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(54) **FUELL CONSUMPTION REDUCTION DEVICE**

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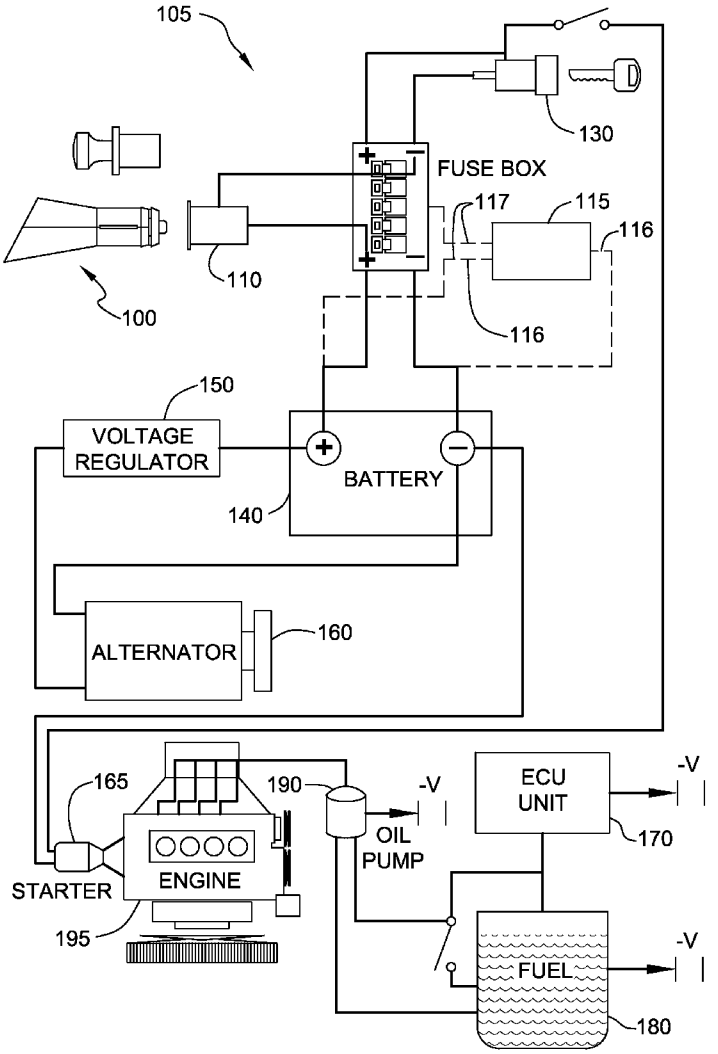
(57) **ABSTRACT**

A fuel consumption reduction device for deployment in a vehicle, including:

an electronic circuit, an encasement adapted to fit into the cigarette lighter socket of the vehicle and to enclose the electronic circuit, a positive terminal positioned on one end of the encasement that is adapted to form contact between the electronic circuit and the positive voltage source connection of the vehicle located in the cigarette lighter socket, at least one negative terminal positioned on the side of the encasement that is adapted to form contact between the electrical circuit and the negative voltage connection of the cigarette lighter; and wherein the electronic circuit is adapted to reduce noise and stabilize the voltage signal of the vehicle.



