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# Improved Seatbelt Sensor Mechanism: Making Compulsory to Wear

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***Abstract: Completely wearing seat belt is very crucial part to save a life of a people by accidents. Our study gave a how to ensure that seat belt is completely wear or not by driver and passenger, we can make electronics arrangement which is associated with the alarm in car. In this mechanism we simply made combinations of some sensor efficiently and use them to prevent people's ideas about not wearing a seatbelt. Nowdays we have cars which make beep sound if seatbelt is not locked but I have seen many people attach seatbelt on empty seat and then sit to get rid of alarm.***
***Keywords: Proximity Sensor, Relay Circuit, Magnetic Flux, Induction, Coil, Oscillator, Magnetic Field, Electromagnetic Field.***

## I. INTRODUCTION

This study deals with mechanism of sensor seatbelt making driver and passengers to wear a seatbelt completely. This electronic arrangement assures that the person has wore a seat belt or not. Now days in cars sensor can detect whether the driver and passenger are seated or not with the help of seat sensor (relay circuit), If the person is seated then relay circuit gets closed and alarm start sounding to wear seat belt. After wearing seat belt sound will turn off.
But there is one disadvantage, I had seen recently that people are locked seat belt before seating so there is no sound for wearing seat belt. This is the way people can omit this technology. For that this is one of solution.

## II. BASIC MECHANISM

First lock the seatbelt without person and mark the distance from where belt is starts coming out, because generally without person seat belt is locked this displacement is lesser than the person who had seated and wear a completely belt due to upper body dimensions. Mark on that belt where from belt is coming out, then placed steel strip behind the mark around 4 to 6 cm. for this execution we had taken Inductive proximity sensor. Our minimum distance will be the length of seatbelt buckled on empty seart.



This is our minimum distance where sensor starts its work

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## III.INDUCTIVE PROXIMITY SENSOR

We are using a sensor which is operating in day or night conditions. The sensor we are using is Inductive proximity sensor. This sensor is used to detect only metallic object (steel strip) without any physical contact. This sensor is easily available in market and cost effective.

We already mention in introduction about seat sensor (relay circuit), which is mounted inside car seats. When a person seat in car this circuit gets close due to person weight alarm will not sound, otherwise sound will continue until seatbelt get locked.

Inductive proximity sensor is used for non-contact detection of metallic objects (steel strip). The operating principal of sensor is based on a coil and oscillator that creates electromagnetic field in operating area. When current flows in inductor it generates electromagnetic field. When any metallic object (steel strip) is entered electromagnetic field, Current will set up in that steel strip due to mutual induction, so steel strip also creates its magnetic field which opposes to sensor magnetic field. Results output current of the sensor varies. This variable in output gives result of steel strip detection.

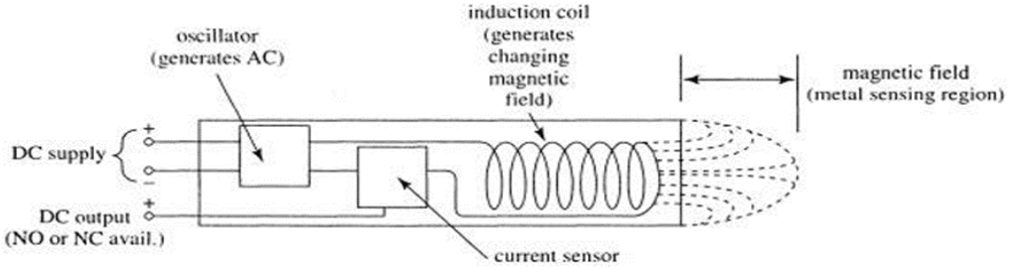



Fig 1)Fundamental Curcuit

This inductive sensor depends upon the Faraday's law of induction. Change in magnetic flux through N turns circuit which develops a voltage as,

$$e = -N\frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

Also,

$$e = -N \times S\frac{\mathrm{d}B}{\mathrm{d}t}$$

The induced magnetic field is **B** is homogeneous on a section *S*, The magnetic flux is also expressed as:

