereof for different vehicles**" or "a downloading

interface for permitting downloading of **enabling data related to the at least one corresponding vehicle device code** for use by said multi-vehicle compatible controller." Accordingly, claims 1 - 22 of the Flick '278 patent are not entitled to the benefit of the filing date of the Flick '811 provisional.

**D.** ***Failure of Flick '597, Flick '623, and/or Flick '561 Patents to Disclose Claims 1-22***

As outlined above, claims 1 - 22 of the Flick '278 patent are not entitled to the benefit of the priority dates of any of the provisional applications to which the Flick '278 patent claims priority. Requester is also unable to locate any language or support in any of the Flick '597 patent, Flick '623 patent, and/or Flick '561 patent for the language of claims 1 - 22 of the Flick '278 patent. Additionally, Applicant respectfully notes that no attempt to incorporate the Flick '551 or Flick '460 patents by reference is made in the Flick '597 patent, the Flick '623 patent, or the Flick '561 patent.

As noted above, claims 1 - 22 of the Flick '278 patent rely upon new figures and disclosure first added to the Flick '278 patent for support. However, Requestor respectfully submits that none of the Flick '597, Flick '623, or Flick '561 patents disclose a "multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles" or "a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller." Accordingly, Requester respectfully submits that claims 1 - 22 of the Flick '278 patent are not entitled to claim priority to the filing dates of the Flick '597 patent, the Flick '623 patent, or the Flick '561 patent. Thus, Requester submits that the earliest priority date

to which any of claims 1 - 22 of the Flick '278 patent are entitled to is July 3, 2007 (i.e. the filing date of the Flick '278 patent).

## III. REEXAMINATION REQUEST SATISFIES REQUIREMENTS OF 37 C.F.R. § 1.510(B)

**37 C.F.R. § 1.510(b)(1):** A statement of each substantial new question of patentability with respect to the relevant prior patents and printed publications is provided in Section VI of this Request.

**37 C.F.R. § 1.510(b)(2):** Reexamination of claims 1 through 22 of the Flick '278 patent is requested as discussed in Section VI. A detailed explanation of the proper application of the prior art to each claim element accompanied with a set of proposed rejections based on such application is provided in Section VII by reference to the claim charts attached as Exhibits D through E.

**37 C.F.R. § 1.510(b)(3):** This reexamination request is based on the prior art references listed below and attached as Exhibits listed in Section V of this Request. A copy of every patent or printed publication relied upon is attached as an Exhibit and is listed in a PTO/SB/42 form submitted herewith, with the exception of U.S. Patents which are listed in the PTO/SB/42 form only per "Best Practices and FAQs for filing requests for reexamination complaint with 37 C.F.R. 1.510 and 1.915" dated May 2010.

**37 C.F.R. § 1.510(b)(4):** A copy of the Flick '278 patent is attached as Exhibit A. Copies of reexamination certificates issued for the Flick '278 patent are attached as Exhibits B and C.

**37 C.F.R. § 1.510(b)(5):** A certificate of service confirming service of this reexamination request in its entirety on the attorney of record is provided on the last page of this reexamination request.

**37 C.F.R. § 1.510(b)(6):** Requester hereby certifies that the statutory estoppel provisions of 35 U.S.C. § 315(e)(1) or 35 U.S.C. § 325(e)(1) do not prohibit the requester from filing the *ex parte* reexamination request.

The fee for this Request has been paid by credit card as part of the EFS-WEB submission.

## IV. RELATED LITIGATION

To the best of Requester's knowledge, Patent Owner has asserted the Flick '278 patent in the following related prior or co-pending litigation:

- Omega Patents, LLC v. Enfora, Inc., N.D. Ga, No. 1:13-cv-00646-TWT;
- Omega Patents, LLC v. Enfora, Inc., N.D. Ga, No. 1:17-cv-02769-TWT; and
- Omega Patents, LLC v. CalAmp Corp., M.D. Fla., Orlando Division, No. 6:13-cv-1950-PGB-DAB ("the CalAmp litigation").

## V. CITATION OF PERTINENT AND APPLICABLE PRIOR ART BELIEVED TO HAVE BEARING ON PATENTABILITY

As explained in detail in this Request, the following prior art references, as they would have been understood by one of ordinary skill in the art at the time of the invention of the Flick '278 patent, raise substantial new questions of patentability with respect to claims 1 through 22. Reexamination of claims 1 through 22 is therefore respectfully requested. The prior art references relied upon in this Request that raise new questions of patentability are as follows:

| Title | Hereinafter |
|---|---|
| U.S. Patent No. 5,719,551 to Flick (issued February 17, 1998) | "Flick '551"<br>(Exhibit Q) |

| Title | Hereinafter |
|---|---|
| U.S. Patent No. 5,940,007 to Brinkmeyer et al. (issued August 17, 1999) | "Brinkmeyer" (Exhibit R) |
| U.S. Patent No. 6,253,064 to Monroe (issued June 26, 2001) | "Monroe" (Exhibit S) |
| U.S. Patent No. 5,081,667 to Drori et al. (issued January 14, 1992) | "Drori" (Exhibit T) |
| *Trimble Microsoft Launch GPS System for Car PC*, available at http://www.spacedaily.com/news/gps-98a.html (published Jan. 8, 1998, last visited June 25, 2019) | "Space Daily Trimble" (Exhibit U) |
| Jim Mateja, *Travetek Makes Mission Possible*, CHICAGO TRIBUNE, available at https://www.chicagotribune.com/news/ct-xpm-1992-04-12-9202020707-story.html (published April 12, 1992, last visited June 25, 2019) | "Mateja" (Exhibit V) |
| John Holusha, *DRIVING SMART; Lost in Yonkers? An Olds Option Could Be a Guide*, THE NEW YORK TIMES, available at https://www.nytimes.com/1994/11/27/automobiles/driving-smart-lost-in-yonkers-an-olds-option-could-be-a-guide.html (published Nov. 27, 1994, last visited June 25, 2019) | "Holusha" (Exhibit W) |

Requestor submits that the references listed in the table above raise substantial new questions of patentability of the claims of the Flick '278 patent. The Flick '551 patent, Brinkmeyer, and Monroe were submitted for consideration during the prosecution of the Flick '278 patent. Aside from these, none of the other references listed in the table above were considered in the '278 File History, the '278 First Reexam, or the '278 Second Reexam.

With respect to previously-considered prior art references, MPEP § 2258.01 states: "If the rejection to be made by the examiner will be based on a combination of 'old art' and art newly cited during the reexamination proceeding, the rejection is proper, and should be made. *See In re Hiniker*, 150 F.3d at 1367, 47 USPQ2d at 1527. (Court held the reexamination proceeding was supported by a substantial new question of patentability where the rejection before the court was based on a combination of art that had been before the examiner during the original prosecution, and art newly cited during the reexamination proceeding.)." Accordingly, the Flick '551 patent, when viewed with Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article, are presented in a new light and raise a substantial new question of patentability.

