

## **TITLE OF INVENTION: SOLAR PANEL**

### **BACKGROUND OF THE INVENTION**

#### **1. Field of the Invention**

This invention relates to a solar panel, particularly to a new solar panel structure which can be made by at least one solar chip set and various construction lap joint plate.

#### **2. Description of the Prior Art**

Conventional solar panel is provided with a solar chip set between two layers of glass, and then frame the periphery of the glass with a metal frame to prevent the solar chip set from being damaged by external forces or moisture. When the conventional solar panel is installed, it needs to be clamped and fixed by a bracket component, so that the conventional solar panel can be stably installed on the top of the building or on the open area. However, this will lead to the potential safety problems of the conventional solar panel having insufficient wind pressure resistance and being blown away by strong winds.

Furthermore, since the conventional solar panel has a height difference between the edge position of the upper glass and the metal frame, dirt such as furring, dust, bird droppings, etc. will quickly accumulate on the edge of the upper glass, so that sunlight is blocked by the dirt, which affects the power generation efficiency.

As Taiwan Patent publication No. TW I741622 " SOLAR PANEL INSTALLATION STRUCTURE " previously invented by the inventor, which is a new type of solar panel structure that integrates the solar cell and various construction lap joint plate, and directly solves the safety problems existing in the assembly and application of the conventional solar panels. However, during the long-term practice of the prior art, the inventor found that there are many problems in the prior art that need to be overcome as follows:

First, since the lap joint plate made of metal has better ductility and thermal expansion and contraction characteristics, in the process of transportation and assembly, the lap joint

plate is easily bent and twisted; and in the process of daily use, the lap joint plate is affected by the change of temperature, and the shape of the lap joint plate cannot be kept stable.

In this way, the solar cell will be easily damaged by the deformation and stretching of the lap joint plate, which will affect the power generation efficiency and increase the maintenance cost.

Second, although the protective layer made of fluorine-containing polymer provided above the solar cell has very good heat resistance, cold resistance, electrical insulation, chemical corrosion resistance, mechanical properties and light penetration. However, its hardness is not enough to support and protect the solar cell from being affected by the deformation and stretching of the lap joint plate.

Third, the plurality of light collecting grooves arranged above the protective layer can make the oblique sunlight concentrated on the solar cell, so as to increase the illumination amount of the solar cell. However, after the rain, the light collecting grooves will prone to remain water, which reduces the light transmittance and affects the power generation efficiency of the solar cell. In addition, the light collecting grooves will also collect dust, bird droppings, scale and other dirt, so that the light collecting grooves will gradually reduce the power generation efficiency of the solar cell after a period of time. Periodic cleaning is required to maintain the best power generation efficiency.

For this reason, the inventor of this invention, having much experience in the development and manufacturing of solar panels and metal building materials, understands and researches the problem of the foregoing conventional solar panel and hence devised this invention.

## **SUMMARY OF THE INVENTION**

The purpose of the present invention is to provide a solar panel that can be lapped into one stable structure and can effectively protect the solar chip set. In the present invention, the outermost layer of the solar chip set arranged above the lap joint plate is covered with a glass

plate, the solar chip set is wrapped between the glass plate and the lap joint plate, so that the hardness of the glass plate can be used to support and protect the solar chip set from being damaged by the deformation and stretching of the lap joint plate. Furthermore, the present invention utilizes the characteristics of the glass plate with high light penetration, corrosion resistance and not easy to adhere to dirt, and the characteristics of the lap joint plate that can concentrate rainwater, so the surface of the glass plate can be kept clean without accumulation of dirt, and the solar chip set can sustain and stable power generation in any environment. In this way, the present invention can effectively overcome the problems of insufficient structural strength of the solar chip set and the problem of dirt affecting power generation efficiency, and by quickly assembling and lapping multiple solar panels into one stable structure, the solar panels have better structural strength, so that the assembly efficiency, wind pressure resistance, and manufacturing and maintenance costs of the solar panels can be improved.

