Appeal decision

Appeal No. 2019-3990

Appellant LG Electronics Incorporated

Patent Attorney KATADA, Takeshi

Attorney KOBAYASHI, Hideaki

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2017-148887, entitled "Solar Cell and Solar Cell Panel Including the Same" (the application published on June 14, 2018, Japanese Unexamined Patent Application Publication No. 2018-93167) has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The application was filed on August 1, 2017 (priority claim under the Paris Convention: December 2, 2016, South Korea), a notice of reasons for refusal was issued on July 4, 2018, and despite submission of a written opinion and a written amendment on October 10, 2018, an examiner's decision of refusal was issued on December 6, 2018, and a certified copy of the decision was delivered to the Appellant on December 11, 2018. Against this, an appeal against the examiner's decision of refusal was requested on March 27, 2019, and a written amendment was submitted simultaneously.

No. 2 Decision to dismiss amendment on the written amendment submitted on March 27, 2019

[Conclusion of Decision to Dismiss Amendment]

The written amendment submitted on March 27, 2019 (hereinafter, referred to as "the Amendment") shall be dismissed.

[Reason]

1 Regarding the Amendment

(1) Description of the Scope of Claims after the Amendment

By the Amendment, Claim 1 of the Scope of Claims was amended as follows (underlines indicate amended portions, and are given by the body and so on).

"A solar cell, comprising:
a semiconductor substrate having a long axis and a short axis that intersect each other;
a first conductivity type region formed on one surface of the semiconductor substrate;
a second conductivity type region formed on the other surface of the semiconductor substrate;
a first electrode electrically connected to the first conductivity type region; and
a second electrode electrically connected to the second conductivity type region,
wherein the first electrode comprises:
a plurality of finger lines positioned in a first direction parallel to the long axis and being parallel to each other, and
a plurality of bus bars including a plurality of pad portions positioned in a second direction parallel to the short axis, and
wherein the plurality of pad portions comprise a first outer pad and a second outer pad respectively located on opposite ends in the second direction, and
wherein a pitch of the bus bar in the first direction with respect to the width of the semiconductor substrate in the second direction is from 0.1 to 0.35".

(2) Description of the Scope of Claims before the Amendment

The description of Claim 1 of the Scope of Claims before the Amendment is as follows.

"A solar cell, comprising:
a semiconductor substrate having a long axis and a short axis that intersect each other;
a first conductivity type region formed on one surface of the semiconductor substrate;
a second conductivity type region formed on the other surface of the semiconductor substrate;
a first electrode electrically connected to the first conductivity type region; and
a second electrode electrically connected to the second conductivity type region,
wherein the first electrode comprises:
a plurality of finger lines positioned in a first direction parallel to the long axis and

being parallel to each other, and

a plurality of bus bars including a plurality of pad portions positioned in a second direction parallel to the short axis, and

wherein the plurality of pad portions comprise a first outer pad and a second outer pad respectively located on opposite ends in the second direction, and

wherein a pitch of the bus bar in the first direction with respect to the width of the semiconductor substrate in the second direction is 0.35 or less."

2 Propriety of amendment

The Amendment is one that adds limitation of "from 0.1 to" to "a pitch of a bus bar" that is a matter required for specifying the invention described in Claim 1 before the Amendment, as per the matters of the amendment, and the inventions described in Claim 1 before and after the Amendment are identical regarding the field of industrial application and the problems to be solved, so that the Amendment falls under the restriction of the Scope of Claims stipulated in Article 17-2(5)(ii) of the Patent Act.

Then, it will be examined whether or not the invention described in Claim 1 after the Amendment (hereinafter, referred to as "the Amended Invention") falls under the provision of Article 126(7) of the Patent Act which is applied mutatis mutandis pursuant to Article 126(6) of the Patent Act (whether or not the appellant should be granted a patent independently at the time of patent application.)

(1) The Amended Invention

The Amended Invention is as described in 1(1) above.

(2) Cited Document

A Cited Document 1

(A) Japanese Unexamined Patent Application Publication No. 2016-72637 (published on May 9, 2016) which is Cited Document distributed before the priority date of the application cited in reasons for refusal stated in the examiner's decision, describes the following together with drawings.

a "[Technical field]

[0001]

The present invention relates to a solar cell and a solar cell panel including the same, and more specifically to a solar cell connected by a wiring member and a solar cell panel including the same."

b "[0025]