In particular, the Flick '551 patent in view of at least one of the Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article render the claims of the Flick '278 patent obvious. Alternatively, Requester submits that the Flick '278 patent, based on the Flick '551 patent in view of at least one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, Mateja article, and the Holusha article (showing the state of the art at the time of the filing of the Flick '551 patent), is invalid for nonstatutory obviousness-type double patenting as an obvious variation of the Flick '551 patent where both patents have the same inventive entity and were commonly owned at the time of their filing.

In view of the above, Requestor submits that the prior art references submitted herein present substantial new questions as to the patentability of the Flick '278 patent.

## VI. STATEMENTS POINTING OUT EACH SUBSTANTIAL NEW QUESTION OF PATENTABILITY

As explained in greater detail below, the Flick '551 patent in combination with the references listed in the table above raise substantial new questions of patentability not previously considered or addressed in the prior examination of the Flick '278 patent. Specifically, the Flick '551 patent in combination with these references raise a question of patentability with respect to obviousness as well as double patenting.

### A. *U.S. Patent No. 5,940,007 to Brinkmeyer and U.S. Patent No. 6,253,064 to Monroe*

U.S. Patent No. 5,940,007 to Brinkmeyer et al. was filed February 24, 1997, and issued August 17, 1999, and therefore Brinkmeyer is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and (b). U.S. Patent No. 6,253,064 to Monroe was filed February 25, 1999, and issued June 26, 2001, and therefore Monroe is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and (b).

Brinkmeyer and Monroe were considered during the prosecution of the Flick '278 patent. When combined with the Flick '551 patent, these references present a substantial new question of patentability.

#### 1. Technological Teaching: A Vehicle Positioning Device and a Wireless Communications Device in a Vehicle Control and Tracking System

As cited in the '278 File History, Brinkmeyer and Monroe both teach a vehicle security system and control system comprising a tracking unit with a vehicle position determining device

and a wireless communication device. *See* '278 File History, Office Action dated January 5, 2011, p. 2-3; *see also* Brinkmeyer, 5:6-16; Fig. 1; Monroe, Fig. 4a-4b.

### 2. Brinkmeyer and Monroe are Analogous Art to the Flick '278 Patent

Brinkmeyer and Monroe are analogous art because they are in the same field of endeavor as the Flick '278 patent, namely vehicle security and vehicle monitoring and tracking units, and more specifically, vehicle tracking devices that can be installed in vehicles that can communicate with vehicle position determining devices. *See In re Klein*, 647 F.3d 1343, 1349 (Fed. Cir. 2011) (noting that a reference is analogous when "the art is from the same field of endeavor, regardless of the problem addressed...").

### 3. Substantial New Question of Patentability as to Claims 1 through 22

Each of claims 1 through 22 recite at least: a vehicle data bus, a vehicle position determining device, a wireless communications device, a multi-vehicle compatible controller, and a downloading interface for permitting downloading of enabling data. As shown below, the Flick '551 patent in view of Brinkmeyer and Monroe disclose these limitations, and more detail is shown in the claim charts attached as Exhibits D and E.

Thus, a reasonable examiner would consider the teachings of the Flick '551 patent in view of Brinkmeyer and Monroe as being important in deciding whether or not claims 1 through 22 of the Flick '278 patent are patentable. For these reasons, the Flick '551 patent in view of any one of Brinkmeyer and Monroe submitted in this Request raise a substantial new question of patentability with respect to the claims of the Flick '278 patent.

### B. ***U.S. Patent No. 5,081,667 to Drori et al.***

U.S. Patent No. 5,081,667 to Drori et al. was filed March 20, 1990, and issued January 14, 1992, and therefore Drori is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and (b).

Drori was not considered during the prosecution of the Flick '278 patent, but was considered in the prosecution of the Flick '551 patent (to which the Flick '278 patent does not claim priority). Requester submits that the combination of the Flick '551 patent and Driori presents a substantial new question of patentability.

#### 1. Technological Teaching: A Vehicle Positioning Device and a Wireless Communications Device in a Vehicle Security System

Drori teaches "[a]n interfacing system for integrating a wide variety of cellular communication systems with most vehicle security systems. The system includes a controller and an interfacing arrangement for matching the cellular telephone to the controller." Drori, Abstract. Additionally, Drori discloses the inclusion of a vehicle position determining device with a vehicle security system. Drori, 4:44-48 ("Inputs from a conventional vehicle security system 13, from a host vehicle (not shown), and from a global positioning tracker (not shown) are received by the system controller 20 via level conversion and filtering circuits 36."). Drori also discloses that "[a]nother feature of the invention activates a navigation system when the alarm is triggered and repeatedly transmits at certain time intervals over the communication system the coordinates identifying the vehicle location." Drori, 2:50-54.

**2. Drori is Analogous Art to the Flick '278 Patent**

Drori is analogous art because they are in the same field of endeavor as the Flick '278 patent, namely vehicle security and vehicle monitoring and tracking units, and more specifically, vehicle tracking devices that can be installed in vehicles that can communicate with vehicle position determining devices. *See In re Klein*, 647 F.3d 1343, 1349 (Fed. Cir. 2011) (noting that a reference is analogous when "the art is from the same field of endeavor, regardless of the problem addressed...").

**3. Substantial New Question of Patentability as to Claims 1 through 22**

Each of claims 1 through 22 recite at least: a vehicle data bus, a vehicle position determining device, a wireless communications device, a multi-vehicle compatible controller, and a downloading interface for permitting downloading of enabling data. As shown below, the Flick '551 patent in view of Drori discloses these limitations, and more detail is shown in the claim charts attached as Exhibits D and E.

Thus, a reasonable examiner would consider the teachings of the Flick '551 patent in view of Drori important in deciding whether or not claims 1 through 22 of the Flick '278 patent are patentable. For these reasons, the Flick '551 patent in view of Drori submitted in this Request raises a substantial new question of patentability with respect to the claims of the Flick '278 patent.

**C. *The Space Daily Trimble Article, the Mateja Article, and the Holusha Article***

The Space Daily Trimble article was published in January 1998, and therefore is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and (b). The Mateja article published April 12, 1992, and therefore is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and (b). The

Holusha article was published November 27, 1994, and therefore is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and (b). These references are primarily used to show that not only were vehicle position determining devices (e.g., GPS) prevalent and well known in the vehicle industry prior to the filing of the Flick '278 patent, but were also well known prior to the filing of the Flick '551 patent nearly eleven years earlier.

None of these references were considered during the prosecution of the Flick '278 patent. When combined with the Flick '551 patent, these references present a substantial new question of patentability.

**1. Technological Teaching: A Vehicle Positioning Device and a Wireless Communications Device in a Vehicle Control and Tracking System**

The Space Daily Trimble article announces the partnership of the Trimble GPS technology with the Microsoft Auto PC platform at the Consumer Electronics Show (CES) in January 1998. Microsoft's Auto PC platform is a mobile computing environment that is extended to consumer vehicles and incorporated by automotive manufacturers. In particular, the Space Daily Trimble article provides industry estimates on the high value of GPS navigation in vehicles, stating that "[a]ccording to the U.S. GPS Industry Council, car navigation will grow from $310 million in 1995 to $3 billion by 2000. The Council estimates that the GPS industry as a whole will grow to over $8 billion by the year 2000." In light of the above industry estimates, a person of ordinary skill in the art would have considered the addition of a vehicle position determining device (e.g., GPS) to vehicle tracking (i.e., "car navigation") obvious not only prior to the filing of the Flick '278 patent, but also prior to the filing of the Flick '551 patent.

