

Method and device for producing solar modules

The invention relates to a method and a device for producing solar modules.

Such methods and devices are known from practice. In this case,
5 photovoltaic cells are assembled into lines and the solar modules are constructed from electrically interconnected lines.

The object of the invention is to provide a method for producing solar modules and a corresponding device which are conducive to
10 the efficient production of solar modules.

First proposed to achieve the object is a method comprising the means and features of the first independent claim directed to a method for producing solar modules. In particular, for achieving
15 the object, it is thus proposed in the case of the method mentioned above that at least two lines are built up and that the at least two lines are co-fed to a cell-fitting operation for the solar module.

20 The co-feeding, in particular simultaneous feeding, of at least two or more lines allows the cell-fitting operation for the solar module to take place in a shorter time, which is conducive to more efficient production of solar modules.

25 The at least two lines may be co-fed to the cell-fitting operation for the solar module by means of a motorized transfer unit, for example by means of a tray and/or by means of a vacuum table and/or a belt conveyor. The use of a motorized transfer unit can be conducive to the largely or even completely automated
30 production of solar modules.

For fitting the lines into the solar module without changing an arrangement of the photovoltaic cells in the lines produced

during the building up of the lines, it is advantageous if a relative alignment of the photovoltaic cells within one line and/or within two different lines is maintained during the feeding.

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In the finished solar module there may be an electrical voltage level within each of the individual lines of photovoltaic cells. There is therefore no electrical voltage build-up in the longitudinal direction of the lines across the photovoltaic
10 cells of a line. In the finished solar module there may be an electrical voltage build-up across the electrically interconnected lines, and thus transversely or at right angles to a longitudinal direction of the lines.

15 According to the method, the photovoltaic cells can thus be assembled into lines, with an electrical voltage level within each of the individual lines of photovoltaic cells. The solar modules can then be constructed from electrically interconnected lines, with an electrical voltage build-up taking place in the
20 solar module across the electrically interconnected lines, and thus transversely or at right angles to a longitudinal direction of the lines.

For the purposes of the claimed invention, a line can thus be
25 distinguished from a conventional string of photovoltaic cells. In a string, the photovoltaic cells are electrically interconnected in such a way that an electrical voltage build-up takes place in the longitudinal direction of the string across the electrically interconnected photovoltaic cells of the
30 string.

For the electrical connection of photovoltaic cells within a line and/or of photovoltaic cells of different, in particular adjacent, lines, an electrically conductive adhesive may be
35 applied to the photovoltaic cells.

In order to prevent a bead of adhesive from tearing off when applying the electrically conductive adhesive to a line of photovoltaic cells, it may be advantageous to adapt a number of co-fed lines to an application rate of an electrically conductive adhesive. In particular, when photovoltaic cells are arranged in at least two lines by means of a transfer unit, a maximum feed or transfer rate, with which the lines are co-fed to the cell-fitting operation for the solar cell, may be limited by the cycle time of the transfer unit in the arrangement of the photovoltaic cells.

The higher the number of lines that are co-fed, the lower a feed or transfer rate at which the at least two lines can be fed to the cell-fitting operation can be. If the electrically conductive adhesive is to be applied during the feeding of at least two lines of photovoltaic cells to the cell-fitting operation for the solar module, for example by a relative movement of the lines during their feeding to the cell-fitting operation for the solar module in relation to a dispensing unit, with which adhesive is dispensed, it may thus be expedient to adapt a number of co-fed lines to the application rate of the electrically conductive adhesive in order to make the application of the electrically conductive adhesive reliable within the process.

If the application rate of the electrically conductive adhesive in turn is variable, the application rate of the electrically conductive adhesive can also be adapted to a number of co-fed lines.

In one embodiment of the method it is provided that a first group of co-fed lines in a first cycle phase are fed at a first vertical distance from a dispensing unit for electrically conductive adhesive and a second group of co-fed lines are then fed at a

second vertical distance from the dispensing unit, which is different from the first vertical distance. In this embodiment of the method there may therefore be two transfer levels in which different groups of co-fed lines are fed to the cell-fitting operation for solar modules. These transfer levels may be arranged here one vertically above the other, so that the transfer levels have different vertical distances from a dispensing point, for example, a dispensing unit, for electrically conductive adhesive onto the co-fed lines.

In order to create conditions that are conducive for connecting adjacent lines, electrically conductive adhesive may be applied with a lateral offset in relation to a longitudinal central axis of a line of photovoltaic cells to a line. In this way, two adjacent lines can be adhesively bonded to one another while mutually overlapping.

