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Portable solar billboard

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Abstract:
Public bulletin boards are widely used in various public places, but due to the large size of the billboards, it is not easy to carry, and the traditional billboards are integrated, when the billboards need to be transferred, the limited storage space of the vehicle needs to be occupied It is extremely inconvenient, and at night, the traditional bulletin boards need to install additional light sources to illuminate them, which greatly increases energy consumption. Based on this paper designed a new structure of the bulletin board, this structure can make the bulletin board when not in use completely folded up and easy to carry, and in use can be completely unfolded and in the bottom of the added retractable support leg structure can be placed anywhere, and according to the terrain or human will to adjust the height. A solar panel is placed on the top of the bulletin board, which can store solar energy during the day and supply energy to the LED lights on the top at night for lighting, which saves energy and is very environmentally friendly.

Keywords: *Portable; solar energy; environment protection Billboard*

1 Introduction

Bulletin boards are an indispensable tool for some organizations such as enterprises and schools or school associations to carry out some publicity. With the increasing number of various organizations in recent years, the demand for bulletin boards will gradually increase [1]. Domestic research on bulletin boards is less, and the first patent was applied for as early as 1987. Since then, various patents on publicity boards have appeared one after another, but most of them are based on appearance design, and there are few utility model and invention patents. Although the research on such devices in my country started late, many patents in this area have also emerged in recent years, but less is actually used [2].

Our country has a huge population base, and the number of various enterprises, schools and other organizations is also increasing. If you want to improve your own popularity, various methods of publicity are essential [3]. This will also lead to a gradual increase in the demand for billboards [4]. However, the existing bulletin boards have many shortcomings, such as: the bulletin boards are bulky, inconvenient to carry and install, and the publicity effect achieved by the bulletin boards is also average, which does not play a big role [5]. In addition, some modern common The bulletin board covers a large area and can only be fixed on the ground. If it is moved, it will take a lot of manpower and material resources, and it will also need to consume extra energy to illuminate the billboard at night, which cannot meet people's needs well [6-7]. Therefore, it is a more urgent task to develop a kind of billboard with reasonable price, environmental protection, portability and ease of use. It is also some expectations of companies or school associations that currently need a lot of publicity. Aiming at these shortcomings, a new mechanical structure bulletin board is designed in this paper.

2 Product design

The base of the bulletin board can play a very good role in fixing. The base is adsorbed on the ground by strong adsorption force to achieve the fixing effect on the billboard. The telescopic rod can adjust the height of the billboard. At the same time, the telescopic rod also increases the portability of the bulletin board. It can shrink the telescopic rod to the minimum and reduce its footprint. The splint and triangular groove are set to facilitate the fixing of promotional materials, and the splint and triangular groove are also convenient. The replacement and retrieval of publicity materials, the sun visor can protect the publicity column and publicity materials in rainy days, prevent rain from damaging the publicity materials, and the sun visor can also provide pedestrians passing by in the sun. A sunshade place, when pedestrians come here to shade, they will notice the content of the promotion, increase the exposure rate of the

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promotional materials, and make the promotion efficiency of the bulletin board higher. The board can be retracted so that it can be retracted when not in use, which is convenient to carry and reduces the space occupied. The player is set up to play promotional materials or some music. Playing promotional materials can make passers-by hear the content to be promoted. Music can add attractiveness to the bulletin boards, and at the same time can cultivate sentiment, adding some romantic atmosphere to the whole section of the road. The LED lights can be set to illuminate the billboards at night, so that the billboards can also be played at night. To the effect, the set anti-slip strip can increase the friction between the back cover and the storage cabinet, preventing the back cover from opening and closing at will.

3 Working Principle

The bulletin board is composed of four parts: telescopic support foot structure, folding board structure, storage structure, and circuit assembly.

3.1 Telescopic support foot structure

The structure of the telescopic support foot is shown in Figure 1. The rotating axis allows the support foot to rotate up and down in the vertical plane, and when not in use, it can be turned to the horizontal and stuck to the bottom of the bulletin board to reduce the space occupation rate.

