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DESIGN AND DEVELOPMENT OF AUTOMOTIVE SMART TAIL LIGHT SYSTEM

MOHD IZZATI IZDIHAR BIN IBRAHIM

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MAY 2010

"I declare this report is on my own work except for summary and quotes that I have mentioned its sources"

Signature :……..

Name of Author : MOHD IZZATI IZDIHAR BIN IBRAHIM

Date : 24th MAY 2010

To my family

for

their love

ABSTRAK

Smart Tail Light System(S.T.L.S) merupakan sepenuhnya konsep baru yang memerlukan masa untuk dipekenali dalam pasaran tempatan dan erti kata lain ialah terbaru dalam era pasaran. Disini dapat memperkenalkan juga lampu belakang terbaru Smart Tail Light System dalam kerete keluaran terbaru tersebut. Nyalaan lampu diod pemancar cahaya yang pertama untuk bagi amaran dimana untuk memberhentikan kenderaan pada kadar normal. Diod pemancar cahaya yang pertama ini sama dengan lampu yang sedia ada pada kenderaan masa kini. Diod pemancar cahaya yang berkelip-kelip menarik perhatian pemerhati dan member peringatan kenderaan dalam berhenti mengejut. Diod pemancar cahaya warna hijau menunjukkan kepada pemandu di belakang bahawa pemandu dihadapan sedang dalam membuat pecutan untuk memotong kenderaan lain dihadapan.

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Finally, but most importantly of all, my parents, Ibrahim b. Abd. Rahman and Normala Bt. Nordin and should receive my greatest appreciation for their enormous love. They always respect what I want to do and give me their full support. The support from my siblings is also highly appreciated.

ABSTRACT

The Smart Tail Light System may take some a little time to become familiar because it's a totally new concept being introduced to a very diverse, vast market. And just like anything else that is new to the public, education is key to inform everyone just what the S.T.L.S. is how it works, and how it will benefit all drivers.. The new Smart Tail Light System (S.T.L.S.) in their car should they see the series of three lights in other cars. Even if drivers are not aware of the meaning of the three brake lights, at no time will anyone ever be in danger. The 1st red light simply means caution, however, there is normal pressure being applied to the brakes to actually slow the vehicle. The 1st red L.E.D is the same as the existing rear tail brake light in most vehicles today. The flashing 2nd red L.E.D. is still red which people are accustomed to seeing anyway. As mentioned previously, the 2nd red L.E.D will illuminate with flashing when the 1st red L.E.D. are activated so drivers will know that the car is de-accelerating. The green L.E.D shows the car to the back driver that car moving in accelerate, where the back driver will be noticed that front car in motion to overtakes or accelerate.

TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURE

LIST OF SYMBOLS

SYMBOL	TITLE	UNIT
a	Acceleration	ms^{-2}
k	Spring constant	N/m
x	Displacement of deflection	m
m	Mass of spring-mass	kg
F	Force	$Kgms^{-2}$
v	Velocity	ms^{-1}
t	Time	s
s	Distance	m

NOMENCLATURE

LED	Light Emitting Diod
STLS	Smart Tail Light System
US	United State
POPBIS	Pounds of Pressure Brake Indication System
PSI	Pound per Square Inch

CHAPTER 1

INTRODUCTION

1.1 Introduction

The introduction and installation of the Smart Tail Light System (S.T.L.S) will increase safety in today's congested highways and therefore decrease the thousands of accidents caused by inexperienced and over-aggressive drivers. The S.T.L.S brake lamps will provide drivers with an early response ahead or the minor concern right in front of them. Highways and streets will be safer and the flow of traffic will easy because everyone will have a better understanding of what all other drivers are doing. Safer streets mean a reduction in car insurance premiums saving all drivers money which in turn makes all drivers much happier.

1.2 Objective

The objective of this project is to design and development of automotive smart tail light system for a new concept tail brake light for prevent rear collisions,getting effectiveness flashing systems give additional warning time to following drivers.

1.3 Scope

Design Smart Tail Light System:-

- Design the smart tail light configuration.
- Design the smart tail light electrical system.
- To create any type of design the new smart tail light system and make research the most suitable design of the Smart Tail Light System.

1.4 Problem Statement

The problem statement in this project is to design and development of a new Smart Tail Light System for vehicle, which more effective than nowadays conventional tail light system and able to inform drivers early response ahead or the minor concern right by they see the series of three lights in front of them. This project is to design a new smart tail light system and suitable design of smart tail light system for this new tail light was needed. The smart tail light system must be easy to install and easy to find the spare parts and maintain. There are many types of conventional tail light system and I have to design any type and choose the best smart tail light system for the vehicles.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction of literature review

Nowadays, many type of tail light system in vehicles. This project is to design a new Smart Tail Light System using the new era technology. In this literature review, I make a research on:-

- Light Emitting Diode (L.E.D.) and it advantages.
- Available market product of adaptive brake tail lights.
- The law of momentum conservation principle.
- The spring force law (Hooke's Law)
- The law of inertia (Newton's First Law)
- Accelerometer and principles.

2.2 Modern LED tail light technology

LED lights are much easier to interface and control, when compared with traditional incandescent bulbs, commonly found in older tail lights. This is because LEDs draw less current, and do not require driver circuits with larger, more expensive electronics. In addition, LED lights are more efficient, and do not generate as much heat as much heat as incandescent light bulbs found in the older tail lights. Lunar Accents Design Corporation has taken LED tail light design to a new level. In our newest "Smart LED Tail Light", an on-board micro controller collects and interprets numerous input signals for processing. One function of the new system include the ability to sense ambient light levels, and adjust the LED output accordingly. During the day, the LED brake lights and LED turn signals provide an increased luminous output. In environments with decreased ambient light levels, they dim accordingly. Another function of the Smart LED Tail Light includes a basic A.I. (artificial intelligence) algorithm that records turn signal and braking activities of the driver. Based on a series of pre-defined driving patterns hard-programmed into the LED controller, the Smart Taillight can adjust turn signal, brake and marker light functions to provide optimal performance on the highway.