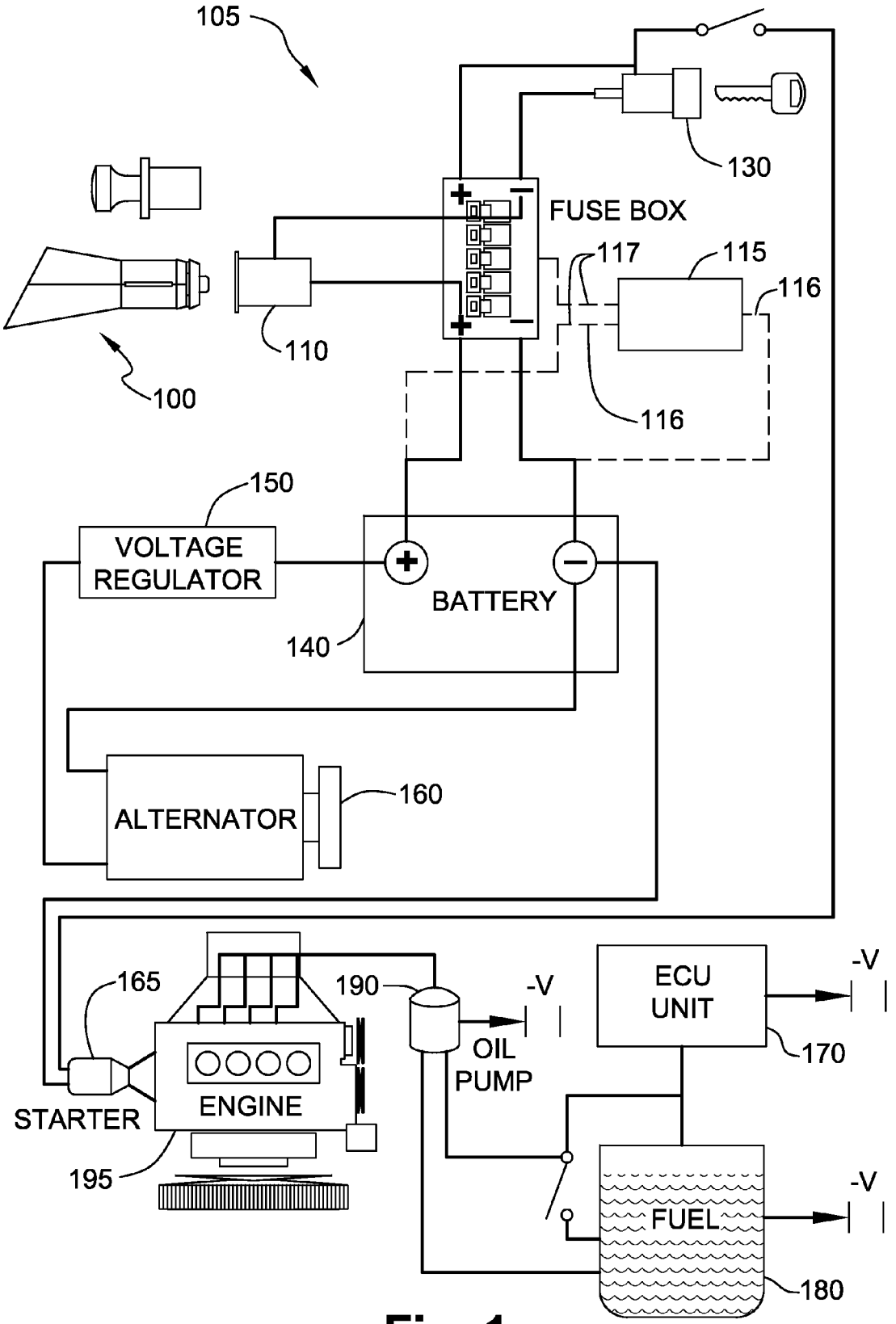

105
130
FUSE BOX
117
115
116
110
100
116
150
VOLTAGE REGULATOR
BATTERY
140
ALTERNATOR
160
165
190
-V
ECU UNIT
-V
OIL PUMP
170
STARTER
ENGINE
195
-V
FUEL
180

