# FUEL PUMP SAFETY DEVICE

## FIELD OF THE INVENTION

The present invention generally pertains to a system and method for preventing dispensing of fuel when a vehicle's engine is running.

## BACKGROUND OF THE INVENTION

Gasoline vapor is highly flammable, so that fuel dispensing devices are provided with safety devices such as sensors which detect that a tank is full and stop the dispensing of fuel under such conditions so as to prevent spillage of fuel, which can result in a buildup of highly flammable vapor.

WIPO Patent Application WO10078881A1 discloses a pump system for a vehicle such as a tanker, the pump system having a pump and a pump engine that is separate from the vehicle's engine. The pump system is configured such that the pump does not work unless the vehicle's engine is switched off. In some embodiments, the pump system is further configured such that the pump does not work unless the vehicle's brakes are on and the vehicle's cab is locked. In this pumping system, a small pump which is independent of a tanker truck's engine, such as a battery-powered electric pump, is used for pumping material out of a tanker truck. To ensure that it is safe to do the pumping, the system ensures that the truck's driving engine is off and, preferably, that the truck's brakes are on and, possibly, that the truck's cab is locked. However, the above are determined by interconnecting the small pump's control system with the delivery truck's control system.

Chinese patent application CN200967422 discloses safety equipment for a natural gas vehicle which contains a natural gas monitor, a central controller, sound-light alarm equipment, a display, a natural gas pipe shutoff device, a pressure monitor, a smoke monitor and a circuit shutoff device. The natural gas monitor and the smoke monitor are positioned on the central controller; the central controller is connected with the sound-light alarm equipment, the pressure monitor, the circuit shutoff device and the natural gas pipe shutoff device. The system can on-line monitor leakage concentration, leakage speed, gas cylinder pressure, test time of the gas cylinder, aeration times of the gas cylinder and combustion smoke of the natural gas vehicle, thereby protecting the vehicle safely and effectively preventing

explosions and fires, especially after accidents. However, this system stops fuel flow to an engine, thereby stopping the engine from running.

US Patent US5224525 discloses a hose nozzle for filling fluid into a tank and for shutting off automatically when the tank is filled is provided. The hose nozzle comprises a housing that has an inlet nozzle and an outlet pipe at opposite ends of the housing and a grip portion of an area of the inlet nozzle. A flow valve is disposed in the housing between the inlet nozzle and the outlet pipe whereby the flow valve further comprises a valve rod. A control device is provided that comprises a pressure channel and a plunger-type control element, for closing the flow valve depending on a pressure present in the pressure channel, against a direction of fluid flow, whereby the control device is disposed in the housing between the inlet nozzle and the flow valve and whereby the pressure channel is connected to a port of the outlet pipe. A manual lever, disposed within the grip portion and connected with one end thereof to the control device, actuates the flow valve and controls a fluid flow from the inlet nozzle to the outlet pipe. A control lever that is pivotably connected with a first end thereof to the one end of the manual lever and with a second end thereof to the valve rod actuates the valve rod.

US5224525 is typical of many patents that disclose means of shutting of fuel flow from a filling nozzle during dispensing of fuel. All detect a condition directly related to the filling process. US5224525 detects whether the fluid in the tank has reached a predetermined level by detecting gas pressure near or at the nozzle and stops the flow of fuel when the pressure has exceeded a preset level. Other such patents have sensors to determine whether the nozzle is in the tank, usually by determining whether the nozzle is in contact with a conductive material, such as a metal portion of a fuel tank.

It is therefore a long felt need to provide a device and method that can shut off fuel flow if a potentially dangerous, but not abnormal, condition is present, the condition being associated with the vehicle but not directly with the fuel or the vehicle's fuel tank.

## SUMMARY OF THE INVENTION

It is an object of the present invention to disclose a system, device and method for preventing dispensing of fuel when a vehicle engine is running.

It is another object of the present invention to disclose a device for reversibly disabling flow of fuel from a fuel dispensing unit, comprising:

a. at least one sensor configured to measure at least one parameter related to a member of a vehicle-related group consisting of: a vehicle, a vehicle accessory, said vehicle's environment and any combination thereof;

b. a database to store at least one characteristic signal pattern related to at least one member of said vehicle-related group; and

c. a set of instructions which, when executed, are configured to (a) analyze at least one said parameter related to at least one said member of said vehicle-related group, said analysis producing at least one measured signal pattern; (b) compare said at least one measured signal pattern with said at least one characteristic signal pattern; and (c) disable said fuel dispensing unit from dispensing fuel consequent to at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern and enable said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least one characteristic signal pattern,

wherein said measurement of said at least one parameter related to a member of said vehicle-related group is performed remotely or via said fuel dispensing unit, said at least one sensor not forming a part of any system of said vehicle.

It is another object of the present invention to disclose the device, wherein said set of instructions additionally comprises instructions which, when executed, configure said fuel dispensing unit to dispense fuel if each said measured signal pattern differs substantially from every said characteristic signal pattern.

It is another object of the present invention to disclose the device, wherein said vehicle accessory is an electronic activator.