2.3 LED advantages

While all diodes release light, most don't do it very effectively. In an ordinary diode, the semiconductor material itself ends up absorbing a lot of the light energy. LEDs are specially constructed to release a large number of photons outward. Additionally, they are housed in a plastic bulb that concentrates the light in a particular direction. As you can see in the diagram, most of the light from the diode bounces off the sides of the bulb, traveling on through the rounded end.

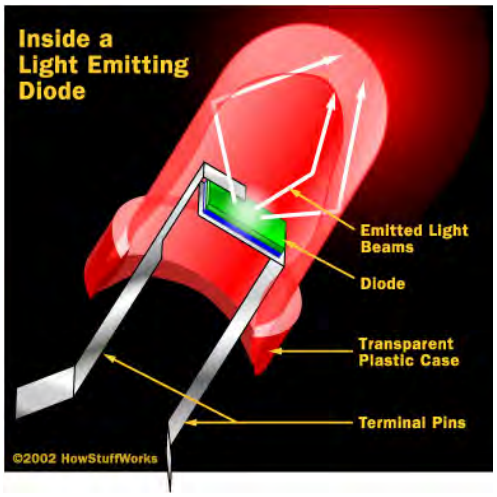

Figure 1.0 Light Emitting Diod (L.E.D.)

(Source: How Stuff Work,2002)

LEDs have several advantages over conventional incandescent lamps. For one thing, they don't have a filament that will burn out, so they last much longer. Additionally, their small plastic bulb makes them a lot more durable. They also fit more easily into modern electronic circuits. But the main advantage is efficiency. In conventional incandescent bulbs, the light-production process involves generating a lot of heat (the filament must be warmed). This is completely wasted energy, unless you're using the lamp as a heater, because a huge portion of the available electricity isn't going toward producing visible light. LEDs generate very little heat, relatively speaking. A much higher percentage of the electrical power is going directly to generating light, which cuts down on the electricity demands considerably.

Up until recently, LEDs were too expensive to use for most lighting applications because they're built around advanced semiconductor material. The price of semiconductor devices has plummeted over the past decade, however, making LEDs a more cost-effective lighting option for a wide range of situations. While they may be more expensive than incandescent lights up front, their lower cost in the long run can make them a better buy. In the future, they will play an even bigger role in the world of technology.

2.4 Research of available market product adaptive brake tail lights.

Brake light that flash on and off when the driver exerts an inordinate amount of pressure on the brakes. The lights are designed to alert motorists that the vehicle is making a sudden emergency stop. Until now, the systems were found mostly in Europe because of a National Highway Traffic Safety Administration rule that requires U.S. cars to have steady illumination of lights.

Figure 1.1 Mercedes-Benz 2007 S600 brake light during an emergency stop (Source: Jack Erjavec, 2007)

In the U.S., Mercedes-Benz features adaptive brake lights that can flash rapidly during emergency braking in its 2007 S600 model. The lights are triggered by the car's brake assist system as well as the stability control system if it senses low-friction road surfaces such as snow or ice. BMW's 7 Series vehicles have a Brake Force Display system that works only when the antilock braking system is activated. The rear tail lights and the brake lights shine at once and at the same intensity to warn that hard braking is taking place.

2.4.1 SuddenSTOP

As for the aftermarket products, Woodford Industries Inc., Los Angeles, will bring to market soon SuddenSTOP, which has a deceleration measurement device and microprocessor in a license-plate frame. When the device determines that the g-force (the tug of gravity on the vehicle when it's accelerating or decelerating) is at or above 0.5g, the bank of lights around the license-plate frame flashes for three seconds. (A normal stop is around 0.2g to 0.3g.) C2 Innovations of Knoxville, Tenn., (c2innovations.com) sells the SAFELight, which replaces the factory-installed incandescent bulbs in tail lights and uses a miniaturized sensor inside the bulb that automatically flashes the lights at a panic stop.

Advantages: To help prevent rear collisions, these attention-getting flashing systems give additional warning time to following drivers. Mercedes-Benz research says the lights help improve driver reaction times by as much as 0.2 second. Also, the Mercedes system uses light-emitting diodes that are brighter and last longer than regular bulbs.

Disadvantages: Since the Mercedes system is still experimental in the U.S., motorists might mistake the flashing light for a turn signal. A more inexpensive solution is to tap on the brakes to alert drivers about an unexpected stop.

2.4.2 Blinking Smart Stop

When you touch your brakes, the Blinking Smart Stop will cause your third brake light to flash quickly approximately 6 times before remaining turn on. This will help get the attention of the drivers following behind you, even when your in bumper to bumper traffic. All emergency vehicles, school buses tow trucks etc. use flashing lights because they get people's attention. You want drivers following you to see you. Be Seen - Be Safe Be Blinking Smart.

2.4.2.1 Works with all incandescent bulbs and LED lighting technologies

Figure 1.2 Blinking Smart Stop (STD) Version

(Source: Raymund, 2006)

Both the Blinking Smart Stop Standard and "Delay" versions of the Brake Light Flasher let you maximize your Brake Light Effectiveness. This compact State-of-the-Art solid-state electronic module converts your ordinary center brake light into an attention getting visual aid alerting device when you are braking. With the Blinking Smart Stop installed, when you apply your brakes, it causes your center high mounted third brake light to automatically emit a visual alerting signal by flashing the light approximately 6 times before entering the steady-state on red light condition.