Fig. 1

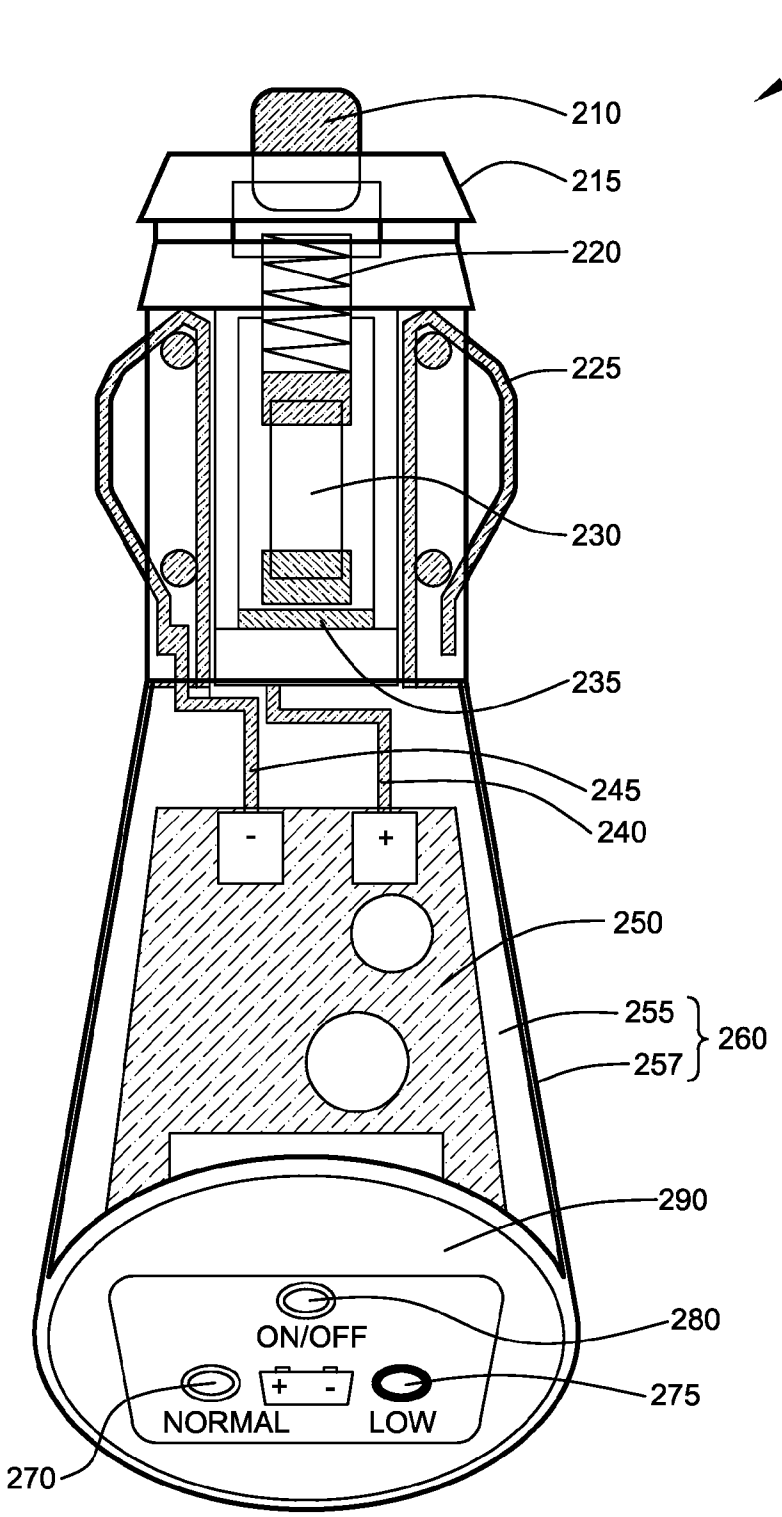

100
210
215
220
225
230
235
245
240
-
+
250
255
257
260
290
ON/OFF
280
+ -
NORMAL
LOW
275
270

Fig. 2A

