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Intelligent lighting System Integrating Concentrating and Guiding Light and Dual Mode Assistant

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ABSTRACT

With the rapid development of science and technology, the combination of new energy and traditional energy has become the mainstream demand of society. The project described in this paper is a kind of green intelligent lighting system, which is mainly composed of photoconductive illuminating system, three-dimensional automatic light tracking system, solar photovoltaic power and municipal electric power complementary lighting system. The lighting system makes full use of solar energy, a new energy source of energy-saving economy, and combines with the on-demand cut-in of municipal electric power supply, which not only ensures the long-term stable lighting action of the system, but also makes the combination effect of power generation and energy-saving the most ideal. It can be used in a variety of environments and has a wide range of applications.

Keywords: Green lighting, Energy saving economy, Photoconductive lighting, Photovoltaic power generation, Municipal power

1. INTRODUCTION

According to the statistics of China's electric power authorities, the national electric power loss exceeds 300 billion kwh, accounting for about 30% of the national generating capacity,[1] among which the lighting system loss accounts for 25% of the entire electric power loss.The fundamental reason for the amazing power consumption in lighting is that we have a strong demand for the lighting system. Secondly, there are defects in the existing lighting system, which makes the system unable to use electricity efficiently, resulting in a large amount of power loss.

According to relevant departments in our country, our country each year about more than two-thirds of the area by the sun for more than 2200 hours, average solar radiation across the country to 586 kj/cm after years, so our country's solar energy storage is huge, in order to realize the green electricity, efficient use of solar energy has become essential to guidelines.

This project aims at this problem, has studied out the related solution.

This project is intelligent-controlled by a single chip microcomputer, mainly composed of light-guided lighting system, three-dimensional automatic tracking system, solar photovoltaic power and municipal power complementary lighting system.The light-guided lighting system captures the natural light source through the daylighting device, and then, after the enhancement and efficient transmission by the light-guided device, the natural light is uniformly introduced into the building by the diffuser.Photovoltaic power generation system USES photovoltaic panels with three-dimensional automatic light tracing to track the maximum power point of photovoltaic array, and adopts avoidance algorithm through wind speed sensor to reduce wind exposure of solar panels and ensure stable operation of photovoltaic panels. The auxiliary intelligent lighting system focuses on converting the voltage issued by the battery with the rotary voltage circuit, so that the LED can get different driving power under different circumstances, and cut into the power supply when needed to ensure the stable operation of the system.

This project integrates energy saving, economy and intelligence into one. It is an intelligent lighting system that integrates poly light guide and dual mode auxiliary.

2. THE PROSPECT AND SIGNIFICANCE OF THE PROJECT

It is estimated that by 2050, renewable energy will account for about 30-40% of the world's total power generation.Solar energy is the most potential and valuable renewable energy in the world.China has a vast territory and a long coastline, so it has abundant solar energy resources. The storage capacity of solar energy in China is very large. The effective development and utilization of solar energy will not only reduce the environmental pollution to a certain extent, but also effectively alleviate the current energy crisis.

This project not only solves the problem of large power consumption of existing lighting system, but also innovates and optimizes the lighting function.In terms of lighting, the project makes full use of the new energy - solar energy. When the outside sun is sufficient, the lighting action is completed through the photoconductive lighting system.But the outside weather is unpredictable, and the use of lighting systems at night is more important.Therefore, the combination of auxiliary intelligent lighting system is extremely critical.

3. DEFINING & MEASURING CSR BEHAVIOR

3.1 Specific application design

3.1.1 Photovoltaic building integration technology

According to relevant data from the Ministry of Housing and Urban-Rural Construction, my country's building energy consumption accounts for about 30% of the total energy consumption of the whole society. Among them, as an important application form of building energy saving-photovoltaic building integration technology, a new type of green building electrical energy saving design with advantages of green environmental protection, energy saving and emission reduction, replacement of some original building materials, reduction of construction costs, and improvement of electricity efficiency.