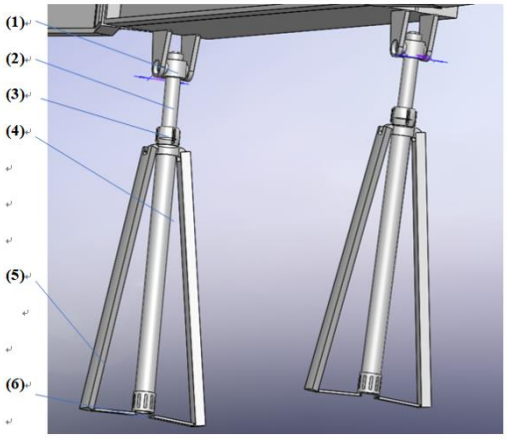

Figure 1 Structure diagram of telescopic support foot (1): rotation axis; (2): telescopic rod 1; (3): knob; (4): telescopic rod 2; (5): support rod; (6): connection sleeve

When using the rotary axis can be rotated to the vertical state, the connection between the knob and the telescopic rod as shown in Figure 2, through the thread at the bottom of the knob and the telescopic rod 2 connected to the upper part of the telescopic rod 1, when the telescopic rod is extended to a certain extent, you can tighten the knob through the friction between the telescopic rod 1 and fixed. At this point by sliding up and down (6) connecting sleeve can be spread the support rod, so that the propaganda bar stable placement.

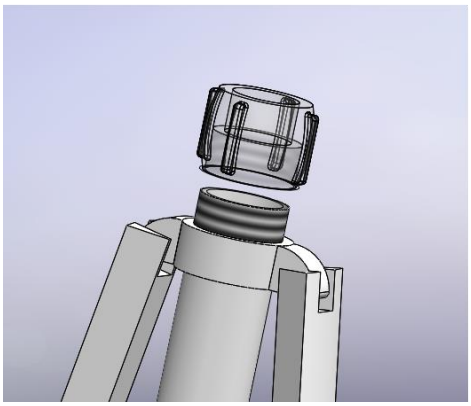

Figure 2 Knob and telescopic rod connection diagram

3.2 Folding plate mechanism

The unfolded and folded states of the folding board are shown in Figures 3 and 4. Folding board 1 and folding board 2 can be connected by ordinary connectors. When not in use, the back of folding board 1 is overlapped with the side of the entire billboard through the connecting rod. At this time, the connecting rod is just placed in slot 1, and the folding board 2 coincides with the back of the bulletin board. Folding board 1 is connected with bulletin board by connecting rod, and connecting rod structure as shown in Figure 5 is used when only needing to rotate connecting rod to straight line and just reaches the dead point in the four-bar structure at this moment.

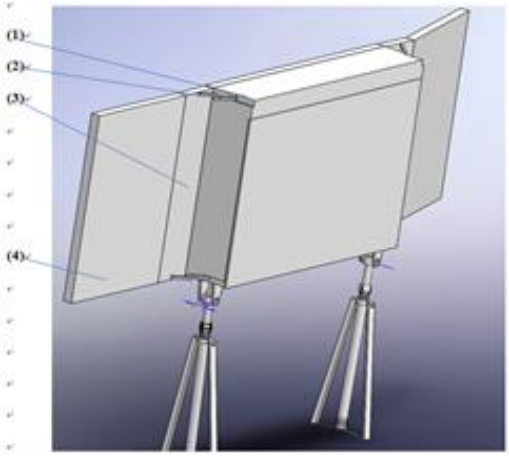

Figure 3 Folding plate unfolding diagram (1): slot; (2): connecting rod; (3): folding plate 1; (4) folding plate 2

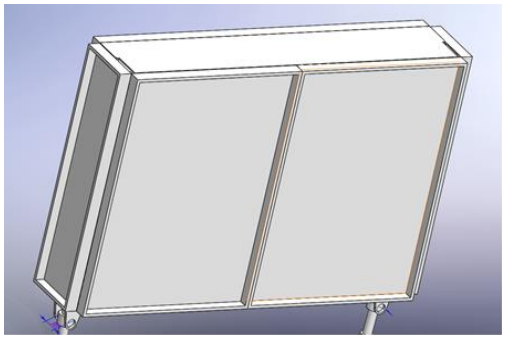

Figure 4 Folded plate folding

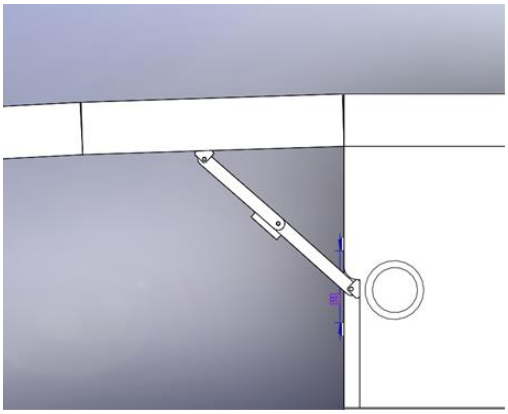

Figure 5 Connection bar structure

3.3 Storage structure

As shown in Figure 6, the back cover and the publicity column can be connected by ordinary connectors. When the publicity column needs to be fully unfolded, the back cover of the publicity column can be uncovered, and the required promotional materials can be placed inside.

