iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** I **Month of publication:** January 2022

DOI: https://doi.org/10.22214/ijraset.2022.39816

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

Design of a Guidable Cornering Light System for Faired Motorcycle

Rohit Jadhav[1], Smit Shendge[2], Manas Metar[3], Aniket Shinde[4]
[1, 2, 3, 4]*Undergraduate from University of Wolverhampton*

Abstract: ***Today's engendering has a rage about faired bikes because they endeavour ergonomic glances as well as speeds. Although it has now graced a fact that most motorcycle accidents occur in darkness due to poor illumination and are more dangerous when the bike is cornering. As per the present contour of headlamps of fairing bikes, the headlamps become stable, giving rider vision at an upright position. These headlights do not provide enough illumination on bent roads and put riders in a vulnerable position. To overcome this dilemma, an alternative lighting system was needed. The goal of the project is to discover a cost-effective explication, increasing the safety and comfort of the rider. This called for cornering lights for faired bikes to persuade the road at the corner. The cornering lights serve riders by illuminating the shadowed area of the curve providing better vision. The Cornering lights can not only be useful in twilight but also bad weather, the rider can have a clear vision and control on the motorbike. The rider may react to the state of danger at an appropriate time.***
Keywords: Motorcycle Cornering Lights, Smart Headlights, Guidable headlight, Adaptive headlight, cornering headlight, safety technology, deflecting headlight.

I. INTRODUCTION

In today's world, everyone needs to travel from one place to another by some other means. In India, there is a good source of public transport but according to the population the public transports are always crowded which repeals people's attention from it and choose a private way of transportation. By this, the number of private vehicles has increased drastically thereby increasing accidents on the road and thereby degrading the quality of safety day by day.

Nowadays almost every house in Indian society has a two-wheeler for transportation purposes. This is due to many reasons happening around like traffic is the best example. According to the land area aspect and driving a two-wheeler in this traffic is a very convenient option to travel due to its compactness and easy manoeuvrability. Due to the increase in the use of motorcycles, there has also been an increase in the accidents, majorly happening at night time and there are few main causes of it like visibility, amount of traffic, driver's consuming alcohol and condition of the roads. In modern times after increasing the safety system in the vehicle itself makes the vehicle costlier thereby reducing the market of the manufacturer so some manufacturers cut off the safety features to reduce cost.

According to many sources, most motorcycle accidents happen during night time and there are many causes to it as mentioned above. So, we took Visibility as our priority to give safety. In a motorcycle which has fairings to it has headlight mounted on its fairing which doesn't provide Illuminance while turning the motorcycle and there are many accidents happening due to this reason.

A. Propound Idea

Our idea is to make a headlight setup in which it has four sections to it vertically and every section with a different deflection angle with a light in it which illuminates the specific level bulb accordingly with the electro-mechanics involved in the system.

B. Objectives of our Research Project

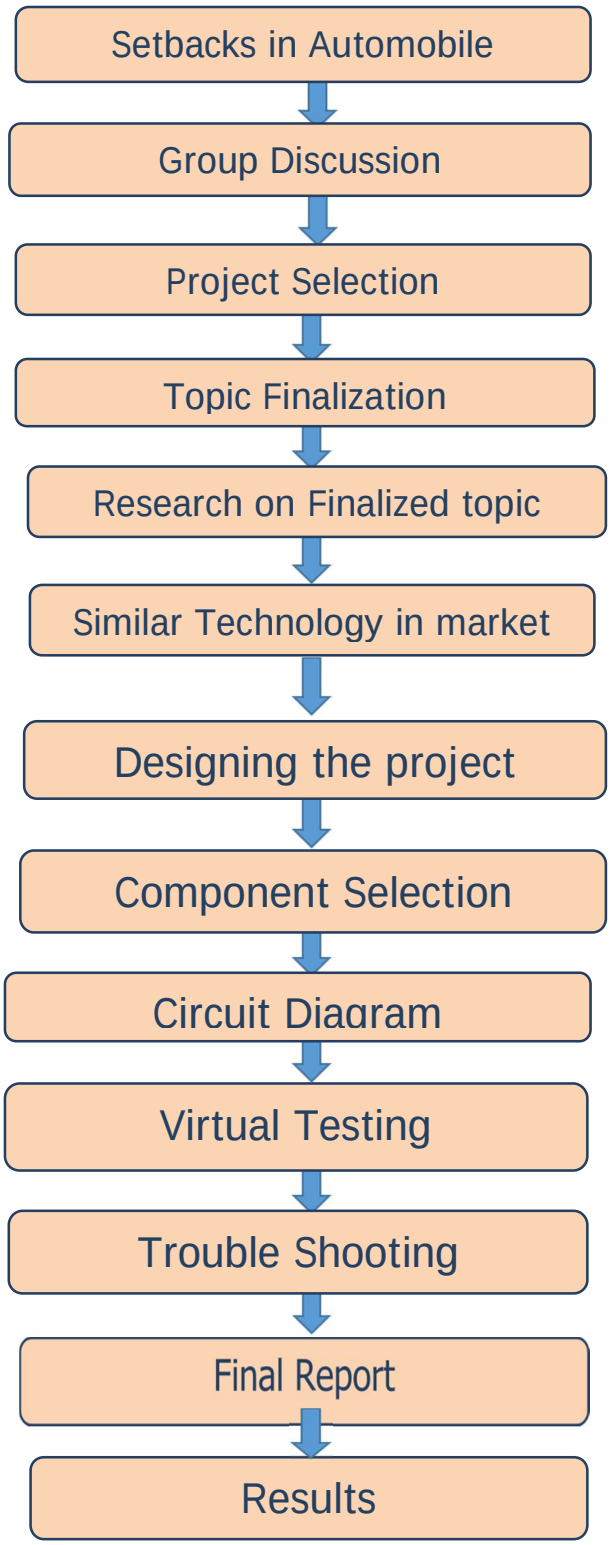
1) Get to know the number of accidents happening due to poor visibility at night due to improper headlight arrangements and its intensity of the two wheelers.
2) Proposed technology is very rare in two wheelers so it should be used in faired motorcycle to add safety to the rider at night time.
3) To design a new headlight setup with optimum way of utilizing the design by keeping the headlight’s deflection more during turning to maintain the visibility of the rider.
4) To make the use of components which are easily available and also are economical to make the whole system economical and user friendly.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

