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Translucent photovoltaic device, translucent photovoltaic product and method of manufacturing the same

Abstract

Translucent photovoltaic product, method of manufacturing the same and manufacturing apparatus. The method comprises: depositing a stack of layers on a carrier substrate, the stack comprising a first electrode layer, a photovoltaic layer and a second electrode layer; cutting through the substrate with the stack of layers to form a first and a second mutually disjoint sections; separating the first and the second section from each other; laminating the first section and the second section with a respective further substrate at a side opposite the carrier substrate to form a respective first and second photovoltaic device; and assembling the photovoltaic product from the first photovoltaic device and the second photovoltaic device, wherein the first and the second sections are mutually complementary comb shaped structures and wherein the second photovoltaic device is arranged in a second plane parallel to and in front of a first plane of said first photovoltaic device.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

(1) This patent application is a U.S. National Phase of PCT International Application No. PCT/NL2020/050809, filed Dec. 18, 2020, which claims priority to European Application No. 19218018.0, filed Dec. 19, 2019, which are both expressly incorporated by reference in their entireties, including any references contained therein.

BACKGROUND

(2) The present invention pertains to a translucent photovoltaic device.

(3) The present invention further pertains to a translucent photovoltaic product comprising a plurality of translucent photovoltaic devices.

(4) The present invention still further pertains to a method of manufacturing the device and the product.

(5) A photovoltaic device typically comprises a photovoltaic stack comprising at least a photovoltaic layer sandwiched between a first electrode and a second electrode.

(6) Translucent photovoltaic devices are widely applicable in situations wherein it is desired to moderate the strength of solar radiation and to convert the absorbed solar radiation into electric energy.

(7) Photovoltaic products are known for this purpose wherein the photovoltaic stack is interrupted by a pattern of translucent sections. The photovoltaic stack may be provided for example in the pattern of a comb, wherein the spaces between the teeth of the comp are of a translucent material.

(8) Current methods of manufacturing include a first stage wherein the layers of the photovoltaic stack are deposited homogeneously over the full area of the device and a subsequent stage wherein the photovoltaic stack is locally removed to provide for the pattern of translucent sections. It is a disadvantage that a substantial amount of valuable material is lost.

SUMMARY

(9) It is an object of the present disclosure to provide a method of manufacturing a translucent photovoltaic device that at least mitigates this disadvantage.

(10) This is achieved by the measures of independent claim **1**. Contrary to the known method, an additional step is provided of cutting through the substrate with the stack of layers to form a plurality of laterally disjoint sections wherein an amount of material removed by said cutting is at least 10 times smaller than an amount of material remaining in the plurality of sections. This additional step makes it possible to subsequently separate the plurality of sections from each other. The separated sections can then each be used in a subsequent process, so that a loss of material is substantially lower than the loss that occurs in a conventional process, wherein the material which is not part of the sections to be manufactured is wasted. A very efficient way to perform the additional step is by laser cutting. This approach is also advantageous, in that it allows execution of the cutting step while the substrate with the stack is moving, e.g. in a roll to roll process. Another approach is to cut the substrate with the stack in a mechanical manner, an example of which is presented below in more detail. Whereas a cutting step according to this approach is more difficult to apply to a moving product, it is advantageous in that the separation of the sections can be achieved with a substantially lower loss of material. When applying laser cutting, the width of the track may be in the order of a few micron to a few tens of microns, whereas when using a mechanical cutting tool, the width of the track may be reduced to the order of magnitude of a micron. Therewith, given a target loss of material which is at most 10% of the amount of material remaining in the plurality of sections, the use of a mechanical cutting tool enables a more fine-grained partitioning.

(11) The present disclosure further provides a translucent photovoltaic product comprising a pair of photovoltaic devices obtained with the improved method. The first photovoltaic device therein has first section on a first further substrate portion and the second photovoltaic device has the second section on a second further substrate portion. The first section and the second section have a

substantially complementary comb-shape. In the photovoltaic product the first photovoltaic device may be arranged in a first plane and the second photovoltaic device may be arranged in a second plane parallel to and in front of a first plane. In particular, the first photovoltaic device and the second photovoltaic device may be movably arranged with respect to each other along at least one direction defined by the first plane. Therewith a translucency of the photovoltaic product can be controlled by a relative movement of the first photovoltaic device and the second photovoltaic device.

(12) The present disclosure further discloses a manufacturing apparatus to manufacture a translucent photovoltaic device that comprises one or more deposition devices, a cutting station and separation means.

