We Claim

- We reduce the death rate caused due to airbags not releasing due to passengers not wearing seat belts.
- We are monitoring the passengers if they are wearing the seat belt or not throughout the travel with the help of the sensor interfaced in the starter motor system.

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Buckle up for safer ride: Car safety with embedded system

Technical Field:

In the present days, four wheelers play a major role in day-to-day transportation which needs a safety check for the passenger which is becoming the top most priority. So here, we have come up with an idea of introducing an ultrasonic sensor along with a microcontroller in the car starter motor system. If the person is wearing a seatbelt properly an input signal is transmitted to the microcontroller which allows a closed loop relay logic which enables the person to ignite the engine.

Problems to be faced:

- When a person fails to wear a seatbelt, when an accident occurs the chances of the airbags to release is nil which might lead to death of the person in most accident cases.
- Another major issue faced is, people nowadays are both buckling the seatbelt and sitting over it, or they use an alternate plastic buckle to fool the car's system.

Objective of the Invention:

- To modify the existing car starter system by introducing an ultrasonic sensor and a microcontroller to the relay which provides closed loop to the starter circuit allowing the driver to start the engine only when he wears the seat belt for a safe ride.
- To allow the driver to ignite the engine on proper buckling of the seat belt.
- To increase the chances of release of airbags in case of an accident.

Description:

Battery:

When it comes to cranking over an engine, nothing is more important than the battery that powers the starter motor. The engine's combustion process is kicked off by the starter motor, an electric motor that spins the engine. Turning the key in the

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ignition activates the starting motor, which pulls current from the vehicle battery and spins the engine's flywheel. The crankshaft of the engine is turned by an electrical arc produced by the battery between the contacts of the starting motor. When the vehicle is in motion with the engine running, the alternator automatically begins charging the battery. As a result, having a car battery that is both healthy and entirely charged is essential for owning a car that starts effortlessly and runs effectively.

Ignition Switch:

The ignition switch in an automobile is an integral part of the circuit that activates the starting motor. It has a few options, including "off," "accessory," "on," and "start," and is normally found on the steering column. The starting relay, fuel pump, and ignition system all get electricity when the key is placed into the switch and switched to the "on" position. The starting relay receives a signal when the key is turned to the "start" position, allowing power to go from the battery to the starter motor. The starting circuit is initiated by the ignition switch, which also contains a mechanical component that is physically engaged. Problems with starting, electrical malfunctions, and even an engine that suddenly shuts off while driving may all be traced back to a broken ignition switch. To guarantee consistent engine starting and operation, check the ignition switch's condition and replace it if required.

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Starter Relay:

The car's starting relay is a very minor part of the larger circuit that controls the starter motor. The starter-battery switch is a mechanical component that connects the two. In order to get power from the battery to the beginning motor, the ignition key sends a signal to the starter relay, which shuts the connections. To turn the engine over, a large amount of electricity must travel through the starter, and here is where the starting relay comes in. When the starter relay isn't working as it should, the engine may be difficult to start or may not start at all. The engine may start correctly one time but fails to start on another occasion due to an intermittent starting problem brought on by a malfunctioning starter relay. Maintaining a dependable engine start requires checking the starter relay's condition and replacing it if required.

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Ultrasonic Sensor:

An ultrasonic sensor is a device that employs ultrasonic waves, which travel at very high frequencies, to determine the location and depth of an item. Above the range of human hearing, the sensor sends out a sound wave that reflects off of nearby objects. The distance to an item may be determined by using a sensor that emits a sound wave and measures how long it takes for the wave to return to the sensor. Some ultrasonic sensors are able to detect the amount of scattering, or the way in which sound waves are reflected and absorbed by various materials, in addition to distance. Material analysis, fluid level monitoring, and obstacle identification in autonomous cars are just a few examples of possible uses for this data. Due to their precision, dependability, and non-contact sensing capabilities, ultrasonic sensors find widespread usage in a variety of industrial, automotive, and medical settings.