Referring to FIG. 3, a solar cell 150 according to the present embodiment includes a semiconductor substrate 160 including a base region 10, conductivity type regions 20 and 30 formed at the semiconductor substrate 160 or on the semiconductor substrate 160, and electrodes 42, 44 connected to the conductivity type regions 20, 30. Here, the conductivity type regions 20 and 30 may include a first conductivity type region 20 having a first conductivity type and a second conductivity type region 30 having a second conductivity type, and the electrodes 42 and 44 may include a first electrode 42 connected to the first conductivity type region 20 and a second electrode 44 connected to the second conductivity type region 30. The solar cell 150 may further include a first passivation film 22, an antireflection film 24, a second passivation film 32, and the like. This will be described in more detail."

c "[0082]

In this embodiment, the electrodes 42 and 44 of the solar cell 150 are formed in consideration of this, and this will be described in detail with reference to FIGS. 9 and 10. Hereinafter, referring to FIGS. 9 and 10, the first electrode 42 is described in detail as a reference, and then the second electrode 44 will be described.

[0083]

FIG. 9 is a plan view showing a solar cell included in a solar cell panel of FIG. 1 and a wiring member connected to the solar cell. FIG. 10 is a plan view showing the solar cell included in the solar cell panel of FIG. 1.

[0084]

Referring to FIGS. 9 and 10, in this embodiment, the solar cell 150 (or the semiconductor substrate 160) can be divided into an electrode area EA and an edge area PA. At this time, the solar cell 150 (or the semiconductor substrate 160) can include, as an example, first and second edge portions 161, 162 parallel to a finger line 42a and third and fourth edge portions 163 and 164 that intersect (for example, intersect orthogonally or obliquely) the finger line 42a. The third and fourth edge portions 163 and 164 are substantially orthogonal to the first and second edge portions 161, 162, respectively, and the third and fourth edge portions 163 and 164 can include central portions 163a and 164a that are substantially orthogonal to the first and second edge portions 161 and 162 and occupy most of the third and fourth edge portions 163 and 164, respectively, and inclined portions 163b and 163b that are inclined from the central portions 163a and 164a and are connected to the first and second edge portions 161 and 162, respectively. Thereby, as an example, the solar cell 150 can have a substantially

octagonal shape in a plan view. However, the present invention is not limited to this, and the solar cell 150 may have any of various planar shapes.

[0085]

In the present embodiment, the electrode area EA may be an area in which the finger lines 42a formed in parallel with each other are arranged at a uniform pitch P. The edge area PA may be an area in which the finger lines 42a are not located or in which the electrode portions are located at a density lower than the density of the finger lines 42a in the electrode area EA. In this embodiment, the case where the electrode portion of the first electrode 42 is not located in the edge area PA has been illustrated.

[0086]

In the present embodiment, the electrode area EA can include a plurality of electrode areas EA divided based on the bus bar line 42b or the wiring member 142. More specifically, the electrode area EA can include a first electrode area EA1 located between two adjacent bus bar lines 42b or wiring members 142, and two second electrode areas EA2 respectively located between the third and fourth edge portions 163 and 164 of the solar cell 150. In this embodiment, the plurality (e.g., 6 or more) of wiring members 142 are provided on the basis of one surface of the solar cell 150, and thus the plurality (that is, the number smaller than the number of the wiring members 142 by one) of first electrode areas EA1 may be provided.

[0087]

At this time, the width W2 of the first electrode area EA1 may be smaller than the width W3 of the second electrode area EA2. In this embodiment, a large number of the wiring members 142 or the bus bar lines 42b are provided. Therefore, the width W3 of the second electrode area EA2 must be relatively large in order to position the inclined portions 163b, 164b of the third or fourth edge portion 163, 164 in the second electrode area EA2. Therefore, it is possible to prevent the bus bar lines 42b or the wiring members 142 from being located at the third or fourth edge portion 163, 164. However, the present invention is not limited to this, and the width W2 of the first electrode area EA1 and the width W3 of the second electrode area EA2 may have various values.

[0088]

In this embodiment, since the respective bus bar lines 42b and the wiring members 142 are arranged with a uniform pitch, the widths W2 of the plurality of first electrode areas EA1 may be substantially the same. As a result, the carriers can move with a uniform average moving distance, so that the carrier collection efficiency can be improved.

[0089]

The edge area PA may include a first edge area PA1 that corresponds to the portion where the wiring member 142 is located and is located between the finger electrodes 42a, and a second edge area PA2 that is the portion other than the first edge area PA1 and is spaced apart by a constant distance between the outermost finger electrode 42a and the first to fourth edge portions 161, 162, 163, and 164 of the semiconductor substrate 160. The first edge area PA1 may be located in a portion adjacent to the edge of the solar cell 150 in the portion where the wiring member 142 is located. The first edge area PA1 is an area in which the end of the first electrode 42 is located apart from the edge portion of the solar cell 150 so that the wiring member 142 can be attached to the first electrode 42 with a sufficient bonding force.