(13) The one or more deposition devices are provided to deposit a stack of layers, comprising at least a first electrode layer, a photovoltaic layer and a second electrode layer on a carrier substrate.

(14) The cutting station is provided to cut through the substrate with the stack of layers to form a plurality of laterally disjoint sections, wherein an amount of material removed by said cutting is at least 10 times smaller than an amount of material remaining in the plurality of sections.

(15) The separation means is to separate the plurality of sections from each other.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) These and other aspects are described in more detail with reference to the drawing. Therein:

(2) FIG. **1**A schematically shows an exemplary method of manufacturing a translucent photovoltaic device;

(3) FIG. **1**B schematically shows a translucent photovoltaic device obtained with the method;

(4) FIG. **1**C schematically shows a photovoltaic product obtained with the method;

(5) FIG. **2**A is a top view according to IIA in FIG. **1**A, that schematically shows a semi-finished device obtained after a first step of the method;

(6) FIG. **2**B is a top view according to IIB in FIG. **1**A, that schematically shows a semi-finished device obtained after a second step of the method;

(7) FIG. **2**C is a top view according to IIC in FIG. **1**B, that schematically shows a semi-finished device obtained after a fourth step of the method;

(8) FIG. **3** shows another exemplary method of manufacturing a translucent photovoltaic device;

(9) FIG. **4** shows various configurations of translucent photovoltaic devices in a photovoltaic product;

(10) FIGS. **5**, **5**A and **5**B illustrate in more detail a step in an embodiment of the method;

(11) FIG. **6**A-**6**F illustrate in more detail another step in an embodiment of the method;

(12) FIGS. **7**A and **7**B illustrate a further embodiment;

(13) FIGS. **8**A and **8**B illustrate a still further embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

(14) Like reference symbols in the various drawings indicate like elements unless otherwise indicated.

(15) FIG. **1**A. schematically shows a method of manufacturing a translucent photovoltaic device. In the embodiment shown the method is performed in a roll to roll process. An upper portion of FIG. **1**A shows a part RA-RB of the roll to roll process. A lower portion shows a subsequent part RB-RC of the roll to roll process. Alternatively the method may be performed batch-wise. It may further be contemplated to perform some of the steps in a roll to roll process and others according to a batch procedure.

(16) The method shown in FIG. **1**A comprises depositing S**1** a stack **20** of layers on a carrier substrate **10**. Dependent on the device specifications and the embodiment of the method used, the

carrier substrate **10** may for example be a polymer like PET or PEN or PI, a metal foil or a composite, e.g. comprising one or more layers of a metal and one or more layers of a polymer. The stack **20** comprises at least: a first electrode layer **21**, a photovoltaic layer **23**, and a second electrode layer **25**. The first electrode layer **21** may be provided as a cathode and the second electrode layer **25** as an anode or reversely. As becomes apparent from the description below other layers may be present below, between and/or on top of these three layers. In embodiments a layer may comprise a plurality of sub-layers.

(17) In the embodiment shown, a first deposition device **111** is used in a sub-step S**1***a* to deposit a first electrode layer **21**. A second deposition device **112** is used in a sub-step S**1***b* to deposit a first charge-carrier transport layer **22**. A third deposition device **113** is used in a sub-step S**1***c* to deposit a photovoltaic layer **23**. A fourth deposition device **114** is used in a sub-step S**1***d* to deposit a second charge-carrier transport layer **24**. A fifth deposition device **115** is used in a sub-step S**1***e* to deposit a second electrode layer **25**. The upper-surface of the carrier substrate **10** with stack **20** as seen in direction IIA is schematically shown in FIG. **2**A. It is noted that various types of deposition devices are available to perform the first step. Examples thereof are vapor deposition methods such as thermal evaporation, e-beam evaporation, sputtering, magnetron sputtering, reactive sputtering, reactive evaporation, etc. and all kinds of chemical vapor deposition methods such as thermal chemical vapor deposition (CVD), photo assisted chemical vapor deposition (PACVD), plasma enhanced chemical vapor deposition (PECVD), (e.g. E-beam PVD, Sputter PVD), (spatial) Atomic Layer Deposition ((s)ALD). Alternatively or additionally, coating techniques may be applied. Examples thereof are spin coating, slot-die coating, kiss-coating, hot-melt coating, spray coating, etc. and all kinds of printing techniques, such as inkjet printing, gravure printing, flexographic printing, screen printing, rotary screen printing, etc. In some examples a single deposition apparatus may be employed to subsequently deposit mutually different layers. Also deposition apparatuses are available that are capable of directly depositing a plurality of layers.