The Mateja article details the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992. The Holusha article details the launch

of the Oldsmobile Guidestar system in late 1994 and early 1995 which uses satellites (of the Global Positioning System) to determine a car's location.

**2. The Space Daily Trimble Article, the Mateja Article, and the Holusha Article are Analogous Art to the Flick '278 Patent**

The Space Daily Trimble Article, the Mateja Article, and the Holusha Article are analogous art because they are in the same field of endeavor as the Flick '278 patent, namely vehicle monitoring and tracking units, and more specifically, vehicle tracking devices that can be installed in vehicles that can communicate with vehicle position determining devices. *See In re Klein*, 647 F.3d 1343, 1349 (Fed. Cir. 2011) (noting that a reference is analogous when "the art is from the same field of endeavor, regardless of the problem addressed...").

**3. Substantial New Question of Patentability as to Claims 1 through 22**

Each of claims 1 through 22 require at least: a vehicle data bus, a vehicle position determining device, a wireless communications device, a multi-vehicle compatible controller, and a downloading interface for permitting downloading of enabling data. As shown below, the Flick '551 patent discloses all of these limitations with the exception of the vehicle position determining device. However, the Space Daily Trimble article, the Mateja article, and the Holusha article show that vehicle position determining devices (e.g., GPS) were well known in the state of the art, and more detail is shown in the claim charts attached as Exhibits D and E.

Thus, a reasonable examiner would consider the teachings of the Flick '551 patent in view of at least one of the Space Daily Trimble Article, the Mateja Article, and the Holusha Article important in deciding whether or not claims 1 through 22 of the Flick '278 patent are patentable. For these reasons, the Flick '551 patent in view of at least one of the Space Daily Trimble article,

the Mateja article, and the Holusha article submitted in this Request raise a substantial new question of patentability with respect to the claims of the Flick '278 patent. Specifically, the Flick '278 patent believed to be invalid as obvious in view of the Flick '551 patent in combination with any one of the Space Daily Trimble article, the Mateja article, and the Holusha article. The Flick '278 patent is also believed to be subject to a nonstatutory obviousness-type double patenting rejection as against the Flick '551 patent in view of the state of the art (e.g., the Space Daily Trimble article, the Mateja article, and the Holusha article).

### D. ***U.S. Patent No. 5,719,551 to Flick***

U.S. Patent No. 5,719,551 to Flick was filed August 22, 1996, and issued on February 17, 1998. Neither the Flick '278 patent nor any of its parent patents makes any priority claim to the Flick '551 patent. Therefore, the Flick '551 patent is prior art to the Flick '278 patent under 35 U.S.C. § 102(a) and § 102(b).

The Flick '278 patent contains the following disclosure regarding the Flick '551 and Flick '460 patent along with U.S. Patent No. 6,756,885 (the Flick '885 patent) in a section titled "Background of the Invention":

> "A number of patents disclose various security and control systems that address data bus interoperability. For example, **U.S. Pat No. 5,719,551, assigned to Omega Patents, LLC, the assignee of the present invention, discloses a vehicle security system for a vehicle including a data bus connecting a plurality of vehicle devices. A signal enabling circuit enables the alarm controller to operate using a set of desired signals selected from a plurality of possible sets for different vehicles. U.S. Pat. No. 6,011,460, assigned to Omega Patents, LLC, discloses a similar system where the set of desired signals from the plurality of different sets of signals for different vehicles is obtained, such as by connection and communication with a downloading device. Additionally, U.S. Pat. No. 6,756,885, also assigned to Omega Patents, LLC, discloses a multi-vehicle control system whereby a multi-vehicle compatible controller stores a set of device codes for a given vehicle device for a plurality of different vehicles.** Device codes are read from the data

> communications bus, and a match between a read device code and the stored device codes is determined to provide compatibility with different vehicles.
>
> **Unfortunately, such advanced techniques for dealing with multiple device codes for a vehicle having a data communications bus have not yet been developed for vehicle tracking units**."

(Flick '278 patent, col. 2, lines 17-41) (emphasis added).

Accordingly, the Flick '551 patent, the Flick '460 patent, and the Flick '885 patent are applicant-admitted prior art in accordance with MPEP § 2129 ("A statement by an applicant in the specification or made during prosecution identifying the work of another as "prior art" is an admission which can be relied upon for both anticipation and obviousness determinations, regardless of whether the admitted prior art would otherwise qualify as prior art under the statutory categories of 35 U.S.C. 102."). In the event that Patent Owner attempts to rely upon the disclosures of the Flick '551, Flick '460, or Flick '885 patents as providing written description support and/or establishing evidence of a constructive reduction to practice of claims 1 - 22 of the Flick '278 patent, Requester notes that such reliance on applicant-admitted prior art is an admission of the invalidity of claims 1 – 22.

Furthermore, the addition of a "vehicle position determining device" to the prior art was deemed insufficient to render claims 1 - 22 patentable during the prosecution of the Flick '278 patent. *See* Exhibit X, Office Action dated January 5, 2011, p. 2- 3; Exhibit Y, Patent Owner's response filed April 5, 2011 at p. 9 of 12 through p. 11 of 12. Specifically, Patent Owner's response states that the Monroe reference disclosing a vehicle security system teaches the use of GPS (i.e. a vehicle position determining device) to determine vehicle position information (p. 9 of 12) and only disputes the teachings of the Brinkmeyer and Monroe references with respect to a "multi-vehicle compatible controller coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code

from among a plurality thereof for different vehicles." *Id.* at p. 10 of 12. Accordingly, reliance on the Flick '551, Flick '460, or Flick '885 patents as disclosing a "multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles" and "a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller" is an admission that the claims of the Flick '278 patent simply involve the obvious addition of a "vehicle position determining device" to applicant-admitted prior art.

**1. Technological Teaching: A Vehicle Security System for a Vehicle Having a Data Communications Bus Including Using a Desired Signal Enabling for a Vehicle Function Controller to Operate Using a Desired Set of Signals for a Corresponding Desired Vehicle Device from a Plurality of Sets of Signals for Different Vehicles**

The Flick ‘278 patent states that the Flick ‘551 patent teaches: “a data bus connecting a plurality of vehicle devices. A signal enabling circuit enables the alarm controller to operate using a set of desired signals selected from a plurality of possible sets for different vehicles.” Flick ‘278 patent, 2:20-25. The Flick ‘551 patent also claims “a desired signal enabling means [comprising] download learning means for learning the desired set of signals from a downloading device.” Flick ‘551 patent, claims 8, 23; *see also* 3:50-60 (“For example, the learning means may comprise downloading learning means for learning the desired set of signals from another device or central station. In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone.”).

