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Anti-Theft Vehicle Restraining System

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***Abstract*--The present system of fuel tank flap opening (Cars and same vehicles) is based on mechanical linkage and the same. The main and only purpose of this is opening and closing of the fuel tank flap is for refilling the fuel.**
Now in this case we are going to add electronic control unit to activate the opening linkage for refilling the fuel. The electronic unit will be password protected i.e. password will be required for the opening and closing of the fuel tank flap (CASE 1.1) and solenoid operated flow control valve (CASE 1.2) in fuel tank pipe just below opening of tank. The system requires the password for opening of fuel flap and valve, If person is authorize he will provide the password and system will not take any action. But if person is unauthorized the system will ask for password and he will not be able to provide the password, system will take the defined actions.
This will be doing the main purpose as present system; in addition to this the system is advantages as its going to provide security in case of stealing.

Key Words: Optimized design, Anti theft device Energy efficient, better security.

I. INTRODUCTION

It will be advantageous to have system that provides more security to vehicle from being stolen.
Presently we are having switch/lever and the same to operate the opening and closing of the fuel tank flap and this switch can be operable by any person. It will be advantageous if we can restrict the access to the authorized person only. In addition to this in this system the password is to be taken under observation for set time interval and processed in ECU and based on that action is taken.
Basically two CASES' can be used in combination to provide the vehicle access to the authorized person only, viz. opening and closing of fuel tank flap (CASE 1.1) and opening and closing of solenoid operated flow control valve situated inside the tank pipe just below the tank opening (CASE 1.2).

CASE 1.1
This is basically for cars and the same vehicles in which flap is present.

In this CASE we are going to operate the flap opening by push switch, which opens and closes the flap after pressing it. In addition to this we are using ECU which will take action of energizing and denergizing the electromagnetic plate for flap opening and closing i.e. opening of fuel tank flap is done in two stages viz. 1) by driver of vehicle by providing password, the electromagnet gets denergized and leaves the metal plate on flap 2) secondly by pressing the flap by fuel refilling person. The 1st stage is done by providing password only i.e. flap will be opened by authorized person only, to refill the fuel. This will be advantageous in case of stealing of vehicle. As the person who stolen the car is not knowing the password and hence he will not be able to open the fuel tank flap to refuel the vehicle. And after entering the wrong password the system will take defined actions. This will cause possibilities of getting caught of that person, or in other case he has to leave the car.
Closing for CASE 1.1 is done in single stages, the fuel refilling person will close the flap by pressing it and then after set delay period the electromagnetic plate will be energized to hold the metal plate provided on flap, i.e. no need to provide the password for closing the flap.

CASE 1.2
This is basically for heavy vehicles in which flap is not present.

In addition to this, for more security to CASE 1.1, as there is chance of breaking the fuel flap by the thief and the same and its relatively easy, so to take care of this case we are providing additional signal from ECU which will operates the solenoid operated flow control valve, situated just below the tank opening i.e. after outside flap, (Valve is situated inside the tank and just below the opening of tank). When this valve is open it will 0allow the fuel to enter into tank, else it's closed and fuel will not be allowed.
After providing password to the system/ECU valve will be opened and will be closed again after set delay period. For CASE 1.2, entry for fuel is given by solenoid operated flow control valve after getting signal from ECU i.e. after entering the password the opening of the valve is done for refueling.
Closing of valve is done after the set delay period, i.e. no need of password for closing of valve.
Now, in some cases though the thief and the same may break the fuel flap (CASE 1.1) for refilling the fuel, we are having additional safety of valve (CASE 1.2) which is not easily breakable/accessible as its situated inside the fuel tank, this will provide additional safety to the flap breaking case and further to vehicle.
The flap (CASE 1.1) & valve (CASE 1.2) are opened simultaneously by ECU after entering the password using keypad and display provided preferably on right most side of the dashboard and will be closed by ECU after set delay