Photovoltaic building integration technology is a new technology that integrates and adds solar photovoltaic products to buildings. The key is to use solar energy to replace traditional energy sources, such as water potential energy, oil, natural gas, and coal. The working principle of photovoltaic building integration technology is to convert the solar energy absorbed from the outside into usable electric energy through the photovoltaic cell matrix. According to the different needs of various buildings, the photovoltaic power generation system performs corresponding electrical energy output and control. Therefore, if the photovoltaic building integration technology is applied to suitable buildings, it can effectively reduce the power loss of the building, and ultimately achieve the goal of improving efficiency, energy saving and emission reduction. Because the use of solar energy belongs to the use of green and pollution-free energy, the combination of solar photovoltaic products and buildings conforms to the modern green building design concept.[2]

3.1.2 Green lighting technology

Green lighting technology is a technology that uses natural light through specific equipment to achieve energy-saving purposes. It changes the traditional lighting technology and uses new lamps and light guides for lighting and energy saving. Therefore, choosing a reasonable green lighting fixture has become the key to achieving energy-saving lighting technology. However, a complete green lighting system must not only use new products such as lamps and light guides, but also meet the green lighting technical requirements including four indicators of high efficiency, energy saving, environmental protection, safety, and comfort. The idealized model of green lighting technology should meet the requirements of no mercury, energy saving, material saving, and no harmful rays

The ideal green lighting technology will use lighting fixtures that meet the following points:

1) Reflective lamps with reasonable light distribution, high reflection efficiency and good durability;
2) Lamps that can be coordinated with light sources and electrical accessories.

Therefore, through the characteristics of green lighting lamps, the effects of energy saving and emission reduction and the concept of green and environmental protection can be realized. Applying such green lighting fixtures to green lighting technology can save energy and protect the environment more efficiently.

3.2 Significance

To sum up, the significance of green building electrical energy-saving design can be summarized through examples of photovoltaic integration technology and green lighting technology. Its significance lies in its strong influence on energy consumption reduction and intelligent lighting design. Using new technology to replace the original traditional technology, realize intelligent innovation in technology, and use green energy in energy, so as to achieve the green effect of improving technology intelligence and energy conservation and environmental protection, and has a better improvement effect and great significance for the current situation of limited energy shortage. Therefore, green building electrical energy-saving design can make many architectural design achieve energy consumption reduction and intelligent function design. In the two aspects of improving the intelligent function and realizing the energy consumption reduction to a large extent, the electrical energy-saving design of green buildings has great significance.

4. APPLICATION OF PHOTOCONDUCTIVE LIGHTING SYSTEM

4.1 Composition and principle of photoconductive lighting system

4.1.1 Composition

The light guide lighting system is mainly composed of three parts: condenser, light guide tube and diffuser.[3]

4.1.2 Working principle

The light-guided lighting system collects sunlight from the outside through the condenser, introduces it into the system, transmits it through the light guide tube efficiently, and finally scatters sunlight evenly into the building by the diffuser.

4.1.2.1 Lens mask model design

In this system, the condenser adopts refraction concentrating system and fresnel lens. The design is shown in Fig.1.

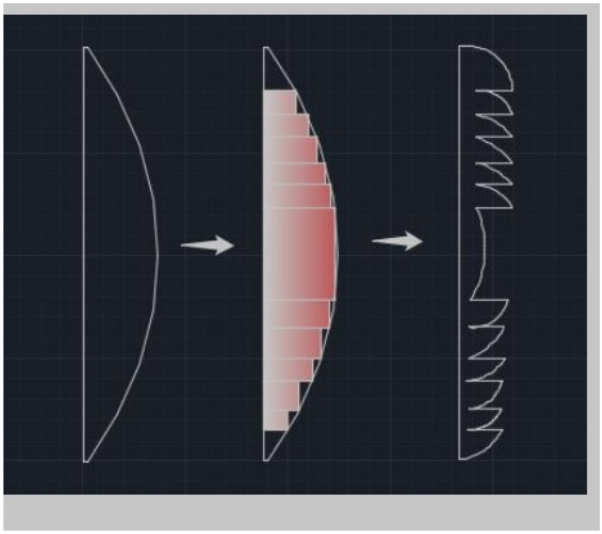

Fig.1 working principle of nipfield lens

4.1.2.2 Light guide model design

Light guide tube is an important part of light transmission. In order to ensure that the project can conduct external natural light efficiently, the light guide lighting system adopts a light guide with a reflectance of tube wall material not less than 0.95.