Microcontroller:

A microcontroller is a small computer on a single integrated circuit that can be programmed to control various electronic devices. In this case, the microcontroller receives data from an ultrasonic sensor, which measures the scattering when signals are transmitted between the seatbelts and the front panels. between the sensor and an object, such as a car or a wall. Based on this data, the microcontroller can determine if the seatbelt is buckled properly and enables the driver to ignite their engine. This is placed as a separate component from the main circuit which receives the input from the Ultrasonic sensor and sends an output signal to a relay which controls the circuit. This

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microcontroller is specially programmed to perform this task.

Relay:

An electromagnetic switch that responds to a relatively weak electrical signal is known as a relay. In this scenario, the relay is controlled by data sent by a microprocessor that measures ultrasonic scattering. When the scattering is at its peak, the microcontroller will send a signal to the relay, which will either activate or deactivate the associated electrical circuit. Starter motor control that is both dependable and adaptable is possible via the employment of a relay, microprocessor, and ultrasonic sensor. This relay when closed enables current to flow from the starter relay to the Starter Solenoid-Motor thereby allowing the engine to crank.

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Starter solenoid-Motor:

An essential part of the starting motor circuit, the solenoid-motor starts the engine by connecting the starter motor to the flywheel. A shift fork actuator is a tiny electromagnetic coil and a plunger that is normally mounted on top of the starting motor. An electric current travel through the starting relay and into the solenoid when the key is turned to the "start" position of the ignition. This generates a magnetic field that pushes the plunger towards the shift fork. When the shift fork is moved in this way, the pinion gear of the starting motor is engaged with the flywheel, and the engine may be started. The pinion gear is disengaged from the flywheel by a solenoid-motor after the engine is up and running.

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Brief diagrammatic representation of the block diagram:

With reference to the block diagram, the circuit begins with the battery which drives the circuit and provides the current to the ignition switch which functions as a switch. This switch when turned to the on position, provides power to the Starter Relay which acts as a switch between the starter motor-solenoid. Here, a relay is introduced which works on the input received from a microcontroller which is interfaced with an ultrasonic sensor. This relay gets turned on once when the interrupt from the ultrasonic sensor is sent as logic high to the microcontroller which then turns on the relay. This

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newly introduced relay acts as a switch between the Starter Motor-Solenoid which acts as a communicator between the sensor and the circuit that ignites the engine once when the input is true.

BENEFICIARIES OF THE INVENTION

- We can save lives of the passengers and driver by increasing the chances of releasing of the airbags.
- The advancement in the automobile sector, with high performance cars being produced with higher speeding limits because of which better safety for the passengers and the drivers are to be ensured.

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Abstract

We face issues with not wearing the seatbelt for various reasons. The problem is that more deaths are caused during accidents because of non-functioning of the airbags while not wearing a seatbelt. So we have to ensure that everyone wears the seatbelt properly. Currently cars have a security alert system which has inbuilt buzzers that beeps if the person is not wearing a seatbelt. The buzzer sound normally stops after a period of 180 seconds. Latest model cars have buzzers that stops beeping only after wearing the seatbelt. This buzzing is easily ignored by the passengers or they just cheat the alert system by using alternate plastic buckles. So there arises a need for a new technology that make sure that the person on the seat in the car wears the seatbelt properly for safe and secure journey .This need for a new technology grabs the attention of many engineers, who are ready to provide invasive and non-invasive technics to find out a solution. Here we come up with a solution where a sensor and a microcontroller is placed between relay and solenoid motor-starter motor. First the sensor transmits signal to the microcontroller, the microcontroller on receiving the signal, with relay logic the circuit is in closed loop condition which helps the user to ignite the engine. In case the driver doesn't wear the seatbelt the sensor fails to send the signal to the microcontroller, then the relay will not close the circuit between motor solenoid starter motor and starter relay. Where the driver of the car will not be able to start the engine. Our invention serves as a highly reliable one because it uses a microcontroller which has a very minimal rate of having a failure, with minimal power consumption. Our invention ensures that people wears the seatbelt properly before starting the car, thus they can have a safe journey. We hope that our invention helps the society reduce the number of fatalities occurring due to car accidents by ensuring that the passengers wear seatbelts properly and allowing them to have a safe travel.