It is another object of the present invention to disclose the device, wherein said electronic activator is selected from a group consisting of an electronic locking mechanism, an ignition control, and any combination thereof.

It is another object of the present invention to disclose the device, wherein said vehicle's environment is selected from a group consisting of: another vehicle, hydrocarbon vapor, a fire, an abnormally high temperature, and any combination thereof.

It is another object of the present invention to disclose the device, wherein, after dispensing of fuel is disabled, said instructions are configured such that, when executed, said device

continues measuring and analyzing said parameters and comparing said parameters to said characteristic parameters until either (1) the attempt to dispense has ended, or (2) the measured monitored parameters indicate that it is safe to dispense fuel.

It is another object of the present invention to disclose the device, wherein at least one said sensor is selected from a group consisting of: a vibration sensor, a temperature sensor, an infrared sensor, a light sensor, a sound sensor, an electric field sensor, a magnetic field sensor, a gas sensor and any combination thereof.

It is another object of the present invention to disclose the device, wherein said signal pattern is selected from a group consisting of: a signal pattern characteristic of a running engine, a signal pattern characteristic of an overheated engine, a signal pattern characteristic of an unlocked vehicle, a signal pattern characteristic of hydrocarbon vapor, a signal pattern characteristic of an ignition control inside the vehicle, a signal pattern characteristic of an electronic locking mechanism inside the vehicle, a signal pattern characteristic of a fire, a signal pattern characteristic of an abnormally high temperature, a signal pattern characteristic of a second running engine in proximity to said fuel dispenser, a signal pattern characteristic of an activated electronic locking mechanism, a signal pattern characteristic of an activated ignition control, and any combination thereof.

It is another object of the present invention to disclose the device, wherein said device is reprogrammable.

It is another object of the present invention to disclose the device, reprogramming effects at least one of the following changes: upgrades said instructions; corrects errors in said instructions, changes the number of sensors, changes the type a sensor, adds a new signal patterns to the database, and any combination thereof.

It is another object of the present invention to disclose the device, wherein said reprogramming is automatic.

It is another object of the present invention to disclose the device, wherein said instructions, when executed, configure said device to add at least one signal pattern to said database.

It is another object of the present invention to disclose the device, wherein said instructions, when executed, configure said device to modify at least one signal pattern in said database.

It is another object of the present invention to disclose the device, wherein said fuel is either liquid or gaseous.

It is another object of the present invention to disclose the device, wherein said fuel is pumpable from a storage tank into a holding tank.

It is another object of the present invention to disclose the device, wherein said fuel is transferable from said storage tank to said holding tank via a member of a group consisting of a nozzle, an open end to a pipe or hose, a screw-on connector, a connector held to a portion of said fuel holding tank by a vacuum, a connector held to an inlet in fluid connection with said fuel holding tank by a vacuum, a connector held to a portion of said fuel holding tank by a magnetic connection, a connector held to an inlet in fluid connection with said fuel holding tank by a magnetic connection, and any combination thereof.

It is another object of the present invention to disclose the device, wherein said fuel is selected from a group consisting of: gasoline, diesel fuel, benzene, kerosene, ethanol, biodiesel, propane, butane, compressed natural gas (CNG), liquefied natural gas (LNG), Dimethyl ether (DME), Liquefied petroleum gas (LPG), ammonia, hydrogen, compressed natural gas (CNG), biogas, liquid nitrogen, wood gas, city gas, and any combination thereof.

It is another object of the present invention to disclose a method of reversibly disabling flow of fuel from a fuel dispensing unit, comprising steps of:

a. providing a device for disabling flow of fuel from a fuel dispensing unit comprising:

   i. at least one sensor configured to measure at least one parameter related to a member of a vehicle-related group consisting of: a vehicle, a vehicle accessory, said vehicle's environment and any combination thereof;

   ii. a database to store at least one characteristic signal pattern related to at least one member of said vehicle-related group;

   iii. a set of instructions which, when executed, are configured to (a) analyze at least one said parameter related to at least one said member of said vehicle-related group, said analysis generating at least one measured signal pattern; (b) compare said at least one measured signal pattern with said at least one characteristic signal pattern; and (c) disable said fuel dispensing unit from dispensing fuel consequent on at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern and enable said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least

one characteristic signal pattern;

b. activating said device;

c. measuring at least one said parameter related to said member of a vehicle-related group;

d. analyzing said parameter related to said member of a vehicle-related group to generate at least one measured signal pattern;

e. comparing said at least one measured signal pattern with said at least one characteristic signal pattern;

f. disabling said fuel dispensing unit from dispensing fuel consequent to at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern; and

g. enabling said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least one characteristic signal pattern

wherein said measurement of said at least one parameter related to a member of said vehicle-related group is performed remotely or via said fuel dispensing unit, said at least one sensor not forming a part of any system of said vehicle.

It is another object of the present invention to disclose the method, additionally comprising steps of dispensing fuel if each said measured signal pattern differs substantially from every said characteristic signal pattern.