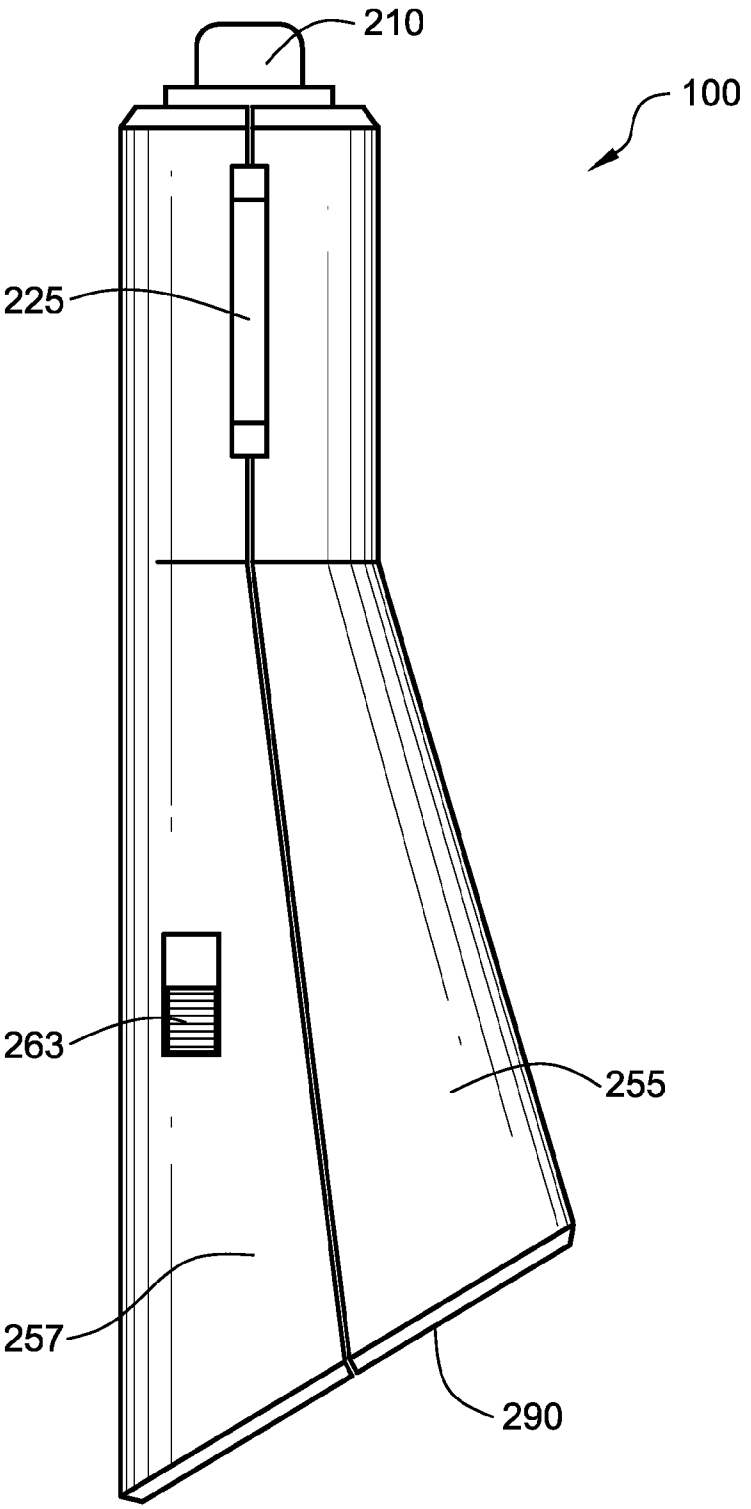


Fig. 2B

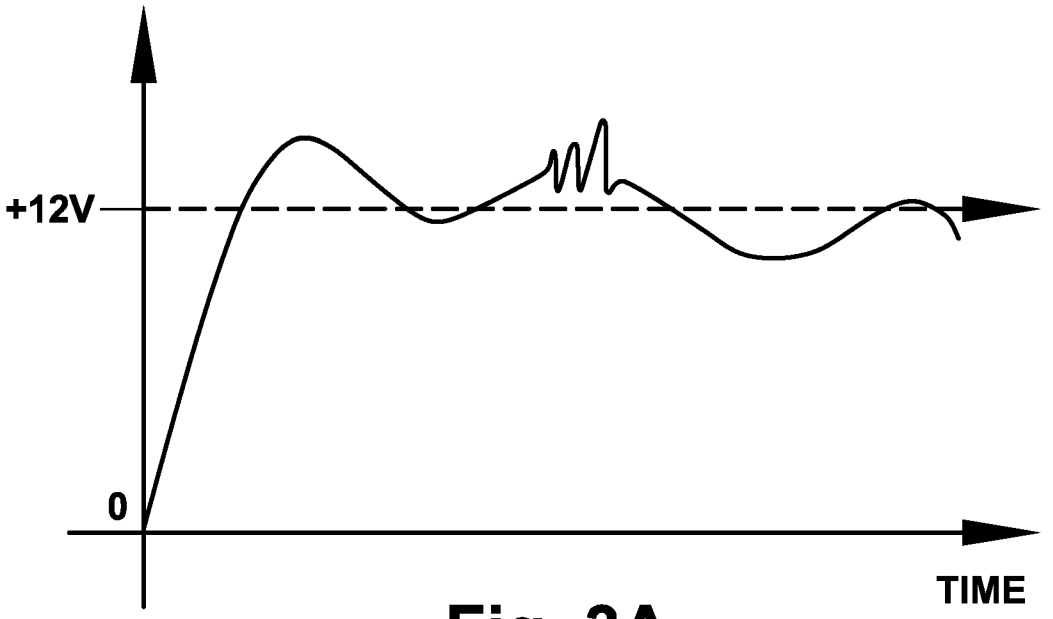


Fig. 3A

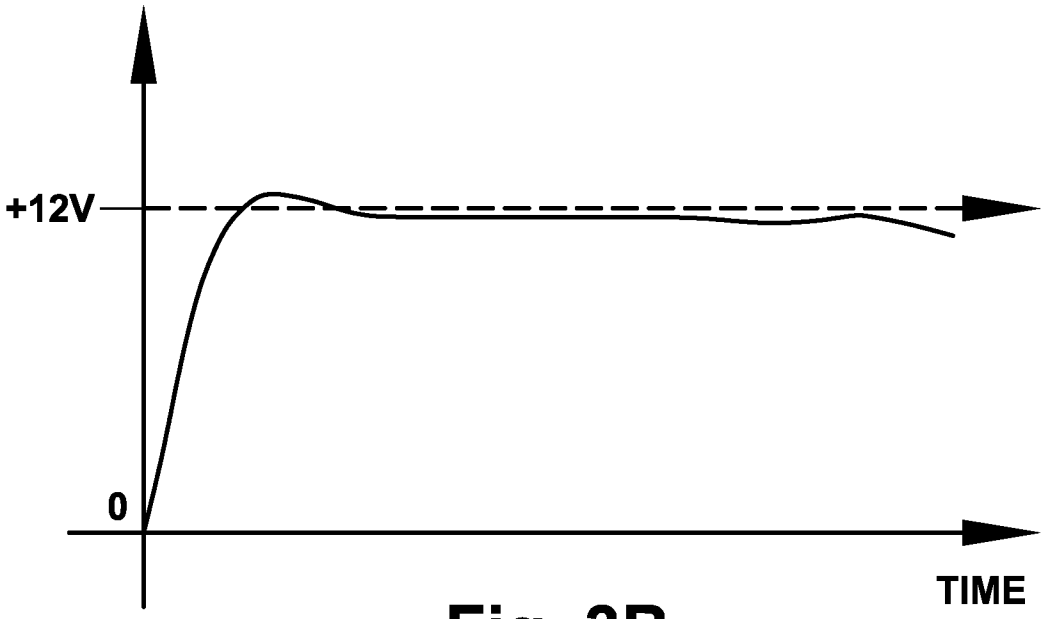
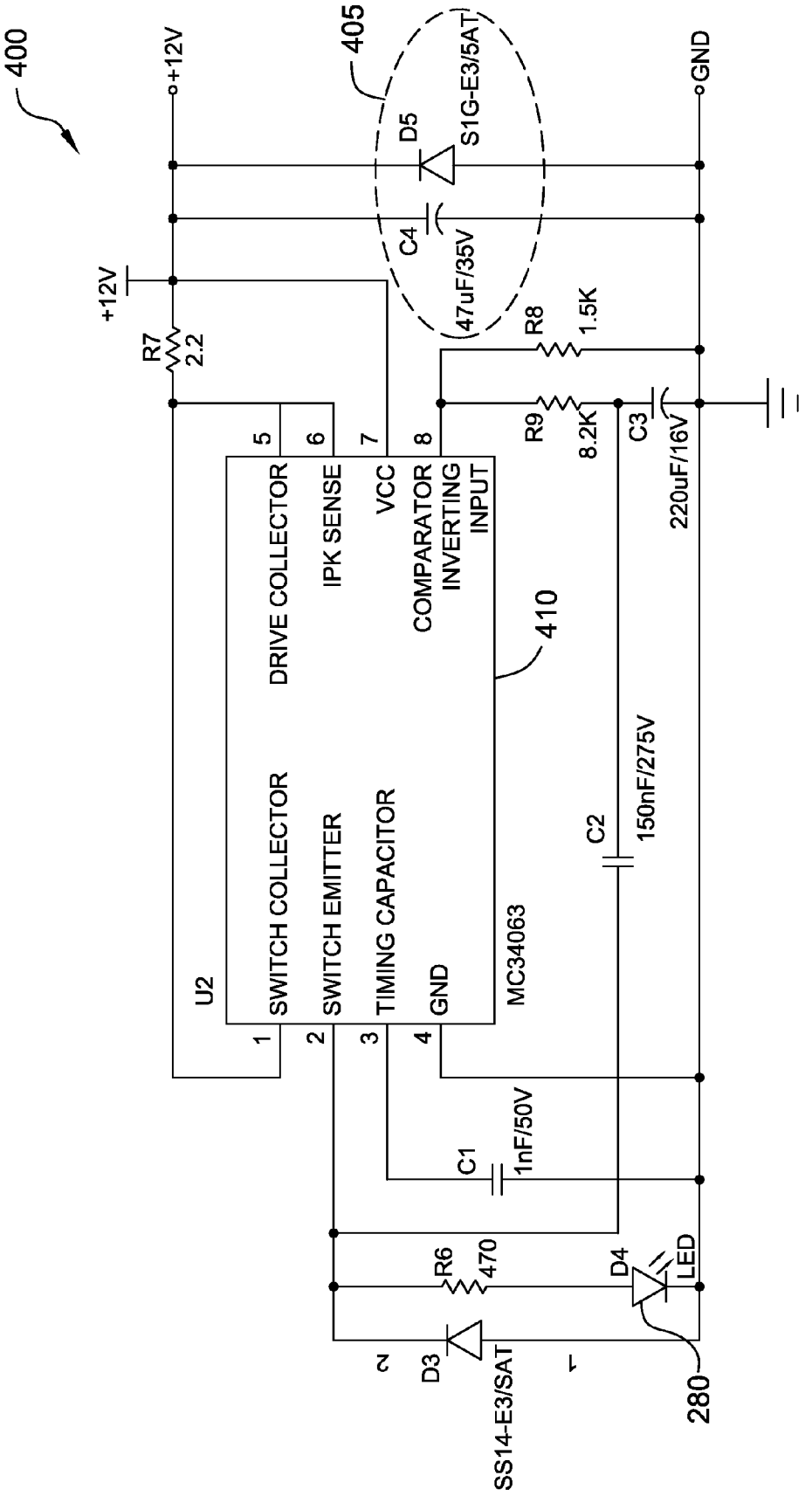