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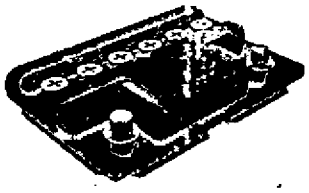

Figure: 1 Battery

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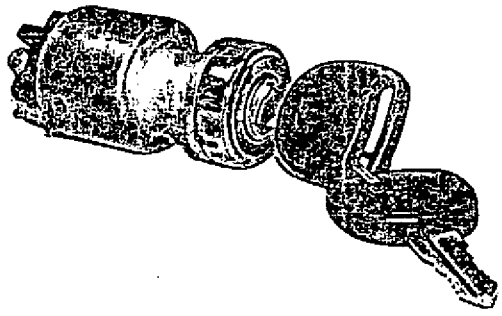

Figure: 2 Ignition Switch

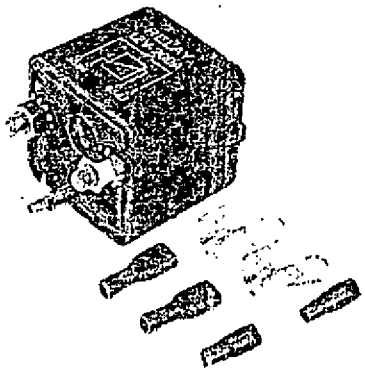

Figure: 3 Starter Relay

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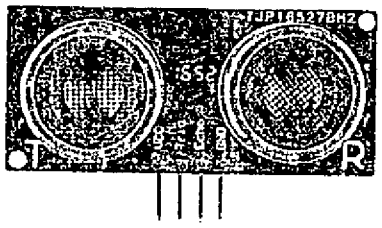

Figure: 4 Ultrasonic Sensor

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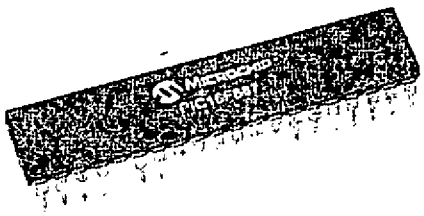

Figure: 5 Microcontroller

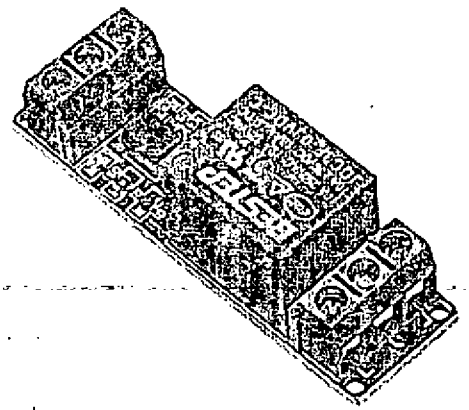

Figure: 6 Relay

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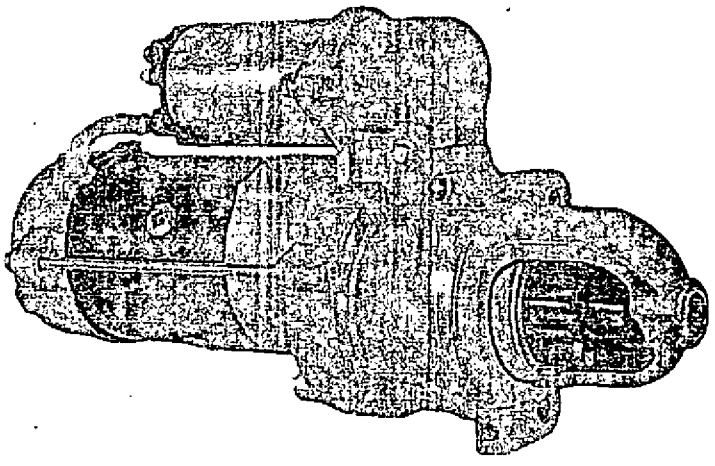