period. We can set different passwords also for CASE 1.1 and CASE 1.2

II. OPERATING

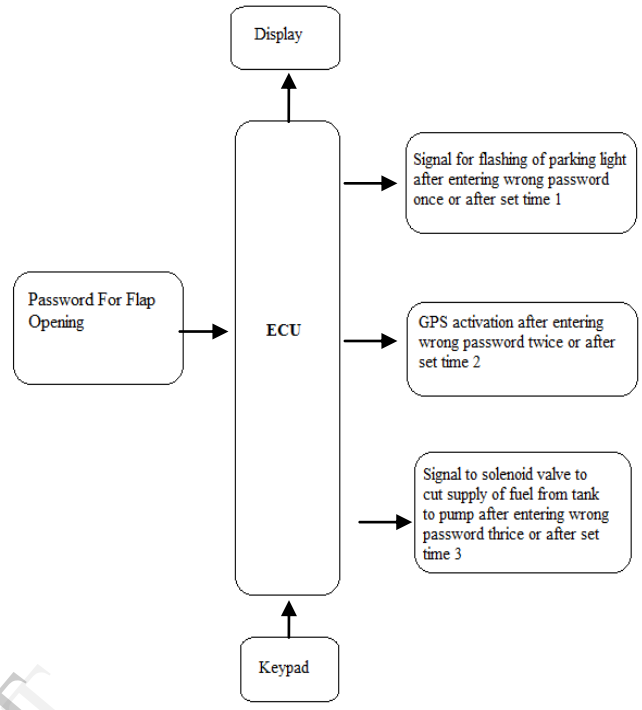
At the time of refilling the fuel for opening the flap and valve the password is required, the password entered is then sent to the micro-controller for processing, The micro-controller then checks for the saved data or the memory of the ECU. Then the magnetic plates are de de-magnetized and the flap opens according to it. After refueling the fuel the fuel operator pushes the flap, the plates then again get energize and hold the plates together for again locking the system. If not provided in set time or after entering wrong password the vehicle will take same three actions in steps as given below. Shown in fig 1.0 & fig 2.0

- Flashing of parking lights.(entering wrong password once or after set time 1)
- Activate GPS (entering wrong password twice or after set time 2)
- Signal to solenoid valve 1 to cut supply of fuel from tank to pump.(entering wrong password thrice or after set time 3)

These three are defined actions for weight, fuel refilling, and set distance/time case.
If password asked and not given in set time the system will take action based on set time 1, 2, 3 as given above.
After these actions, system will not allow any password etc for set period, so that vehicle can't move from that place, this will provide the authorized person sufficient time for reaching to his vehicle.

This will provide safety to the vehicle from being stolen. This device will act as an antitheft.
Other major advantage of the system is the elimination of mechanical linkage which is used presently. This will save costing of linkages. As well as it will provide additional feature of holding the flap, in case of improper locking/pushing the flap does not get completely locked and chances of opening of flap are more in such case as we are using electromagnetic plates which after energizing will at least partially hold the metal plate on flap and will result into holding of flap as closed in case of improper locking of flap by fuel refilling person or same.