Each solar panel in the present invention includes a lap joint plate and at least one solar chip set. said lap joint plate is provided with at least one flat portion and a plurality of protruding portions, said flat portion is arranged between adjacent two protruding portions, the two protruding portions located at both ends of said lap joint plate is used to overlap the protruding parts of the adjacent lap joint plates, the height of said protruding portions are all higher than said flat portion. Said solar chip set is arranged above said flat portion, an insulating layer may be provided between said solar chip set and said flat portion of lap joint plate, said insulating layer is respectively stuck to the bottom of said solar chip set and the top of said flat portion. A light-concentrating layer may be arranged above said solar chip set, the bottom of said light-concentrating layer is stuck to the top of said solar chip set. A glass plate is arranged above said light-concentrating layer, the area of said glass plate is larger than the area of said solar chip set and light-concentrating layer, said solar chip set and light-concentrating layer are located in the center of said glass plate, and the bottom of said glass plate is stuck to the top of said light-concentrating layer. A sealant is arranged

between the outer periphery of said glass plate and said flat portion of lap joint plate, said sealant makes said glass plate and said flat portion of lap joint plate adhere to each other, so that said glass plate directly bears the deformation and stretching of said lap joint plate, said glass plate is used to support and protect the solar chip set to prevent said solar chip set from being damaged by the deformation and stretching of said lap joint plate, and said sealant seals said solar chip set and light-concentrating layer between said glass plate and insulating layer to prevent said solar chip set from contacting with external moisture.

The solar panel of present invention, among which the above-mentioned light-concentrating layer may not be provided on said solar chip set, so as to achieve the purpose of reducing the manufacturing cost; and the above-mentioned insulating layer may be replaced with a glass base plate to enhance the overall structural strength of said solar chip set.

### **BRIEF DESCRIPTION OF DRAWINGS**

This invention will be better understood by referring to the accompanying drawings, wherein:

FIG. 1 is a stereogram of a first embodiment in the present invention;

FIG. 2 is a front view of FIG. 1;

FIG. 3 is a an enlarged view of area A of FIG. 2;

FIG. 4 is a an enlarged view of area B of FIG. 2;

FIG. 5 is a stereogram of a second embodiment in the present invention;

FIG. 6 is a front view of FIG. 5;

FIG. 7 is a an enlarged view of area C of FIG. 6;

FIG. 8 is a an enlarged view of area D of FIG. 6;

FIG. 9 is a stereogram of a third embodiment in the present invention;

FIG. 10 is a front view of FIG. 9;

FIG. 11 is a an enlarged view of area E of FIG. 10; and

FIG. 12 is a an enlarged view of area F of FIG. 10.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

The preferred embodiments of a solar panel in the present invention, as shown in Fig. 1 to 12, each solar panel includes a lap joint plate 1 and at least one solar chip set 2 as main components combined together.

Said lap joint plate 1 is provided with at least one flat portion 10 and a plurality of protruding portions 11, said flat portion 10 is arranged between adjacent two protruding portions 11, and the two protruding portions 11 located at both ends of said lap joint plate 1 can be used to overlap the protruding parts 11 of the adjacent lap joint plates 1, so that said lap joint plate 1 can be infinitely overlapped and extended with adjacent overlapping plates 1. The height of said protruding portions 11 are all higher than said flat portion 10 , so that the rainwater can be collected to flow to said flat portion 10 and directly wash said solar chip set 2 above said flat portion 10.

As shown in Fig. 1 to 4, it is the first embodiment of the present invention. Said solar chip set 2 is arranged above said flat portion 10, said solar chip set 2 may be various solar chip set. Said solar chip set 2 is provided with a control box 20 and a plurality of output wires 21, said control box 20 is connected to said solar chip set 2 and collects the electricity generated by said solar chip sets 2, said output lines 21 of said adjacent solar chip sets 2 are connected to each other, so that all the solar chip sets 2 of the solar panels can be connected in series, and the electric energy generated by the solar chip sets 2 can be output to an external electrical equipment or a electricity storage equipment. An insulating layer 22 is provided between said solar chip set 2 and said flat portion 10 of lap joint plate 1 (such as adhesive layer, rubber film or plastic film with thermal insulation and electrical insulation functions). said insulating layer 22 is respectively stuck to the bottom of said solar chip set 2 and the top of said flat portion 10 to avoid direct contact between said solar chip set 2 and flat portion 10 and protect said solar chip set 2.

