

Home Intelligent Ventilation and Lighting System

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Abstract

The intelligent ventilation and lighting system is designed with a four-bar linkage structure. The switch of the curtain is controlled by the motor and the steering gear. The lighting function and the ventilation function cooperate with each other. At the same time, it also has the Bluetooth function to realize the intelligent control of the curtain. The system can solve the problems of poor indoor air quality and insufficient daily lighting, and is conducive to improving people's living comfort.

Keywords

Four-link structure; Bluetooth control.

1. BACKGROUND

Doors and windows are the necessities of a house. Since ancient times, traditional doors and windows have played an indispensable role in the ventilation of people's lives. Mechanical technology is constantly developing and becoming mature. The combination of intelligent automation technology and mechanical equipment design combines traditional manual with the replacement of manufacturing technology, the manufacturing industry has ushered in an unprecedented height. The combination of intelligent automation technology and mechanical technology not only liberates human hands, but also liberates human hearts. The ventilation function of traditional doors and windows can no longer meet the requirements of contemporary people for living comfort. Smart doors and windows are the results of combining multiple fields on the basis of traditional doors and windows. Although a relatively complete research field and market has not yet been formed, smart doors and windows are an indispensable part of the smart home system. It can play a better role and help in people's lives. The combination of intelligent technology and mechanical technology and the changes in human psychological cognition provide development conditions for the smart home field. At the same time, smart ventilation doors and windows are blank in the Chinese market and have huge development space.

The improvement of people's requirements for living comfort has also provided social conditions for the development of smart homes [1]. The state's support for emerging industries such as the Internet of Things is undoubtedly the promotion of smart homes, and the development of the smart ventilation industry will be broader.

2. INTRODUCTION

This project is dedicated to researching a smart home system applied in daily life to solve the problems of ventilation and lighting in daily life. By innovating the mechanical structure of the home ventilation and lighting system, and writing detection programs and control programs to control the mechanical structure of the system, the automatic control of the intelligent ventilation and lighting system is realized. The main control module in the system is connected

with the bluetooth module, which can realize human-computer interaction through bluetooth, so that the system can meet the two working modes of automatic and manual at the same time.

3. SYSTEM ANALYSIS

3.1. Feature Design

The device can control the door and window switches through the steering gear, and design two working modes - 1, full intelligent mode 2, semi-intelligent mode. In the full intelligent mode, the system detects indoor and outdoor air quality through detection modules such as temperature and humidity, PM2.5, and the detection information is processed by the main control module to determine whether the ventilation conditions are met. In the semi-smart mode, the ventilation interacts with the person through the Bluetooth function of the mobile phone, so that the ventilation can be carried out according to the intention of the person. At the same time, in this system, we add the lighting function, and control the opening and closing of the curtains through the motor. The lighting function and the ventilation function cooperate with each other to make the overall function more complete and more conducive to improving people's living comfort.

3.2. Window Switch Transmission Structure Design

The window switch form is different from the traditional rotary switch window. It adopts the switch form with the upper edge of the window as the axis and the lower edge switch. The transmission structure of the window switch adopts a plane four-bar linkage structure [2], as shown in picture 1. This design can avoid the impact of bad weather to a certain extent, such as the impact of rain and dust on the indoor environment, and the switch of the window is maximized to prevent children from accidentally falling when playing by the window.

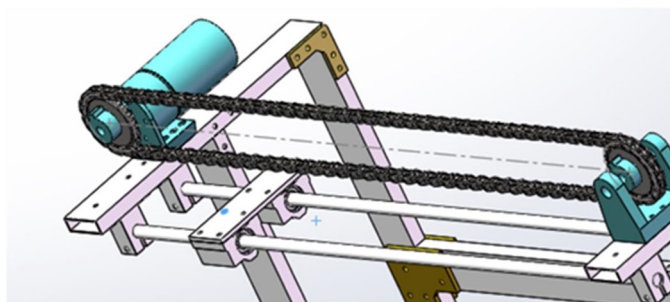


Figure 1. Window switch transmission structure design

3.3. Curtain Transmission Structure Design

The curtain drive adopts the cooperation of motor, chain and linear bearing to convert the torque of the motor into linear motion, the linear bearing controls the motion path, and the motor and the chain control the running speed. As shown in figure 2:

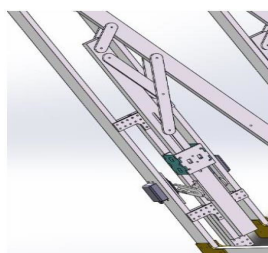


Figure 2. Curtain transmission structure design

3.4. Sensor Monitoring Design

There may be toxic and harmful substances in the air. The MQ135 air monitoring sensor we use contains gas-sensitive materials. When the environment where the sensor is located contains polluted gas, the conductivity of the sensor increases with the increase in the concentration of polluted gas in the air, and It has high sensitivity to benzene series vapor and ammonia gas, and can convert the change of electrical conductivity into a signal corresponding to the gas concentration, so that we only need to measure the output signal to monitor the concentration of pollutants in the air.