(18) In this roll to roll process, the carrier substrate **10** with the stack **20** is continuously transported in a direction P.sub.AB and is therewith guided along a laser-cutting station **120**, where the substrate **10** with the stack of layers **20** is cut through (S**2**) to form a plurality of laterally disjoint sections A (**10**A+**20**A) and B(**10**B+**20**B). Therewith the stack of layers is supported by a support, e.g. a belt (not shown). Alternatively, mechanical means may be applied, as shown for example in FIG. **5**, **5**A, **5**B. The upper-surface of the carrier substrate **10** with stack **20** as seen in direction IIB, subsequent to step S**2** is schematically shown in FIG. **2**B. As shown further in FIG. **2**C, the plurality of sections comprise a first section A and a second section B that form a pair of interdigitated structures. In this example section **20**A is formed as comb-structure having parallel strips **20**A**1** extending from a base **20**A**2**. Similarly, section **20**B is formed as comb-structure having parallel strips **20**B**1** extending from a base **20**B**2**. Only a minor amount **20**X of material is removed in this cutting step. The amount **20**X which is lost is at least 10 times smaller than an amount of material remaining in the plurality of sections. For example the parallel strips **20**A**1**, **20**B**1** may have a width of about 50 micron and the trenches **20**X between them may have a width in the order of 1 micron.

(19) As a subsequent step S**3**, the plurality of sections A, B are separated from each other. In the embodiment shown, this is achieved with the following sequence of sub-steps.

(20) A lamination unit **131**, arranged further stream-downwards in the transportation direction P.sub.AB of the roll to roll process, is provided to laminate (step S**3**A) the one or more of the sections to be separated with a further substrate **30**. The further substrate **30** is provided with an adhesive coating **40**B, **40**B′ in a pattern corresponding to that of one sections, here section B.

(21) The carrier substrate **10** with the stack **20** having laminated thereon the further substrate **30** is then transported to further laser cutting station **132** which performs a step S**3**AB, wherein the further substrate **30** is partitioned into further substrate sections **30**B. Alternatively, the further substrate **30** may be laminated already as further substrate sections **30**B, therewith obviating the

step S**3**AB. Further stream downwards, in the direction P.sub.BC, a delamination device **133** is provided that performs a sub-step S**3**B wherein the further substrate sections **30**B having adhered thereto the sections B are separated from the sections A. In an embodiment, the further substrate **30** may be continuous and the further substrate sections **30**B having adhered thereto the sections B may be partitioned after delaminating. As shown in FIG. **1**A, a further substrate section **30**B having adhered thereto second sections B forms a photovoltaic device **1**B. Likewise a sections A can be separated and adhered to a further substrate **30**A to form a photovoltaic device **1**A, as shown in FIG. **1**B. The photovoltaic devices **1**A, **1**B may be subjected to further processing steps, for example to provide one or more protection layers, to provide a getter material, to provide electrical connections and/or to provide electric bypass elements.

(22) FIG. **3** further illustrates an embodiment of the method wherein the upper portion (a) of the figure shows the result of the first step S**1**, the central portion (b) of the figure shows the result of the second step S**2**, and the lower portion (c) of FIG. **3** shows the third step S**3**. The delamination device **133** used therein is a delamination roller. In this third step S**3**, the further substrate **30**B is continuous. After being delaminated together with the sections B, from the support SP with the sections A, the further substrate **30**B may partitioned.

(23) FIG. **1**C shows a further method step S**4**, wherein a photovoltaic product **100** is assembled from the first photovoltaic device **1**A and the second photovoltaic device **1**B. The second photovoltaic device **1**A is arranged in a second plane PB, indicated as the center plane of the further substrate **30**B parallel to and in front of a first plane PA, indicated as the center plane of the further substrate **30**A of the first photovoltaic device **1**A.

(24) FIG. **1**C, further shows that the first photovoltaic device **1**A and the second photovoltaic device **1**B may be assembled in step S**4** so as to be movably arranged with respect to each other. As shown in FIG. **1**C, the second photovoltaic device **1**B can be moved with respect to the first photovoltaic device **1**A along a direction B that is aligned with the plane PA.