A light-concentrating layer 23 is arranged above said solar chip set 2, the bottom of said light-concentrating layer 23 is stuck to the top of said solar chip set 2, and said light-concentrating layer 23 may be made of various highly light-transmitting materials. A plurality of light-concentrating grooves 230 are arranged above said light-concentrating layer 23, said light-concentrating grooves 230 make the sunlight irradiated obliquely concentrated on said solar chip set 2 to improve the amount of sunlight and solar energy conversion efficiency of said solar chip set 2.

A glass plate 25 is arranged above said light-concentrating layer 23, the area of said glass plate 25 is larger than the area of said solar chip set 2 and light-concentrating layer 23, said solar chip set 2 and light-concentrating layer 23 are located in the center of said glass plate 25, and the bottom of said glass plate 25 is stuck to the top of said light-concentrating layer 23. A sealant 27 is arranged between the outer periphery of said glass plate 25 and said flat portion 10 of lap joint plate 1. Said sealant 27 makes said glass plate 25 and said flat portion 10 of lap joint plate 1 adhere to each other, so that said glass plate 25 can directly bear the deformation and stretching of said lap joint plate 1, and said glass plate 25 can support and protect the solar chip set 2 below it to prevent said solar chip set 2 from being damaged by the deformation and stretching of said lap joint plate 1. In addition, said sealant 27 seals said solar chip set 2 and light-concentrating layer 23 between said glass plate 25 and insulating layer 22, so said solar chip set 2 can be prevented from contacting with external moisture to prolong the service life of said solar chip set 2 and improve its safety.

It is worth noting that said glass plate 25 has better light transmittance and stability than other plastic plates (such as PC boards, etc.), and does not have the problems of deterioration and fogging to affect its light transmittance. Furthermore, since said solar chip set 2 is protected by said glass plate 25, the material selection of said light-concentrating layer 23 is not limited to the material that need to have high heat resistance, cold resistance, electrical insulation, chemical resistance or mechanical properties, so that the manufacturing cost of said light-concentrating layer 23 can be reduced, and the competitiveness can be improved.

As shown in Fig. 5 to 8, it is the second embodiment of the present invention, the above-mentioned light-concentrating layer 23 may not be provided on said solar chip set 2, so as to achieve the purpose of reducing the manufacturing cost. Said solar chip set 2 is arranged above said flat portion 10, said solar chip set 2 may be various solar chip set. Said solar chip set 2 is provided with a control box 20 and a plurality of output wires 21, said control box 20 is connected to said solar chip set 2 and collects the electricity generated by said solar chip sets 2, said output lines 21 of said adjacent solar chip sets 2 are connected to each other, so that all the solar chip sets 2 of the solar panels can be connected in series, and the electric energy generated by the solar chip sets 2 can be output to an external electrical equipment or a electricity storage equipment. An insulating layer 22 is provided between said solar chip set 2 and said flat portion 10 of lap joint plate 1, said insulating layer 22 is respectively stuck to the bottom of said solar chip set 2 and the top of said flat portion 10 to avoid direct contact between said solar chip set 2 and flat portion 10 and protect said solar chip set 2.

In the second embodiment, a glass plate 25 is arranged above said solar chip set 2, the area of said glass plate 25 is larger than the area of said solar chip set 2, and said solar chip set 2 is located in the center of said glass plate 25. The bottom of said glass plate 25 is stuck to the top of said solar chip set 2, a sealant 27 is arranged between the outer periphery of said glass plate 25 and said flat portion 10 of lap joint plate 1, said sealant 27 makes said glass plate 25 and said flat portion 10 of lap joint plate 1 adhere to each other, so that said glass plate 25 can directly bear the deformation and stretching of said lap joint plate 1, and said glass plate 25 can support and protect the solar chip set 2 below it to prevent said solar chip set 2 from being damaged by the deformation and stretching of said lap joint plate 1. In addition, said sealant 27 seals said solar chip set 2 between said glass plate 25 and insulating layer 22, so said solar chip set 2 can be prevented from contacting with external moisture to prolong the service life of said solar chip set 2 and improve its safety.

