Study on Innovative Design of Green Energy Multifunction Integrated Smart Windows

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Abstract. With the rapid development of global economy, it emerges increasing consumption of human society, fossil energy and other non-renewable energy will become increasingly depleted. While accelerating the development of new energy sources, attaches great importance to energy conservation has become the consensus of the international community. China's building energy consumption accounts for 33% of total energy consumption society terminal, where energy windows and more than 40% of building energy consumption. Meanwhile, with the improvement of people's living environment requirements, the market ordinary windows cannot meet people's needs. Therefore, the development of green and features a large number of windows to reduce energy consumption, tap the energy potential of a very important practical significance. The current common market for building windows have mostly only traditional lighting and ventilation functions, poor thermal insulation effect, lack of intelligence control, not easy routine cleaning, dust-proof anti-fog and haze deficits. Our group innovatively designed multi-functional smart green energy-saving windows, according to the different needs of different rooms, the use of module division and functional integration method, designed windows and ventilation fans, writing projection integration, independent lighting, intelligent phase change pattern combined with many features. Second, the use of self-developed laboratory infrared light VO2 film selective absorption of low-doped W and having the effect of TiO2 photocatalytic degradation nano-flowers with self-cleaning film, enhanced thermal insulation properties of windows and self-cleaning effect. New green energy-saving multi-functional smart windows, novel structure, environmental protection and energy saving, advanced concepts and many features will have broad market prospects with the windows in the building.

Introduction

With the improvement of people's quality of life, user performance requirements for windows increasingly green energy, multi-functional integrated, intelligent. Simple popular windows features a single, has been unable to meet market demand, targeted multifunctional window design is particularly necessary. The team deficiencies and user demand for various types of windows summarize, the modular windows, combined with innovative membrane technology and self-powered intelligent control theory, the corresponding function block, and the perfect combination of each module, innovative design based multifunction integrated green energy smart windows series.

And the market compared to the existing windows, new green energy-saving functions integrated multifunction smart windows office, living, entertainment, learning and other project team designed the new structure; application of new membrane technology and thin film solar cells on the material , energy saving and environmental protection; application of automatic control theory, intelligent control.. I believe there is a great market for glazing impact, will be subject to the majority of consumers.

Specific Design of New Green Energy-Saving Multi-Functional Smart Window Systems

Design Characteristics of Different Room Window. With the increasing demand for home life, currently owned by the windows function has been unable to meet the people's needs. The research

group for the different needs of different rooms, the structure of the corresponding window design alteration, are proposed ventilator, self-lighting, writing projector integration for living rooms, bedrooms, conference rooms, children's rooms, innovative designs transform, increasing the window function, to make up for the shortcomings of the existing windows, improved interior space utilization.

Living room windows need to meet the following functions: (1) light, airy effect, capable of autonomous ventilation; (2) simple and elegant appearance; (3) noise reduction, thermal insulation, energy conservation; (4) security; (5) Automatic switching window.

Based on the above demand, the team innovatively applied to the windows of fan structure, adopt automatic control mode, to update the indoor air, healthy green, to achieve the independent ventilation; to achieve transformation pattern by rotating the glass, simple and beautiful. The overall design of the main living room window lighting area, ventilation area ventilation area beautiful area and secure attachment of four modules, the overall structure as shown below:

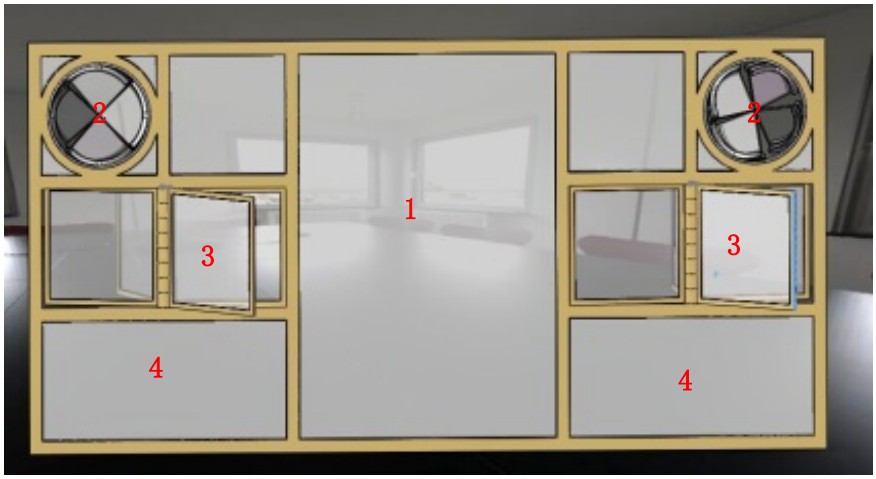

Fig. 1 Living room window overall effect

1 Main lighting zone 2. Smart ventilation zone 3. Ventilation beautiful area 4. Security fixed zone

Living room window is divided into four parts, namely:

(1) The main lighting area: In order to ensure good lighting effects, and the width of the window in the middle third of the total width of the region as the main lighting area (width can be prepared according to personal preference) in the region by the double transparent glass, Considering the noise and thermal insulation properties, this area is fixed seal, can not open the window.