### 2. The Flick '551 Patent is Analogous Art to the Flick '278 Patent

The Flick '551 patent is analogous art because it is in the same field of endeavor as the Flick '278 patent, namely vehicle security and vehicle monitoring and tracking units, and more specifically, vehicle tracking devices that can be installed in vehicles, communicate with vehicle devices via a vehicle bus using vehicle codes from among a plurality of vehicle codes for different vehicles, communicate with vehicle position determining devices, and download data related to the vehicle device codes. *See In re Klein*, 647 F.3d 1343, 1349 (Fed. Cir. 2011) (noting that a reference is analogous when "the art is from the same field of endeavor, regardless of the problem addressed..."). Therefore, the technological teachings of the Flick '551 patent are directly analogous art to the Flick '278 patent.

### 3. Substantial New Question of Patentability as to Claims 1 through 22

Claims 1-22 of the Flick '278 patent recite at least: a vehicle data bus, a vehicle position determining device, a wireless communications device, a multi-vehicle compatible controller, and a downloading interface for permitting downloading of enabling data. For the reasons set forth below, Requester submits that the Flick '278 patent is rendered unpatentable under 35 U.S.C. § 103. As an alternative, Requester submits that there is a substantial new question of patentability under non-statutory double patenting grounds.

#### a. 35 U.S.C. § 103 Rejection over the Flick '551 Patent in Combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble Article, the Mateja Article, or the Holusha Article

As shown in sections VI(A), (B), and (C) above, the Flick '551 patent in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and

the Holusha article disclose the limitations recited in the claims of the Flick '278 patent, and more detail is shown in the claim chart attached as Exhibit D. A reasonable examiner would consider the teachings of the Flick '551 patent in combination with Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article important in deciding whether or not claims 1 through 22 of the Flick '278 patent are patentable. Accordingly, it is submitted that the Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article raise a substantial new question of patentability at least with respect to claims 1 through 22 of the Flick '278 patent.

**b. Nonstatutory Double Patenting Rejection over the Flick '551 Patent in view of the State of the Art**

Although no double patenting rejection was made with respect to the Flick '551 patent in the '278 File History, Requester submits that the claims of the Flick '278 patent are not patentably distinct in view of the claims of the Flick '551 patent. Though the claims of the Flick '551 patent are not identical to the claims of the Flick '278 patent, it would have been obvious to a person of ordinary skill in the art at the time of the priority date of the Flick '278 patent to include a vehicle position determining device in view of the Flick '551 patent.

***(i) Obviousness-Type Double Patenting Rejection over the Flick '551 Patent in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble Article, the Mateja Article, and the Holusha Article showing the State of the Art***

As an initial matter, one significant difference between a rejection based on 35 U.S.C. § 103 and one based on obviousness-type double patenting grounds is that "a double patenting

rejection must rely on a comparison with the claims in an issued patent or pending application, whereas an anticipation or obviousness rejection based on the same patent or application under 35 U.S.C. 102 or 103 relies on a comparison with what is disclosed (whether or not claimed) in the same issued patent or pending application. In a 35 U.S.C. 102 or 103 rejection over a prior art patent, the reference patent is available for all that it fairly discloses to one of ordinary skill in the art, regardless of what is claimed. *In re Heck*, 699 F.2d 1331, 216 USPQ 1038 (Fed. Cir. 1983)." MPEP § 804(III). However, where appropriate, "[t]he examiner should make both a double patenting rejection based on common ownership and a rejection based on prior art when the facts support both rejections." MPEP § 804(II)(C).

MPEP § 804(II)(B)(2) states that "[t]he analysis employed with regard to nonstatutory, obviousness-type double patenting is "similar to, but not necessarily the same as that undertaken under 35 USC § 103." *In re Braat*, 937 F.2d 589, 592-93, 19 USPQ2d 1289, 1292 (Fed. Cir. 1991) (citing *In re Longi*, 759 F.2d 887, 892 n.4, 225 USPQ 645, 648 n.4 (Fed. Cir. 1985)); *see also Geneva Pharmaceuticals*, 349 F.3d at 1378 n.1, 68 USPQ2d at 1869 n.1 (Fed. Cir. 2003); *In re Basell Poliolefine*, 547 F.3d 1371, 1379, 89 USPQ2d 1030, 1036 (Fed. Cir. 2008).

In determining a rejection under obviousness-type double patenting, the analysis should make clear "why a person of ordinary skill in the art would conclude that the invention defined in the claim at issue would have been an obvious variation of the invention defined in a claim in the patent." MPEP § 804(II)(B)(2). Generally, it is held that if the same invention is not being claimed twice, but one of the claims-at-issue is merely an obvious variation of the invention disclosed and claimed in the reference patent, the claim at issue is subject to an obviousness-type double-patenting rejection. *See In re Vogel*, 422 F.2d 438, 441-43 (C.C.P.A. 1940) (holding

that the claim-at-issue was subject to a double patenting rejection where the additional limitation of the permeability range of packaging material, while not disclosed in the reference patent, was "merely an obvious variation"). This analysis is known as the one-way test for distinctness. See MPEP 804(II)(B)(2)(b) ("If the application under examination is the later-filed application, or both applications are filed on the same day, only a one-way determination of distinctness is needed in resolving the issue of double patenting, i.e., whether the invention claimed in the application would have been anticipated by, **or an obvious variation of**, the invention claimed in the patent. [citations omitted]") (emphasis added).

MPEP § 804(II)(B)(2) further states that:

> "The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966) that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 should typically be considered when making a nonstatutory double patenting analysis based on "obviousness." See MPEP § 2141 for guidelines for determining obviousness. These factual inquiries are summarized as follows:
>
> (A) Determine the scope and content of a patent claim relative to a claim in the application at issue;
>
> (B) Determine the differences between the scope and content of the patent claim as determined in (A) and the claim in the application at issue;
>
> (C) Determine the level of ordinary skill in the pertinent art; and
>
> (D) Evaluate any objective indicia of nonobviousness."

A comparison of the scope and content of the Flick '278 patent relative the claims in the Flick '551 patent is shown in the claim chart in Exhibit E. As can be seen from the claim chart, a determination can be made that the claim limitations of the Flick '278 patent are all present in the Flick '551 patent with the only exception of the "vehicle position determining device." For example, Claims 21, 23, and 24 of the Flick '551 patent disclose:

| Claim 1 of the Flick '278 Patent | Claims of the Flick '551 Patent |
|---|---|
| "A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle" | "A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices" (Claim 21) |

| Claim 1 of the Flick '278 Patent | Claims of the Flick '551 Patent |
|---|---|
| "a vehicle position determining device" | N/A |
| "a wireless communications device" | "cellular telephone means" (Claim 24) |
| "a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device" | "an alarm controller and associated alarm controller bus interface means for interfacing said alarm controller to the data communications bus" (Claim 21)<br><br>"cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device" (Claim 24) |
| said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles" | "an alarm controller and associated alarm controller bus interface means for interfacing said alarm controller to the data communications bus" (Claim 21)<br><br>"desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator" (Claim 21) |
| "a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller" | "said desired signal enabling means comprising learning means for learning the desired set of signals." (Claim 21)<br><br>"said learning means comprises download learning means for learning the desired set of signals from a downloading device" (Claim 23)<br><br>"cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." (Claim 24) |