(25) FIG. **4** shows five exemplary configurations **100**A, **100**B, **100**C, **100**D, **100**E of the first photovoltaic device **1**A and the second photovoltaic device **1**B in the photovoltaic product **100** obtained in step S**4**. In exemplary configurations **100**A, the parallel strips **20**A**1** of photovoltaic device **1**A (See FIG. **2**C) fully cover the spaces between the parallel strips **20**B**1** of photovoltaic device **1**B. Therewith the configuration **100**A is an opaque mode of photovoltaic product **100**, and almost all (solar) radiation incident on the surface formed by the photovoltaic product **100**. is captured for conversion into electrical energy. In configuration **100**B, the photovoltaic device **1**B is moved slightly in the direction B**1** of the parallel strips **20**B**1**, so that openings **110** are formed that transmit light. The total surface area of the photovoltaic product **100** is enlarged and the surface area available for capturing solar radiation for opto-electrical conversion remains the same. In configuration **1**C, the second photovoltaic device **1**B is shifted further away in the direction B**1**, so that the total surface area of the photovoltaic product **100** is doubled. The surface area available for capturing solar radiation for opto-electrical conversion remains the same and about a same surface area is available for transmitting light. A photovoltaic product **100** which is configurable by movement of photovoltaic device **1**B in the direction B**1** can therewith be used as a roof like element of which the total surface can be adapted without changing the surface area available for power production.

(26) In configuration **100**D, the photovoltaic device **1**B is moved relative to photovoltaic device **1**A in a direction B**2**, which is in a direction transverse to direction B**1**, but also aligned with the planes PA, PB. With a relatively small movement in the direction B**2**, the photovoltaic product **100** becomes translucent, without significantly changing its surface area. About half the surface area becomes available for transmission of solar radiation in configuration **100**D.

(27) Hence a photovoltaic product **100** being configurable by a relative translation of the photovoltaic device **1**B relative to photovoltaic device **1**A in a direction B**2** is suitable for applications wherein it is required that the translucence of the photovoltaic product can be

controlled, without significantly changing the total surface area of the photovoltaic product.

(28) In a still further embodiment of the photovoltaic product **100**, the photovoltaic device **1**B can be moved relative to photovoltaic device **1**A in a direction B**2**, in any direction aligned with the planes PA, PB. Such a photovoltaic product **100** may for example be reconfigured from configuration **100**C to configuration **100**E by a translation in the direction B**2** or from a configuration **100**D to configuration **100**E by a translation in the direction B**1**. Therewith this further embodiment of the photovoltaic product **100** is suitable for a wide range of applications.

(29) FIG. **5**, **5**A, **5**B shows an exemplary mechanical cutting tool **122**, **125** which is suitable for use in step S**2** of the method. The cutting tool comprises an anvil **122** of which a top-view according to VA in FIG. **5** is shown in FIG. **5**A, and of which a cutter **125** of which a bottom-view according to VB in FIG. **5** is shown in FIG. **5**B. The cutter **125** has a form complementary to that of a recession **124** in the anvil. More in particular, the cutter **125** has a cutting edge **126** that faces an edge of the recession **124** in the anvil **122**, and the cutter has a recessed portion **127** within the cutting edge **126**. The depth of the recessed portion **127** gradually increases in a direction from the cutting edge **126** towards a centerline **128** within opposing parts of the cutting edge **126**.

(30) FIG. **6**A-**6**D shows a step of cutting S**2** through the stack of layers to form a plurality of laterally disjoint sections A, B in an embodiment of the method using the tool of FIG. **5**, **5**A, **5**B. As shown therein, a substrate **10** with the stack **20** is provided between the anvil **122** and the cutter **125**. FIG. **6**A shows a first stage S**2**A of step S**2**, wherein the substrate **10** with stack **20** is positioned on the anvil **122**. There it rests on the surface **123** of the anvil **122** between the recession **124**. The cutter **125** does not contact the substrate **10** with stack **20**.

(31) FIG. **6**B shows a second stage S**2**B of step S**2**. Therein the cutter **125** is moved down towards the anvil **122**, so that its cutting edge **126** touches the surface of the stack **20**. During this movement the cutting edge **126** of the cutter **125** gradually cuts through the substrate **10** with stack **20** so that a first and a first section are formed, wherein section A is pressed into the recession **124** of the anvil **122**, whereas section B remains at the level of surface **123** of the anvil **122**. This final stage S**2**C is illustrated in FIG. **6**C.