As shown in Fig. 9 to 12, it is the third embodiment of the present invention, the above-mentioned light-concentrating layer 23 may not be provided on said solar chip set 2,

and said insulating layer 22 is replaced with a glass base plate 28 to enhance the overall structural strength of said solar chip set 2. A glass base plate 28 is arranged between said solar chip set 2 and said flat portion 10 of lap joint plate 1, said glass base plate 28 is respectively stuck to the bottom of said solar chip set 2 and the top of said flat portion 10. The area of said glass base plate 28 is larger than the area of said solar chip set 2, and said solar chip set 2 is located in the center of said glass base plate 28. said solar chip set 2 may be various solar chip set, said solar chip set 2 is provided with a control box 20 and a plurality of output wires 21, said control box 20 is connected to said solar chip set 2 and collects the electricity generated by said solar chip sets 2, said output lines 21 of said adjacent solar chip sets 2 are connected to each other, so that all the solar chip sets 2 of the solar panels can be connected in series, and the electric energy generated by the solar chip sets 2 can be output to an external electrical equipment or a electricity storage equipment.

In the third embodiment, a glass plate 25 is arranged above said solar chip set 2, the area of said glass plate 25 is larger than the area of said solar chip set 2, and said solar chip set 2 is located in the center of said glass plate 25. The bottom of said glass plate 25 is stuck to the top of said solar chip set 2, a sealant 27 is arranged between the outer periphery of said glass plate 25 and the outer periphery of said glass base plate 28, said sealant 27 makes said glass plate 25 and said glass base plate 28 adhere to each other, so that said glass plate 25 and said glass base plate 28 can jointly bear the deformation and stretching of said lap joint plate 1, and said glass plate 25 and said glass base plate 28 can support and protect said solar chip set 2 to prevent said solar chip set 2 from being damaged by the deformation and stretching of said lap joint plate 1. In addition, said sealant 27 seals said solar chip set 2 between said glass plate 25 and glass base plate 28, so said solar chip set 2 can be prevented from contacting with external moisture to prolong the service life of said solar chip set 2 and improve its safety.

In summary, the solar panel of the present invention can assemble the solar chip set 2 and various building lap joint plates 1 into one stable structure, when the solar power

generation facility needs to install multiple solar panels, the construction personnel only need to overlap and combine the protruding portions 11 of the adjacent lap joint plates 1 to each other to quickly complete the connection and assembly of multiple solar panels. Furthermore, in the present invention, a glass plate is arranged on the outermost layer of the solar chip set 2, so that the solar chip set 2 is wrapped between the glass plate and the lap joint plate. The hardness of the glass plate can be used to support and protect the solar chip set 2, so as to the solar chip set 2 will not be damaged by the deformation and stretching of the lap joint plate 1. The present invention utilizes the characteristics of the glass plate with high light penetration, corrosion resistance and not easy to adhere to dirt, and the characteristics of the lap joint plate that can concentrate rainwater, so the surface of the glass plate can be kept clean without accumulation of dirt, and the solar chip set can sustain a stable power generation in any environment.

In this way, the present invention can effectively overcome the problems of insufficient structural strength of the solar chip set and the problem of dirt affecting power generation efficiency, and by quickly assembling and lapping multiple solar panels into one stable structure, the solar panels have better structural strength, so that the assembly efficiency, wind pressure resistance, and manufacturing and maintenance costs of the solar panels can be improved.

While the preferred embodiments of this invention have been described above, it will be recognized and understood that various modifications may be made therein and appended claims are intended to cover all such modifications that may fall within the spirit and scope of the invention.

