

High Beam Energy Collection Device

Jiazeng Zhang

Taian No.1 Senior High School of Shandong Province, 271000, China

Abstract

The existing solar panel system is partially improved, and a high beam energy collection device is designed by using single chip microcomputer, light sensor and deceleration motor. Solar panels are designed to face the coming direction of vehicles to receive the light energy from the lights of opposite vehicles, which can realize the light energy collection of the system at night and make up for the problem that solar panels cannot collect enough electric energy due to climate factors.

Keywords

Single chip microcomputer; Light energy; Solar panels; Street lamp.

1. Text: Systematic Overview

At present, most roads are equipped with street lamps that use solar panels to collect solar energy. Because the direction of solar panels is fixed, they can only collect daytime light energy, resulting in relatively limited collection and reserve of electric energy. In addition, this is also true in bad weather conditions such as rainy days. However, most cars on the road have the function of high beam and have strong light intensity, especially on the road with large traffic flow, which can accumulate considerable light energy. Based on the above situation, the light energy under this condition can be collected, the secondary utilization of energy can be realized, and the loss of energy can be reduced.

High beam energy collection device is a support that can automatically adjust solar panels according to light intensity and time, which is mainly divided into light detection part, electric execution part, charging circuit and main control part. Among them, the light detection part is mainly responsible for sensing the intensity of sunlight, the electric execution part is mainly responsible for driving the solar panel to rotate, the charging circuit is mainly responsible for collecting the energy of the solar panel and storing it in the battery, and the main control part is mainly responsible for converting the data of the light detection part and controlling the operation of the whole system [1].

During the day, after the main control part detects the illumination through the light detection part, it drives the electric execution part to turn the solar panel upward and receive the light energy of the sun; At night, when the light detection part detects that the light intensity is weakened, the main control part will drive the electric execution part to turn the solar panel to the coming direction of the vehicle, so as to receive the light energy of vehicle lights and realize the light energy collection at night.

2. Introduction of Each Part

2.1. Light Detection Part

The light detection part is mainly responsible for converting the illumination intensity signal into voltage signal, so that the main control module can convert and process it. Its core device is photosensitive resistance, and its resistance value is inversely proportional to light intensity [2]. Its circuit schematic diagram is shown in the following figure. Photosensitive resistor is connected in series with a certain value resistor, and signals are led out from the connection

nodes of the two devices to form a voltage divider. The output of the voltage divider is connected to the amplifier on the module to stabilize and enhance the signal, which is convenient for the main control part to read more stable data.

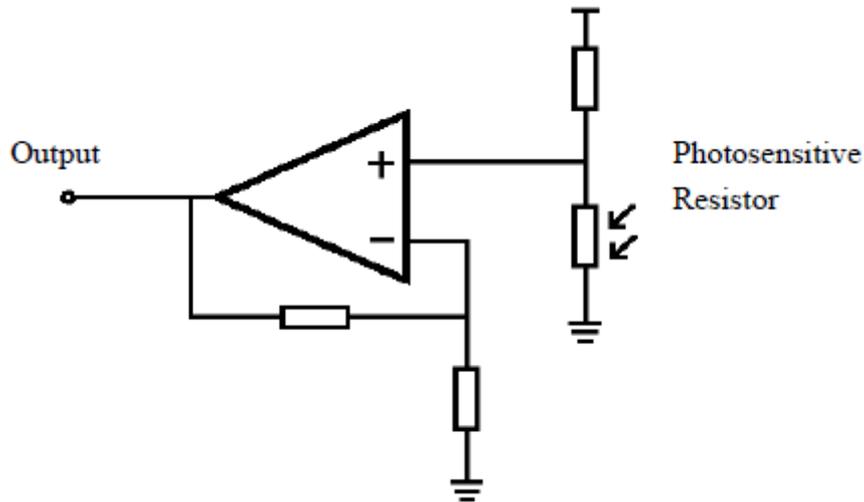


Fig. 1 Circuit Schematic Diagram of Light Detection Part

2.2. Electric Execution Part

The electric execution part consists of a motor and its driving plate, a limit switch and a transmission mechanism. Its main function is to drive the solar panel installed on the transmission mechanism to rotate to the designated position. Among them, the DC motor with reduction gearbox is used, which can produce relatively large torque under relatively low power consumption and reduce driving energy consumption. The motor and the rotating mechanism are installed at two limit angle positions of the transmission mechanism through a gear belt limit switch, as shown in the structural diagram of the electric execution part, which is convenient for the main control part to detect the rotating position of the solar panel.