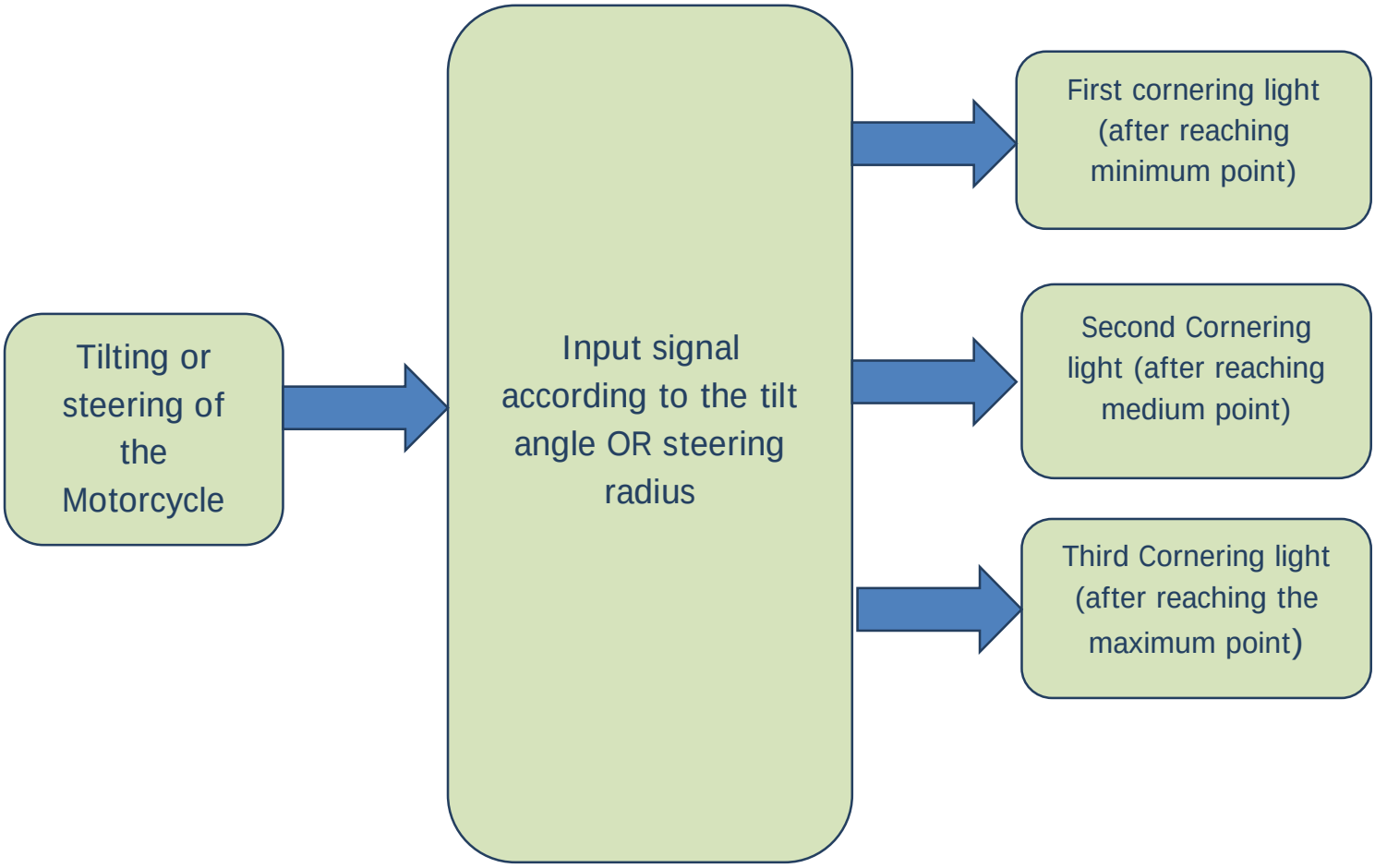
II. METHODOLOGY

To achieve the purposed goals of the proposed project, an electro-mechanical system had to be designed. Before the inception researches for similar concepts have been done and with the discussion of the research papers and goals of the project some basic diagrams of the mechanism were made. After troubleshooting and improving the structure the required components were selected.