4.1.2.3 Diffuser model design

Diffusers are usually made of PC or PMMA materials, so they have good transmittance and diffusivity. The mask is usually treated with anti-static spraying technology, and the surface is anti fogging but not dust absorption, which is easy to clean. In order to distribute the light transmitted by the light guide tube into the room evenly, the diffuser uses a thin lens for divergent light, and the thinner the lens is, the better the light transmission and light dispersion will be.[2]

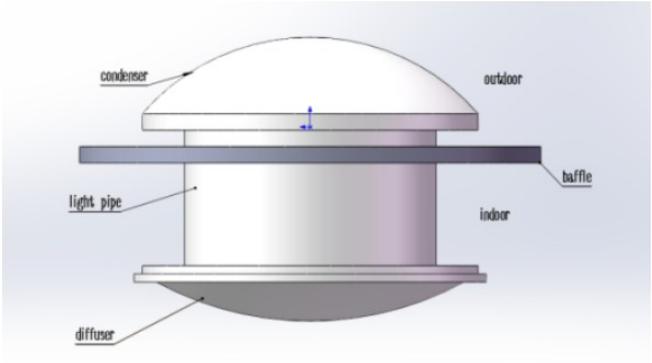

Fig.2 modeling diagram of photoconductive lighting system

4.2 Function and application significance of photoconductive lighting system

4.2.1 Function

Lighting and energy saving are the two most prominent functions of light guide lighting system.

According to the three functional components of the condenser, light guide tube and diffuser, the lighting effect brought by natural light can be realized. The light is concentrated and collected by the concentrator, and efficiently transmitted by the light guide tube. Finally, the accumulated sunlight is dispersed and illuminated by the diffuser to realize the lighting function. Different from the traditional lighting system, the energy used in the photoconductive lighting system belongs to the green energy - light energy. In the past, the lighting system is based on the municipal powersupply for lighting and corresponding functions. The light energy is used in the photoconductive lighting system to achieve the lighting effect of natural light through three key components. And some characteristics of the light guide lighting system to fill the deficiencies of the traditional lighting system, More sun exposure can not only improve the level of adrenaline, improve people's mood, but also promote calcium absorption. In other words, on the basis of realizing the lighting function, the light-guided lighting system can also achieve extraordinary health effects.

Photoconductive lighting system not only has good lighting effect, but also is relatively energy-saving.With the progress of The Times, China's scientific and technological level is increasing day by day, the social economy is also booming, followed by social production has put forward a great use of energy demand.In order to prevent the society from serious energy loss, it is an important step to save traditional energy and improve the utilization technology of renewable resources.The light-guided lighting system makes use of the renewable resource — solar energy lighting, which can not only make people have soft and comfortable lighting experience, but also make it have economic, practical, energy-saving and environmental protection social value. Because the energy of the photoconductive lighting system comes from the natural sunlight, the green environmental protection significance of the photoconductive lighting system is more prominent. On the basis of providing lighting, it can also realize green energy saving. Therefore, the function of photoconductive lighting system is practical and critical.

4.2.2 Application significance

Since the 21st century, with the rapid development of society, the speed of energy consumption is increasing day by day. Therefore, how to effectively deal with the problem of energy shortage has become an important issue for governments of all countries.Among them, the most feasible measures are energy conservation and emission reduction and active development of renewable energy utilization technology.

When the factors of energy saving and environmental protection are considered in electrical lighting system, the lighting system not only requires the lighting power to reach the target value, but also has higher requirements for the lamp's work efficiency and electric energy control algorithm.