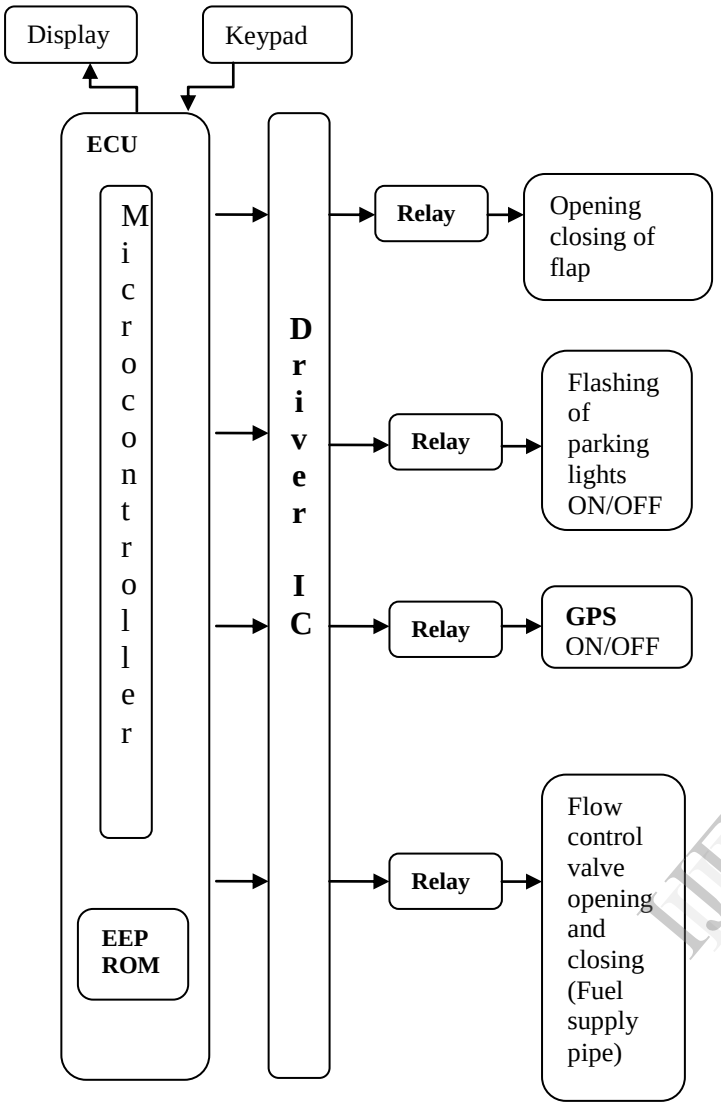
Fig 1.0



An embodiment of the anti-theft system for the motor vehicle is shown that is having a fuel tank flap movement based sensing actuating mechanism as illustrated by a second case (CASE 1.1, hereinafter).

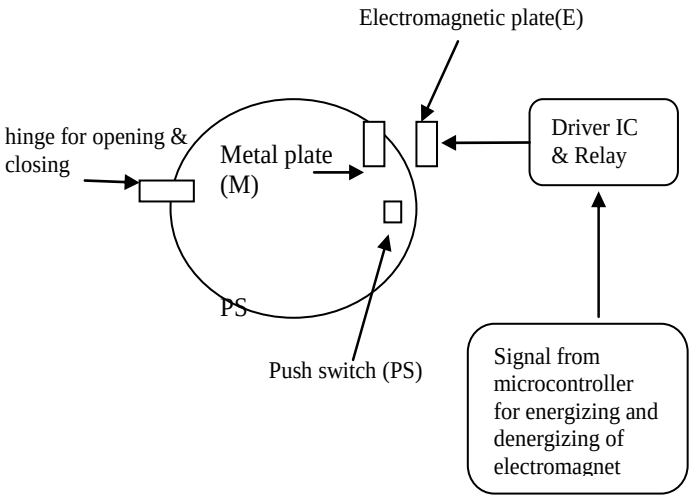
The fig consists of the micro-controller, or the ECU unit, the keypad for entering the digits or password, the display system for observing the output, the relays for taking the required action such as that of opening and closing the flap, flashing of the parking lights, switching on the GPS for alerting the driver, an additional feature can also be provided ,such as that of horn blowing this can alert the near-by passers that a theft is happening thus can be useful at that time from the theft from being happening.

Fig 2.0



In this one alternative embodiment, the anti-theft system includes flaps shown in FIG. 3.0The flap includes a hinge. The hinge facilitates opening and closing movement of the flap. The flap is positioned with a metal plate and a push switch. The metal plate is in communication with an electromagnetic plate. The electromagnetic plate is connected to the microcontroller through a driver IC and the relay. The electromagnetic plate energizes and/or de-energizes per signals of the microcontroller in this one alternative embodiment for facilitating opening and closing of flap. The push switch facilitates primary opening and closing of the flap. The opening and closing of flap is based on password provided to microcontroller.

Fig 3.0 Flap system



Referring to FIG.4.0, a closing action of the flap is shown. In the closing action of the flap, a continuous supply from a battery 'S is provided for energizing the electromagnetic plate that holds the metal plate on the flap due to magnetization. A relay is used to provide an actuation signal for energizing the electromagnetic plate in this one embodiment. It is understood here that the closing action of fuel tank flap is done in two stages, namely a first stage and a second stage. The first stage is such that any person other than the driver, such as a fuel refilling person, closes the flap by pressing the flap. In the second stage, the electromagnetic plate energizes after the set delay period to hold the metal plate on the flap without any need to provide a password for closing the flap.