[0090]

The first electrode 42 may include the plurality of finger lines 42a spaced apart from each other with a constant width W5 and a pitch P in the electrode area EA. Although in the figure the finger lines 42a are illustrated as being parallel to each other and parallel to the main edge portions (in particular, the first and second edge portions) of the solar cell 150, the present invention is not limited to this.

[0091]

As an example, the finger lines 42a of the first electrode 42 may have a width W5 of 35 μm to 120 μm. The finger lines 42a of the first electrode 42 may have a pitch P of 1.2 mm to 2.8 mm, and the number of the finger lines 42a may be 55 to 130 in the direction intersecting the finger lines 42a. The width W5 and the pitch P may be formed according to easy processing conditions, and are limited so as to minimize the shading loss due to the finger lines 42a while effectively collecting a current generated by photoelectric conversion. The thickness of the finger lines 42a may be 5 μm to 50 μm. The thickness of the finger lines 42a may be within a range that can be easily formed during the process and can have a desired specific resistance. However, the present invention is not limited to this, and the width, pitch, thickness, etc. of the finger lines 42a may change in various manners depending on changes in process conditions, the size of the solar cell 150, the constituent materials of the finger lines 42a, and the like.

[0092]

At this time, the width W1 of the wiring member 142 can be smaller than the pitch P of the finger lines 42a and larger than the width of the finger lines 42a. However, the present invention is not limited to this, and various modifications are possible.

[0093]

The first electrode 42 can include bus bar lines 42b formed in the electrode area EA in a direction intersecting the finger lines 42a and connecting the finger lines 42a. As an example, the bus bar line 42b can be continuously formed from a portion adjacent to the first edge portion 161 to a portion adjacent to the second edge portion 162. As described above, the bus bar lines 42b may be located so as to correspond to the portion where the wiring member 142 for connection with the adjacent solar cell 150 is located. Such bus bar lines 42b may be provided in one-to-one correspondence with the wiring members 142. Accordingly, in the present embodiment, the number of bus bar lines 42b may be the same as the number of wiring members 142, with one surface of the solar cell 150 as a reference. In the present embodiment, the bus bar line 42b is located in a portion adjacent to the wiring member 142, is formed in a direction orthogonal or inclined to the finger line 42a, and may mean an electrode portion connected to or in contact with the wiring member 142.

[0094]

The bus bar line 42b can be provided with a line portion 421 that extends long with a relatively narrow width along the direction in which the wiring member 142 is connected, and a pad portion 422 that has a width greater than that of the line portion 421 and increases the connection area with the wiring member 142. The line portion 421 with the narrow width can minimize the area that blocks the light incident on the solar cell 150, and the pad portion 422 with the wide width can improve the adhesive force between the wiring member 142 and the bus bar line 42b to thereby reduce the contact resistance. The bus bar line 42b may include an extension 423 that is connected to an end portion of the finger line 42a adjacent to the first edge area PA1 and divides the electrode area EA and the first edge area PA1."

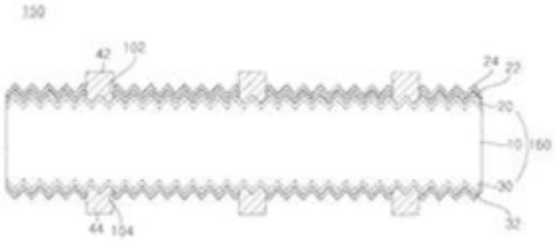
d "[0149]

The present inventor has also found that the number of the wiring members 142 (or the number of the bus bar lines 42b) located on one surface of the solar cell 150 has a certain relationship with the width W1 of the wiring members 142. FIG. 13 is a diagram showing the output of the solar cell panel 100 measured while changing the width W1 and the number of the wiring members 142. It can be seen that when 6 to 33 wiring members 142 having a width W1 of 250 μm to 500 μm are provided, the output of the solar cell panel 100 has an excellent value. At this time, it can be seen that if the width W1 of the wiring members 142 is increased, the number of required wiring members 142 can be reduced."