Photoconductive lighting system uses renewable energy, on this basis, reducing its energy consumption is very important.At present, China's lighting consumption accounts for about 30% of the total power generation, In 2019, China's total power generation will be about 7.14×10^{12} kwh, The estimated annual lighting power consumption is 7.14×10^{11} kwh. According to the relevant data statistics, the daytime lighting consumption accounts for more than 50% of the total lighting power consumption. If the photoconductive lighting system is widely used, the daytime lighting power consumption will be reduced by about 50%, this is equivalent to about 1.785×10^{11} kwh of electricity savings per year. If the electricity price is calculated at 0.8 yuan/kwh, it will save at least 1.428 billion yuan in electricity bills every year.

Therefore, the application of renewable energy for energy conservation and emission reduction and socio-economic contribution is very considerable.In addition, since China's power plants are still dominated by thermal power generation, every 1kwh of electricity saved is equivalent to saving 0.4kg of standard coal and 4L of clean water, and reducing the emissions of 1kg of carbon dioxide and 0.03kg of sulfur dioxide from coal combustion.Therefore, the application of light-guided lighting system can not only provide new ideas for lighting, but also realize energy conservation, emission reduction, green environmental protection and economic and practical.

In addition, the application of photoconductive lighting system is also beneficial to human health. Because of the special structure of the system, it can introduce sunlight and make use of it, so it retains the original characteristics of the natural view. Its wide spectrum, uniform and soft light characteristics can effectively protect the eyes, and can play a certain role in sterilization. In addition, because the light emitted by the system does not have the influence of frequency and glare, and the anti radiation layer is added on the condenser, so that the system can give light while reducing the negative impact of sunlight on human body to the minimum. To sum up, photoconductive lighting system is one of the development directions of renewable energy technology. It is very important to study the photoconductive lighting system and explore its application for the development and application of new energy in China.[4]

5. SOLAR PHOTOVOLTAIC POWER AND MUNICIPAL POWERCOMPLEMENTARY LIGHTING SYSTEM

In this project, solar photovoltaic power and municipal electric power complementary lighting system is also called auxiliary intelligent lighting system, which is composed of photovoltaic power generation system and municipal electric power supply system, including illuminance sensor, dual-mode LED lamp (including 12V and 24V), human body infrared sensor, relay, etc.

The dual-mode LED lamp is connected with the single chip microcomputer and the battery of photovoltaic power generation system through the relay, and the illuminance sensor is connected with STC8051 single chip microcomputer. The illuminance sensor and infrared sensor are used to control the dual-mode high-efficiency LED lamp. When the illuminance sensor detects that the illuminance of the photoconductive lighting is insufficient, it provides 12V low energy consumption to provide auxiliary lighting. When the human body infrared sensor detects that someone has entered the lighting area, turn on the 24 V strong light auxiliary lighting to meet the working illumination requirements, and turn off the strong light auxiliary lighting after waiting for the person to leave to save energy consumption.And real-time detection of battery power, when the battery can not provide enough power to the device, the municipal powerautomatically cut into the system to supply power for the whole device.

5.1 Photovoltaic power generation system

Solar energy is a new energy that is highly praised and used in China. Compared with traditional energy sources such as coal and natural gas, solar energy has become a new energy source in China,Solar energy has great advantages, it is not only a huge reserve, can be taken everywhere, no need to transport, but also green, pollution-free, very environmental protection.It is the mainstream architectural design concept to convert solar energy into electric energy in buildings.

The photovoltaic power generation system of this project is mainly composed of three-dimensional automatic tracking system, solar photovoltaic panels, batteries, controllers, inverter automatic conversion switches and other equipment.

When the external solar light intensity is sufficient, the three-dimensional automatic tracking system will control the solar photovoltaic panel to carry out the three-dimensional rotating light tracing, so as to realize the maximum power point tracking of the photovoltaic array. The photovoltaic cell module receives optical energy and converts it into electric energy output through the controller. Part of the electric energy is used to provide energy for the whole intelligent lighting device, and the other part is stored in the battery. When the MCU receives the indoor light intensity data sensed by the illuminance sensor and judges that it is lower than the preset value, it is used. The solar photovoltaic panel of this project is equipped with wind speed sensor. The wind speed and wind direction are analyzed by using the aerodynamic theory, and the data are modeled and simulated, and the functional relationship that will affect the wind speed and direction of the photovoltaic panel is derived. The function formula and the formula of the maximum pursuit angle are calculated by the processor to obtain the optimal chasing angle, so as to prolong the life of the photovoltaic panel. Moreover, the photovoltaic module is made of tempered glass package with high light transmittance. The surface is made of anti-aging glue film and high-strength backplane, and has the advantages of high efficiency and long service life.