Fig. 3B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+12V
405
D5
S1G-E3/5AT
GND
C4
47uF/35V
+12V
R7
2.2
R8
1.5K
R9
8.2K
C3
220uF/16V
U2
SWITCH COLLECTOR
SWITCH EMITTER
TIMING CAPACITOR
GND
DRIVE COLLECTOR
IPK SENSE
VCC
COMPARATOR INVERTING INPUT
410
MC34063
C2
150nF/275V
C1
1nF/50V
R6
470
D4
LED
D3
SS14-E3/SAT
280

Fig. 4A

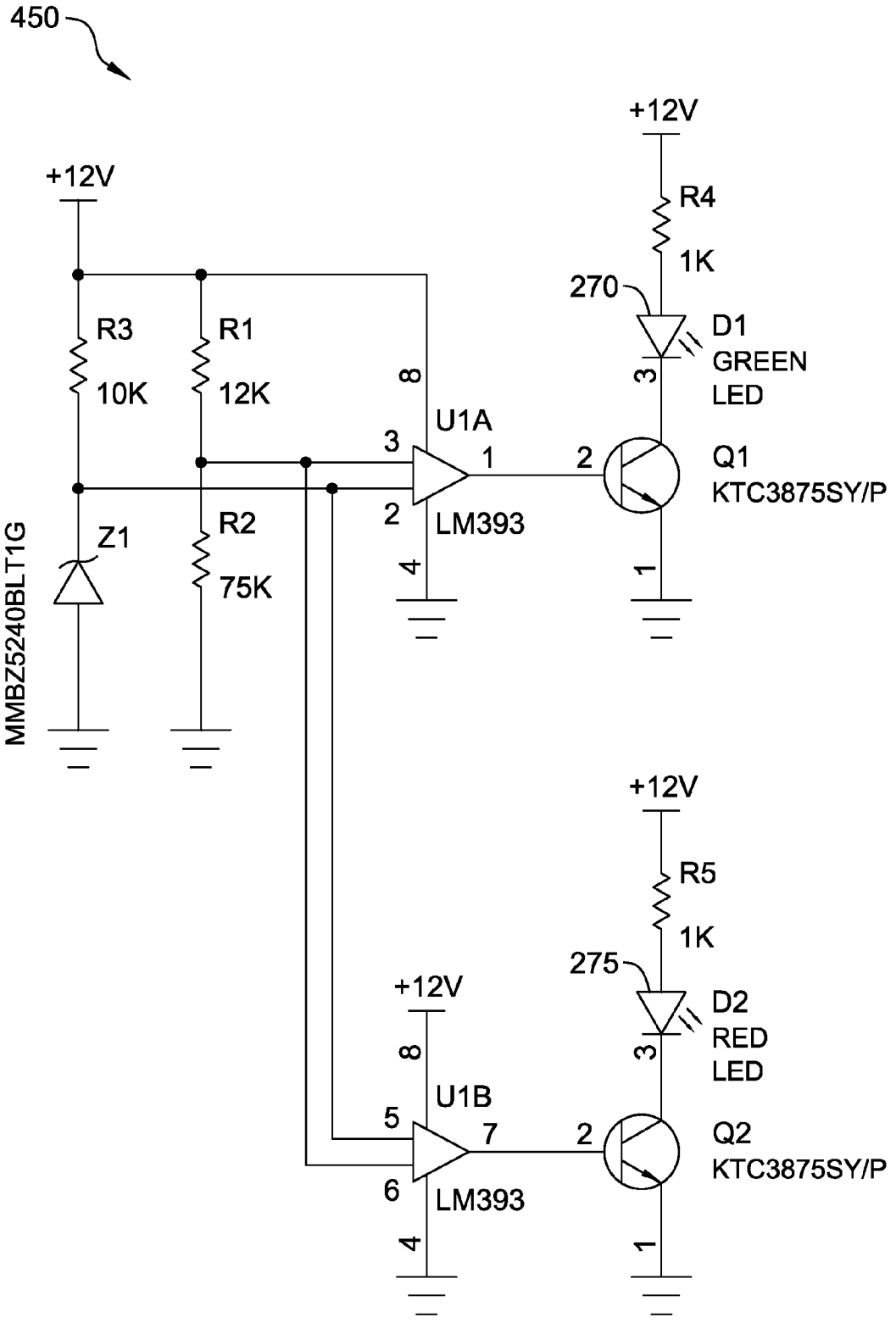
450
+12V
R3
10K
R1
12K
R2
75K
Z1
MMBZ5240BLT1G
U1A
LM393
8
3
1
2
4
+12V
R4
1K
270
D1
GREEN
LED
Q1
KTC3875SY/P
+12V
R5
1K
275
D2
RED
LED
+12V
U1B
LM393
5
7
6
Q2
KTC3875SY/P

Fig. 4B

FUELL CONSUMPTION REDUCTION DEVICE

FIELD OF THE INVENTION

[0001] The present Invention relates generally to a device for reducing the consumption of fuel by motorized vehicles and more specifically to reducing fuel consumption through the use of an electrical circuit.

BACKGROUND OF THE INVENTION

[0002] Fuel consumption is a key expense in the use of motorized vehicles. Motorized vehicles burn fuel of various types, for example gasoline, liquefied petroleum gas (LPG), bio-diesel or diesel. However regardless of the type of fuel used it remains a key expense in the usage of the vehicle.

[0003] Many fuel economy boosting technologies have been suggested, for example using lighter materials for the vehicle, using thinner engine oils that require less energy to circulate, using better coolants so that engines reach their efficient operating temperature quicker, using low rolling resistance tires or optimizing engine combustion strategies.

[0004] Typically vehicles use 12 or 24 Volt batteries for providing electric current to operate the vehicle. An alternator with a voltage regulator charges the battery while the engine is working and serves as a backup voltage source. The electrical system provides power for lights (e.g. headlights), fans, defrosters, speakers, radios and many other systems in the vehicle. In modern vehicles an electrical control unit (ECU) is used to control provision of fuel to the engine. The ECU typically controls some or all of the following functions and other functions, in the engine:

[0005] 1. Engine speed;

[0006] 2. Engine fuel pump control;

[0007] 3. Engine temperature control;

[0008] 4. Engine timing control.