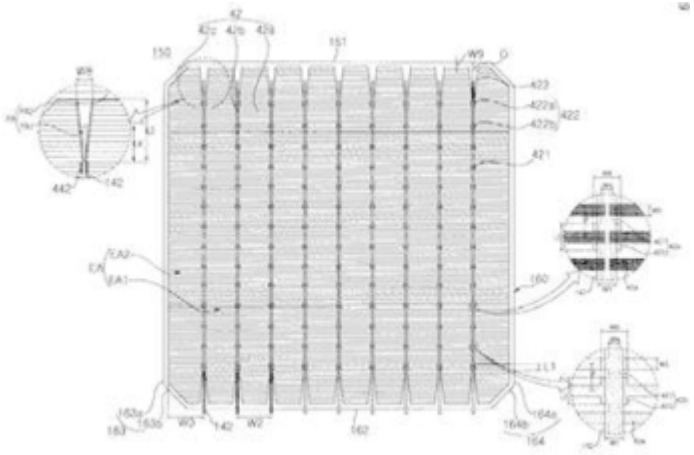
e From FIG. 3, it can be seen that the first conductivity type region 20 is formed on one surface of the semiconductor substrate 160, and the second conductivity type region 30 is formed on the other surface of the semiconductor substrate 160.

f From FIGS. 9 and 10, it can be seen that a plurality of pad portions 422 are provided along the bus bar lines 42b, and are equipped with pad portions respectively positioned on both sides.

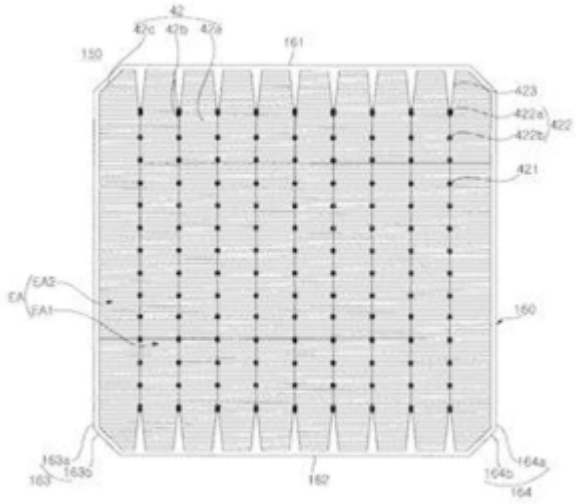
g FIG. 3 is as follows.



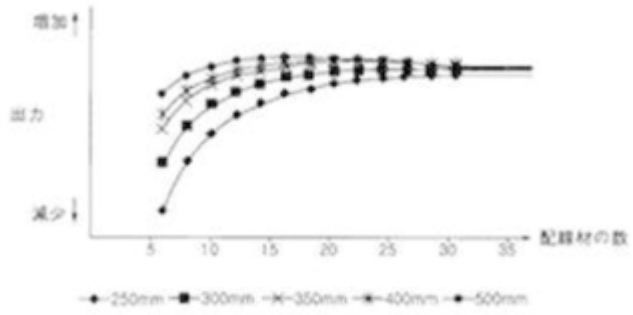
h FIG. 9 is as follows.



i FIG. 10 is as follows.



j FIG. 13 is as follows.



配線材の数 Number of wiring materials
増加 Increase
出力 Output
減少 Decrease

(B) According to the above descriptions and drawings, it can be recognized that Cited Documents describe the following invention (hereinafter, referred to as "Cited Invention").

Cited Invention
"A solar cell 150 connected by a wiring member, comprising:
a semiconductor substrate 160 including a base region 10; and

conductivity type regions 20 and 30 formed on the semiconductor substrate 160, the conductivity type region 20 and 30 including a first conductivity type region 20 having a first conductivity type and a second conductivity type region 30 having a second conductivity type,

wherein the first conductivity type region 20 is formed on one surface of the semiconductor substrate 160, and the second conductivity type region 30 is formed on the other surface of the semiconductor substrate 160,

wherein electrodes 42 and 44 may include a first electrode 42 connected to the first conductivity type region 20 and a second electrode 44 connected to the second conductivity type region 30,

wherein the first electrode 42 may include a plurality of finger lines 42a spaced apart from each other with a constant width W5 and a pitch P in the electrode area EA, the finger lines 42a being parallel to each other and parallel to main edge portions (in particular, the first and second edge portions) of the solar cell 150,

wherein the first electrode 42 can include bus bar lines 42b formed in the electrode area EA in a direction intersecting the finger lines 42a and connecting the finger lines 42a, and the bus bar lines 42b may be located so as to correspond to the portion where the wiring member 142 for connection with the adjacent solar cell 150 is located,

wherein the bus bar line 42b can be provided with a line portion 421 that extends long with a relatively narrow width along the direction in which the wiring member 142 is connected, and a pad portion 422 that has a width greater than that of the line portion 421 and increases the connection area with the wiring member 142,

wherein the plurality of pad portions 422 are provided along the bus bar lines 42b, and are equipped with pad portions respectively positioned on both sides, and

wherein the number of the wiring members 142 (or the number of the bus bar lines 42b) located on one surface of the solar cell 150 has a certain relationship with the width W1 of the wiring members 142, and when 6 to 33 wiring members 142 having a width W1 of 250 μm to 500 μm are provided, the output of the solar cell panel 100 has an excellent value."