Figure: 7 Starter Solenoid – Motor

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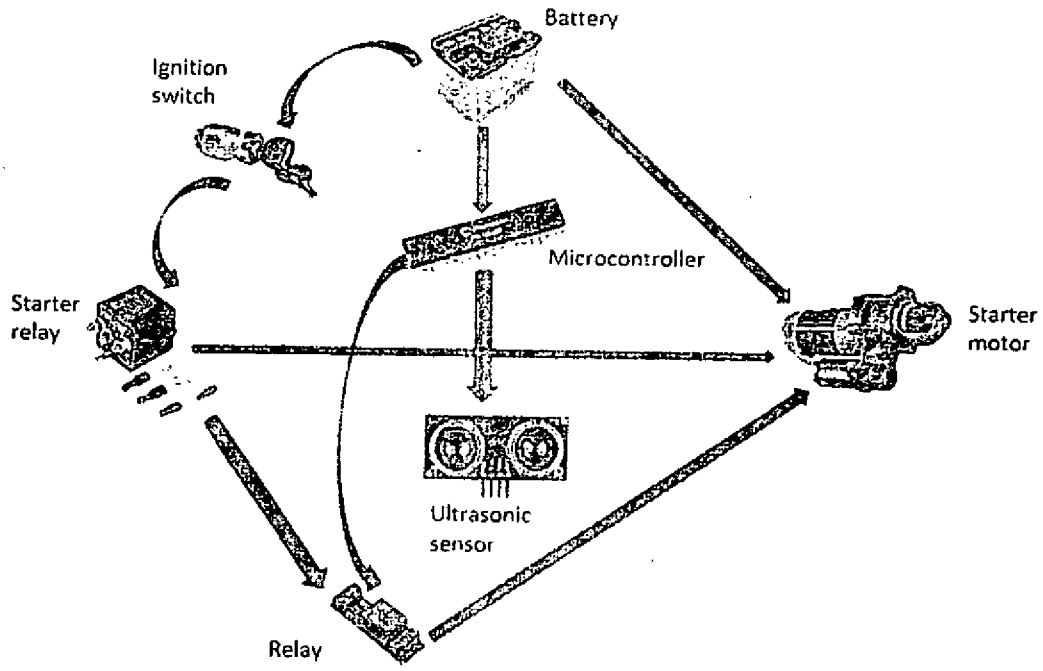

Figure 8: Block Diagram of proposed model

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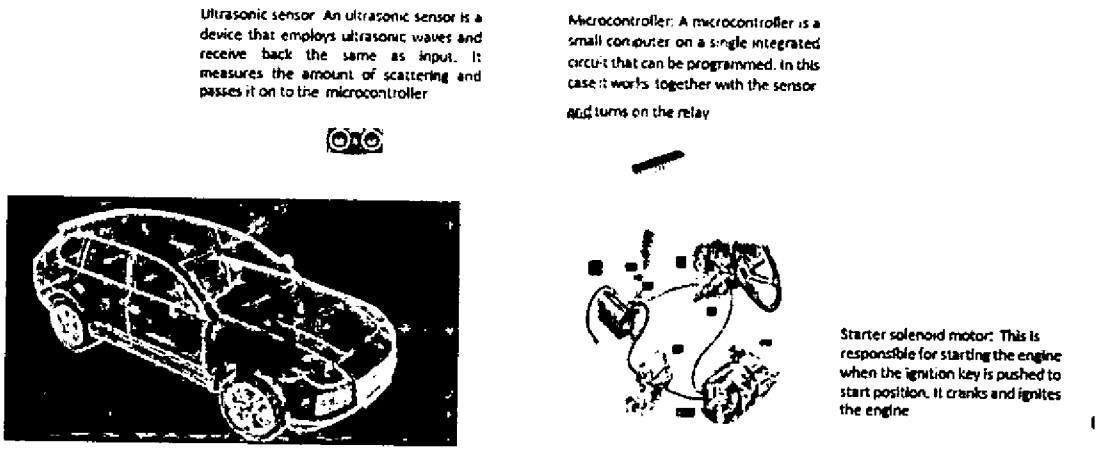

Figure 9: Proposed working model

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