With respect to the limitation of the "vehicle position determining device," GPS systems within vehicle tracking units and car alarm systems were well known to a person of ordinary skill in the art at the time of the July 3, 2007 priority date of the Flick '278 patent. "When considering

obviousness of a combination of known elements, the operative question is thus 'whether the improvement is more than the predictable use of prior art elements according to their established functions.'" MPEP § 2141 (citing *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Not only does Requester submit that vehicle position determining devices (e.g., GPS) were well known as of the July 3, 2007 priority date, Requester also submits that GPS systems were well known to be used in vehicle security and tracking at least as early as 1992. *See, e.g.*, Brinkmeyer at 5:6-16 (stating "...vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the Global Positioning System"), Fig. 1; Monroe at Fig. 4a-4b; Drori at 4:44-48 ("Inputs from a conventional vehicle security system 13, from a host vehicle (not shown), and from a global positioning tracker (not shown) are received by the system controller 20 via level conversion and filtering circuits 36."); Mateja (detailing the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992); Space Daily Trimble article (announcement of Trimble at Consumer Electronics Show as GPS technology provider to Microsoft); Holusha article (availability of the Oldsmobile Guidestar system and services utilizing the Global Positioning System satellites). As such, the addition of GPS systems to vehicle security and tracking systems would yield no more than predictable results.

The prosecution history of the Flick '278 patent also presents evidence that a "vehicle position determining device" was well known in the art. In the '278 File History, the addition of a "vehicle position determining device" to the prior art was deemed insufficient to render claims 1 - 22 patentable during the prosecution of the Flick '278 patent. *See* Exhibit X, Office Action dated January 5, 2011, p. 2- 3; Exhibit Y, Patent Owner's response filed April 5, 2011, p. 9 of 12 through p. 11 of 12. Specifically, Patent Owner's response affirmatively states that the Monroe

reference teaches the use of GPS (i.e. a vehicle position determining device) to determine vehicle position information (p. 9) and only disputes the teachings of the Brinkmeyer and Monroe references with respect to a "multi-vehicle compatible controller coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles." (p. 10). The same can also be said from examining the prosecution history of the Flick '551 patent. *See, e.g.,* prosecution history of the Flick '551 patent, List of References Cited by Examiner dated June 10, 1997, citing U.S. Patent No. 5,081,667 to Drori et al. at 4:44-48 ("Inputs from a **conventional vehicle security system 13**, from a host vehicle (not shown), and from **a global positioning tracker** (not shown) are received by the system controller 20 via level conversion and filtering circuits 36.") (emphasis added). Thus, the prosecution history of the Flick '278 patent, along with Patent Owner's comments, provide evidence of both the level of the person of ordinary skill in the art and objective evidence that vehicle location determining devices were well known in the state of the art.

The Flick '278 prosecution history also shows that the "multi-vehicle compatible controller" and "a downloading interface for permitting downloading of enabling data" features were the features that the Patent Owner used to differentiate over the prior art references such as Brinkmeyer and Monroe. *See* Exhibit Y, Patent Owner's response filed April 5, 2011, p. 9 of 12 through p. 11 of 12. These features are duplicative of the features already claimed in the Flick '551 patent. *See, e.g.*, Flick '551 patent, claims 21, 23, and 24.

Requester submits that when viewing the Flick '278 File History and these prior art references under the *KSR* analysis, the addition of vehicle position determining devices (e.g., GPS) did not result in something more than the predictable use of prior art elements according

to their established functions. Accordingly, a person of ordinary skill in the art would conclude that the inclusion of a "vehicle position determining device" as claimed in the Flick '278 patent would have been an obvious variation of the invention defined in the Flick '551 patent. *See* MPEP § 804(II)(B)(2).

Requester submits that an obviousness-type double patenting rejection of the claims of the Flick '278 patent in view of the Flick '551 patent cannot be overcome by way of filing a terminal disclaimer because the Flick '551 patent (filed August 22, 1996, and issued February 17, 1998) is now expired. *See Boehringer Ingelheim Int'l GmbH v. Barr Labs, Inc.*, 592 F.3d 1340, 1347-48 (Fed. Cir. 2010) ("a terminal disclaimer filed after the expiration of the earlier patent over which claims have been found obvious cannot cure obviousness-type double patenting."). Accordingly, Requester submits that the claims of the Flick '278 patent are unpatentable in view of the Flick '551 patent.

Should the Patent Office find insufficient reason to issue an obviousness-type double patenting rejection, Requester alternatively proposes a nonstatutory double patenting rejection based on equitable principles. Requester submits that the claims of the Flick '278 patent, if allowed to remain, would improperly extend the "right to exclude" already granted in the Flick '551 patent. Furthermore, Requester submits that there is no apparent reason why Patent Owner was prevented from presenting claims corresponding to those of the Flick '551 patent during prosecution of the Flick '561 patent application (to which the later Flick '278 patent claimed priority) or during prosecution of the Flick '278 patent itself. *See In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968); *see also* MPEP § 804.

## VII. PROPOSED REJECTIONS AND DETAILED EXPLANATIONS OF THE PERTINENCY AND MANNER OF APPLYING THE CITED PRIOR ART TO EVERY CLAIM FOR WHICH REEXAMINATION IS REQUESTED

The above-referenced prior art raises substantial new questions of patentability with respect to claims 1 through 22 of the Flick '278 patent. Below, Requester sets out proposed rejections that provide a detailed explanation of the pertinence and manner of applying these publications and/or patents to each of these claims. As this is a reexamination under 35 U.S.C. 304, the claims should be "given the broadest reasonable interpretation consistent with the specification and limitations in the specification [should] not [be] read into the claims." MPEP § 2258(I)(G)(citing *In re Yamamoto*, 740 F.2d 1569, 222 USPQ 934 (Fed. Cir. 1984)).

| SUMMARY OF PROPOSED REJECTIONS | SUPPORTING CLAIM CHART |
|---|---|
| Claims 1-22 are rejected under 35 U.S.C. § 103(a) as unpatentable over Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. | **Exhibit D** |
| Claims 1-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the Flick '551 patent in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article. | **Exhibit E** |

**A. *Claims 1-22 are Unpatentable over Flick '551 in combination with of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble Article, the Mateja Article, and the Holusha Article***

Each and every limitation of claims 1-22 is disclosed by Flick '551 in combination with any one of the Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article as shown in detail in the claim chart attached as Exhibit D. Accordingly, the following proposed rejections are appropriate.

Claims 1 through 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article.

**With regard to claim 1**, as set out in detail in Exhibit D, the Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 1. Specifically, these references teach:

- *A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible tracking unit comprising*: the Flick '551 patent discloses a multi-vehicle compatible tracking unit for a vehicle that includes a vehicle data bus extending throughout the vehicle. Flick '551 patent, Abstract (e.g., "The vehicle security system is for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices. The security system preferably further includes a desired signal enabling circuit for enabling the alarm controller to operate using a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles.").