B Cited Document 2

Japanese Unexamined Patent Application Publication No. 2014-33240 (published on February 20, 2014) which is Cited Document distributed before the priority date of the application cited in reasons for refusal stated in the examiner's decision, describes the following together with drawings.

a "[Technical field]
[0001]

The present invention relates to a plurality of solar cell modules that are installed side by side on a roof or the like in a solar power generation system that converts light energy of the sun and the like into electric energy."

b "[0020]

Further, on the light-receiving surface of the substrate 11, as a light-receiving surface side electrode for extracting electric energy converted from incident light, grid electrodes 13 which are fine wire electrodes formed of silver, and light-receiving surface bus electrodes (light-receiving surface lead connection electrodes) 14 with a predetermined width which are also formed of silver are used, and those are electrically connected to the n-type diffusion layer at the bottom portions respectively. Two light-receiving surface bus electrodes 14 are formed in parallel along a first direction, which is a connecting direction of the solar battery cells 20. A large number of the grid electrodes 13 are formed in a thin shape in a direction orthogonal to the light-receiving surface bus electrodes 14. The grid electrode 13 is formed to be as thin as possible and to extend over the entire light-receiving surface (front surface) in order to extract electric power generated on the light-receiving surface without waste. When exposed to sunlight, the light-receiving surface side of FIG. 3 becomes a negative (−) electrode and the back surface side of FIG. 4 becomes a positive (+) electrode. The light-receiving surface bus electrode 14 is connected to the light-receiving surface side lead wire 4 and is provided for further extracting the electric energy collected by the grid electrode 13 to the outside (FIG. 3). In FIGS. 3 and 5 and the like, although the light-receiving surface bus electrode 14 is shown to be thinner than the light-receiving surface side lead wire 4, this is because the state in which the light-receiving surface bus electrode 14 and the light-receiving surface side lead wire 4 overlap is expressed in an easily understandable manner, and in practice the light-receiving surface bus electrode 14 and the light-receiving surface side lead wire 4 have the same width.
[0021]

On the other hand, the back surface of the substrate 11 is provided with a back surface current collecting electrode 12 made of aluminum so as to cover almost the entire back surface. Further, at a position corresponding to the grid electrode 13 on the back surface of the substrate 11 (a position where the grid electrode 13 and the substrate 11 overlap in the thickness direction), a back surface bus electrode (back surface lead connection electrode) 15 made of silver is formed so as to extend in the first direction

that is the connecting direction of the solar battery cell 20. The back surface bus electrode 15 is connected to the back surface side lead wire 7 and is provided for further extracting the electric energy collected by the back surface current collecting electrode 12 to the outside (FIG. 4). Further, in FIGS. 4 and 6 and the like, although the back surface bus electrode 15 is shown thicker than the back surface side lead wire 7, this is to express the state in which the back surface bus electrode 15 and the back surface side lead wire 7 overlap, and in practice the back surface bus electrode 15 and the back surface lead wire 7 have the same width.

[0022]

The back surface of the substrate 11 may be covered with a silver electrode over the front surface, but the cost thereof is high. Therefore, as described above, the back surface bus electrode 15 made of silver is provided only at the position where the back surface side lead wire 7 is particularly connected. The back surface bus electrode 15 may be provided in a dot shape (stepping stone shape) discretely in addition to the linear shape as in the present embodiment. In the present embodiment, the solar battery cells manufactured in the square shape as described above are divided into two in an extending direction of the light-receiving surface bus electrode 14, before being connected to each other by the light-receiving surface side lead wire 4 and the back surface side lead wire 7, thereby obtaining a rectangular solar battery cell 20 in which a ratio of a short side length S to a long side length L is 1/2:1.

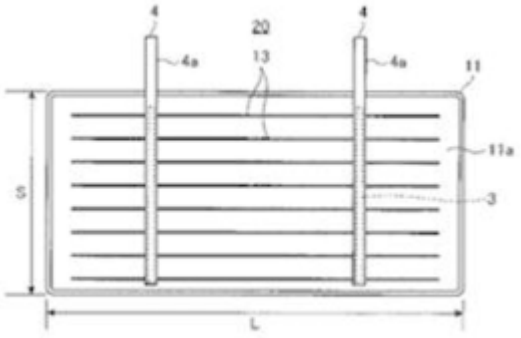
[0023]

In order to obtain the divided solar battery cell 20, first, a predetermined process is performed to form the light-receiving surface bus electrode 14, the grid electrode 13, the back surface current collecting electrode 12, and the back surface bus electrode 15 on the square substrate 11, thereby manufacturing a basic solar battery cell (first solar battery cell). At this time, the light-receiving surface electrode area and the back surface electrode area where these electrodes are formed by being divided into two areas in accordance with a dividing line, and the rectangular solar battery cell 20 is obtained by cutting the dividing line. In addition, although the solar battery cell 20 of the present embodiment divides the solar battery cell formed into a square into two, it may be divided into three or four, or more (n divided). When dividing into n parts, the light-receiving surface electrode area and the back surface electrode area are formed separately in n places in advance."