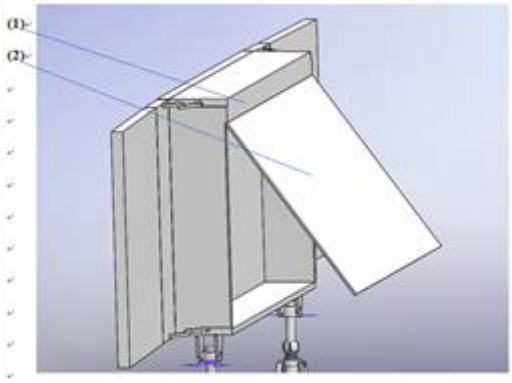

Figure 6 Storage structure (1): circuit placement; (2): back cover

3.4 Circuit Components

The circuit device is placed on the upper part of the bulletin board as shown in Figure 6 (1), and the solar panel is placed on the top of the billboard to absorb solar energy and store it in the battery during the day. It can also achieve the effect of publicity.

3.5 Usage

When using, first through the rotary axis of the two sides of the column support feet rotate to the vertical state, and then loosen the knob, will adjust the telescopic rod up and down to the desired height and then tighten the knob to the telescopic rod height fixed, then the two sides of the connecting sleeve down slide to support the rod to expand, I both sides of the support rod through a connecting rod and connecting sleeve connected, the connecting sleeve slide to the bottom so that the connecting rod just parallel to the ground and Make the support feet on both sides of the support rod and the middle of the support rod three points of a line and just touch the ground. Next, we will be behind the folding board 2 rotation to the folding board 1 parallel, and then the folding board 1 will be unfolded, so that the two connecting rods just straight at this time just to reach the dead spot position in the four rod structure. All done, you can open the back cover will be placed in advance of our publicity material out and placed on the surface of the bulletin board. At this time only need to be placed in the sunlight can be through the top of the solar panel to absorb solar energy and storage, in the night can be stored during the day by led energy release, in order to achieve the purpose of lighting, so as to ensure that the night column can also play a role in the case of energy saving to achieve the purpose of environmental protection.

4 Analysis of innovation points and prospects

4.1 Innovation

(1) The structure of solar panel is adopted, so that our billboard can achieve the effect of publicity even at night, and the energy source is environmentally friendly without spending extra electricity. (2). Our billboard uses a folding board structure to improve the space utilization rate and make the surface area utilization rate reach more than 90%.

(3) The structure of the support foot with telescopic rod allows us to adjust the placement height of the propaganda, and the support foot is fully expanded into a triangle, which improves the stability of the propaganda board and prevents it from being placed on various terrains.

(4) The whole billboard is a cuboid when folded, and we use aluminum alloy to reduce the weight of the billboard.

(5) The hollow part in the middle of our bulletin board can be placed with some materials for our publicity in advance, which also facilitates our publicity and improves the space utilization.

4.2 Prospect analysis

Now more and more enterprises as well as schools and some school clubs need to promote their products or some activities and so on, so the market of the bulletin board will gradually increase, and the current market of the bulletin board, due to a large area, not easy to carry and move and night need to consume electricity for lighting and other issues, resulting in school clubs and enterprises can not carry out effective publicity, and because of At present, the number of bulletin boards is relatively small, leading to many enterprises and school associations can not use the bulletin board for publicity. And our bulletin board just to overcome these shortcomings, it can be carried anywhere we want to propaganda, and occupies a small area, and when not in use can be completely folded up, the space occupied than the general luggage is small, when using the entire surface area can be fully expanded and the bottom can

extend the support legs to support the whole board, and the bottom of the support legs for the telescopic structure, can be adjusted according to the terrain or human will. Can be adjusted according to the terrain or human will to adjust the height. And in the era of environmental protection and conservation, our board uses solar energy as the energy source to illuminate the board at night, which not only achieves environmental protection but also saves excess electricity.

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Author introduction: Zhao Fangyue, male, undergraduate, research direction: mechanical design.

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