- *a vehicle position determining device*: GPS systems within vehicle tracking units were well known at the time of the invention, as disclosed by any one of numerous patents and publications as detailed in Exhibit D, including the Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article.
- The Patent Office and Patent Owner acknowledged that vehicle position determining devices were well known in the art during the prosecution of the Flick '278 patent. *See* '278 File History, Office Action dated January 5, 2011, p. 2, citing to Monroe at Fig. 4a-4b, and Brinkmeyer at 5:6-16 ("…vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the Global Positioning System."); Patent Owner's response filed April 5, 2011 at p. 9 of 12 (stating that the Monroe reference teaches the use of GPS (i.e. a vehicle position determining device) to determine vehicle position information and only disputing the teachings of the Brinkmeyer and Monroe references with respect to a "multi-vehicle compatible controller coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles.").
- The Patent Office found that vehicle position determining devices were well known in the art during the prosecution of the Flick '551 patent. *See* Flick '551 File History, List of References Cited by Examiner dated June 10, 1997, citing Drori ("Inputs from a conventional vehicle security system 13, from a host vehicle (not shown), and from a global positioning tracker (not shown) are received by the system controller 20 via level conversion and filtering circuits 36." (4:44-48)).

- Furthermore, other prior art references show that vehicle position determining devices, including but not limited to GPS, were well known in the art. *See, e.g.*, Space Daily Trimble article (announcement of Trimble at Consumer Electronics Show as GPS technology provider to Microsoft); Mateja article (detailing the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992); Holusha article (availability of the Oldsmobile Guidestar system and services utilizing the Global Positioning System satellites).
- *a wireless communications device:* The Flick '551 patent discloses a wireless communications device e.g., remote transmitter and receiver. *See e.g.*, Fig. 1, TX/RX 13; *see also* 4:15-20.
- *a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information:* The Flick '551 patent discloses that "[a] vehicle function controller is provided along with an associated vehicle function controller bus interface means for interfacing the vehicle function controller to the data communications bus. The remote control system also includes desired signal enabling means for causing the vehicle function controller **to operate using a desired set of signals for a desired vehicle from a plurality of possible sets of digital signals for different vehicles**. **Accordingly, the vehicle function controller can communicate with a vehicle device via the data communications bus so that the vehicle function controller is capable of operating the vehicle device responsive to the remote transmitter**." Flick '551 patent, 4:18-30 (emphasis added); see also, claims 36 and 50 of the Flick '551

patent. As detailed above, tracking units that would send vehicle position information were well known at the time of the invention, and as detailed in the claim chart in Exhibit D. *See, e.g.*, '278 File History, Office Action dated January 5, 2011, p. 2, citing to Fig. 4a-4b of Monroe (US Pat. 6,253,064) and Brinkmeyer (US Pat. 5,940,007), col 5., lines 6-16 ("…vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the Global Positioning System."); Flick '551 File History, List of References Cited by Examiner dated June 10, 1997, citing Drori; Space Daily Trimble article (announcement of Trimble at Consumer Electronics Show as GPS technology provider to Microsoft); Mateja article (detailing the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992); Holusha article (availability of the Oldsmobile Guidestar system and services utilizing the Global Positioning System satellites). For more with respect to "multi-vehicle compatible," see below.

- *said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles:* The Flick '551 patent discloses a multi-vehicle compatible controller e.g., "alarm controller", coupled to the vehicle data bus for communication thereover with at least one vehicle device e.g., vehicle security sensor, using at least one corresponding vehicle device code from among a plurality thereof for different vehicles e.g., a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. *See* Flick '551 patent, Abstract

(e.g., "The vehicle security system is for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices. The security system preferably further includes a desired signal enabling circuit for enabling the alarm controller to operate using a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles."); *see also*, Flick '551 patent, claims 1, 15, 21, 28, 36, and 50.

- *a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller:* The Flick '551 patent discloses downloading of enabling data e.g., learning the desired set of signals from another device or central station, for use by said multi-vehicle compatible controller, with the set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. *See* Flick '551 patent, col. 3, lines 50-60; *see also, e.g.*, claims 21, 23, 24, 8, and 35 of the Flick '551 patent.

**With regard to claim 13**, as set out in detail in Exhibit D, the Flick '551 patent in view of the Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all of the limitations of Claim 13. Claim 13 is nearly identical to Claim 1, with only the addition of the feature "said downloading interface comprising a connector for temporary connection to a downloading device."

The Flick '551 patent discloses the downloading interface includes a connector for temporary connection to a downloading device. *See e.g.*, Fig. 6, download learning means 84 includes a connector for temporary connection to a downloading device e.g., cellular telephone 86; *see also*, 3:50-60 ("In particular, the security system may interface to a cellular telephone

and the desired set of signals may be downloaded or received and stored via the cellular telephone"; 7:55-67 ("The download learning means 84 may include an interface connected to the illustrated vehicle cellular telephone 86 to permit learning or downloading of the desired signal set from a remote or central monitoring and control station 88, for example.").

**With regard to claim 18**, as set out in detail in Exhibit D, the Flick '551 in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all of the limitations of Claim 18. Claim 18 is nearly identical to Claim 1, with only the addition of the feature "said downloading interface comprising a wireless receiver for temporary connection to a downloading device."

The Flick '551 patent discloses the wireless signal downloading interface includes a wireless receiver for temporary connection to a downloading device. *See e.g.*, Fig. 6 and "The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter." The Flick '551 patent discloses the downloading interface includes a wireless receiver for temporary connection to a downloading device. *See e.g.*, Fig. 6, download learning means 84 includes a connector for temporary connection to a downloading device e.g., cellular telephone 86; 3:50-60 ("In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone"); *see also* claim 24 of the Flick '551 patent.

Claims 2-9, 11, 14-17, and 19-22 are dependent claims. Each and every additional aspect of claims 2-9, 11, 14-17, and 19-22 is disclosed by the Flick '551 patent in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the

Holusha article as shown in detail in the claim chart attached as Exhibit D. Accordingly, the following proposed rejection is appropriate.

Claims 2-9, 11, 14-17, and 19-22 are rejected under 35 U.S.C. § 103(a) as unpatentable over the Flick '551 patent in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article.

**With regard to claim 2**, as set out in detail in Exhibit D, the Flick '551 patent in view of the Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 2. It was well known at the time of the invention that the downloading interface includes a wired signal downloading interface. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that this was well known. *See* '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 3**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 3. It was well known at the time of the invention that the wired signal downloading interface includes a connector for temporary connection to a downloading device. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that this was well known. *See* '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13 stating "It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known."

Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 4**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 4. The Flick '551 patent discloses the downloading interface includes a wireless signal downloading interface. *See e.g.*, Fig. 6; 3:50-60; claim 24 of the Flick '551 patent.

**With regard to claim 5**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 5.

The Flick '551 patent discloses the wireless signal downloading interface includes a wireless receiver for temporary connection to a downloading device. *See e.g.*, Fig. 6 and "The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter;" *see also* claim 24 of the Flick '551 patent. Furthermore, during the prosecution history of the '278 patent, the examiner acknowledged that "[i]t is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known." *See* '278 Office action dated 6/22/2010, rejection of claims 2-3 and 13. Furthermore, Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 6**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 6.