In this system, the storage battery is used to store the electric energy that the solar photovoltaic panel converts through the controller when it is irradiated by the sun, And when the equipment is working, it supplies power to the load.The controller plays an important role in the operation of preventing the battery from

overcharging and overdischarging. It can reduce the unnecessary damage of the battery.

Photovoltaic inverter is used to convert DC generated by solar photovoltaic panel into 220 V AC.The solar inverter has special functions to coordinate with photovoltaic cell matrix, such as maximum power point tracking and islanding protection.

5.2 Municipal power supply system

The municipal power supply system is mainly composed of switch rectifier and DC distribution panel. The switch rectifier is mainly composed of input circuit, power converter, rectifier filter circuit and control circuit. [1]The input circuit transforms the AC input voltage into a relatively flat high-voltage DC voltage, which is converted into a high-frequency pulse voltage by a power converter, and then the high-frequency pulse voltage is converted into a stable DC voltage by the rectifier filter circuit, and output to the load. The function of the control circuit is to ensure that the output DC voltage is stable and adjustable.

In this project, the key technology to realize the complementarity of solar photovoltaic power and municipal power is the way to select the cut in conditions and judge the cut in position of city power.

5.2.1 The conditions of municipal power cut in

In the complementary lighting system of solar photovoltaic power and municipal power, when the energy provided by photovoltaic cells is not enough to drive the whole lighting system, or even enough to drive dual-mode LED lights, the municipal powercan be cut in, only. Therefore, how to judge that if photovoltaic cells can provide enough energy driving device is the key to this problem.[2]

This project uses the method of testing the battery terminal voltage to judge whether the photovoltaic cell can provide enough energy. On account of the solar light intensity is basically stable in the daytime, the discharge current of the battery is basically constant, and the energy stored in the photovoltaic system is reflected in the terminal voltage of the battery, so it can be judged whether the market power needs to be cut in by checking the terminal voltage of the battery.[3]

5.2.2 The choice of municipal power cut in

In this project, the light source equipment of auxiliary intelligent lighting system is led lamp, which belongs to low-voltage DC light source equipment. Therefore, this project adopts the method of switching low-voltage DC light source. When the terminal voltage of the battery is lower than the preset value, the system allows the power supply to cut in.

5.3 Selection of photovoltaic cell and battery capacity

Because the double-mode LED lamp in this project does not need to consider the situation of insufficient solar light intensity in continuous cloudy and rainy days, The capacity of the battery only needs to support the power of the equipment for one day.To prevent unnecessary damage to the battery, the discharge depth should not be too deep, and should not exceed 75%.For the purpose of this project, the battery voltage should not be lower than 11V. When the battery voltage is lower than this value, the system should allow the mains to cut in.The cut in operation of municipal power is unidirectional in control, and the cut-out operation has nothing to do with the battery power in the evening, it can only be carried out after daybreak.This is to ensure the discharge depth of the battery.

5.4 Selection of dual mode LED lamp

Because when the solar photovoltaic panel is irradiated by the sun, the power output by the controller is DC,The AC variable frequency switching power supply installed in the distribution panel also outputs DC.Therefore, there is no need to install the traditional LED drive power supply in the LED lamp, only a simple constant-current power supply needs to be installed.In this project, LED lamps will be converted from 12V low light irradiation to 24V high light irradiation according to different environments, so LED low-voltage AC AC bulbs that can accept 12V and 24V voltage will be selected.[4]