(32) Now the cutter **125** is removed in stage S**2**D of step S**2**, shown in FIG. **6**D, so that the two sections A, B can be accessed for further processing steps. FIG. **6**E shows an exemplary further processing step, S**3**A, which is a first stage of separation step S**3**. Therein section B (of substrate **10** and stack **20**) is adhered to further substrate **30**B. For this purpose an adhesive may be provided on the surface of the stack **20** or the surface of the further substrate **30**B facing the stack, or both. Any adhesive may be used for this purpose, as only section B comes into contact with the substrate **30** in this stage S**3**A. The element **133** may be a plate which is pressed against the surface of the further substrate **30**B facing away from the section B. It may for example hold the further substrate **30**B during the operation by a vacuum created in openings in its surface facing the further substrate **30**B. As an alternative the element **133** may be a roller, which adheres the further substrate **30**B to section B in a rolling movement.

(33) After section B is adhered to further substrate **30**B and removed from the anvil **122** in stage S**3**A of step S**3**, section A may be processed in a similar manner as shown in FIG. **6**F where it is adhered to another further substrate **30**A.

(34) FIGS. **7**A and **7**B shows step S**3** in an embodiment of the method. Therein FIG. **7**A show the execution of this step in a side-view, and FIG. **7**B shows a top-view of the substrate **10** with stack **20**. The substrate **10** with stack **20**, which are partitioned into sections A, B in a previous step S**2**, are supplied in a direction D sliding over a temporary support SP towards a pair of lamination rollers **220**A, **220**B. The first lamination roller **220**A carries a first further substrate **230**A that is provided with an adhesive coating having a pattern conformal to that of the sections A. The second lamination roller **220**B carries a second further substrate **230**B that is provided with an adhesive coating (not-shown) having a pattern conformal to that of the sections B. As a result, the sections A are adhered to the first further substrate **230**A, and the sections B are carried to the second further

substrate **230**B.

(35) FIGS. **8**A and **8**B shows step S**3** in another embodiment of the method. In a first sub-step S**3**A, the substrate **10** with stack **20**, partitioned into sections A, B are supplied in a direction D sliding over a temporary support SP towards a pair of lamination rollers **320**A, **320**B. In this case, the sections A and B are directly adhered to lamination rollers **320**A and **320**B respectively. To that end lamination roller **320**A is provided with an adhesive layer (not-shown) of an adhesive of a first type T**1**, having a pattern conformal to that of the sections A and the adhesive T**1** is provided on the surface of the lamination roller **320**B with a pattern conformal to that of the sections B. Lamination roller **320**A rotates in a clockwise direction to have at its surface a tangential velocity equal to the velocity of the substrate **10** with stack **20** in the direction D. Analogously, lamination roller **320**B rotates in a counterclockwise direction to have at its surface a tangential velocity equal to the velocity of the substrate **10** with stack **20**. Upon completion of the first sub-step S**3**A, lamination roller **320**A carries one or more partitions A, and lamination roller **320**B carries one or more partitions B.

(36) In a subsequent second sub-step S**3**B, the sections A and B are transferred from the lamination rollers **320**A, **320**B to a respective target substrate. For example, FIG. **8**B shows how three sections B are laminated by the lamination roller **320**B onto the target substrate **340**B. This may for example be the case in that the lamination roller **320**B rotates and translates with a velocity equal to the tangential velocity of the surface of the substrate **10** facing the target substrate **340**B in a direction X over the surface of the target substrate **340**B. Alternatively, the lamination roller **320**B may have its rotation axis at a fixed position and the target substrate **340**B may be translated in a direction −X, provided that the relative velocity of the surface of the substrate **10** facing the target substrate **340**B is substantially equal to the velocity of the target substrate **340**B. The target substrate **340**B may be provided with a layer of an adhesive of a second type T**2**, which exerts an adhesive force on the section B exceeding the adhesive force exerted by the adhesive of the first type T**1** provided on the surface of the lamination roller **320**B. Alternatively, a same adhesive may be applied on the surface of the lamination roller **320**B and the target substrate **340**B, and the adhesive on the lamination roller **320**B may be weakened in step S**3**B, for example by heating the lamination roller **320**B. In again another embodiment the lamination rollers **320**A, **320**B may be configured to hold the sections A and B respectively by applying a vacuum to microscopic openings on the surface of the rollers. It is noted that the two step approach demonstrated in FIG. **8**A, **8**B is very suitable for applications wherein the target substrate, e.g. **340**B is a rigid substrate, such as glass.