The Flick '551 patent discloses the corresponding at least one vehicle code is for reading e.g., "data communications bus interface provides both input and output interfaces" from the at least one vehicle device. *See* e.g., Fig. 2 and "In the illustrated embodiment, the CPU 12 is also operatively connected to a memory (EEPROM) 14 and a data communications bus interface 15 which provides both input and output interfaces to various vehicle devices;" see also claim 21 of the Flick '551 patent. Furthermore, as observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "reading from the at least one vehicle device." *See* '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 7**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 7. The Flick '551 patent discloses the corresponding at least one vehicle code is for writing e.g., "data communications bus interface provides both input and output interfaces" from the at least one vehicle device. See e.g., Fig. 2 and "In the illustrated embodiment, the CPU 12 is also operatively connected to a memory (EEPROM) 14 and a data communications bus interface 15 which provides both input and output interfaces to various vehicle devices;" see also claim 21 of the Flick '551 patent. Furthermore, as observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "writing to the at least one vehicle device." *See* '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 8**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 8. It was well known at the time of the invention that the downloading interface comprised downloading of at least one programming instruction. See also, claim 21 of the Flick '551 patent. As observed during the original prosecution history of the '278 patent, these are well known variants and that a disclosure of "transceivers" is sufficient to disclose "permitting downloading of at least one programming instruction for said multi-vehicle compatible controller." *See* '278 Office Action dated 1/5/2011, page 3. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 9**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 9. The Flick '551 patent discloses "transceivers" including transmitter/receiver 13 illustrated in Fig. 1, stating "The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter." (Col. 4, lines 15-20) which is sufficient to disclose "permitting downloading of at least one programming instruction for said multi-vehicle compatible controller." *See also* 8:2-4; claims 21, 24, 36, and 50 of the Flick '551 patent. Applicant did not dispute this statement in any of their responses filed during the prosecution of the '278 patent.

**With regard to claim 10**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 10. The Flick '551 patent discloses the at least one vehicle remote control function includes at least one of a security function e.g., "armed and disarmed modes", a remote keyless entry function e.g., "remote keyless entry system", and a remote

engine starting function e.g., "remote engine starting system". See e.g., armed and disarmed modes (col. 8, lines 2-4), remote keyless entry system (col. 8, lines 13-17), and remote engine starting system (col. 8, lines 27-34); *see also*, claims 37-38, and 39 of the Flick '551 patent.

**With regard to claim 11**, as set out above in the analysis of claim 1 and in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 11. In particular, GPS was well known in the art at the time of the invention.

**With regard to claim 12**, as set out in detail in Exhibit D, the Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article teaches all limitations of claim 12. The Flick '551 patent discloses a housing. See e.g., Fig. 1, illustrating controller 11 in a housing.

**With regard to claim 14**, as set out above with respect to Claim 6, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 14.

**With regard to claim 15**, as set out above with respect to Claim 7, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 15.

**With regard to claim 16**, as set out above with respect to Claim 8, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 16.

**With regard to claim 17**, as set out above with respect to Claim 9, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 17.

**With regard to claim 19**, as set out above with respect to Claim 6, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 19.

**With regard to claim 20**, as set out above with respect to Claim 7, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 20.

**With regard to claim 21**, as set out above with respect to Claim 8, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 21.

**With regard to claim 22**, as set out above with respect to Claim 9, and as set forth in Exhibit D, Flick '551 patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article discloses all the limitations of Claim 22.

**B. *Claims 1-22 are Unpatentable over the Flick '551 Patent in view of Brinkmeyer, Monroe, Drori, the Space Daily Trimble Article, the Mateja Article, and the Holusha Article***

The Flick '278 patent is subject to a non-statutory, obviousness-type double patenting rejection in view of the Flick '551 patent as set forth above. Accordingly, the following proposed rejection is appropriate.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not

patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). *See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

Claims 1-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the Flick '551 patent. Secondary references including Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article show the state of the art at the time of the Flick '551 patent. A person of ordinary skill in the art would have found the addition of a vehicle position determining device to be an obvious variant of the invention claimed in the Flick '551 patent.

An obviousness-type double patenting rejection of the claims of the Flick '278 patent in view of the Flick '551 patent cannot be overcome by way of filing a terminal disclaimer because the Flick '551 patent (filed August 22, 1996, and issued February 17, 1998) is now expired. *See Boehringer Ingelheim Int'l GmbH v. Barr Labs, Inc.*, 592 F.3d 1340, 1347-48 (Fed. Cir. 2010) ("a terminal disclaimer filed after the expiration of the earlier patent over which claims have been found obvious cannot cure obviousness-type double patenting."). Accordingly, the claims of the Flick '278 patent are unpatentable in view of the now-expired Flick '551 patent.

Alternatively, the claims of the Flick '278 patent are found unpatentable on grounds of double patenting under equitable principles. The claims of the Flick '278 patent, if allowed to remain, would improperly extend the "right to exclude" already granted in the Flick '551 patent. There is no apparent reason why Patent Owner was prevented from presenting claims to the

feature of a vehicle position determining device which, as documented above, was well known in the art. *See In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968); *see also* MPEP § 804.

**With regard to claim 1**, as set out in detail in Exhibit E, the claims of the Flick '551 patent as understood in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article as secondary references showing the state of the art reads on all limitations of claim 1. Specifically, the Flick '551 patent and these secondary references teach:

- *A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible tracking unit comprising*: Claim 21 of the Flick '551 patent claims: "A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices." *See also* Claims 1, 5, 28, 36, and 50 of the Flick '551 patent.
- *a vehicle position determining device*: Brinkmeyer states that the "…vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the Global Positioning System." Brinkmeyer, 5:6-16. Monroe discloses a GPS system in a vehicle tracking unit. Monroe, Fig. 4a-4b.
- Drori discloses the combination of a GPS device with a vehicle security system. Drori at 4:44-48 ("Inputs from a conventional vehicle security system 13, from a host vehicle (not shown), and from a global positioning tracker (not shown) are received by the system controller 20 via level conversion and filtering circuits 36.").
- Furthermore, as detailed above, other prior art references show that vehicle position determining devices, including but not limited to GPS, were well known in

the art. *See, e.g.*, Space Daily Trimble article (announcement of Trimble at Consumer Electronics Show as GPS technology provider to Microsoft); Mateja (detailing the public availability and rentals of Oldsmobile vehicles using the TravTek satellite positioning system as early as 1992); Holusha article (availability of the Oldsmobile Guidestar system and services utilizing the Global Positioning System satellites).

- *a wireless communications device:* Claim 24 of the Flick '551 patent claims: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device."
- *a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information:* Claim 36 of the Flick '551 patent claims: "a receiver within the vehicle for receiving a signal from said remote transmitter" and "a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus." Claim 36 also recites: "desired signal enabling means for enabling said function controller to operate **using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter**." (emphasis added). Claim 50 of the Flick '551 patent claims: "enabling the vehicle function controller to operate using

a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles **for permitting the vehicle function controller to communicate via the data communications bus with at least one of the vehicle devices**." (emphasis added). Claim 50 also recites: "receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter." As discussed above, vehicle tracking units that included vehicle position determining devices were well known in the art. For more with respect to "multi-vehicle compatible," see below.