A. Workflow Plan



B. Functioning of the Guidable cornering Light



C. Circuit Diagram of the System

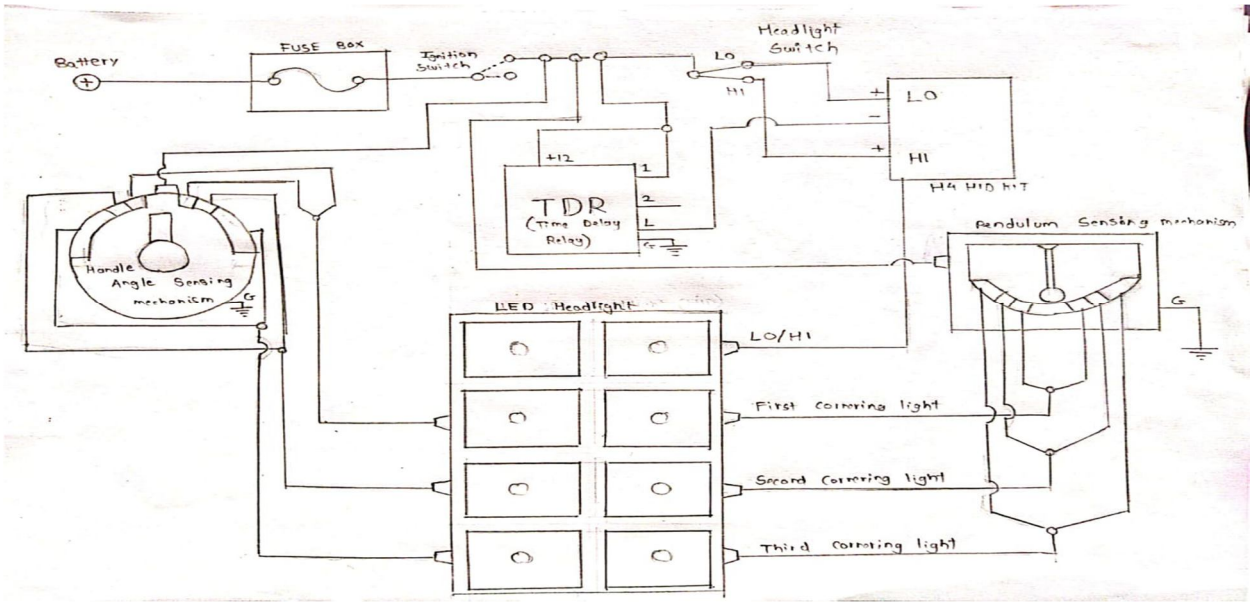


Fig. 1 Circuit Diagram of a guidable cornering light

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

D. Mechanism

We have two self-made mechanisms which helps to achieve our project goal. One is a Pendulum mechanism which will be situated at the front of the tank this pendulum will work as a switch as the pendulum itself is a conductor and on opposite side of the pendulum is circuit wire with conductor at its end as well which will complete the circuit if the pendulum makes an oscillatory motion when the rider leans the motorcycle in either direction making the particular LED headlight glow while turning the motorcycle with some lean angle. Sometime while turning the turn is not that deep that the rider will lean himself so there comes another mechanism in action it situated just in front of handle bar's fork. It is similar to pendulum mechanism but this is in horizontal to the motorcycle and as the motorcycle's handle is maneuvered angle of the mechanism moves to the conducting material on either side completing the circuit and illuminating the particular headlight.

Components used for this system

1) *Light Reflectors:* Light reflectors are used to scatter the light to illuminate light in a more outspread region. It is widely used in headlights, torch, and other application where light is used.

Fig. 2 Light reflector

2) *Pendulum Mechanism*

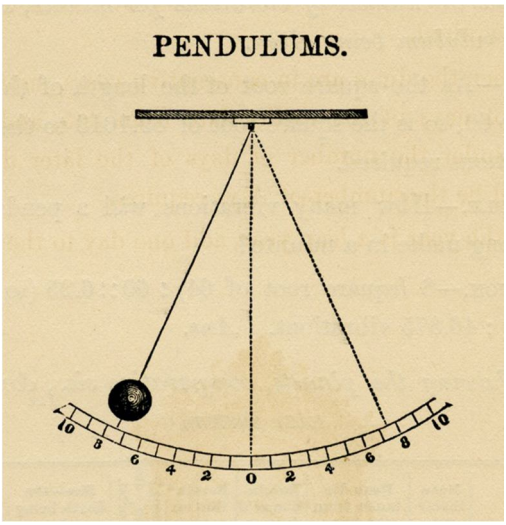


Fig. 3 Pendulum Mechanism

It is a mechanism system which is widely used in clocks well known as pendulum clocks. It is mechanism which has an oscillation motion to a circular metal ball structure and at its one end with a solid metal stick is present, it's a piece thing combined. At the other end of the stick is pivoted at a point which makes the pendulum oscillate when pushed.