It is another object of the present invention to disclose the method, wherein said vehicle accessory is an electronic activator.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting said electronic activator from a group consisting of an electronic locking mechanism, an ignition control, and any combination thereof.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting said vehicle's environment from a group consisting of: another vehicle, hydrocarbon vapor, a fire, an abnormally high temperature, and any combination thereof.

It is another object of the present invention to disclose the method, additionally comprising steps of measuring and analyzing said parameters and comparing said parameters to said

characteristic parameters after dispensing of fuel is disabled until either (1) the attempt to dispense has ended, or (2) the measured monitored parameters indicate that it is safe to dispense fuel.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting at least one said sensor from a group consisting of: a vibration sensor, a temperature sensor, an infrared sensor, a light sensor, a sound sensor, an electric field sensor, a magnetic field sensor, a gas sensor and any combination thereof.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting said signal pattern from a group consisting of: a signal pattern characteristic of a running engine, a signal pattern characteristic of an overheated engine, a signal pattern characteristic of an unlocked vehicle, a signal pattern characteristic of hydrocarbon vapor, a signal pattern characteristic of an ignition control inside the vehicle, a signal pattern characteristic of an electronic locking mechanism inside the vehicle, a signal pattern characteristic of a fire, a signal pattern characteristic of an abnormally high temperature, a signal pattern characteristic of a second running engine in proximity to said fuel dispenser, a signal pattern characteristic of an activated electronic locking mechanism, a signal pattern characteristic of an activated ignition control, and any combination thereof.

It is another object of the present invention to disclose the method, additionally comprising steps of reprogramming said device.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting said reprogramming from a group consisting of: upgrading said instructions; correcting errors in said instructions, changing the number of sensors, changing the type a sensor, adding a new signal patterns to the database, and any combination thereof.

It is another object of the present invention to disclose the method, additionally comprising steps of automatically reprogramming said device.

It is another object of the present invention to disclose the method, additionally comprising steps of adding at least one signal pattern to said database.

It is another object of the present invention to disclose the method, additionally comprising steps of modifying at least one signal pattern in said database.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting said fuel to be either liquid or gaseous.

It is another object of the present invention to disclose the method, additionally comprising steps of pumping said fuel from a storage tank into a holding tank.

It is another object of the present invention to disclose the method, additionally comprising steps of transferring said fuel from said storage tank to said holding tank via a member of a group consisting of a nozzle, an open end to a pipe or hose, a screw-on connector, a connector held to a portion of said fuel holding tank by a vacuum, a connector held to an inlet in fluid connection with said fuel holding tank by a vacuum, a connector held to a portion of said fuel holding tank by a magnetic connection, a connector held to an inlet in fluid connection with said fuel holding tank by a magnetic connection, and any combination thereof.

It is another object of the present invention to disclose the method, additionally comprising steps of selecting said fuel from a group consisting of: gasoline, diesel fuel, benzene, kerosene, ethanol, biodiesel, propane, butane, compressed natural gas (CNG), liquefied natural gas (LNG), Dimethyl ether (DME), Liquefied petroleum gas (LPG), ammonia, hydrogen, compressed natural gas (CNG), biogas, liquid nitrogen, wood gas, city gas, and any combination thereof.

## BRIEF DESCRIPTION OF THE FIGURES

In order to better understand the invention and its implementation in practice, a plurality of embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, wherein

Fig. 1 schematically illustrates an embodiment of the device.

Fig. 2 illustrates an embodiment of a method of operating the device.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description is provided, alongside all chapters of the present invention, so as to enable any person skilled in the art to make use of said invention and sets forth the best modes contemplated by the inventor of carrying out this invention. Various modifications, however, will remain apparent to those skilled in the art, since the generic principles of the present invention have been defined specifically to provide a means and method for preventing dispensing of fuel when a vehicle engine is running.

The term **'about'** refers hereinafter to a range of 25% below or above the referred value.

The present invention discloses a shutoff device for a fuel pump for filling vehicle fuel tanks or other holding tanks. The device is useful for any type of fuel dispensing pump where a vehicle fuel tank is filled, typically via a nozzle, the fuel having been stored in a fuel storage device such as a large storage tank. It is especially useful for fuel dispensing pumps where the owner of the vehicle dispenses the fuel, for non-limiting example, dispensing pumps for gasoline or diesel fuel at automobile and truck filling stations or garages, dispensing pumps for boats at marinas, or dispensing pumps for light aircraft at airports.

The fuel can be any fuel, liquid or gaseous, that is pumpable and that can be dispensed into a holding tank via a nozzle. Examples of fuel include, but are not limited to, gasoline, diesel fuel, benzene, kerosene, ethanol, biodiesel, propane, butane, compressed natural gas (CNG), liquefied natural gas (LNG), Dimethyl ether (DME), Liquefied petroleum gas (LPG), ammonia, hydrogen, compressed natural gas (CNG), biogas, liquid nitrogen, wood gas, city gas, and any combination thereof.

The fuel can exit from the fuel dispenser and enter the fuel holding tank via a nozzle, via an open end to a pipe or hose, via a screw-on connector, via a connector held to a portion of the fuel holding tank or to an inlet in fluid connection with the fuel holding tank by a vacuum or by a magnetic connection, and by any combination thereof.