$$\Phi = B \times S$$

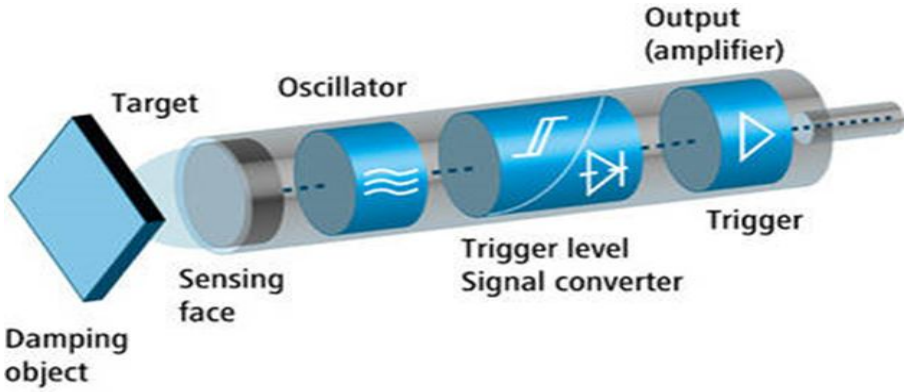



Fig 2)Working of sensor

We are mounting a small steel strip on seat belt of all seats. The sensor is mounted near from the where seat belt comes out.

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## IV. WORKING

First we have to check whether the person is seated or not by using pressure sensor (relay circuit). After that we have to check the seat belt is perfectly wear or not. For ensuring that we are using electronic sensor. The working of sensor is, when the seat belt comes out the steel strip also come with it after minimum distance get passed. This steel strip is detected by a sensor.

First relay circuit is closed. By inductive proximity sensor generated eddy current in steel strip and it gives detection of metal as an output to controller with the help of binary 1's and 0's. when the steel strip is detected the sensor output is binary 1, Otherwise it will be 0. Where binary 1 is tells us, belt is locked perfectly. If binary 0 means not taken a belt or they had locked belt behind the back of the person as I had already talk about that. It means that belt steel strip cannot comes out, results it sounds will turns on for ensuring the lock seat belt properly.

If car is moving on road, if someone try to remove seat belt in running condition previous invention is happened that unlocked belt will turn sound.



Fig 3)Sensor: Autonics PR18-8DN DC10~30 8mm M18 Inductive Proximity Sensor NPN-NO (Unshielded)



| Model | Autonics M18 NPN-NO |
|---|---|
| Operating Voltage (VDC) | 10 ~ 30 |
| Detection Distance (mm) | 8 |
| Outer Thread Size | M18 |
| Object Type | Inductive |
| Output Type | NPN Normally Open Three-line |
| Installation Type | Non-Flush (Unshielded) |
| Max Output Current (mA) | 200 |
| Setting Distance (mm) | 0 ~ 5.6 |
| Insulation Resistance (MΩ) | 50 |
| Response Frequency | 350 Hz |
| Operating Temperature (°C) | -25 to 70 |
| Storage condition (°C) | -30 to 80 |
| Cable Diamensions | Ø5, 3-Wire, 2 Meter |
| Weight (gm) | 85 |
| Shipment Weight | 0.121 kg |
| Shipment Dimensions | 15 × 12 × 4 cm |

Table 1) Sensor Specification

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## V. ADVANTAGES

*A.* We strongly ensure that whether the seat belt is perfectly wearing or not.
*B.* The sensor which can operates in dirt, dust, oil, grease or soot, which could not affect the inductive sensing.
*C.* Range of the sensor is from 0 ~ 8 mm even if we can wear a metallic jewellery it will not affect the sensor working.
*D.* Sensor is economical.
*E.* This mechanism is easy to build.