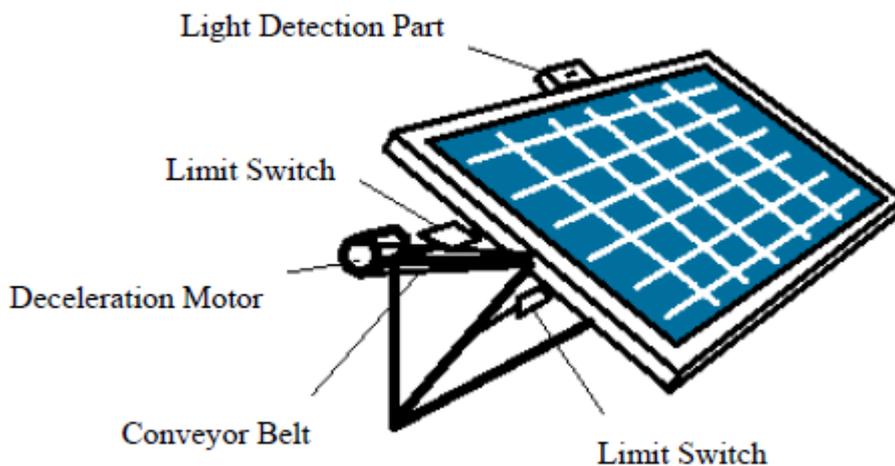


Fig. 2 Schematic Diagram of Electric Execution Part

2.3. Charging Circuit

The common solar charging circuit in the market is adopted, which is mainly responsible for storing the electric energy collected by the solar panel into the battery to provide electric energy for external electrical appliances and the device itself.

2.4. Main Control Part

The arduino uno development board is used as the core, with built-in analog-to-digital conversion circuit and pwm circuit, which controls the operation of all processes of the device. The analog input, digital input and pwm output of the main control circuit are respectively connected with the output of the light detection part, the limit switch of the electric execution part and the drive signal input of the motor drive board. The overall frame diagram of the device is shown in the following figure.

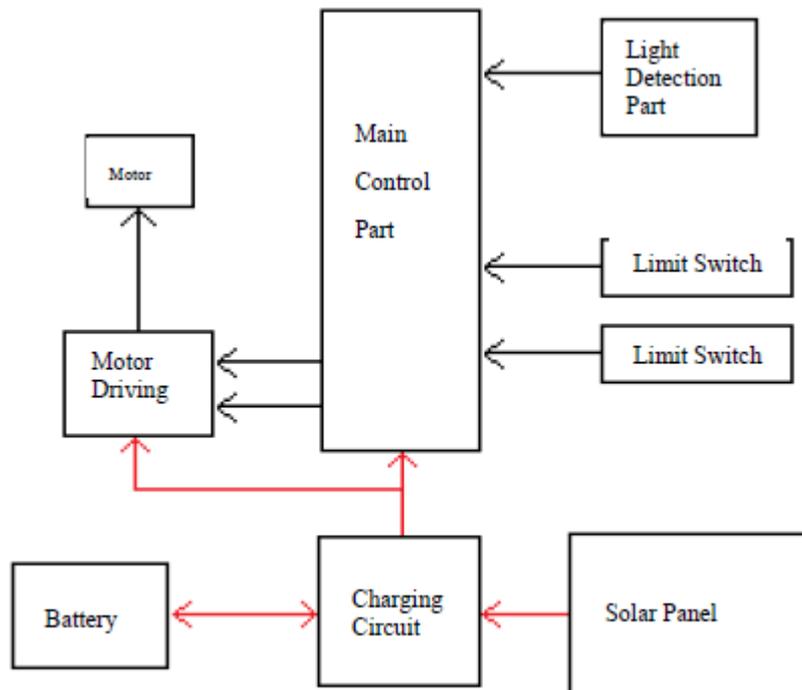


Fig. 3 System Frame Diagram

3. Running Process

During the day, the sunlight irradiates the light detection part, causing it to output a lower voltage. When the main control part detects that the output of the light detection part is lower than the threshold value, it controls the motor to rotate forward and drives the solar panel to turn upwards. When the solar panel touches the limit switch^[3], the main control part controls the motor to stop running.

On the contrary, at night, the light detection part cannot receive the irradiation of sunlight, so that it outputs a higher voltage. When the main control part detects that the output of the light detection part is higher than the threshold value, the motor is controlled to reverse and drive the solar panel to turn to the coming direction of the vehicle. When the solar panel touches the limit switch, the motor stops running.

4. Conclusion:

Through the single chip microcomputer control circuit, the existing solar panel system is partially improved. Using single chip microcomputer, light sensor and deceleration motor, a high beam energy collection device is designed, which makes up for the problem that solar panels can't collect enough electric energy due to climate factors, and has the advantages of energy saving, environmental protection, safety and health.

References

- [1] Di Bin; Song Hongming. Research on a New Solar Tracking System. Journal of Harbin University of Science and Technology [J]. 2012 (2) 67-71.
- [2] Han Donglin; An Qiang; Ji Lingyan. Design of Intelligent LED Lighting Control System. Information Technology [J]. 2012 (1) 167-168 .
- [3] Chen Chang; Xu Xiaomin; Zhang Yan, Design of Sunlight automatic tracking control platform Neijiang Technology [J].2016(12) 38,47.