[0009] The ECU typically includes a logic circuit or computer to accept sensor readings and optimally control functionality of the engine during the motion of the vehicle. Generally each vehicle manufacturer programs the ECU to provide optimum performance and optimal fuel consumption. The ECU is designed to function at a specific voltage, however in the real world during use of the vehicle the electrical currents in the vehicle are situated in many different states and affected by interferences, for example working with the lights off or with the lights on, working with the radio off or on, working with heaters/coolers and fans off or on, poor (e.g. corroded) contacts and strong contacts, and many other situations. As a result the electrical currents in the vehicle are not a perfect regulated voltage DC signal but rather a noisy signal fluctuating around the specific voltage. The noisy signal has a detrimental affect on the accuracy of the functionality of the ECU, thus preventing fuel consumption from reaching its optimal state.

SUMMARY OF THE INVENTION

[0010] An aspect of an embodiment of the invention, relates to a fuel consumption reducer that includes an electronic circuit connected in parallel to the power source of the vehicle to clean out noise from the power signal in the vehicles electric system. In an exemplary embodiment of the invention, the electric circuit absorbs excess voltages and supplements deficient voltages to achieve a more linear regulated voltage in the electric system of the vehicle. In an exemplary embodiment of the invention, the fuel consumption reducer is plugged into the cigarette lighter of the vehicle. Alternatively, the fuel consumption reducer is connected in other positions in parallel to the battery of the vehicle, for example connected directly to the battery or through the fuse box.

[0011] In an exemplary embodiment of the invention, the fuel consumption reducer provides an indication regarding the charge status of the battery of the vehicle. Optionally, if the charge status of the vehicle falls below a predefined threshold value the fuel consumption reducer will provide an indication, so that the user of the vehicle will be aware of the need to service the vehicle, for example to change the battery.

[0012] In some embodiments of the invention, the fuel consumption reducer provides a visual alarm or an audible alarm regarding the charge status. Optionally, a panel with visual indication is tilted upward so that it is easily viewable by the vehicle user.

[0013] There is thus provided in accordance to an exemplary embodiment of the invention, a fuel consumption reduction device for deployment in a vehicle, comprising:

[0014] an electronic circuit;

[0015] an encasement adapted to fit into the cigarette lighter socket of the vehicle and to enclose the electronic circuit;

[0016] a positive terminal positioned on one end of the encasement that is adapted to form contact between the electronic circuit and the positive voltage source connection of the vehicle located in the cigarette lighter socket;

[0017] at least one negative terminal positioned on the side of the encasement that is adapted to form contact between the electrical circuit and the negative voltage connection of the cigarette lighter; and

[0018] wherein the electronic circuit is adapted to reduce noise and stabilize the voltage signal of the vehicle.

[0019] In an exemplary embodiment of the invention, the electronic circuit is adapted to reduce noise and stabilize the voltage signal of the vehicle by absorbing excess voltage from the voltage signal of the vehicle and supplementing deficient voltage of the voltage signal. Optionally, the device further comprises a front panel that provides an indication if the device is functional. In an exemplary embodiment of the invention, the indication is provided by a LED that is a part of the electronic circuit. Optionally, the electronic circuit is adapted to provide an indication if the status of the battery of the vehicle is below a pre-selected value. In an exemplary embodiment of the invention, the pre-selected value is user selectable. Optionally, the device further comprises a switch to turn the device on or off during use of the vehicle.

[0020] There is further provided according to an exemplary embodiment of the invention, a method of fuel consumption reduction in a vehicle, comprising;

[0021] preparing an electronic circuit that is adapted to reduce noise and stabilize the voltage signal provided by the battery of a vehicle connected in parallel to the electronic circuit;

[0022] enclosing the electronic circuit in a body that is adapted to fit into the cigarette lighter socket of the vehicle and form electrical contact between the electronic circuit and the electrical system of the vehicle in parallel to the battery;

[0023] plugging the body into the cigarette lighter socket of the vehicle, so that it can be activated during the use of the vehicle. Optionally, the electronic circuit is automatically activated when starting the vehicle.

[0024] In an exemplary embodiment of the invention, the electronic circuit can be selectively turned on and turned off by the user of the vehicle when deployed in the cigarette lighter socket of the vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The present invention will be understood and better appreciated from the following detailed description taken in conjunction with the drawings. Identical structures, elements or parts, which appear in more than one figure, are generally labeled with the same or similar number in all the figures in which they appear, wherein:

[0026] FIG. **1** is a schematic illustration of an electrical circuit of a vehicle for deploying a fuel consumption reducer, according to an exemplary embodiment of the invention;

[0027] FIG. **2**A is a schematic illustration of a top view of a fuel consumption reducer, according to an exemplary embodiment of the invention;

[0028] FIG. **2**B is a schematic illustration of a side view of a fuel consumption reducer, according to an exemplary embodiment of the invention:

[0029] FIG. **3**A is a schematic graph of the voltage signal of a vehicle before deploying a fuel consumption reducer, according to an exemplary embodiment of the invention;

[0030] FIG. **3**B is a schematic graph of the voltage signal of a vehicle after deploying a fuel consumption reducer, according to an exemplary embodiment of the invention;

[0031] FIG. **4**A is a diagram of a circuit for smoothing the power signal of a vehicle, according to an exemplary embodiment of the invention; and

[0032] FIG. **4**B is a diagram of a circuit for determining the status of the vehicle battery, according to an exemplary embodiment of the invention.