6. WORKING PROCESS OF THE SYSTEM

6.1 Overall working process

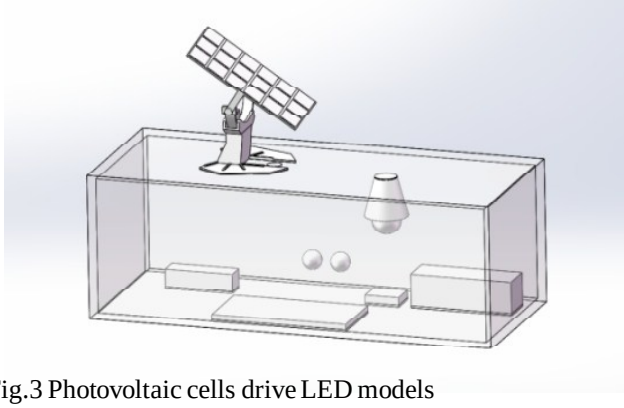

Fig.3 Photovoltaic cells drive LED models

The simulation model of the system is shown in Fig.3.The single-chip microcomputer is connected with 3D automatic tracking system, photovoltaic power generation system and auxiliary intelligent lighting system to realize intelligent control.

When the external sunlight is sufficient, the light guide lighting system captures the sunlight through the outdoor daylighting cover device and introduces it into the system, Automatic distribution is carried out inside the system, and then the sunlight is enhanced and transmitted efficiently by the light guide device, and the natural light is uniformly introduced into the room by the diffuser.

The project can not only directly process and utilize solar energy through the photoconductive lighting system.Moreover, the solar photovoltaic panels equipped with 3D automatic tracking system are connected with the auxiliary intelligent lighting system through the photovoltaic power generation system to provide driving power for the whole device.When the external sunlight is sufficient, the three-dimensional automatic light tracking system uses the disturbance observation method with variable step size to track the maximum power point of the photovoltaic array. The photovoltaic cell module receives the light energy. Part of the electric energy converted by the controller is used to provide driving power for the whole lighting system, and the other part is stored in the battery.

When the external sun's light is insufficient, the indoor light intensity data collected by the illuminency sensor is lower than the preset value, and the PHOTOVOLTAIC battery is started to supply power for the dual-mode LED lamp.The dual-mode LED lamp is connected with the storage battery of the single-chip microcomputer and photovoltaic power generation system through the relay, and the light intensity sensor is connected with the single-chip microcomputer.The dual-mode high-efficiency LED lamp is controlled by the light intensity sensor and the human body infrared sensor. When the light intensity sensor detects the insufficient light intensity of the light-guided lighting, the low-energy 12V low-light auxiliary lighting is provided.When the human body infrared sensor detects that someone has entered the lighting area, turn on the 24V strong light auxiliary lighting to meet the working illumination requirements, and turn off the strong light auxiliary lighting after waiting for the person to leave,Reduce the loss of stored energy.And real-time detection of battery terminal voltage, when the battery is insufficient, cut into the municipal power supply for the device.The auxiliary intelligent lighting system realizes green lighting according to the illumination condition and human body induction.

6.2 Local working process

6.2.1 Charging and discharging process of battery

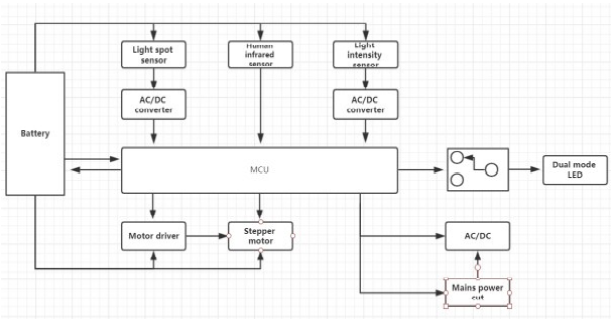

Fig.4 Structure diagram of LED driven by photovoltaic battery

In the charging state, the solar photovoltaic panel and the lead-acid battery are connected through a two-way flyback converter. The system drives the dsPIC microprocessor to monitor and control the solar photovoltaic panel to work at the maximum power point.During the day with sufficient sunlight, the system directly converts the chemical energy radiated by the solar photovoltaic panel into electrical energy through the photoelectric effect, and uses photovoltaic batteries to store the electrical energy. When lighting is needed, the LED is driven by the discharge of the battery to provide lighting.[1]