When the brightness of the light becomes lower than the threshold, open the curtains, adjust the angle of the windows, and increase the light in the room. When the brightness is higher than the threshold, close and adjust to reduce the light. We use photodiode relays, which have high sensitivity and good photosensitive performance. We use this function to realize dynamic photosensitive switch curtains, change the angle of windows, and change the light.

Due to the long-term non-opening of windows for ventilation, the carbon dioxide concentration may be too high. The CCS811 carbon dioxide sensor is used for detection. This sensor has low power consumption. The internal intelligent algorithm calculates the output value and detects this value to adjust the opening and closing of the window.

In winter, there may be serious pollution and high PM2.5 concentration outdoors. In this case, PM2.5 sensors will be added to the outside of our products for environmental detection to remind customers to change the degree of opening and closing of windows to increase customer safety.

3.5. Motor Selection

In this product, 37GB555 DC geared motor is used to control the opening and closing of curtains. This DC motor has the characteristics of large torque, adjustable speed, stability and reliability. Adjust to achieve the desired indoor lighting. Our windows will be opened and closed to different degrees to achieve indoor ventilation and gas exchange, which requires the control of the steering gear. The steering gear has a good angle control ability, so that our windows can be automatically adjusted. Windows open and close.

3.6. Bluetooth Communication

The HC-05 bluetooth module we use is very small and high-performance, and can be paired with various smart terminals with bluetooth function, such as mobile phones and computers. This module supports a relatively wide baud rate range: 4900~1383400, so that our system can be well connected with the mobile APP, and people can open the window directly through the mobile phone without having to manually open the window.

4. MARKET ANALYSIS

The audience of the intelligent ventilation and lighting system is mainly urban residents. Compared with the traditional ventilation and lighting system, the intelligent ventilation and lighting system adds a smart Bluetooth module. Users can either manually switch the ventilation or use the Bluetooth module for remote operation [3].

There are many kinds of ventilation systems in my country's national patents, such as: ventilators, exhaust fans, industrial exhaust fans, negative pressure fans and so on. Some of them exhaust air in one direction, and some can achieve two-way ventilation. However, most of the ventilation systems have a single function, are expensive, and are controlled by human beings, which are sometimes very inconvenient. In addition to the ventilation system in the home, the large-scale ventilation system in the factory also has great advantages. Most of the existing industrial ventilation systems are bulky, expensive, inconvenient to operate, and have

extremely serious noise pollution. The cost of this project is low, the size is small, the operation is also controlled manually or intelligently, and the noise is extremely small, which solves the problem for the factory very well. There are great prospects for development in the market.

5. MARKETING ANALYSIS

Utilize online and offline selling of goods in terms of marketing strategies.

Online sales mainly use online shopping platforms. With the increasing development of technology, the Internet has spread to thousands of households, prompting the development of online shopping. A large number of consumers will choose to buy products online [4], so this channel cannot be ignored. When selling online, it is necessary to carefully introduce products to facilitate customers to understand the products, and to seize the promotion opportunities of "618", "Double Eleven" and other shopping festivals to sell.

To find a market offline, choose to set up a physical store sales point near the newly built community in Tangshan City, which is convenient for displaying and selling products to consumers, and also convenient for door-to-door installation. Pay attention to product promotion, and use street billboards, TV advertisements, web advertisements, and cooperation with online self-media people to promote products. Focusing on product quality, after-sales maintenance, safety performance, efficiency and other issues that consumers are most concerned about, targeted publicity is made, so that consumers can have a deep understanding of our product, so that they can buy with confidence and use them with peace of mind.

6. EPILOGUE

Based on the combination of intelligent control and natural ventilation, this household intelligent ventilation and lighting system innovates the ventilation structure and adds the lighting function. The ventilation function and the lighting function cooperate with each other to make the whole system more comprehensive and effectively improve the comfort of the home. In the future home intelligent ventilation and lighting system, there will be a good development.

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