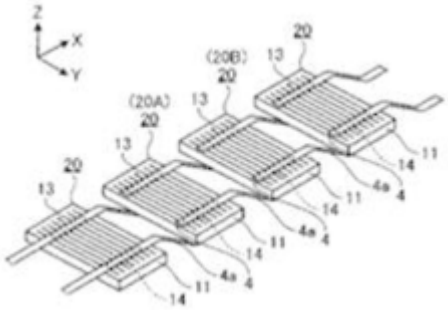
c From FIGS. 3 and 5, it can be seen that the grid electrode 13 is formed in parallel with the long axis of the solar battery cell 20, and the light-receiving surface bus

electrode 14 is formed in parallel with the short axis of the solar battery cell 20.

d FIG. 3 is as follows.



e FIG. 5 is as follows.



C Cited Document 3

Japanese Unexamined Patent Application Publication No. 2016-146373 (published on August 12, 2016), which is Cited Document distributed before the priority date of the application cited in reasons for refusal stated in the examiner's decision, describes the following together with drawings.

a "[Technical field]

[0001]

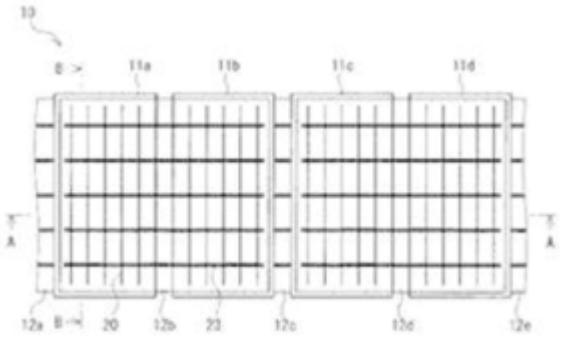
The present invention relates to a solar cell module and a method for manufacturing the same."

b "[0036]

"The planar shape of the solar battery cell 11 is a rectangle. In the solar battery cell 11, the length of an arranging direction of a metal wire 23, which will be described

later, (an axial direction of the metal wire 23: a left-right direction in FIG. 1) is 1/2 of the length of an arranging direction of the finger electrodes 20 and 21 (an axial direction of the finger electrodes 20 and 21: a vertical direction in FIG. 1). That is, the planar shape of the solar battery cell 11 is a shape obtained by dividing a square into two equal parts in one side direction. Usually, the planar shape of the solar battery cell is a square. On the other hand, as described above, the power loss due to the electric resistance of the connecting member 12 is proportional to the square of the current. Therefore, by halving the area of the solar battery cell 11 and doubling the number in this way, the current amount can be reduced while keeping the output power the same, and the power loss can be reduced to 1/4 theoretically."

c FIG. 1 is as follows.



(3) Comparison

The Amended Invention and Cited Invention will be compared.

A "A solar cell," "a semiconductor substrate," "a first conductivity type region," "a second conductivity type region," "a first electrode," and "a second electrode" of Cited Intention respectively correspond to "a solar cell," "a semiconductor substrate," "a first conductivity type region," "a second conductivity type region," "a first electrode," and "a second electrode" of the Amended Invention.

B In Cited Invention, since "the first electrode 42 may include the plurality of finger lines 42a spaced apart from each other with a constant width W5 and a pitch P in the electrode area EA, the finger lines 42a being parallel to each other and parallel to the main edge portions (in particular, the first and second edge portions) of the solar cell 150," "can include bus bar lines 42b formed in the electrode area EA in a direction intersecting the finger lines 42a and connecting the finger lines 42a," and "the bus bar

line 42b can be provided with a line portion 421 that extends long with a relatively narrow width along the direction in which the wiring member 142 is connected, and a pad portion 422 that has a width greater than that of the line portion 421 and increases the connection area with the wiring member 142," an extending direction of "a finger line 42a" and "a direction intersecting the finger line 42a" of Cited Invention respectively correspond to "a first direction" and "a second direction" of the Amended Invention, and it is common with the configuration that "the first electrode includes a plurality of finger lines positioned in a first direction parallel to the long axis and being parallel to each other, and a plurality of bus bars including a plurality of pad portions positioned in a second direction parallel to the short axis" of the Amended Invention in the point "the first electrode includes a plurality of finger lines positioned in a first direction parallel to one axis and being parallel to each other, and a plurality of bus bars including a plurality of pad portions positioned in a second direction parallel to the other axis."