Unlike prior-art systems, the shutoff device of the present invention (1) is entirely associated with the fuel pumping system; no connection with the car's electronic or mechanical components is needed and (2) is not associated with conditions related to dispensing of the fuel such as, but not limited to, the amount of fuel in the tank, the presence of spills, or the presence of a hose, a nozzle, a connector or another dispensing means in the recipient's fuel tank, in an inlet in fluid communication with the fuel tank, or connected to the fuel tank or an inlet in fluid communication with the fuel tank.

The device comprises at least one sensor in communication with a set of instructions for controlling a shutoff valve. The sensor is configured to measure signals related to an active (running) engine and to send the signals to a processor configured to execute a series of instructions. The processor analyzes the signals and determines whether they are signals characteristic of an active engine. If the signals are characteristic of an active engine, the processor disables flow of fuel from the fuel dispenser, preventing the user from filling his tank until the engine has been stopped if dispensing had not yet started, or stopping fuel

from flowing into the vehicle's fuel tank if dispensing had started.

In some embodiments, sensors, preferably on the fuel dispenser, monitor other safety-related conditions, such as, but not limited to, ignition controllers such as keys or electronic keys in the ignition, and at least one of the vehicle's points of ingress and egress being locked (e.g., door, window, trunk, hood, and sunroof). Processors can determine, for non-limiting example, from sensed electromagnetic fields, for electronic locking mechanism, the presence of electric or magnetic fields characteristic of activation of the electronic locking mechanism. For example, in such embodiments, the device can prevent flow of fuel if it has not detected the electric or magnetic fields characteristic of an attempt to lock the vehicle, as the vehicle would have to be unlocked to allow egress of the user.

Similarly, from sensed electromagnetic fields, a processor can determine the location of an electronic ignition controller; the device can then disable flow of fuel if the same is within the vehicle or enters the vehicle.

After the flow of fuel is disabled, the system continues to monitor the vehicle until such time as (1) the user indicates that the attempt to dispense has ended, or (2) the engine is stopped and all other monitored parameters indicate that it is safe to dispense fuel (e.g., car locked, keys out of ignition, etc). A typical, but not limiting, method of ending an attempt to dispense fuel is to return the fuel nozzle to its rest on the dispenser cabinet.

When the analyzed signals cease to be those of a running engine and all other monitored parameters indicate a safe dispense, flow of fuel is enabled and control of fuel flow is by means of the conventional controls, such as, but not limited to, pressure sensors or other sensors conventionally used for automatic control of fuel flow or the conventional manual trigger typically found on gas dispenser nozzles for manual control.

In preferred embodiments, the sensor is a vibration sensor and the processor identifies vibrations characteristic of a running engine. Other sensor types can be, for non-limiting example, sound sensors, with the processor identifying sound patterns characteristic of a running engine, electric field sensors and/or magnetic field sensors with the processor identifying electric and/or magnetic fields characteristic of a running engine, temperature or infrared sensors, with the processor identifying infrared patterns characteristic of a running engine.

In some embodiments, any of temperature, visible light or infrared sensors can be used, with the processor detecting abnormal sources of heat and disabling fuel flow if abnormal

sources of heat, such as a fire, are detected.

In some embodiments, gas sensors can be used, with the processor detecting components characteristic of hydrocarbon vapors. In such embodiments, fuel flow can be disabled if the concentration of hydrocarbon vapors is greater than a predetermined level.

In some embodiments, the presence of another vehicle with running or overheated engine can be detected, if said other vehicle is within a predetermined distance of the vehicle into which fuel is to be dispensed.

In some embodiments, a fire or other source of abnormally high temperature can be detected, if the fire is within a predetermined distance of the vehicle into which fuel is to be dispensed.

It should be noted that the device can comprise any combination of the above embodiments.

A schematic of an embodiment of the device (**300**) is shown in **Fig. 1**. The device (**300**, dashed square) comprises a number, *n*, of sensors (**340**) which sense (dashed lines) some combination of parameters related to the vehicle (**310**), parameters related to vehicle accessories (**320**), and parameters related to the environment of the vehicle (**330**). Parameters related to the vehicle (**310**) can include, but are not limited to, vibrations, temperature patterns, sounds, electric and magnetic fields, light patterns and any combination thereof. Vehicle accessories (**320**) are items such as, but not limited to, electronic keys. Parameters related to the vehicle's accessories (**320**) can include, but are not limited to, vibrations, temperature patterns, sounds, electric and magnetic fields, light patterns and any combination thereof. Parameters related to the vehicle's environment (**330**) include, but are not limited to, vibrations, temperatures, temperature patterns, sounds, electric and magnetic fields, light patterns, gas concentrations and any combination thereof.

The sensor (**340**) measurements are transmitted, either wiredly or wirelessly, to *m* sensor signal receivers (**350**), which can be an integral part of a processing unit (**350**) or can be one or more independent units in communication with the processing unit (**350**).