## CLAIMS

[CLAIM 1] A solar panel at least comprising:

a lap joint plate is provided with at least one flat portion and a plurality of protruding portions, said flat portion is arranged between adjacent two protruding portions, the two protruding portions located at both ends of said lap joint plate is used to overlap the protruding parts of the adjacent lap joint plates, the height of said protruding portions are all higher than said flat portion; and

at least one solar chip set is arranged above said flat portion, an insulating layer is provided between said solar chip set and said flat portion of lap joint plate, said insulating layer is respectively stuck to the bottom of said solar chip set and the top of said flat portion; a light-concentrating layer is arranged above said solar chip set, the bottom of said light-concentrating layer is stuck to the top of said solar chip set, a plurality of light-concentrating grooves are arranged above said light-concentrating layer; a glass plate is arranged above said light-concentrating layer, the area of said glass plate is larger than the area of said solar chip set and light-concentrating layer, said solar chip set and light-concentrating layer are located in the center of said glass plate, and the bottom of said glass plate is stuck to the top of said light-concentrating layer; a sealant is arranged between the outer periphery of said glass plate and said flat portion of lap joint plate, said sealant makes said glass plate and said flat portion of lap joint plate adhere to each other, so that said glass plate directly bears the deformation and stretching of said lap joint plate, said glass plate is used to support and protect the solar chip set to prevent said solar chip set from being damaged by the deformation and stretching of said lap joint plate, and said sealant seals said solar chip set and light-concentrating layer between said glass plate and insulating layer to prevent said solar chip set from contacting with external moisture.

[CLAIM 2] The solar panel according to claim 1, wherein said light-concentrating layer 23 is made of highly light-transmitting material.

[CLAIM 3] A solar panel at least comprising:

a lap joint plate is provided with at least one flat portion and a plurality of protruding portions, said flat portion is arranged between adjacent two protruding portions, the two protruding portions located at both ends of said lap joint plate is used to overlap the protruding parts of the adjacent lap joint plates, the height of said protruding portions are all higher than said flat portion; and

at least one solar chip set is arranged above said flat portion, an insulating layer is provided between said solar chip set and said flat portion of lap joint plate, said insulating layer is respectively stuck to the bottom of said solar chip set and the top of said flat portion; a glass plate is arranged above said solar chip set, the area of said glass plate is larger than the area of said solar chip set, said solar chip set is located in the center of said glass plate, and the bottom of said glass plate is stuck to the top of said solar chip set; a sealant is arranged between the outer periphery of said glass plate and said flat portion of lap joint plate, said sealant makes said glass plate and said flat portion of lap joint plate adhere to each other, so that said glass plate directly bears the deformation and stretching of said lap joint plate, said glass plate is used to support and protect the solar chip set to prevent said solar chip set from being damaged by the deformation and stretching of said lap joint plate, and said sealant seals said solar chip set between said glass plate and insulating layer to prevent said solar chip set from contacting with external moisture.

[CLAIM 4] A solar panel at least comprising:

a lap joint plate is provided with at least one flat portion and a plurality of protruding portions, said flat portion is arranged between adjacent two protruding portions, the two protruding portions located at both ends of said lap joint plate is used to overlap the protruding parts of the adjacent lap joint plates, the height of said protruding portions are all higher than said flat portion; and

at least one solar chip set is arranged above said flat portion, an glass base plate is

provided between said solar chip set and said flat portion of lap joint plate, said glass base plate is respectively stuck to the bottom of said solar chip set and the top of said flat portion, the area of said glass base plate is larger than the area of said solar chip set, and said solar chip set is located in the center of said glass base plate; a glass plate is arranged above said solar chip set, the area of said glass plate is larger than the area of said solar chip set, said solar chip set is located in the center of said glass plate, and the bottom of said glass plate is stuck to the top of said solar chip set; a sealant is arranged between the outer periphery of said glass plate and the outer periphery of said glass base plate, said sealant makes said glass plate and said glass base plate adhere to each other, so that said glass plate and said glass base plate jointly bear the deformation and stretching of said lap joint plate, said glass plate and said glass base plate are used to support and protect the solar chip set to prevent said solar chip set from being damaged by the deformation and stretching of said lap joint plate, and said sealant seals said solar chip set between said glass plate and glass base plate to prevent said solar chip set from contacting with external moisture.