Fig 4.0 Operation of Flap closing

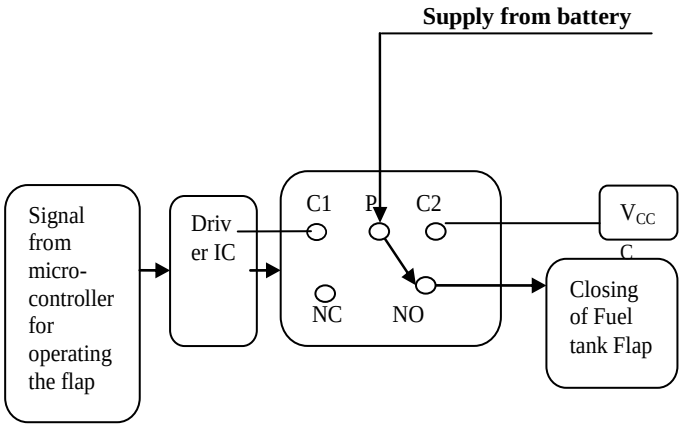
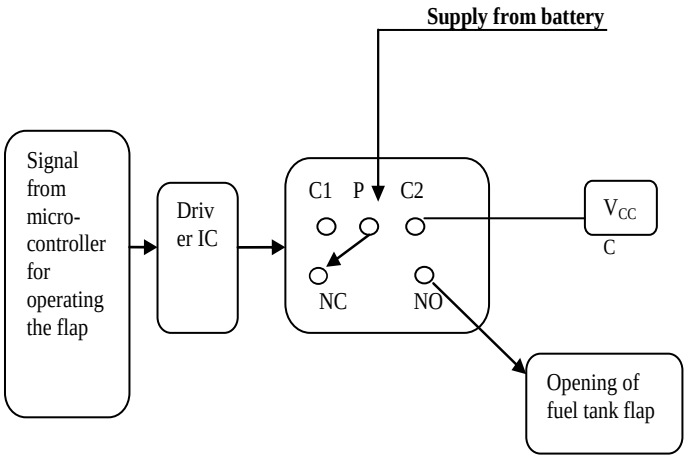


Fig 5.0 Operation of Flap opening



Referring to FIG.5.0, an opening action of the flap is shown. In the opening action of the flap, a plurality of signals from the microcontroller is provided for de-energizing the electromagnetic plate that demagnetizes the electromagnetic plate thereby breaking the contact with the metal plate on the flap due to demagnetization. A relay is used to provide actuation signal for de-energizing the electromagnetic plate in this one embodiment. It is under stood here that opening of fuel tank flap is done in two stages, namely a first stage and a second stage.

- The first stage is such that the driver of vehicle provides password that activates the relay to de-energize the electromagnet thereby separating the electromagnetic plate from the metal plate.
- The second stage is such that by pressing the push switch i.e. pressing on flap by any other person other than the driver, such as for example fuel refilling person.

This is specifically advantageous in case of stolen situation of the vehicle as the person who has stolen the car is unaware of the password and would be unable to open the fuel tank flap to refuel the vehicle. After entering the wrong password, system takes predefined set of actions thereby causing the person to be caught or alternatively leave the car in the said instance.

Now referring to FIG2.0, a block diagram of the anti-theft system for a motor vehicle having the flap movement based sensing actuating mechanism is shown as illustrated by a second case (CASE 1.1, herein after) in this one alternative embodiment. In the CASE 1.1, the flap is opened or closed using the push switch. In this one alternative embodiment, ECU is configured to energize and de-energize the electromagnetic plate based on opening and closing actions of the flap. It is understood here that a delay is initiated in this alternative embodiment as the system asks for the password to the user. The microcontroller generates a signal asking a password in this one alternative embodiment. The microcontroller in ECU performs a plurality of actions if the password entered is incorrect or in a case where an observed delay period is more than the set delay period. The delay period is defined as a first delay (delay 1, hereinafter), a second delay (delay 2, hereinafter) and a third delay (delay 3, herein after). The microcontroller performs a plurality of actions related to flap are fed to driver IC. In this one embodiment, the microcontroller performs a first action (action 1, hereinafter), a second action (action 2, hereinafter) and a third action (action 3, hereinafter). The action 1 is such that the ECU gives ON/OFF signals to flash/parking lights of the motor vehicle using the relay after delay 1 or wrong entry of the password for a first instance. The action 2 is such that the ECU gives ON/OFF signals to the GPS using the relay after delay or wrong entry of the password for a second instance. The action 3 is such that the ECU gives closing signals to a flow control valve of a fuel supply pipe of the motor vehicle using the relay after delay 3 or wrong entry of the password for a third instance. It is understood here that system switches to an OFF condition for a predefined period without accepting any password after sequentially performing action 1, action 2 and action 3. This gives sufficient time to the authorized user of the motor vehicle to identify the position of the vehicle