- *said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles:* Claim 21 of the Flick '551 patent claims: "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." *See also* Claims 1, 15, 28, 36, and 50 of the Flick '551 patent.
- *a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller:* Claim 23 of the Flick '551 patent claims: "download learning

means for learning the desired set of signals from a downloading device." Claim 24 of the Flick '551 patent claims: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." *See also*, Claims 8 and 35 of the Flick '551 patent.

**With regard to claim 2**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 2. It was well known at the time of the invention that a downloading interface includes a wired signal downloading interface. A person of ordinary skill in the art would have found the addition of a wired signal downloading interface to be an obvious variant of the invention claimed in the Flick '551 claims.

**With regard to claim 3**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 3. It was well known at the time of the invention that the wired signal downloading interface includes a connector for temporary connection to a downloading device. A person of ordinary skill in the art would have found the addition of a temporary connection to a downloading device to be an obvious variant of the invention claimed in the Flick '551 claims.

**With regard to claim 4**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 4. Claim 24 of the Flick '551 patent claims "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device."

**With regard to claim 5**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 5. Claim 24 of the Flick '551 patent claims "cellular telephone means cooperating with said download learning means for receiving signals from a

remote downloading device." Accordingly, cellular involves temporary connections as it moves in and out of cell phone service range.

**With regard to claim 6**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 6. Claim 21 of the Flick '551 patent recites "communicate via the data communications bus with at least one of the vehicle security sensor," which would include reading from the at least one vehicle device. Claim 21 of the Flick '551 patent recites "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals."

**With regard to claim 7**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 7. Claim 21 of the Flick '551 patent recites "communicate via the data communications bus with at least one of the vehicle security sensor," which would include writing to the at least one vehicle device. Claim 21 of the Flick '551 patent recites "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals."

**With regard to claim 8**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 8. Claim 21 of the Flick '551 patent recites "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a

corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." Claim 23 of the Flick '551 patent recites "download learning means for learning the desired set of signals from a downloading device."

**With regard to claim 9**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 9. Claim 21 of the Flick '551 patent recites "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals." Claim 24 of the Flick '551 patent recites a "cellular telephone means cooperating with said download learning means for receiving signals" which necessarily involves a remote transmitter.

Claim 36 of the Flick '551 patent includes "a remote transmitter;" and "a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus; and" "desired signal enabling means for enabling said vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter."

Claim 50 of the Flick '551 patent includes "receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter."

**With regard to claim 10**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 10. Claim 37 of the Flick '551 patent recites "vehicle function controller comprises an alarm controller being capable of generating an alarm responsive to the vehicle security sensor." Claim 38 of the Flick '551 patent recites "vehicle function controller comprises a door lock controller for moving the vehicle door locks between locked and unlocked positions responsive to said remote transmitter." Claim 39 of the Flick '551 patent recites "vehicle function controller comprises a remote start controller for operating the vehicle engine starting means responsive to said remote transmitter."

**With regard to claim 11**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 11. As discussed above and as set forth with respect to claim 1 above, a person of ordinary skill in the art would have found the addition of a Global Positioning System (GPS) receiver to be an obvious variant of the claims in the Flick '551 patent.

**With regard to claim 12**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 12. A person of ordinary skill in the art would have found the addition of a housing to be an obvious variant of the claims in the Flick '551 patent.

**With regard to claim 13**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 13. Claim 13 is nearly identical to Claim 1, with only the addition of the feature "said downloading interface comprising a connector for temporary connection to a downloading device." It was well known at the time of the invention that the

wired signal downloading interface includes a connector for temporary connection to a downloading device.

**With regard to claim 14**, as set out above with respect to Claim 6, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all the limitations of Claim 14.

**With regard to claim 15**, as set out above with respect to Claim 7, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 15.

**With regard to claim 16**, as set out above with respect to Claim 8, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 16.

**With regard to claim 17**, as set out above with respect to Claim 9, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 17.

**With regard to claim 18**, as set out in detail in Exhibit E, the claims of the Flick '551 patent read on all of the limitations of Claim 18. Claim 18 is nearly identical to Claim 1, with only the addition of the feature "said downloading interface comprising a wireless receiver for temporary connection to a downloading device." Claim 24 of the Flick '551 patent claims "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device." Accordingly, cellular involves temporary connections as it moves in and out of cell phone service range. Furthermore, a person of ordinary skill in the art would have found the addition of a wireless receiver for temporary connection to a downloading device to be an obvious variant of the invention claimed in the Flick '551 claims.

**With regard to claim 19**, as set out above with respect to Claim 6, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all the limitations of Claim 19.

**With regard to claim 20**, as set out above with respect to Claim 7, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all the limitations of Claim 20.

**With regard to claim 21**, as set out above with respect to Claim 8, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all the limitations of Claim 21.

**With regard to claim 22**, as set out above with respect to Claim 9, and as set forth in Exhibit E, the claims of the Flick '551 patent read on all the limitations of Claim 22.

## VIII. CONCLUSION

The prior art described herein raise substantial new questions of patentability with respect to the claims of the Flick '278 patent. As shown in detail above, and in the attached claim charts, the elements of each claim were disclosed in the Flick '551 patent in view of the prior art references. As the Flick '551 patent and Flick '278 patents had the same inventor and were commonly owned at the time of their application filings (and to the best of Requester's knowledge, appear to remain so today), Patent Owner should not be entitled to extend the right to exclude based on the inclusion of the obvious and well known feature of a vehicle position determining device. In addition, any attempt by Patent Owner to rely upon the disclosures of the Flick '551, Flick '460, or Flick '885 patents to establish an earlier priority date for any of claims 1 - 22 of the Flick '278 patent is an admission that claims 1 – 22 are invalid in view of applicant-admitted prior art.

Based on the teachings of the prior art described previously, claims 1 through 22 of the Flick '278 patent fail to satisfy the requirements for patentability set out in 35 U.S.C. § 103 and in the judicially created doctrine of nonstatutory double patenting, and are therefore unpatentable. Furthermore, Requester submits that an obviousness-type double patenting rejection of the claims of the Flick '278 patent in view of the Flick '551 patent cannot be overcome by way of filing a terminal disclaimer because the Flick '551 patent (filed August 22, 1996, and issued February 17, 1998) is now expired.

For these reasons, and those more fully stated above and in the attached claim charts, it is respectfully requested that this Request for *ex parte* Reexamination be granted and that all claims of the Flick '278 patent be Finally Rejected.

Respectfully submitted,



Date: December 11, 2019

By: _____

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**CERTIFICATE OF SERVICE**

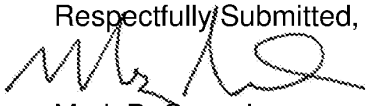
**Certificate of Service in compliance with 37 C.F.R. § 1.510(b)(5)**

Pursuant to 37 C.F.R. § 1.510(b)(5) and 37 C.F.R. § 1.33(c), I hereby certify that on December 11, 2019, a complete copy of this *ex parte* reexamination request, including the accompanying transmittal, FORM PTO/SB/42, and all attachments and exhibits, are being served via First Class U.S. Mail upon Patent Owner at the correspondence address as shown in PAIR:

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In accordance with 37 C.F.R. § 1.510(b)(5), on December 11, 2019.

Respectfully Submitted,



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