C In Cited Invention, since "the plurality of pad portions 422 are provided along the bus bar lines 42b, and are equipped with pad portions respectively positioned on both sides," it has a configuration that "the plurality of pad portions include a first outer pad and a second outer pad respectively located on opposite ends in the second direction" of the Amended Invention.

D From A to C above, the Amended Invention and Cited Invention correspond to each other in the following point, and differ in Different Features 1 to 3.

<Corresponding Feature>
"A solar cell, comprising:
a semiconductor substrate;
a first conductivity type region formed on one surface of the semiconductor substrate;
a second conductivity type region formed on the other surface of the semiconductor substrate;
a first electrode electrically connected to the first conductivity type region; and
a second electrode electrically connected to the second conductivity type region,
wherein the first electrode includes a plurality of finger lines positioned in a first direction parallel to one axis and being parallel to each other, and a plurality of bus bars including a plurality of pad portions positioned in a second direction parallel to the other axis, and

wherein the plurality of pad portions includes a first outer pad and a second outer pad respectively located on opposite ends in the second direction."

<Different Feature 1>

Regarding "a semiconductor substrate," in the Amended Invention, it "has a long axis and a short axis that intersect each other," whereas, such a feature is not specified in Cited Invention.

<Different Feature 2>

Regarding "finger lines" and "bus bars," in the Amended Invention, "finger lines" are "positioned in a first direction parallel to the long axis," and "bus bars" are "positioned in a second direction parallel to the short axis," whereas such a feature is not specified in Cited Invention.

<Different Feature 3>

In the Amended Feature, "a pitch of the bus bar in the first direction with respect to the width of the semiconductor substrate in the second direction is 0.1 to 0.35," whereas such a feature is not specified in Cited Invention.

(4) Judgment

A Regarding Different Features 1 and 2

Since Different Features 1 and 2 are related to each other, they are examined together.

In a technical field of solar cells, it is well-known, as described in Cited Documents 2 and 3, that a square shaped solar cell is divided into two parts to be used as a rectangular solar cell having a long axis and a short axis, and that when forming the rectangular solar cell, finger lines (corresponding to "grid electrodes 13" of Cited Document 2, and "finger electrodes 20 and 21" of Cited Invention 3) are positioned in parallel to a long axis, and bus bars (corresponding to "light-receiving surface bus electrodes 14" of Cited Document 2, and a part of "a metal wire 23" of Cited Document 3) are positioned in parallel to a short axis. Further, it is obvious that the rectangular shape of the solar cell means that the semiconductor substrate is also rectangular.

Then, in the technical field of solar cells, how to set the shape of a solar cell is a matter which can be appropriately selected by a person skilled in the art, and in the Amended Invention, since no special circumstances to form the solar cell in a square shape can be found, it could be easily conceived by a person skilled in the art to apply the well-known matter to Cited Invention and to make the configuration of the

Amended Invention relating to Different Features 1 and 2.

B Regarding Different Feature 3

Since Cited Invention has the configuration that "the number of the wiring members 142 (or the number of the bus bar lines 42b) located on one surface of the solar cell 150 has a certain relationship with the width W1 of the wiring members 142, and when 6 to 33 wiring members 142 having a width W1 of 250 μm to 500 μm are provided, the output of the solar cell panel 100 has an excellent value," it may include the aspect in which the number of the wiring members 142 is 6 to 19; that is, the aspect in which the number of the bus bar lines 42b is 6 to 19.

Then, as explained in A above, when applying the well-known matter to Cited Invention, assuming the aspect in which the number of the wiring members 142 is 6 to 19; that is, the aspect in which the number of the bus bar lines 42b is 6 to 19, the pitch of the bus bar line 42b becomes about 1/7 to 1/20 of the width of the long axis of the solar cell (semiconductor substrate). Since the width of the long axis is about twice the width of the short axis, the pitch of the bus bar line 42b is about 1/3.5 (=0.29) to 1/10 (=0.1) of the width of the short axis (the width of the semiconductor substrate in the second direction of the Amended Invention), which becomes a value that satisfies the numerical limitation related to Different Feature 3.

Therefore, it can be said that the numerical limitation related to Different Feature 3 is extremely likely to be satisfied as a result in Cited Invention when applying the well-known matter to Cited Invention as explained in the above item A, so that it is cannot be said that it is an exceptional numerical range. Further, according to the description of the present specification, no particular critical significance is recognized.

Therefore, the numerical limitation is merely a design matter that could be appropriately set by a person skilled in the art as necessary.