(37) In the claims the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A single component or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A translucent photovoltaic product comprising: a first section and a second section cut from respective sections of a stack of layers deposited on a carrier substrate, the stack comprising at least: a first electrode layer, a photovoltaic layer and a second electrode layer; a first photovoltaic device formed with the first section on a first further substrate portion; and a second photovoltaic device formed with the second section on a second further substrate portion, wherein the first section and the second section have a substantially complementary comb-shape, the first section comprising first parallel strips having a width W and a space of width S between subsequent ones of the first parallel strips, the second section comprising second parallel strips also having a width W and a space of width S between subsequent ones of the second parallel strips, wherein a ratio

(S−W)/W is at most 0.2, and wherein the first photovoltaic device is arranged in a first plane and the second photovoltaic device is arranged in a second plane parallel to and in front of the first plane.

2. The translucent photovoltaic product according to claim 1, wherein the first photovoltaic device and the second photovoltaic device are movably arranged with respect to each other along at least one direction defined by the first plane.

3. The translucent photovoltaic product according to claim 2, wherein the first section with which the first photovoltaic device is formed has first parallel strips extending from a first base, wherein the second section with which the second photovoltaic device is formed has second parallel strips extending from a second base, wherein the first photovoltaic device and the second photovoltaic device are movably arranged with respect to each other at least according to a first direction aligned with the first parallel strips and the second parallel strips allowing the second parallel strips of the second section to cover the spaces between the first parallel strips of the first section to an extent defined by the relative position in the first direction.

4. The translucent photovoltaic product according to claim 2, wherein the first section with which the first photovoltaic device is formed has first parallel strips extending from a first base, wherein the second section with which the second photovoltaic device is formed has second parallel strips extending from a second base, and wherein the first photovoltaic device and the second photovoltaic device are movably arranged with respect to each other at least according to a second direction transverse to a direction of the first parallel strips and the second parallel strips allowing the second parallel strips of the second section to cover the spaces between the first parallel strips of the first section to an extent defined by the relative position in the second direction.

5. A translucent photovoltaic product comprising: a first photovoltaic device, and a second photovoltaic device, wherein the first photovoltaic device and the second photovoltaic device respectively comprise a first section and a second section cut from respective sections of a stack of layers deposited on a carrier substrate, the stack comprising at least: a first electrode layer, a photovoltaic layer and a second electrode layer; wherein the first photovoltaic device is formed with the first section on a first further substrate portion and the second photovoltaic device formed with the second section on a second further substrate portion, wherein the respective materials of the carrier substrate, the first electrode layer, the photovoltaic layer and the second electrode layer of the first section are the same as those of the carrier substrate, the first electrode layer, the photovoltaic layer and the second electrode layer of the second section; wherein the first section and the second section have a substantially complementary comb-shape, the first section comprising first parallel strips having a width W and a space of width S between subsequent ones of the first parallel strips, the second section comprising second parallel strips also having a width W and a space of width S between subsequent ones of the second parallel strips, wherein a ratio (S−W)/W is at most 0.2, and wherein the first photovoltaic device is arranged in a first plane and the second photovoltaic device is arranged in a second plane parallel to and in front of the first plane.

6. The translucent photovoltaic product according to claim 5, wherein the first photovoltaic device and the second photovoltaic device are movably arranged with respect to each other along at least one direction defined by the first plane.

7. The translucent photovoltaic product according to claim 6, wherein the first section with which the first photovoltaic device is formed has the first parallel strips extending from a first base, wherein the second section with which the second photovoltaic device is formed has the second parallel strips extending from a second base, and wherein the first photovoltaic device and the second photovoltaic device are movably arranged with respect to each other at least according to a first direction aligned with the first parallel strips and the second parallel strips allowing the second parallel strips of the second section to cover the spaces between the first parallel strips of the first section to an extent defined by the relative position in the first direction.

8. The translucent photovoltaic product according to claim 6, wherein the first section with which the first photovoltaic device is formed has first parallel strips extending from a first base, wherein the second section with which the second photovoltaic device is formed has second parallel strips extending from a second base, and wherein the first photovoltaic device and the second photovoltaic device are movably arranged with respect to each other at least according to a second direction transverse to a direction of the first parallel strips and the second parallel strips allowing the second parallel strips of the second section to cover the spaces between the first parallel strips of the first section to an extent defined by the relative position in the second direction.