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Automatic Upper-Dipper Control for Vehicles

Jayant Kaneriya
Student, Department of Mechanical Engineering(Automobile), Madhav Institute of Technology & Science, Gwalior (MP), India

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ABSTRACT -While driving a vehicle during night, headlight plays an important role. An exasperating situation may arrive due to the headlight glare form the opposite vehicle during night. As we know human eyes are very sensitive to the light, when eyes suddenly comes in contact with the light after darkness, vision gets blank and require some time to recover the vision. On numerous occasionsthe situation arrives when suddenly vehicle approaches from front with headlamp in high beam mode causes temporary blindness to the eyes of the driver. Here probability of accident could occur. To prevail over this manual dipping problem, an automatic mechanism has made to change the upper mode into dipper mode automatically whenever situation occurs. This paper will help in reducing number of accidents due to headlight glare to a great extent during nighttime and provide ease in driving. Methodology, modeling and analysis is briefly discussed in this paper.

Keywords: Headlight, automatic dipper, LDR, headlight glare, vehicle, etc.

Fig. 1 Headlight at high beam intensity

In each vehicle dipper beam is provided additionally with the higher beam to scale back the dazzle from oncoming vehicle. Automatic dipper lightweight management may be a system that mechanically changes the light from higher to dipper beam by sensing the light of oncoming vehicle.

I. INTRODUCTION

Now days the number of vehicles on road is increasing extremely and no. of accidents on road also increases. Especially at the hours of darkness most of the accidents are occurred because of dazzling of headlamp. Whereas diving at the hours of darkness the headlamp beam of oncoming vehicle is directly effects the driver's eye and eye gets blur, it takes three to eight sec to recover to its traditional vision. Fig.1 shows the light beam of headlamp that causes indistinctness on driver's eye.

II. COMPONENTS AND THEIR DESCRIPTION

Now let us see the main components used in this device and their general description.

A) HEADLAMP –

Fig. 2 Double Filament Bulb

Double filament bulb is fitted in headlamp of the vehicle shown in Fig.2. Here one filament is employed for higher beam and another for dipper beam. While driving at night time, the headlight is the sole source of vision and it is required primarily from evening to morning. Driver can switch the

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headlamp from higher beam to dipper beam or the other way round using manual switch.

B) IC 555 –

Fig. 3 IC 555

Fig. 4 Pin diagram of IC 555

555 timer IC is the main control of this system and it is chiefly known for generating stable time delays. Here for this methodology, mono-stable mode is used for developing the timing logic. It is an 8 pin IC procurable in dual-in-package (DIP). Fig. 4 shows the pin diagram of 555 IC[3].

The eight pins do the subsequent functions: 1. Ground, that acts as a safety measure as with electrical plugs 2. Trigger, that passes on voltage to start out the timing operations, Pin 2 is termed as Trigger input because it is this input that sets the output to the high state. 3. Output, that carries voltage to the device using the timer, Pin 3 is the digital output of the 555. It will be connected on to the inputs of alternative digital ICs, or it can manage other devices with the assistance of a few additional components. 4. Reset, this is often used to finish the timing operation 5. Control voltage, an alternative pin used to dominant the timer from outside the main circuit set-up 6. Threshold, that determines how long the timer ought to output voltage in every on/off cycle – in other words, how long the timing interval should be 7.Discharge, connected to a capacitor that conjointly influences the timing interval 8. V+, that is the voltage input, Pin eight is where you connect the positive power supply (Vs) to the 555. This will be any voltage between 3V and 15V DC, however 5V DC once working with digital ICs. Pin 1 is that 0V connection to the power supply.

C) BATTERY –A supply of 12 volts is needed for the circuit. This supply is taken from the vehicle's battery itself. This is preferred because it is a constant DC supply and there is no need to provide a separate electrical source.

D) RELAY –

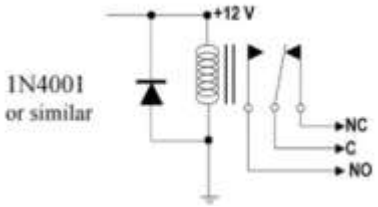

Fig. 5 Relay Driver

In this system relay is employed as switch to vary the lamp connections from higher beam to lower beam. Relay is electromagnetic switch that operates once current is flowing through its coil. Affiliation of higher beam is given to NC (normally close) terminal; dipper beam is given to NO (normally open) terminal and common is connected directly connected to 12V supply [4]. Relay coil is energized once output of 555 IC gets high and de-energize when output gets low.

E) LDR –

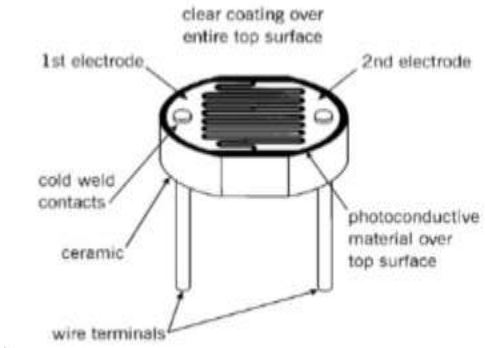

Fig. 6 Construction of LDR

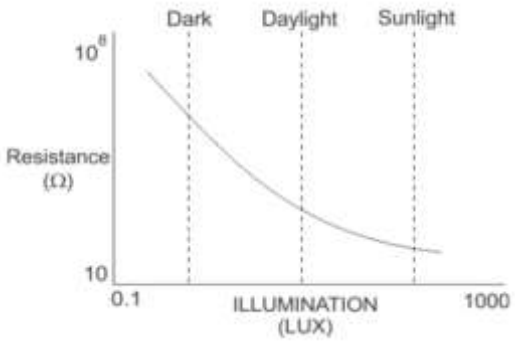

Fig. 7 Characteristics of LDR

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It is nothing however a photo sensor or photo electrical device i.e. once the light falls on these LDR's then the resistance of the circuit amends consequently with the change in intensity of the light. LDR is a light dependent resistor, the resistance of LDR will increase in dark up to twenty kΩ and falls up to few hundred Ω in light.

F) SWITCHES -Switch is generally used for to create or to break the contact; here 2 SPDT (Single Pole Double Through) switches are used, one for choosing the automated or manual dipper control mode and another one for manual upper-dipper of light.

G) DIODES -Diodes are 2 terminal devices that exhibit low resistance to current flow in one direction and high resistance to current flow within the other. The direction in which the current flow is commonly noted as the forward direction whereas the negligible current flow is known as the reverse direction. While the diode is conducting a low voltage is dropped across it and this is often called as the forward voltage drop. The diode is one in every of the best kinds of semiconductor and it is accustomed to controlling the flow of electrons.

III. WORKING AND PRINCIPLE

PRINCIPLE-The following block diagram clearly explains the proposed system.

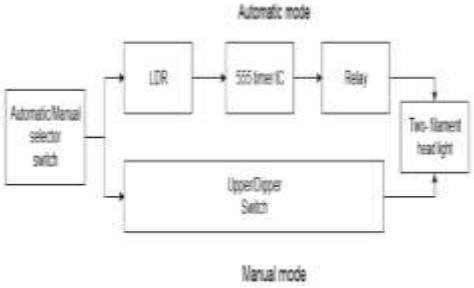

Fig. 8 Block diagram of vehicle headlight management system

Given block diagram in Fig. 8 suggests a clear idea about the dipper system. In automatic mode LDR senses the light of approaching vehicle, then the resistance of LDR amends as per light intensity. Because of change in intensity the voltage given to 555 timer management IC becomes high or low. On the premise of trigger and threshold condition, the output changes its state to high or low consistent with that the relay coil will energize or de-energize. Relay amends its position from NC to NO it'll cause the headlamp control from higher to dipper. Once the approaching vehicle passed away, LDR goes in dark and output of 555 IC amends again. It changes headlight from lower beam to higher beam.[1]

WORKING -Generally, there are 2 modes of operation viz. manual and automatic mode, for choosing manual and automatic mode SPDT switch (S1) is provided. In manual mode use the SPDT switch (S2) for controlling high beam and low beam condition of the headlamp. In manual mode rejection of flowing reverse current through automatic system, diode D2 and D3 are connected to NC and NO terminal, it solely operates in forward direction it suggests that just for automatic mode.