An alternative embodiment of the anti-theft system for the motor vehicle is same as that of fig 2.0 only changes is instead of flap ,solenoid operated valve is used that is having a flow control valve positioned at the bottom of the fuel tank configured with movement sensing actuating mechanism as illustrated by a third case (CASE 1.2, hereinafter). However, it is understood that system may include at least two flow control valves such that one of the flow control valve is positioned in a tank of the vehicle and the other flow control valve is positioned in a fuel supply line of the vehicle. The flow control valves are solenoid operated flow control valve in this one embodiment. The flow control valves are having an open position and a closed position. The open position allows fuel to enter into the fuel tank. The closed position prevents fuel from entering into the fuel tank. ECU is in communication with the flow control valves to provide opening or closing actions through a relay controlled through the driver IC.

Referring to FIG5.0, similar for flow control valve an opening action of the flow control valve can be taken.. In the opening action of the flow control valve, a plurality of signals from the microcontroller is provided through driver IC such that a continuous supply from battery is fed to the flow control valve. The relay is used for providing supply from battery to the flow control valve. Accordingly, the flow control valve performs an opening action in this one embodiment.

III. ADVANTAGE

1. System is password protected and configured to actuate after a predefined set period that makes the vehicle not to move from the place. This provides an authorized person sufficient time to reach to his vehicle in case of instances such as theft.

2 .CASE 1.1 are usable for light vehicles with the fuel tank caps.

3 .CASE 1.2 are usable in combination for heavy vehicles having no provision of fuel tank flaps.

4. CASE 1.1, CASE 1.2 are usable in combination for all types of vehicles with/without the provision of fuel tank flaps. This may also add safety to system for the vehicles wherein breaking of the flap is relatively easier.
5. This can be used in 2 wheelers also.
6. Eliminates existing Mechanical Linkage of flap opening.
7. Cost reduces comparing with existing system.

IV. WE CLAIM

1. An anti-theft signaling system adapted for preventing theft of a vehicle, the anti-theft signaling system comprising:
a fuel tank flap having a movement based sensing mechanism configured thereon, the fuel tank having a metal plate and push switch positioned thereon, the metal plate communicating with an electromagnetic plate;
& at least one solenoid operated flow control valve positioning inside a fuel tank of the vehicle, the flow control valve having an open position and closed position, the open position facilitating entry of fuel inside the fuel tank, the closed position preventing entry of fuel inside the tank;

an electronic control unit having a microcontroller and an electrically erasable programmable read-only memory, the microcontroller connecting to the electromagnetic plate through a driver integrated circuit and a first relay, the microcontroller facilitating an opening action and a closing action of the fuel tank flap & also the solenoid operated flow control valve; the microcontroller communicating with a plurality of relays through the driver integrated circuit for performing a plurality of predefined actions.

2. The anti-theft signaling system as claimed in claim 1, wherein the microcontroller communicates with a second relay to perform a first action of actuating at least one parking light of the vehicle.

3.The anti-theft signaling system as claimed in claim 1, wherein the microcontroller communicates with a third relay to perform a second action of actuating a global positioning system of the vehicle.

4. The anti-theft signaling system as claimed in claim 1, wherein the microcontroller communicates with a fourth relay to perform a third action of actuating a flow control valve in a fuel supply pipe of the vehicle.

5. The anti-theft signaling system as claimed in claim 1, wherein the closing action of the flap is such that the electromagnetic plate energizes due to : magnetization to hold the metal plate thereon.

6. The anti-theft signaling system as claimed in claim 7, wherein the microcontroller requires a password in an instance of opening of flap for refueling.

V. CONCLUSION

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching.
The embodiments were chosen and described in order to best explain the principles of the present invention and its practical application, to thereby enable others, skilled in the art to best utilize the present invention and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omission and substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but such are intended to cover the application or implementation without departing from the spirit or scope of the present invention

VI. FUTURE SCOPE

Based on the understood features of the present invention and the invention disclosures provided in the above cited prior arts, we can model the systems to prevent thefts of the vehicles and like.

The system can be used for the enhanced security of the vehicle with the current system used ,thus saving cost of the whole system and giving a better security to the vehicle.

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