(2) Intelligent ventilation area: ventilation zone located in the upper left and upper right area of the window. While the reverse rotation, to achieve the intake and exhaust functions. As shown below, the ventilation zone is essentially a rotating circular window with square cut. The structure has both internal and external frame, between the frame and the inner frame is equipped with card slot, so that the inner frame can be rotated 360 ° outer box. Were divided into four segments round glass, each sector by the central axis of the inner frame are fixed together, and each segment is rotatable about the central axis of rotation of a certain angle, the blade is formed, by the opening and closing of a fan motor control. To facilitate the opening and closing of the blades, each blade will be chamfered.

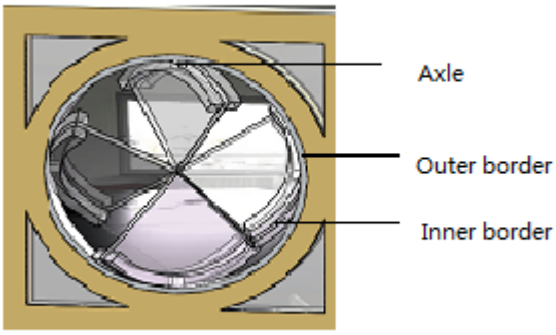

Fig. 2 Exhaust fan chart

Rotation of the fan blades for the design of the linkage structure, so that all the blades can rotate together. Figure: When the blue frame is rotated, the blades can rotate at the same time.

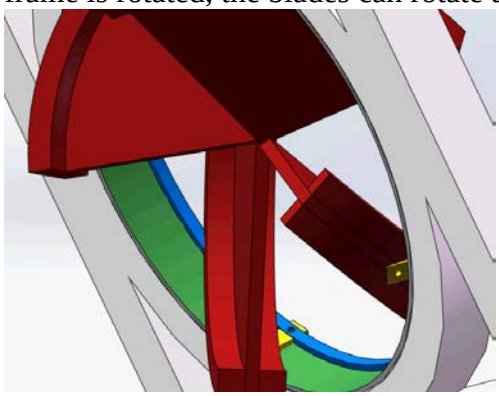

Fig. 3 Linkage Chart

(3) Ventilation beautiful area: the area from the three-leaved glass, designed to hinge type, as shown in the following figure, three-leaved glass can be separately around the middle axis, forming adjust the size of the vents. Every door glass posted a series of patterns, rotation, can form different patterns, to achieve beautiful results. Each with two windows, a window frame sides raised a sunken, may constitute a closing double-glazed, the edge has a switching device, can be fixed stuck, realize close the window.

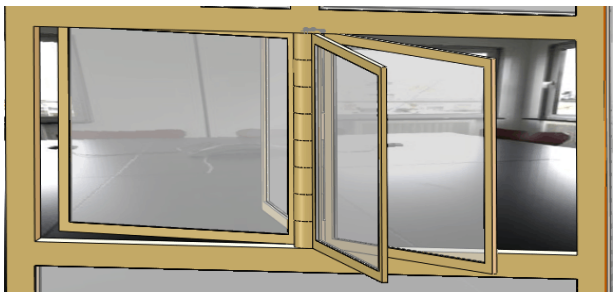

Fig. 4 Ventilation beautiful area structure

Most families do interior decoration of the time, we will take into account the children's room to make a special decoration for the children to create a healthy and comfortable environment. Windows existing on the market are stereotyped, the lack of interest and relevance. The team designed the children's room windows can be based on the child's own preferences designs, but also with lighting, projection, painting, eye, learning and other functions combine diverse functions.

Entire glazing is divided into two parts. The upper half is open downward automatic windows, the active portion is high, and with tilt design, to prevent children from climbing, to ensure the child's safety. The lower part of the pattern can be varied glass curtain. The whole structure is

simple and elegant, not the lack of new ideas, you can choose according to the children's hobbies, interesting.

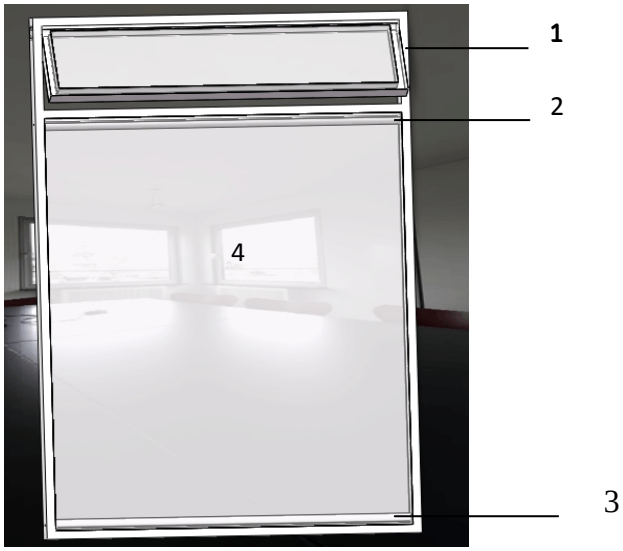

Fig. 5 The overall effect of the children's room window glazing 2.