3) TDR (Time Delay Relay)

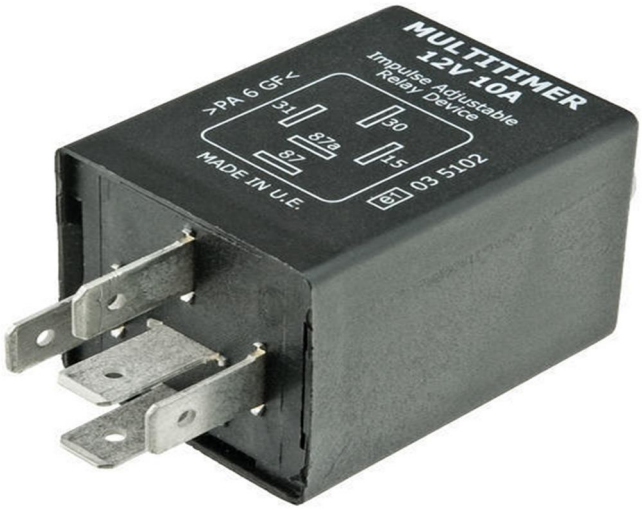


Fig. 4 Time Delay Relay

It is an electrical device used in electrical circuits to control any device according to the given time by either switching that device ON or OFF early or by delaying it. This time delay relay is controlled by changing input voltage, closing or opening the switch, by other switch buttons and by changing the voltage of the circuit.

4) LED

Fig. 5 LED

LED stands for light emitting diode, it's a type of a semiconductor which gives light when current is passed through it. LEDs are expensive than other market availability of lights but it gives amazing illumination compared to others as well as it has a very long working life and a very less maintenance.

5) Fuse

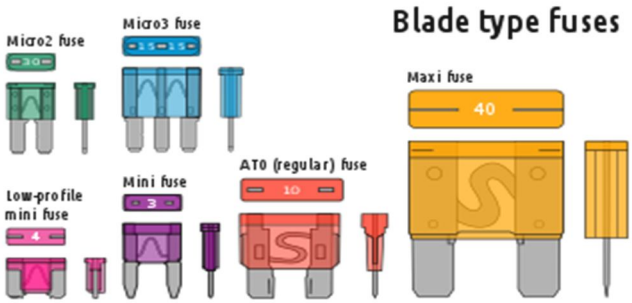


Fig. 6 Fuse

It is an electrical device which is used almost in every electrical circuit. Its work is to keep the circuit under an estimated current or voltage to keep other electrical device safe when in use. It does this by having a thin wire to it which gets cut by means of heat as it melts keeping the over current or voltage shutdown between the devices.

6) Wiring

Fig. 7 Wires

It is a copper layers which are used to transfer electricity from one point to another and is always enclosed in a plastic casing usually made of PVC, polyethylene, etc. to cover the copper layers by adding a protection to the user from direct contact of the flowing electricity through it. Wiring system plays major role when it comes to electricity.

7) Wiring Harness

Fig. 8 Wire Harness

It is a safety feature provided in wiring system in which each and every wire is insulated at the wirings are placed in a proper area until the reach of the electricity's final reach point or device to keep the system safe. This is done as one wires in bunch can cause a lot of heat so it's kept in proper distance and location to prevent and short-circuit or any other electrical faults.

III. LITERATURE REVIEW

Kobayashi et al. The paper focuses on using microcontroller in headlamp so it can be turned ON and OFF with certain tilting angle. With the help of ECU, the headlamps must be illuminated brighter in the early hours and oncoming traffic shouldn't bother keeping driver visibility good. Also, with the help of new cornering light system (ACL) it is easy to drive at corners. In this system hydraulic cylinders are used with the help of microcontroller. He adds that user defined operating conditions should be available with the help of microcontroller using steering wheel. The direction of steering steers will define turning angles of headlamps illumination.

Kenchi Nishiorura et al. The paper suggests about automatic adjustment of light direction axis of the vehicle headlamps. The steering angle sensor will forward the signal to microcontroller unit which will start further defined process stored in microcontroller database. The sensor detects the steering angle as per turning radius and headlamps deflect at the direction of which is car moving.

Hiroshi Okuchi et .al This well-known researcher defined different type of using microcontroller in headlamps. He suggested using microcontroller optical axis can be changed where optics of headlamps will be movable as per the sensors. So, the battery is used to do this process in replace of hydraulic compressor which will useful in less consumption of space and power.

Ming-ShyanHuanga Et al The suggested optical design has following features. First, this optical design controls the angle of light pattern without light masking so as to achieve much higher light efficiency. Second, in view of the tendency that the advanced light emitting diode, automobile headlight is designed to be a low beam light module and a high beam light still needs an auxiliary lighting system, the optical system designed in this research, mainly adopting DMD module as high/low beam light switch, can switch on and off both the high and low beam lights. Because DMD's function of accepting a bi-dimensional image, high/low beam light patterns can be determined by DMD. Third, a light pattern will be created and compensated simultaneously by DMD, which might replace mechanical adaptive front-lighting system because DMD provides fast response and simultaneous compensation. Fourth, a design using a multiple reflection curved mirror is employed in this research to adjust light energy distribution; therefore, the articulation of the light pattern can be enhanced. By implementing DMD in automotive headlight can get an efficiency of 85%.