In the discharge state, the battery drives the bidirectional flyback converter to release electrical energy to the load to supply power to the LED. In order to make the LED work in the constant current drive mode, a constant current drive circuit is added.Through the sampling circuit, the current signal on the resistance on the LED load branch is passed through the voltage/ current conversion circuit, the current signal is converted into a voltage signal and fed back to the constant current drive module and the constant voltage drive module through the feedback control module, and the converted voltage The signal is compared with the reference value set by the operational amplifier, and the MOS tube gate drive signal Vgs is obtained, and the constant current is realized by linear adjustment of the MOS tube impedance.

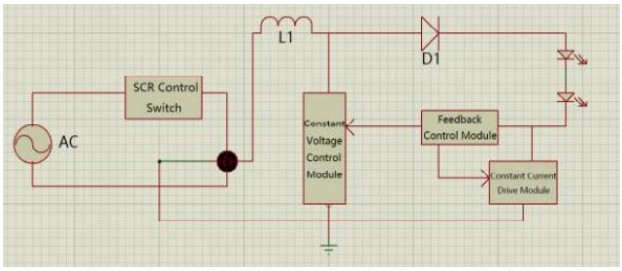

Fig.5 LED constant current drive circuit

6.2.2 Battery terminal voltage detection process

Through the battery terminal voltage detection circuit and voltage comparison circuit, the voltage value of the terminal voltage is detected with the voltage value of the main circuit circuit circuit, and the voltage values on both sides are compared.When it is detected that the battery power is not in the recharge state, the LED passes through the mains power cut through the isolation transformer step-down treatment, and then passes through the rectifier bridge consisting of four diodes and two large-capacity filter capacitors to convert the ALTERNATING current into direct current.Finally, a voltage stabilizing circuit composed of three lm7805 voltage stabilizing chips is input. Finally, a filter capacitor is connected at the output end. After such simple processing, the 220 V AC is converted into DC to provide power for LED.Repeat the above, when the infrared sensor of the human body detects that there is no one in the lighting system, the SCM controls the LED pin to obtain 12V DIRECT current drive. When a presence is detected in the lighting system, the LED obtains a 24V DC drive.

6.2.3 The principle of LED driven by mains power

Mains power (220V, 50Hz), after the isolation transformer step-down treatment, then through the rectifier bridge consisting of four diodes and two large capacity filter capacitors, the alternating current will be converted into direct current.Finally, a voltage stabilizing circuit composed of three lm7805 voltage stabilizing chips is input. Finally, a filter capacitor is connected at the output end. After such simple processing, the 220 V AC is converted into DC to provide power for LED.When the human body infrared sensor detects that there is no one, the LED gets 12V DC drive; When someone is detected, the LED gets 24V DC drive.

Innovation

1. A light seeking module is set in the single-chip microcomputer system, and a double axis tracking mechanism is added to the photovoltaic panel to realize the three-dimensional rotation of the solar panel and automatically capture the direct sunlight position.
2. Through wind speed and wind direction sensor, aerodynamics theory is used to analyze the data. When the force of wind on the current Angle of photovoltaic panel reaches the set value, the tracking Angle of photovoltaic panel is automatically adjusted. Under the premise of ensuring the safety of photovoltaic panel, the Angle value of maximum tracking efficiency is found.
3. The LED module in the auxiliary lighting system has the following three power supply modesÿ ‘$ The photovoltaic battery power is 12V power supply output through the voltage conversion circuit;

   a$The photovoltaic battery is a 24 V power supply output through the voltage conversion circuit;

   b$ Municipal power.
4. This project is a green intelligent lighting system, which is prepared to be composed of photovoltaic power generation system, light-guided lighting system and auxiliary intelligent lighting system. It makes full use of solar power generation and storage to provide driving energy for the whole device.Voltage conversion circuit

is used to convert the voltage from the battery to achieve different LED power drive under different conditions. And solve the problem that the battery power may be insufficient when the user's power consumption is too high.