1. The push-pull windows 2. miniature electric putter 3. 4. curtain glass curtain Reel Children's room window is divided into two parts, namely:

(1) Activities section: over the entire glazing is automatically controlled double sliding window is controlled by micro-electric putter. Telescopic pusher by a motor control switches to control windows. We can control the motor by remote control, in order to achieve the purpose of automatic windows. Mini electric putter structure:

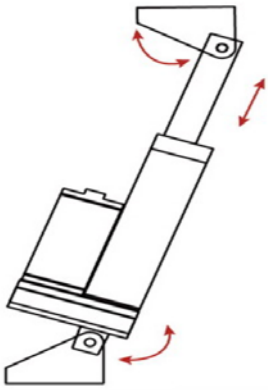

Fig. 6 Mini putt

(2) Fixed part: the whole bottom half of the sub-windows are stationary double glazing, to be able to transform the pattern of features. Curtain patterned insulating layer located between the double glazing, the upper and lower ends of the curtain with a motor control spool can be controlled by remote control curtain pattern. The inner layer of the double-glazed glass whiteboard, you can let the kids enjoy the painting on the windows, full of fun. Reel structure:

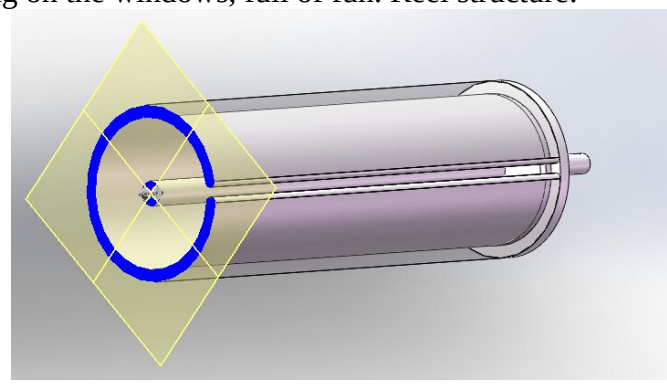

Fig. 7 Reel

Conclusion

The new green energy intelligent multi-glazed windows are on the market for less and smart home concept put forward innovative design. For the whole public, set multi-functional, environmentally friendly, intelligent in one unique system designed to create a new style of glass.

The team under the new market demands, and design practice in the transformation window, add a number of innovative elements, design a ventilation windows, writing projection integrated glazing, windows and other design changes to address the existing structure of a single window problem. On the basis of the design of the fully integrated smart home concept, while the glazed series reflects the idea of green energy: solar energy storage device improved self-powered windows, save energy; the use of advanced thin film, so that the window has a light transmittance Selective before, to maintain a comfortable indoor environment, improve energy issues windows, a positive response to the national policy for sustainable development.

Since the technology is limited, there are some deficiencies in this window series, such as slight noise generated by motor rotation, the stable operation of the linkage mechanism, installation and aesthetic design with a pattern corresponding to the device. For lack of this team is still looking for solutions, and strive to better the actual results. I believe this series will have a great impact on windows market and will affect the vast number of consumers.

References

[1] M.C. Li. Studied Micro-Structure of the Solar Cell Surface Nanometer. Seventh China Functional Materials and Applications Conference Proceedings (Volume 7). 2010.

[2] S.P. Duan, G.Q. Zhang, J.G. Peng, Technological Advances and Other Natural Ventilation Study. HVAC, 2004, 34 (3): 22-28.

[3] Z.W. Bu, H.W. Mao, H. Yang. Influence Low-E Glass on Air Conditioning Load and Building Energy Consumption . HVAC, 2005, 35 (8): 119-121.

[4] J.R. Liang, M. Hu, X.D. Wang. Preparation and Infrared Optical Properties of the Beam Following the Course, Et Nano Vanadium Dioxide Thin Films. 2009.

[5] C.Q. Wang. Preparation of Vanadium Dioxide Nanowires M Phase Research. Harbin Institute of Technology, 2013.

[6] H.F. Wang, Y. Li, X.J. Yu. Study Variable Temperature Infrared Optical Properties of Vanadium Dioxide Thin Films . SPIE, 2010 (5): 1522-1526.

[7] Y. Yuan, G.X. Wen, Li Meicheng. Study Film and the Heat Treatment Process for Preparing Microcrystalline Silicon LPCVD. 2009 Advanced Optical Technology and Its Applications Symposium (The Book), 2009.

[8] J.J. Zhu, Li Meichen.g Wireless Sensor Self-Powered Micro Energy Technology Research Renewable Energy, 2012, 11: 014.