The processing unit (**350**) comprises an analysis unit, configured with instruction for analyzing the received measurements. The analysis unit is in communication with a database for storing characteristic signal patterns such as, but not limited to, vibration patterns, sound patterns, infrared patterns, electric field patterns, magnetic field patterns and light patterns for engines of different makes and sizes. Also storable in the database are vibration patterns, sound patterns, infrared patterns, electric field patterns, magnetic field patterns and light patterns for engine accessories and vibration patterns, sound patterns, infrared patterns,

electric field patterns, magnetic field patterns and light patterns for typical abnormal conditions in the vehicle's environment, as described above.

In preferred embodiments, signal patterns can be compared to those in the database and, if a signal pattern differs substantially from existing patterns, it can be added automatically to those stored in the database.

The analysis unit is in communication, either wired or wireless, with the fuel pump control system. If the analysis unit determines that a shutdown condition exists, as described above, it sends a shutdown signal to the fuel flow controller (**360**), thereby disabling flow of fuel from the fuel dispenser.

In some embodiments, the fuel flow controller (**360**) is an integral part of the device. In other embodiments, the fuel flow controller (**360**) comprises a separate unit.

In some embodiments, the fuel dispenser as manufactured comprises the device of the current invention. In other embodiments, the device is retrofitted to a fuel dispenser.

In preferred embodiments, the device can be reprogrammed, to upgrade or correct errors in the instructions, to change the number or type of sensors (and modify the instructions appropriately), to add new signal patterns to the database, and any combination thereof.

In preferred embodiments, the device is a "smart device"; it can "learn" new patterns and can improve its recognition of signal patterns by "experience".

An embodiment of a method (**200**) for using the device is shown in **Fig. 2**. The system is activated (**210**), typically by a user starting an attempt to dispense fuel. In some embodiments, the system is activated when the fuel dispenser is activated. Once activated, the sensor(s) measure parameter(s) (**220**) related to at least one of the vehicle, the vehicle accessories and the vehicle's environment, as described above. The measured parameter(s) are communicated to a processing unit, which analyzes the measured parameter(s) (**230**). The system then compares (**240**) the signal pattern(s) of the analyzed parameter(s) to the characteristic signal patterns for active engines stored in the database. If a match is found, fuel flow is disabled (**260**),

If no match is found, the system then compares (**250**) the signal pattern(s) of the analyzed parameter(s) to the characteristic signal patterns for other potentially unsafe conditions stored in the database, as described above. If a match is found, fuel flow is disabled (**260**),

If no match is found or after fuel flow is disabled as a result of a match being found, the system determines (**270**) whether the user is ending the attempt to dispense fuel, for non-limiting example by replacing the dispense nozzle on its hook, or whether the dispense event is to continue. If the dispense event is to continue, if, for non-limiting example, the user intends to turn off the engine and complete filling the vehicle's fuel tank, the cycle repeats, with fresh measurement(s) of the parameter(s) (**220**). Otherwise, the cycle terminates.

CLAIMS:

1. A device for reversibly disabling flow of fuel from a fuel dispensing unit, comprising:

    a. at least one sensor configured to measure at least one parameter related to a member of a vehicle-related group consisting of: a vehicle, a vehicle accessory, said vehicle's environment and any combination thereof;

    b. a database to store at least one characteristic signal pattern related to at least one member of said vehicle-related group;

    c. a set of instructions which, when executed, are configured to (a) analyze at least one said parameter related to at least one said member of said vehicle-related group, said analysis producing at least one measured signal pattern; (b) compare said at least one measured signal pattern with said at least one characteristic signal pattern; and (c) disable said fuel dispensing unit from dispensing fuel consequent to at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern and enable said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least one characteristic signal pattern,

    wherein said measurement of said at least one parameter related to a member of said vehicle-related group is performed remotely or via said fuel dispensing unit, said at least one sensor not forming a part of any system of said vehicle.

2. The device of claim 1, wherein said set of instructions additionally comprises instructions which, when executed, configure said fuel dispensing unit to dispense fuel if each said measured signal pattern differs substantially from every said characteristic signal pattern.

3. The device of claim 1, wherein said vehicle accessory is an electronic activator.

4. The device of claim 3, wherein said electronic activator is selected from a group consisting of an electronic locking mechanism, an ignition control, and any combination thereof.

5. The device of claim 1, wherein said vehicle's environment is selected from a group consisting of: another vehicle, hydrocarbon vapor, a fire, an abnormally high temperature, and any combination thereof.

6. The device of claim 1, wherein, after dispensing of fuel is disabled, said instructions are configured such that, when executed, said device continues measuring and analyzing said parameters and comparing said parameters to said characteristic parameters until either (1) the attempt to dispense has ended, or (2) the measured monitored parameters indicate that it is safe to dispense fuel.

7. The device of claim 1, wherein at least one said sensor is selected from a group consisting of: a vibration sensor, a temperature sensor, an infrared sensor, a light sensor, a sound sensor, an electric field sensor, a magnetic field sensor, a gas sensor and any combination thereof.