Christiane J. REINERT-WEISS Et al. This paper tells how an Augmented Reality technology can be used in an automotive headlight system. It can be used in automotive headlight system, only challenges that needs to be faced are it should be simple in construction and also should have the ability to withstand that temperature range of 40°C to 125°C also at the same time it should with stand that for a long period of time keeping the life span of up to a 15 years or 300,000 KM. They have implemented AR technology by using small mirror with proper angle to a LED Matrix with tire optics in a flat horizontal position and a wire grid polarizer at last also with angle for separation of light. With this setup an AR headlight can be implement in automotive headlight system which will give light in accordance and also convey a message to the other road usage in the form of light.

Toby J. Lloyd Et al. This paper tells that Driving Motorcycle at night can cause injuries and even death in some cases due to low illuminations mostly while taking turns. To solve this issue an infrared sensor (light) is used and positioned on the Chin area of helmet and also an IR filter is used to increase efficiency of the sensor. To sense the movement of the helmet an inertia measurement unit is used and to send signals of the generated sensor electronic control module (ECM) is used. Further to turn electrical signals to motion and electromechanical control apparatus is used to actuate the angle of light according to the position of the person driving the motorcycle and the position that person is looking.

Rohan Sharma Et al. Headlights of a fairing bike has reduced vibrations and it is easy to maneuver the bike because of less heaviness. But it creates issue of almost zero illumination area while turning in a less illuminated place. To over this issue they used a gyroscope sensor. It senses the tilt in bike and actuated reflectors using servo motor according to the tilt, thereby providing illumination while turning and adds safety to the rider.

Shreyas S. Et al. It speaks about a four-wheeler adaptive headlight system to reduce blind spots created during night period. This adaptive headlight system uses microcontroller and stepper motor on either side of the headlights to actuate the angle of the headlight. Signals are communicated by using microcontroller to control either side of the stepper motor. Also, adaptive headlight has a feature of turning on and off the headlight by using a photo diode, when the threshold of the photo diode falls the light turns on automatically.

Christiane Jasmin Reinert-Weiss Et al. This paper speaks on the technology of a Matrix LED for a high-resolution adaptive headlight system. This paper particularly speaks about AMLCD based Matrix headlight system and used a 30K switchable pixel. These small pixels are switchable which makes it precise while functioning as each and every pixel can be controlled to illuminate particular frontal area of the vehicle thereby making it very purposeful in functioning.

De-Shau Huang Et al. The above researchers state that using LED headlamps Is more efficient and effective. LEDs are light weight, have high intensity which illuminate more than usual headlamps and have more life span. The temperature range is drastically reduced using LED lamps. But LED lamps have complex circuit, to assemble, it can be fully operated by ECU. For the angular deflection they have used curved deflector which has been fitted on the glass of headlamps. When vehicle makes a turn, the sensors change its brightness condition to the same direction also because of curved deflectors it has become more efficient in corners.