Features

This project infuses new ideas to create a green intelligent lighting system, which is mainly composed of light-guided lighting system, THREE-DIMENSIONAL automatic light tracing system, light-guided lighting system, photovoltaic power and commercial power complementary lighting system, solar photovoltaic panel and single-chip microcomputer.

Photoconductive lighting module focuses on the structure design and material selection, and is committed to maximize the use of natural light sources.

Photovoltaic power generation module focuses on the optimal control strategy of energy efficiency of 3D photovoltaic power generation module, which controls the three-dimensional rotation of solar photovoltaic panels and automatically tracks the maximum solar power point from multiple angles.In addition, real-time wind speed and direction are detected by wind speed sensor, and corresponding avoidance algorithm is adopted to reduce wind exposure of solar panels, so as to ensure the stable operation of photovoltaic panels while generating power efficiently.

The auxiliary intelligent lighting module focuses on the design and use of functional circuits. For example, the voltage emitted by the battery is converted by using the rotary voltage circuit, so that the dual-mode LED lamp can be driven at different power voltages in different situations. And solve the situation that the battery power may be insufficient when the power consumption is too high.

Energy-saving effect analysis

If the photoconductive lighting system, solar photovoltaic power and municipal power complementary lighting system are applied in underground garage, shopping mall, indoor market, building corridor and other places, their energy-saving effect will be fully utilized. It can be roughly reflected in the following three aspects:

1) Energy saving of photoconductive lighting system

As a new type of lighting device, photoconductive lighting system can bring a large number of natural light sources into the room with only a small amount of power consumption when the external light intensity is sufficient.The system can concentrate light for about 10 hours per day on average, and the lighting area is large.Its service life is more than 25 years, which is twice the service life of ordinary electric lighting lamps.The system can not only reduce the building power consumption, but also reduce the maintenance cost.

2) Energy saving of photovoltaic power generation system

The photovoltaic cell module receives light energy and converts it into electricity output through the controller.In the daytime, the outside sun is sufficient. The project uses the photoconductive lighting system for lighting, and the photovoltaic power supply is only used to provide energy for the entire intelligent lighting device;Another part of the energy is stored in photovoltaic cells, which provide energy for the dual-mode LED lights at night.In this way, the power in the photovoltaic battery can basically meet the user's electricity demand at night. The system does not need to cut into the market power immediately to supply power for LED lights, and the power saving rate is as high as 45%.

3) Dual mode dimming for energy saving

The dimming function of dual-mode high-efficiency LED lamp is mainly controlled by illuminance sensor and infrared sensor of human body.When the illumination sensor detects insufficient illumination of the light-guided lighting, it provides 12V low-energy low-light auxiliary lighting.When the human body infrared sensor detects that someone has entered the lighting area, turn on the 24 V strong light auxiliary lighting to meet the working illumination requirements,After waiting for people to leave, turn off the strong light auxiliary lighting to save the energy consumption of reserve.In this way, not only the problem of excessive lighting is solved, but also more than 10% of electricity can be saved.

CONCLUSION

In this paper, a new type of green intelligent lighting system is described and analyzed. The components, working principle, design steps and system configuration of the lighting system are introduced.With the continuous development and progress of the society, the continuous research and discussion on green building design at home

and abroad make the energy-saving methods and measures of green building continuously improved and improved.The project introduced in this paper combines the THREE-DIMENSIONAL automatic tracing system, the light-guided lighting system and the photovoltaic power and utility complementary lighting system, all of which are connected with the single chip microcomputer for the realization of intelligent control.This not only makes the system make full use of the new energy - solar energy, but also can ensure the stable operation of the system lighting action.At the same time, SCM through the control of a variety of sensors, such as light sensor, human infrared sensor, so as to control the dual-mode high-efficiency LED lamp in different conditions by different power voltage driven, so that the energy saving effect of the system is more prominent, the whole system design is more reasonable.

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