8. The device of claim 1, wherein said signal pattern is selected from a group consisting of: a signal pattern characteristic of a running engine, a signal pattern characteristic of an overheated engine, a signal pattern characteristic of an unlocked vehicle, a signal pattern characteristic of hydrocarbon vapor, a signal pattern characteristic of an ignition control inside the vehicle, a signal pattern characteristic of an electronic locking mechanism inside the vehicle, a signal pattern characteristic of a fire, a signal pattern characteristic of an abnormally high temperature, a signal pattern characteristic of a second running engine in proximity to said fuel dispenser, a signal pattern characteristic of an activated electronic locking mechanism, a signal pattern characteristic of an activated ignition control, and any combination thereof.

9. The device of claim 1, wherein said device is reprogrammable.

10. The device of claim 7, wherein reprogramming effects at least one of the following changes: upgrades said instructions; corrects errors in said instructions, changes the number of sensors, changes the type a sensor, adds a new signal patterns to the database, and any combination thereof.

11. The device of claim 7, wherein said reprogramming is automatic.

12. The device of claim 9, wherein said instructions, when executed, configure said device to add at least one signal pattern to said database.

13. The device of claim 9, wherein said instructions, when executed, configure said device to modify at least one signal pattern in said database.

14. The device of claim 1, wherein said fuel is either liquid or gaseous.

15. The device of claim 1, wherein said fuel is pumpable from a storage tank into a holding

tank.

16. The device of claim 1, wherein said fuel is transferable from said storage tank to said holding tank via a member of a group consisting of a nozzle, an open end to a pipe or hose, a screw-on connector, a connector held to a portion of said fuel holding tank by a vacuum, a connector held to an inlet in fluid connection with said fuel holding tank by a vacuum, a connector held to a portion of said fuel holding tank by a magnetic connection, a connector held to an inlet in fluid connection with said fuel holding tank by a magnetic connection, and any combination thereof.

17. The device of claim 1, wherein said fuel is selected from a group consisting of: gasoline, diesel fuel, benzene, kerosene, ethanol, biodiesel, propane, butane, compressed natural gas (CNG), liquefied natural gas (LNG), Dimethyl ether (DME), Liquefied petroleum gas (LPG), ammonia, hydrogen, compressed natural gas (CNG), biogas, liquid nitrogen, wood gas, city gas, and any combination thereof.

18. A method of reversibly disabling flow of fuel from a fuel dispensing unit, comprising steps of:

    a. providing a device for disabling flow of fuel from a fuel dispensing unit comprising:at least one sensor configured to measure at least one parameter related to a member of a vehicle-related group consisting of: a vehicle, a vehicle accessory, said vehicle's environment and any combination thereof;a database to store at least one characteristic signal pattern related to at least one member of said vehicle-related group; a set of instructions which, when executed, are configured to (a) analyze at least one said parameter related to at least one said member of said vehicle-related group, said analysis generating at least one measured signal pattern; (b) compare said at least one measured signal pattern with said at least one characteristic signal pattern; and (c) disable said fuel dispensing unit from dispensing fuel consequent on at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern and enable said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least one characteristic signal pattern;

    b. activating said device;

    c. measuring at least one said parameter related to said member of a vehicle-related

group;

d. analyzing said parameter related to said member of a vehicle-related group to generate at least one measured signal pattern;

e. comparing said at least one measured signal pattern with said at least one characteristic signal pattern;

f. disabling said fuel dispensing unit from dispensing fuel consequent to at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern; and

g. enabling said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least one characteristic signal pattern

wherein said measurement of said at least one parameter related to a member of said vehicle-related group is performed remotely or via said fuel dispensing unit, said at least one sensor not forming a part of any system of said vehicle.

19. The method of claim 18, additionally comprising steps of dispensing fuel if each said measured signal pattern differs substantially from every said characteristic signal pattern.

20. The method of claim 18, wherein said vehicle accessory is an electronic activator.

21. The method of claim 18, additionally comprising steps of selecting said electronic activator from a group consisting of an electronic locking mechanism, an ignition control, and any combination thereof.

22. The method of claim 18, additionally comprising steps of selecting said vehicle's environment from a group consisting of: another vehicle, hydrocarbon vapor, a fire, an abnormally high temperature, and any combination thereof.

23. The method of claim 18, additionally comprising steps of measuring and analyzing said parameters and comparing said parameters to said characteristic parameters after dispensing of fuel is disabled until either (1) the attempt to dispense has ended, or (2) the measured monitored parameters indicate that it is safe to dispense fuel.

24. The method of claim 18, additionally comprising steps of selecting at least one said sensor from a group consisting of: a vibration sensor, a temperature sensor, an infrared

sensor, a light sensor, a sound sensor, an electric field sensor, a magnetic field sensor, a gas sensor and any combination thereof.

25. The method of claim 18, additionally comprising steps of selecting said signal pattern from a group consisting of: a signal pattern characteristic of a running engine, a signal pattern characteristic of an overheated engine, a signal pattern characteristic of an unlocked vehicle, a signal pattern characteristic of hydrocarbon vapor, a signal pattern characteristic of an ignition control inside the vehicle, a signal pattern characteristic of an electronic locking mechanism inside the vehicle, a signal pattern characteristic of a fire, a signal pattern characteristic of an abnormally high temperature, a signal pattern characteristic of a second running engine in proximity to said fuel dispenser, a signal pattern characteristic of an activated electronic locking mechanism, a signal pattern characteristic of an activated ignition control, and any combination thereof.