IV. TESTING AND RESULTS

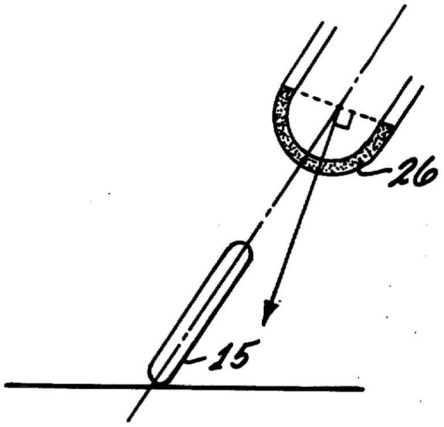


Fig. 9 Tilting Angle position of faired motorcycle

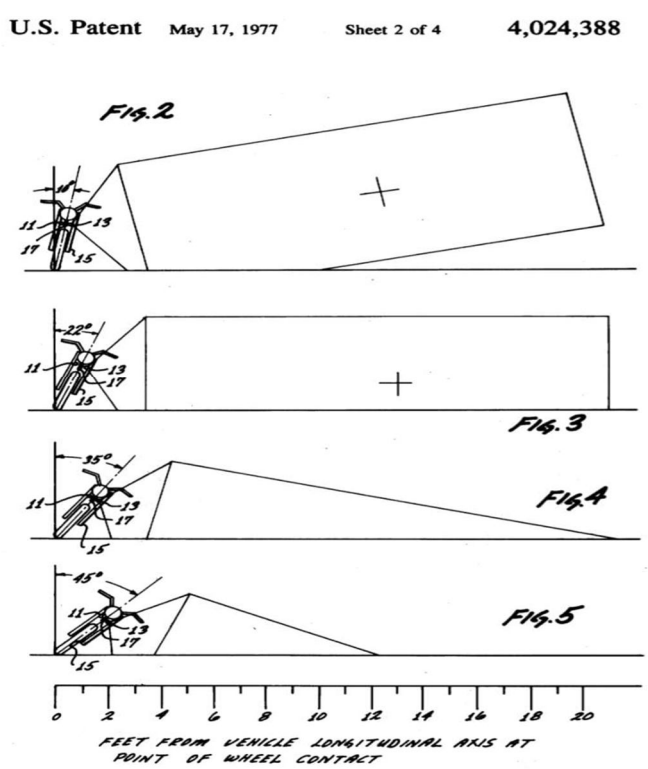


Fig. 10 Various Tilting angle to activate the guidable cornering lights

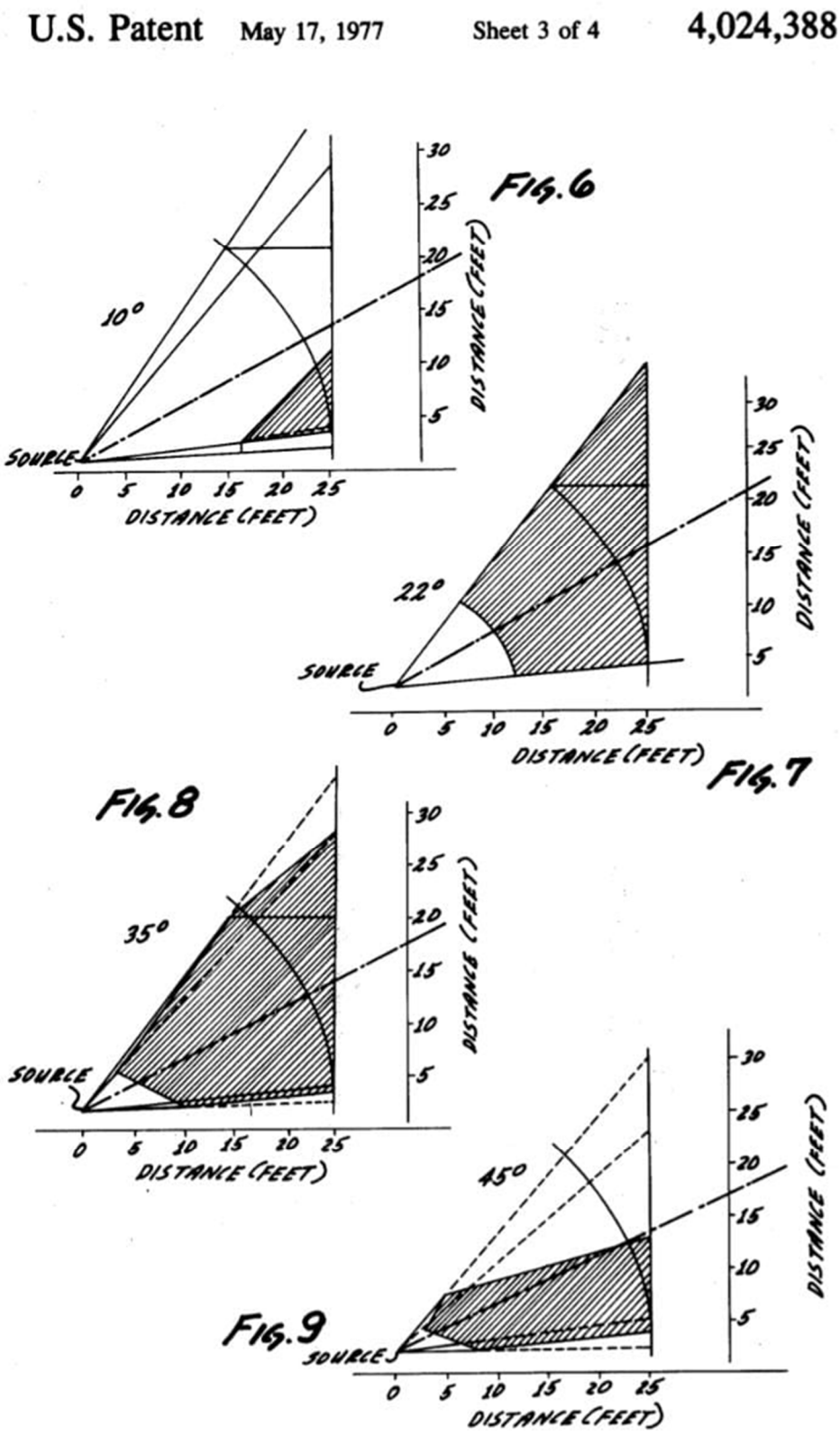


Fig. 11 Guidable cornering light intensity angle

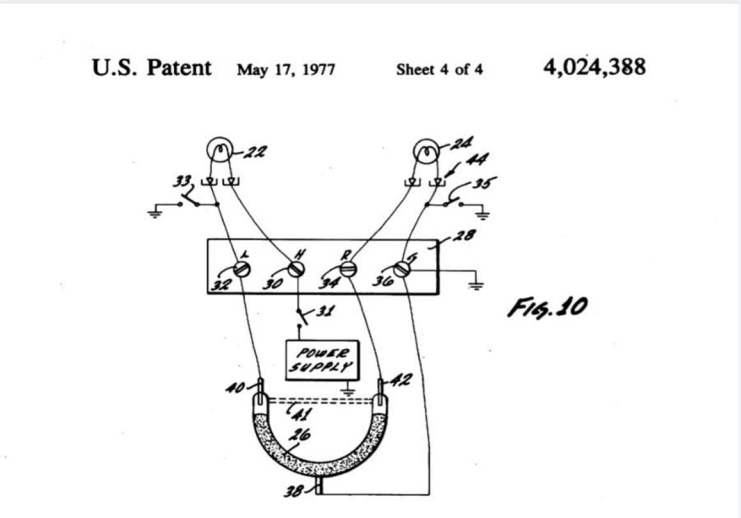


Fig. 12 Basic Diagram of Guidable cornering light

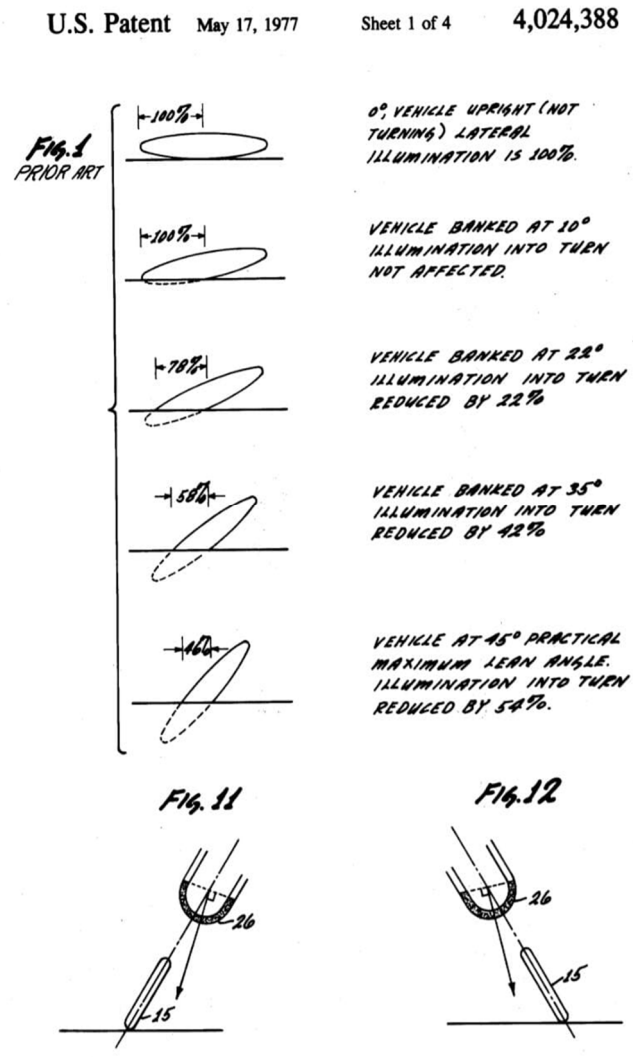


Fig.13 Various Position at which guidable cornering light gets activated

Brief description of the drawings according to th Patent:
FIG. 1 shows the lighting coverage pattern of a conventional headlight for various lean angels of the vehicle.
FIG. 2 is a front view showing the cornering light beam when the vehicle is tilted 10 degrees.
FIG. 3 is a front view showing the cornering light beam when the vehicle is tilted 22 degrees.
FIG. 4 is a front view showing the cornering light beam when the vehicle is tilted 35 degrees.
FIG. 5 is a front view showing the cornering light beam when the vehicle is tilted 45 degrees.
FIG. 6 is a plan view showing the area on the ground illuminated by the cornering light when the vehicle is tilted 10 degrees.
FIG. 7 is a plan view showing the area on the ground illuminated by the cornering light when the vehicle is tilted 22 degrees.
FIG. 8 is a plan view showing the area on the ground illuminated by the cornering light when the vehicle is tilted 35 degrees.
FIG. 9 is a plan view showing the area on the ground illuminated by the cornering light when the vehicle is tilted 45 degrees.
FIG. 10 is an electrical circuit diagram showing how the tilt actuated switch is connected to the cornering light circuit.
FIG. 11 is a rear view of the vehicle executing a right turn, showing the relationship between the effective "g" force vector and the tilt of the vehicle.
FIG. 12 is a rear view of the vehicle executing a left turn, showing the relationship between the effective "g" force vector and the tilt of the vehicle**.**

As per the proposed design we have overcome two major problems illumination in the night while cornering on a faired bike.
1) The banking of motorcycle with variable cornering angle.
2) Non availability of guiding lights while cornering.
This design will correct the bank angle and maximize the illumination area of angle on banking road.