C Regarding the functions and effects

The effects of the Amended Invention according to Different Features 1 to 3 are of a degree that can be predicted by a person skilled in the art from Cited Invention and the well-known matter.

D Appellant's allegation

The Appellant, in the written request for appeal, alleges that

"C2) In particular, conventionally, even if the long axis and the short axis were provided, the pitch of the bus bar 42b with respect to the width (W3) of the

semiconductor substrate 160 exceeded 0.35, and the current flow path could not be optimized. From this, it was difficult to actually realize the effect by the solar cell 150 having the short axis and the long axis in order to reduce the current. Against this, the Invention adopts the unique matters specifying the invention, thereby limiting the pitch of the bus bars 42b with respect to the width (W3) of the semiconductor substrate 160 to a certain ratio or less, and thus could effectively improve the efficiency of the solar cell 150 having the short axis and the long axis ([0083]).

C3) Accordingly, as described above, it can be clearly understood that the Invention has critical significance and its technical significance (effect) by adopting the unique matters specifying the invention, that is 'the upper limit value of the pitch is 0.35 or less'".

D2) Accordingly, as described above, it can be clearly understood that the Invention has critical significance and its technical significance (effect) by adopting the unique matters specifying the invention, that is 'the upper limit value of the pitch is 0.1 or more'".

Examining the allegation, as explained in B above, the point that "a pitch is 0.1 to 0.35" is a numerical value that can be assumed from the aspect in which the number of bus bar lines 42b in Cited Invention is 6 to 19, and according to the allegation and the description of the specification, no particular technical or critical significance is found in the numerical limitation, so that adopting such a numerical limitation is merely a design matter that could be appropriately set by a person skilled in the art as necessary.

Thus, the Appellant's allegation cannot be accepted.

(5) Summary

Accordingly, the Amended Invention could have been easily made by a person skilled in the art on the basis of Cited Invention and the well-known matter, and the appellant should not be granted a patent for it independently at the time of patent application under the provisions of Article 29(2) of the Patent Act.

3 Closing on the Amendment

As described above, since the Amendment violates the provision of Article 126(7) of the Patent Act which is applied mutatis mutandis in the provisions of Article 17-2(6) of the Patent Act, the Amendment shall be dismissed under the provisions of Article 53(1) of the Patent Act applied mutatis mutandis by replacing certain terms pursuant to Article 159(1) of the Patent Act.

Therefore, the decision to dismiss the amendment shall be made as described in

the conclusion.

No. 3 Regarding the Invention

1 The Invention

Since the amendment dated March 27, 2019 was dismissed as described above, although the invention before the Amendment corresponding to the Amended Invention is the invention according to Claim 1 of the Scope of Claims in the written amendment submitted on October 10, 2018, the invention according to Claim 1 (hereinafter, referred to as "the Invention") is as specified by the matter described in Claim 1, as described in No. 2 [Reason] 1 (2) above.

2 Reason for refusal stated in the examiner's decision

The reason for refusal stated in the examiner's decision, is that

the invention according to Claim 1 of the present application could have been easily invented by a person having a usual knowledge in the technical field to which the Invention belongs before the application was filed, on the basis of the invention described in Cited Document 1 distributed before the priority date of the application, and the well-known matter, and accordingly, the appellant should not be granted a patent for the Invention under the provisions of Article 29(2) of the Patent Act.

3 Regarding inventive step

(1) Cited Documents

Cited Documents 1 to 3 cited and described matters thereof cited in the reasons for refusal stated in the examiner's decision are as described in No. 2 [Reason] 2 (2) above.

(2) Comparison / Judgment

The Invention is one that, regarding "a pitch of the bus bar," omits the limitation matter of "0.1 to" from the Amended Invention examined in No. 2 [Reason] 2 above.

Then, the Amended Invention that corresponds to one including all the matters specifying the Invention and limiting that could have been easily invented by a person skilled in the art on the basis of Cited Invention and the well-known matter, as described in No. 2 [Reasons] 2 above, so that the Invention is also one that could have been easily invented by a person skilled in the art on the basis of Cited Invention and the well-known matter.

No. 4 Closing

As described above, the Invention could have been easily invented by a person skilled in the art on the basis of Cited Invention and the well-known matter, and thus the Appellant should not be granted a patent for the invention in accordance with the provisions of Article 29(2) of the Patent Act.

Accordingly, the application should be rejected without examining inventions relating to other claims.

Therefore, the appeal decision shall be made as described in the conclusion.

February 3, 2020

Chief administrative judge: SEGAWA, Katsuhisa
Administrative judge: INOUE, Hiroyuki
Administrative judge: NOMURA, Nobuo