## VI. CONCLUSION

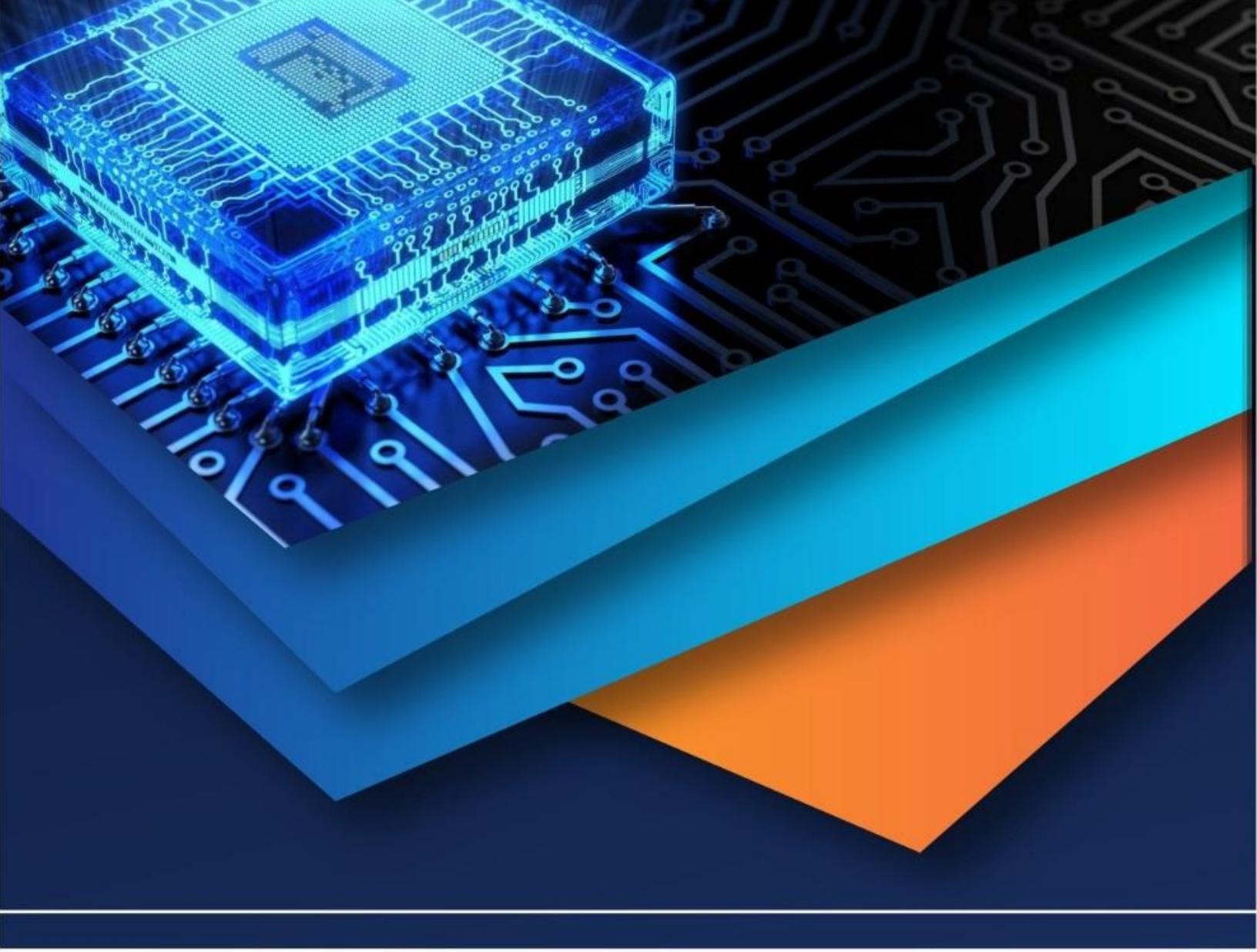
*A.* From this we are ensuring that the seat belt wear by driver and passenger.
*B.* We can reduce an accidents death significantly.
*C.* Due to this everyone has to build a habit of seat belt while driving.
*D.* Don't let them escape from different ways of not wearing seatbelt.
*E.* Great way towards the safety of driver and passenger because in every 6 minutes one life is saved by seatbelt.




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