26. The method of claim 18, additionally comprising steps of reprogramming said device.

27. The method of claim 26, additionally comprising steps of selecting said reprogramming from a group consisting of: upgrading said instructions; correcting errors in said instructions, changing the number of sensors, changing the type a sensor, adding a new signal patterns to the database, and any combination thereof.

28. The method of claim 26, additionally comprising steps of automatically reprogramming said device.

29. The method of claim 28, additionally comprising steps of adding at least one signal pattern to said database.

30. The method of claim 28, additionally comprising steps of modifying at least one signal pattern in said database.

31. The method of claim 18, additionally comprising steps of selecting said fuel to be either liquid or gaseous.

32. The method of claim 18, additionally comprising steps of pumping said fuel from a storage tank into a holding tank.

33. The method of claim 18, additionally comprising steps of transferring said fuel from said storage tank to said holding tank via a member of a group consisting of a nozzle, an open end to a pipe or hose, a screw-on connector, a connector held to a portion of said fuel holding tank by a vacuum, a connector held to an inlet in fluid connection with said

fuel holding tank by a vacuum, a connector held to a portion of said fuel holding tank by a magnetic connection, a connector held to an inlet in fluid connection with said fuel holding tank by a magnetic connection, and any combination thereof.

34. The method of claim 18, additionally comprising steps of selecting said fuel from a group consisting of: gasoline, diesel fuel, benzene, kerosene, ethanol, biodiesel, propane, butane, compressed natural gas (CNG), liquefied natural gas (LNG), Dimethyl ether (DME), Liquefied petroleum gas (LPG), ammonia, hydrogen, compressed natural gas (CNG), biogas, liquid nitrogen, wood gas, city gas, and any combination thereof.

# ABSTRACT

The present invention provides a device for reversibly disabling flow of fuel from a fuel dispensing unit, comprising:

a. at least one sensor configured to measure at least one parameter related to a member of a vehicle-related group consisting of: a vehicle, a vehicle accessory, said vehicle's environment and any combination thereof;

b. a database to store at least one characteristic signal pattern related to at least one member of said vehicle-related group;

c. a set of instructions which, when executed, are configured to (a) analyze at least one said parameter related to at least one said member of said vehicle-related group, said analysis producing at least one measured signal pattern; (b) compare said at least one measured signal pattern with said at least one characteristic signal pattern; and (c) disable said fuel dispensing unit from dispensing fuel consequent to at least one said measured signal pattern being substantially similar to at least one said characteristic signal pattern and enable said fuel dispensing unit to dispense fuel consequent to all of said at least one measured signal pattern being substantially different from all of said at least one characteristic signal pattern,

wherein said measurement of said at least one parameter related to a member of said vehicle-related group is performed remotely or via said fuel dispensing unit, said at least one sensor not forming a part of any system of said vehicle.

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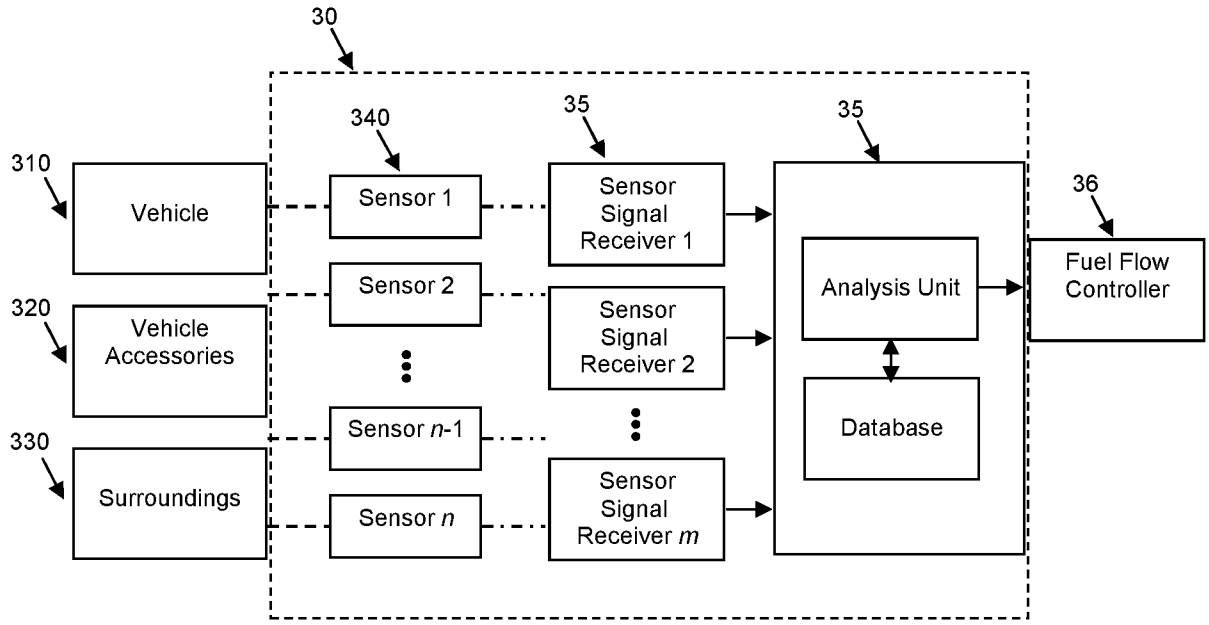
30
340
35
35
310
Vehicle
Sensor 1
Sensor Signal Receiver 1
36
Sensor 2
Sensor Signal Receiver 2
Analysis Unit
Fuel Flow Controller
320
Vehicle Accessories
Database
Sensor n-1
330
Surroundings
Sensor n
Sensor Signal Receiver m