DETAILED DESCRIPTION

[0033] FIG. **1** is a schematic illustration of an electrical circuit **105** of a vehicle for deploying a fuel consumption reducer **100**, according to an exemplary embodiment of the invention. In an exemplary embodiment of the invention, fuel consumption reducer **100** is Inserted into a cigarette lighter socket **110** of the vehicle. The cigarette lighter socket **110** is connected via a fuse box **120** to a battery **140** that serves as the basic power source of the vehicle. During use of the vehicle, the power from battery **140** is supplemented with power from an alternator **160**, which provides power through a voltage regulator **150**. Alternator **160** additionally charges battery **140**.

[0034] A switch **130** provides power to a starter **165** to start engine **195** of the vehicle. Once engine **195** is started an electrical control unit (ECU) **170** controls an oil pump **190** and fuel pump **180**, to provide the correct amount of fuel and oil to engine **195** while the vehicle is being used.

[0035] In an exemplary embodiment of the invention, during use of the vehicle, fuel consumption reducer **100** is connected in parallel to battery **140** and it smoothes out the power signal provided by the battery to the various electrical devices in the vehicle including ECU **170**.

[0036] FIG. **2**A is a schematic illustration of a top view of fuel consumption reducer **100**, according to an exemplary embodiment of the invention. In an exemplary embodiment of the invention, fuel consumption reducer **100** includes an essentially conical shaped body **260** that is made up from an upper part **255** and a lower part **257**, which are connected together to encase the internal parts of fuel consumption reducer **100**. Optionally, a front panel **290** is placed at the fore end of fuel consumption reducer **100** facing the vehicle user to provide indications regarding the status of fuel consumption reducer **100**. The rear end that is plugged into cigarette lighter socket **110** of the vehicle includes a positive terminal **210** positioned in a plug in cover **215**, to be able to open and close the rear end of fuel consumption reducer **100**, for example to change a fuse **230**. Positive terminal **210** connects to a spring **220** that is in contact with fuse **230**. Fuse **230** is in contact with a base plug terminal **235**, which is connected via a wired positive line **240** to a circuit **250**, which provides the functionality of fuel consumption reducer **100**. Circuit **250** is also connected through a wired negative line **245** to negative terminals **225**, which connect to the negative contacts of cigarette lighter socket **110**. Optionally, the above described structure for fuel consumption reducer **100** may vary and other structures may be used to implement a device containing an electrical circuit **250** placed in parallel to other devices in the vehicle such as ECU unit **170**.

[0037] Deploying fuel consumption reducer **100** in cigarette lighter socket **110** makes it easy to deploy and enables it to be in view of the users of the vehicle. However in some embodiments of the invention, fuel consumption reducer **100** may be installed as a permanent device **115** in the vehicle as shown in FIG. **1**, for example like a radio or alarm. The device may be positioned inside the vehicle in view of the users or in any other position, for example under the hood. Optionally, permanent device **115** is connected directly (**116**) to the battery **140** or connected (**117**) through fuse box **120**.

[0038] In some embodiments of the invention, electrical circuit **250** additionally provides an indication regarding the status of the charge in battery **140**, for example if battery **140** is in a normal state or if the charge is low and the battery needs to be serviced. In an exemplary embodiment of the invention, front panel **290** includes LEDs to provide indication regarding the status of fuel consumption reducer **100**. Optionally, A first LED **280** many indicate if the device is on or off. A second LED **270** may indicate if the status of charge in battery **140** is normal. A third LED may indicate if the status of charge in battery **140** is low, for example when the voltage is below 11.5V for a car or 23V for a larger vehicle such as a truck. Optionally, a single LED may be able to display more than one color (e.g. green and red): one color may indicate that the charge is below 11.5V and another color may indicate that the charge is below 23V. Alternatively, additional LEDs may be used, to provide various indications. In some embodiments of the invention, other types of indicators may be used, for example an LCD screen or a 7 segment display.

[0039] In some embodiments of the invention, front panel **290** may also include an activation switch, for example by pressing on LED **280**, to turn fuel consumption reducer **100** on or off during use of the vehicle. In some embodiments of the invention, fuel consumption reducer **100** turns on automatically when the vehicle switch **130** is turned to the on position or when the vehicle motor is turned on. Optionally, LED **280** will light up, for example with a green light to indicate that fuel consumption reducer **100** is active.

[0040] In some embodiments of the invention, fuel consumption reducer **100** provides indication of the status of battery **140** when the vehicle is not turned on. Alternatively or additionally, fuel consumption reducer **100** provides indication of the status of battery **140** after turning on the switch but before starting the motor of the vehicle. In some vehicles the

cigarette lighter socket **110** is only provided power after turning on switch **130**, so if fuel consumption reducer **100** is connected via cigarette lighter socket **110** it will only provide indication for those vehicles after turning on the switch.

[0041] FIG. **2**B is a schematic illustration of a side view of fuel consumption reducer **100**, according to an exemplary embodiment of the invention. In an exemplary embodiment of the invention, upper part **255** is not symmetrical with lower part **257** in forming body **260**. Optionally, upper part **255** is shorter so that front panel **290** will be tilted upward to allow easy visibility of front panel **290** by the vehicle driver.

[0042] FIG. **3**A is a schematic graph of the voltage signal of a vehicle before deploying fuel consumption reducer **100**, according to an exemplary embodiment of the invention. FIG. **3**B is a schematic graph of the voltage signal of a vehicle after deploying fuel consumption reducer **100**, according to an exemplary embodiment of the invention. In standard vehicles the voltage signal suffers from noise due to the electronic equipment powered by the electrical system of the vehicle and optionally also resulting from the effects caused by the contribution of alternator **160**. In an exemplary embodiment of the invention, fuel consumption reducer **100** reduces the electrical noise and stabilizes the voltage, so that after deploying fuel consumption reducer **100**, ECU **170** is provided with a cleaner and more accurate voltage signal. As a result ECU **170** functions more accurately and reduces fuel consumption of the vehicle.