V. CONCLUSION

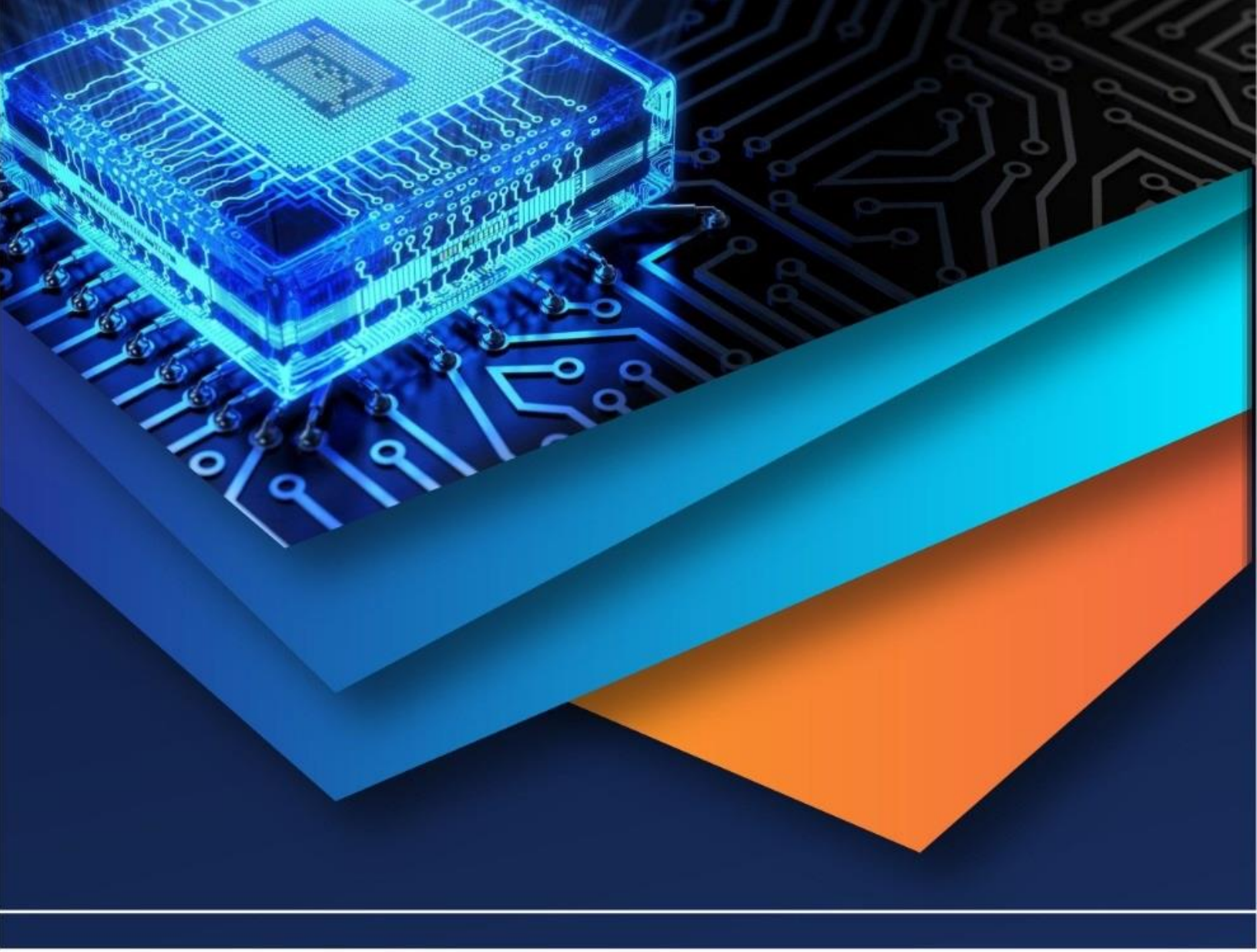
The designed mechanism works with no flaws. The LEDs glow sequentially while cornering and turning, preventing blinding of oncoming traffic. The illumination is effectively bright, enough to provide better vision for the obstacles and gives more time to the rider to respond to it. The project does not weigh cost and works fine, hence it can be widely implemented.

VI. FUTURE SCOPE

The fortune of two wheelers might compromise speed with safety concern. Since years there has been a notable boost in bike casualties in twilight, which put forward the necessity of promising luminous headlight structure. The project extraordinarily targets the bikes with fairings. Future faired bikes may come up with intelligent headlight system but it would add to the cost for this particular system, rather our composition and mechanism can save the big budget conclusively. This intuition of cornering light, is itself a headlight but could exhibit the barriers of the road while inclining the bike towards a corner. The system also furnishes vision of the sides of the road even while taking a simple turn. This featured system procures acceptable vision of the sides of the roads and subtracts the risk of casualties occurring at night. The rider gets more time to respond to the obstacle even while speeding. Looking forward to the future, the design of the headlights can be improved without need of changing the mechanism which could still perform seamlessly. As the system provides effective brightness and improved vision, it should definitely decrease the number of fatalities of riders riding at night. The results have satisfied the safety concern, need of extra lights and avoided lavish budgets. Implementation of this system can save many lives.

REFERENCES

[1] Mr.Nick, "made-in-china," 19 06 2020. [Online]. Available: https://evitekhid.en.made-in-china.com/product/uCbJDHiAVmcQ/China-H7-9-36V-36W-3800lm-C6-Car-LED-Headlights-for-Automotive-Parts-with-IP67-Waterproof-LED-Xenon-Conversion-Kit.html.
[2] 19 05 2020. [Online]. Available: https://www.indiamart.com/proddetail/metal-light-reflectors-8857780088.html.
[3] "indiamart," 19 5 2020. [Online]. Available: https://www.indiamart.com/proddetail/metal-light-reflectors-8857780088.html.
[4] "olddesignshop," 19 5 2020. [Online]. Available: https://olddesignshop.com/2019/08/pendulum-vintage-illustration/.
[5] "indiamart," 5 2020. [Online]. Available: https://www.indiamart.com/proddetail/on-delay-relay-4483296588.html.
[6] "wikipedia," 19 5 2020. [Online]. Available: https://en.wikipedia.org/wiki/Fuse_(automotive).
[7] "alibaba," 19 5 2020. [Online]. Available: ://www.alibaba.com/product-detail/BV-THN-THHN-1-5mm-2_62001178349.html.
[8] "amazon," 19 5 2020. [Online]. Available: https://www.amazon.com/Headlight-Harness-Toyota-Headlights-Problem/dp/B07B9QQMMH.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY