SURVEY AND DESIGN OF A HEADLIGHT CIRCUIT TO REDUCE POWER CONSUMPTION

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ABSTRACT

All the components in an automobile are powered by internal combustion engines and thereby reducing its mechanical efficiency. Battery in an automobile is charged with an internal combustion engine with the conversion of mechanical to electrical energy by an alternator also known as generator. Most of the people often forget to turn off their light in the morning which reduces mechanical efficiency of an engine. We have designed an electrical circuit which will automatically cut out the headlight circuit during the daytime. This circuit will increase the mechanical efficiency of the engine by reducing power loss due to the headlights.

Key words: Battery, Alternator, Electrical Circuit, Internal Combustion Engine, Headlights.

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1. INTRODUCTION

1.1 Alternators
They are used in modern automobiles to charge the battery and to power the electrical system when its engine is running. The definition of alternator is hidden in the name of this machine itself. An alternator is such a machine which produces alternation electricity. It is a kind of generators which converts mechanical energy into alternating electrical energy. It is also known as synchronous generator.
1.2 Headlights
Headlights are the most important part of an automotive electrical systems. They increases the driver’s visibility in the night time. Headlights take their power from the battery which in turn gets charged by an alternator. If the headlights are on when they are not required like in day time they reduce the mechanical efficiency of an engine.

1.3 Observation table
A survey was conducted at Indore to find out how many number of vehicle were running with their lights turned on.

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Vehicle type</th>
<th>Number of Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2- wheeler</td>
<td>37</td>
</tr>
<tr>
<td>2</td>
<td>4- wheeler</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>Bus</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Truck</td>
<td>5</td>
</tr>
</tbody>
</table>

2. CALCULATIONS

2.1 List of symbols
- W = watt
- A = ampere
- hr = hour

2.2 Assumed data
- Battery = 12 V, 65 A-hr
- Lamp = 50W * 2 = 100W
- Alternator rating = 150 amp

2.3 Current requirement by lamp
Power = Voltage * Current
100 = 12 * I
I = 8.33 Amp

2.4 Time of complete discharge of battery
Time = (65A-hr)/ (8.33A)
= 7.80 hrs

2.5 Resistance offered by alternator
Voltage = Alternator current * Resistance
V = I² * R
12/150 = R
R = 0.08 ohm

2.6 Power generated by engine to drive the alternator
P= (I^2) * R
P = (65 * 65) * 0.08
P = 338 W
The ampere rating of the battery is 65 that is it can deliver 65 A of current continuously for an hour or for a complete discharge. If the headlights are continuously running for 7.8 hours than the engine has to deliver 338 watts for running it for 7.8 hours. In other words, if the light remain on for 7.8 hours during day time than 338 watts from an engine are wasted.

3. CONVENTIONAL ELECTRIC CIRCUIT

![Figure 1](Image)

**Figure 1** A headlight circuit inducting current flow with the dimmer switch in the low BEAM Position

4. NEW DESIGN

![Figure 2](Image)

**Figure 2** The new design of the circuit
When light falls on the phototransistor, it begins to conduct up to about 1.5 mA, which pulls down the voltage at the lower side of the resistor by 1.5 V, turning off the transistor, which turns off the lamp. When it’s dark, the transistor is able to conduct about 15 mA through the lamp. So the lamp will start.

5. CONCLUSION
Survey shows that there are ample of vehicles including 2- wheelers and 4- wheelers having their lights turned on in day time which results in loss of engine’s mechanical power. The circuit designed can help to reduce this loss up to some extent which in turn helps to save fuel.

REFERENCES