[0043] FIG. **4**A is a diagram of a circuit **400** for smoothing the voltage signal of a vehicle, according to an exemplary embodiment of the invention. In an exemplary embodiment of the invention, circuit **400** serves as a voltage regulator for the voltage in the vehicle. Circuit **400** uses a capacitor diode setup **405** to store excess electrical power and supplement voltage deficiencies of the voltage signal of the vehicle. The circuit includes a DC-DC converter control circuit **410** (e.g. MC34063) to control the functionality of circuit **400** and provide a smoother stabilized voltage signal in the electrical circuits of the vehicle. Optionally, the circuit includes LED **280** to provide indication that fuel consumption reducer **100** is functional.

[0044] FIG. **4**B is a diagram of a circuit **450** for determining the status of the vehicle battery, according to an exemplary embodiment of the invention. In an exemplary embodiment of the invention, circuit **450** includes a resistive voltage divider to operate LED **270** (Normal) and LED **275** (Low). Optionally, if the voltage provided by battery **140** is lower than a pre-selected threshold value (e.g. 11.5V or 23V as explained above) LED **275** (Low) will be lit up to provide a warning for the user of the vehicle to have the vehicle serviced. Alternatively, if the voltage provided by battery **140** is higher than the pre-selected voltage LED **270** (Normal) will be lit up.

[0045] In some embodiments of the invention, fuel consumption reducer **100** is provided with models with different pre-selected voltage thresholds, for example a threshold of 11.5V for cars and 23V for trucks. Alternatively, a single model may have a selectable threshold, for example that can be selected by a switch **263** (in FIG. **2**B) on body **260**.

[0046] In an exemplary embodiment of the invention, the user inserts fuel consumption reducer **100** into cigarette lighter socket **110** of the vehicle. The user turns switch **130** to the on position. Optionally, two green LEDs will be lit on front panel **290**. One indicating that the device is receiving power and functional and the other indicating that battery **140** of the vehicle is functioning correctly.

[0047] In an exemplary embodiment of the invention, fuel consumption reducer **100** was tested on various vehicles to measure the effectiveness of the device. The vehicles tested included vehicles from the following manufacturers:

[0048] 1. Toyota.

[0049] 2. Honda.

[0050] 3. Subaru.

[0051] 4. Isuzu.

[0052] Some of the vehicles tested used gasoline and some used Diesel. The engine sizes of the vehicles tested varied from 1500 cc to 3000 cc.

[0053] The measured results showed savings in fuel consumption of between 7% to 30% depending on various factors, for example the type of vehicle (e.g. manufacturer, model), the age of the vehicle, and the electronic equipment deployed in the vehicle (some equipment cause more electrical noise than others).

[0054] An exemplary method that can be used for testing fuel consumption is performed by the following process:

[0055] 1. Load the fuel tank until it is completely full.

[0056] 2. Drive a pre-selected distance (e.g. 100, 200, 300 km/miles).

[0057] 3.Refill the fuel tank until it is completely full and record the amount of fuel required for refilling the fuel tank.

[0058] 4. Calculate the average fuel consumption per liter/gallon.

[0059] The above process can be performed with fuel consumption reducer **100** deployed and without it deployed to compare the results. The above process can be performed multiple times with and without deploying fuel consumption reducer **100** to factor out the effects relating to the specific course taken on each round of the testing process. Since driving through traffic may be more fuel consuming than driving on an open highway.

[0060] It should be appreciated that the above described methods and apparatus may be varied in many ways, including omitting or adding steps, changing the order of steps and the type of devices used. It should be appreciated that different features may be combined in different ways. In particular, not all the features shown above in a particular embodiment are necessary in every embodiment of the invention. Further combinations of the above features are also considered to be within the scope of some embodiments of the invention.

[0061] It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims, which follow.

We claim:

1. A fuel consumption reduction device for deployment in a vehicle, comprising:

an electronic circuit;

an encasement adapted to fit into the cigarette lighter socket of the vehicle and to enclose the electronic circuit;

a positive terminal positioned on one end of the encasement that is adapted to form contact between the electronic circuit and the positive voltage source connection of the vehicle located in the cigarette lighter socket;

at least one negative terminal positioned on the side of the encasement that is adapted to form contact between the electrical circuit and the negative voltage connection of the cigarette lighter; and

wherein said electronic circuit is adapted to reduce noise and stabilize the voltage signal of the vehicle.

2. A fuel consumption reduction device according to claim **1**, wherein said electronic circuit is adapted to reduce noise and stabilize the voltage signal of the vehicle by absorbing excess voltage from the voltage signal of the vehicle and to supplement deficient voltage of the voltage signal.

3. A fuel consumption reduction device according to claim **1**, further comprising a front panel that provides an indication if the device is functional.

4. A fuel consumption reduction device according to claim **3**, wherein said indication is provided by a LED that is a part of the electronic circuit.

5. A fuel consumption reduction device according to claim **1**, wherein said electronic circuit is adapted to provide an indication if the status of the battery of the vehicle is below a pre-selected value.

6. A fuel consumption reduction device according to claim **5**, wherein said pre-selected value is user selectable.

7. A fuel consumption reduction device according to claim **1**, further comprising a switch to turn the device on or off during use of said vehicle.

8. A method of fuel consumption reduction in a vehicle, comprising:

preparing an electronic circuit that is adapted to reduce noise and stabilize the voltage signal provided by the battery of a vehicle connected in parallel to said electronic circuit;

enclosing said electronic circuit in a body that is adapted to fit into the cigarette lighter socket of the vehicle and form electrical contact between the electronic circuit and the electrical system of the vehicle in parallel to the battery;

plugging said body into the cigarette lighter socket of the vehicle, so that it can be activated during the use of the vehicle.

9. A method of fuel consumption reduction in a vehicle according to claim **8**, wherein said electronic circuit is automatically activated when starting the vehicle.

10. A method, of fuel consumption reduction in a vehicle according to claim **8**, wherein said electronic circuit can be selectively turned on and turned off by the user of the vehicle when deployed in the cigarette lighter socket, of the vehicle.

* * * * *