Fig.1

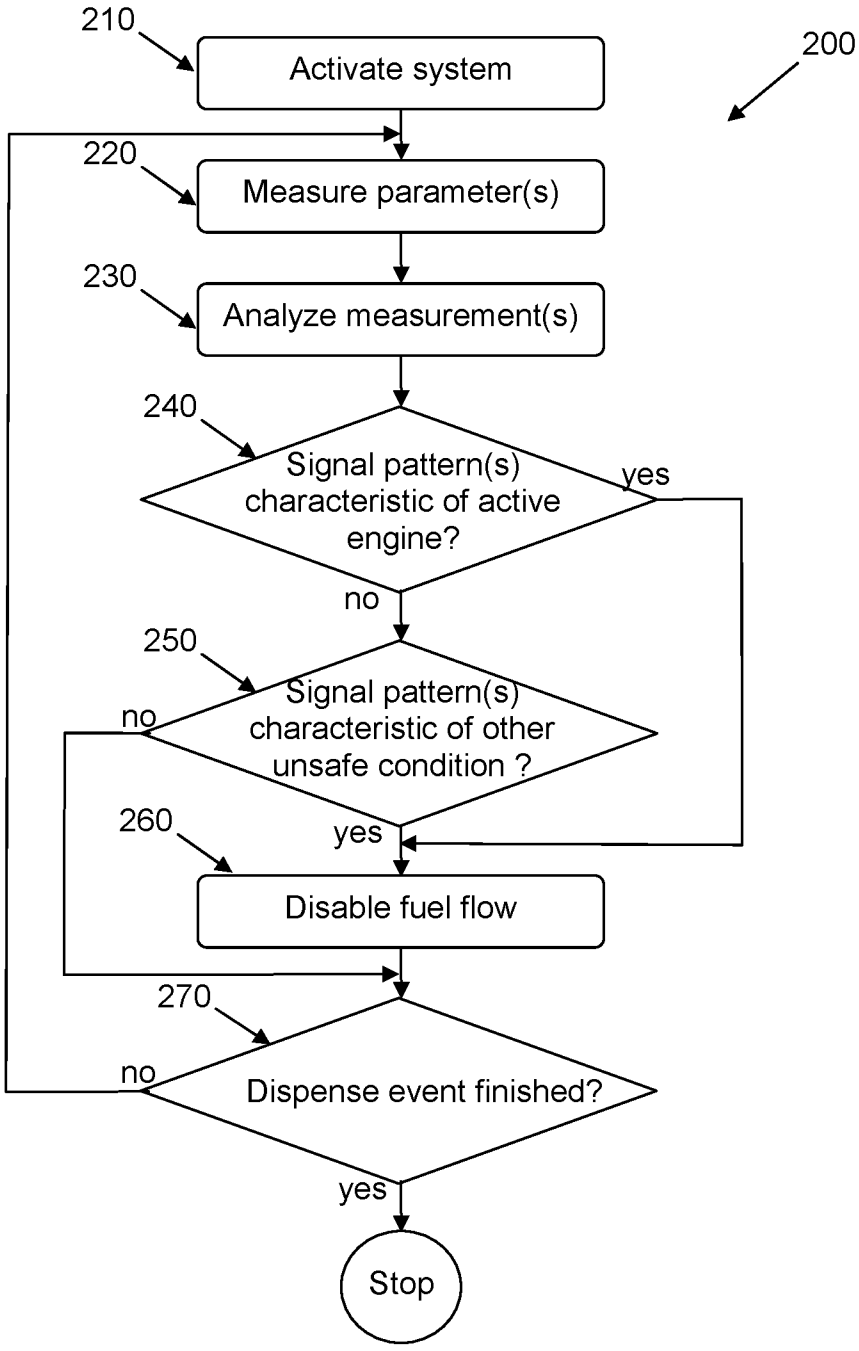
210
Activate system
200
220
Measure parameter(s)
230
Analyze measurement(s)
240
Signal pattern(s) characteristic of active engine?
yes
no
250
Signal pattern(s) characteristic of other unsafe condition ?
no
yes
260
Disable fuel flow
270
Dispense event finished?
no
yes
Stop

Fig.2