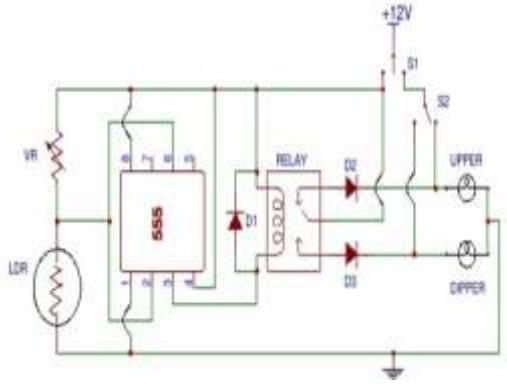

Fig. 9 Circuit diagram of dipper control

Automatic mode consists of relay, switch, IC 555, LDR, etc. as shown in Fig.9. Normally, LDR's resistance is low (2 kΩ) in brightness and high (20 kΩ) in darkness. LDR and VR work as the potential divider and VR controls the output voltage of potential divider that causes change in controlling time period and LDR's intensity.

Fig.18 shows the inner structure of 555 IC, therein 3 resistors of 5 kΩ act as voltage divider and gives the voltage ⅔ Vcc to comparator one and ⅓ Vcc to comparator two, where Vcc is the supply of 12V. These two voltages give the timing interval [2]. Resistance of LDR falls to 2 kΩ and voltage gets shorted to ground.

Due to that a negative voltage goes to trigger pin, which is set at one-third of Vcc by comparator 2. If that voltage is equal to one-third of Vcc, the comparator 2 output goes high and comparator 1 is not equal to two-third of Vcc so its output is low. It sets FF at S=1, R=0 and output of FF is Q=1, $\bar{Q}$=0, this output is inverted by electrical convertor present at pin 3 therefore output of 555 IC becomes high. Relay coil gets energized and changes its connections from higher beam (connected to Normally Closed) to lower beam (connected to Normally Open).

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Once the approaching vehicle is passed on to the beyond, LDR sensor goes in darkness. Due to this LDR's resistance will increase to 20 kΩ and voltage that got shorted LDR's low resistance, is recovered again and given to trigger pins and threshold of 555 IC. Due to that the positive voltage goes to threshold pin that is set at ⅔ Vcc by comparator one. If that voltage is equal to two-third of Vcc the comparator 1 output goes high and comparator 2 is not equal to one-third of Vcc so output is low. It sets FF at S=0, R=1 and output of FF is Q=0, $\bar{Q}$=1, this output is inverted by electrical convertor present at pin 3 thence the output of 555 IC becomes low. Now the relay coil will get de-energized and its connection is changed from lower beam to higher beam, and this condition will remain same till any light beam from approaching vehicle falls on LDR detector.

IV. RESULT AND DISCUSSION

The circuit is made in setup with circuit diagram on the bread board and 12V power is applied to the circuit. Alter the 10k potentiometer (VR) for adjusting the light intensity with encompassing intensity to energize relay. LDR's resistance is low (2 kΩ) in light and high (20 kΩ) in dark. Allow the tiny torch light to be fall on the LDR, measure the resistance of LDR and operating range of relay. With the assistance of tiny torch, we tend to vary the resistance of the LDR and we measure some distance at different resistance were relay can operate successfully. Therefore, it is clear that the LDR resistance is high in darkness and low in light. Thus, we tend to alter potentiometer (VR) at 10 kΩ in the circuit, because at night darkness is more and light intensity of vehicles returning from front is high. So the dipper control depends on the intensity of light and distance.

V. CONCLUSION

In this paper LDR is used to convert manual headlight control into automatic. One of the major problems while travelling at night time is glaring of light from approaching vehicle. Although there is a manual methodology to reduce the headlight beam, but it will be troublesome during some situations.

There are two modes automatic and manual mode. While driving within the cities there are light all over which may have an effect on the operation of the device at that point the mode can shift to manual mode to avoid flickering of the headlamp. Main components helps to run the circuit are simply accessible and are also low cost. The circuit is compatible with any vehicle and doesn't need any other supply; it will expeditiously work on battery fitted in the vehicles. Thus the installation of this safety system in every vehicle offer safety at night driving, increase comfort level of driver and reduce the road accidents.

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