Also proposed to achieve the object is a method for producing solar modules of the type mentioned at the beginning which comprises the features of the second independent claim directed to such a method. To achieve the object, in the case of the method defined at the beginning it is thus proposed in particular that offsetting elements are used during the building up of the lines to form an offset of adjacent lines in relation to one another.

The offset of adjacent lines in relation to one another may be advantageous to produce a mechanically secure and stable connection between adjacent lines within a solar module.

The use of relatively offset lines of photovoltaic cells in a solar module offers the possibility of electrically connecting a photovoltaic cell of a line to multiple photovoltaic cells of the same and/or adjacent lines surrounding the photovoltaic cell on the solar module. This can lead to a solar module that is

constructed in such a way that, even if one or more photovoltaic cells of the solar module are shaded, it provides a high performance.

5 If the offset of adjacent lines in relation to one another is already produced before the solar module is fitted with cells, when the lines of photovoltaic cells are being built up, handling of the lines when the solar module is fitted with cells can be made considerably easier. This can significantly increase the
10 efficiency of the method in the production of solar modules.

It should be mentioned at this point that the use of such offsetting elements may also be useful in the case of the previously mentioned method which is characterized by the
15 features of the first independent claim 1.

Photovoltaic cells that have a shorter length and/or a different geometry compared to other photovoltaic cells of a line may be used for example as offsetting elements.

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In one embodiment of the method, it may be provided that at least two lines offset in relation to one another are co-fed to the cell-fitting operation.

25 The photovoltaic cells that are assembled into lines may be so-called photovoltaic cell shingles.

In one embodiment of the method, groups of at least two lines are built up in parallel in time and are fed to a common cell-fitting operation. In this way, the number of co-fed lines can
30 be increased by scaling the process.

Also proposed to achieve the object is a device for producing solar modules which has the means features of the independent
35 claim directed to such a device. To achieve the object, in the

case of the device defined at the beginning it is thus proposed in particular that this devices means by which the device is set up for carrying out the method according to one of the claims direct to a method for producing solar modules.

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In one embodiment of the device it may be provided that it has a motorized transfer unit, with which at least two lines of photovoltaic cells can be co-fed to a cell-fitting operation for a solar module to be produced.

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A tray, a conveyor table, in particular with a vacuum table, a belt conveyor, in particular with a vacuum table and/or a vacuum table may serve for example as a motorized transfer unit. With the aid of a vacuum table, it is possible to use a vacuum to fix photovoltaic cells arranged in lines on the vacuum table during the feeding to the cell-fitting operation. Fixing photovoltaic cells by means of a vacuum is particularly gentle and can help to reduce or even completely avoid waste in the production of solar modules.

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The motorized transfer unit may be set up to move the photovoltaic cells of the lines from a loading point to an unloading point, at which the lines of photovoltaic cells are removed from the transfer unit for fitting into a solar module.

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At the transfer unit, at least two support positions for each line of photovoltaic cells may be formed and/or defined. In this way, it is possible with the transfer unit to co-feed at least two lines of photovoltaic cells to a cell-fitting operation for solar modules.

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In the case of a preferred embodiment of the device, the transfer unit may have at least one series of suction openings for each support position. In this way, rows of photovoltaic cells

arranged on the at least two support positions of the transfer unit can be fixed on the transfer unit by means of a vacuum.

The device may comprise a vacuum generating unit, with which
5 lines of photovoltaic cells can be fixed on the transfer unit by a vacuum, in particular during the co-feeding of at least two lines to the cell-fitting operation for a solar module. As already previously mentioned, the use of vacuum to fix the lines allows particularly gentle, and therefore efficient, fixing of
10 photovoltaic cells during their feeding on the transfer unit.

The vacuum generating unit may be connected here to suction openings of the transfer unit. The vacuum generated by the vacuum generating unit can be transferred to the lines of photovoltaic
15 cells via the suction openings of the transfer unit.

The device may also have a dispensing unit for dispensing electrically conductive adhesive onto lines of photovoltaic cells. The dispensing unit may be arranged in such a way that
20 dispensing of electrically conductive adhesive onto lines of photovoltaic cells that are arranged on the transfer unit is possible. The dispensing unit may for example be arranged between a loading point, at which the photovoltaic cells are arranged for the building up of lines on the previously mentioned transfer
25 unit, and an unloading point, at which the lines are unloaded from the transfer unit. In this way, it is possible to apply the electrically conductive adhesive to the lines of photovoltaic cells with the aid of the dispensing unit by a relative movement between the dispensing unit and the transfer unit. The lines can
30 thus be provided with electrically conductive adhesive during their transfer between the loading point and the unloading point. If necessary, here the relative movement may be the transfer movement of the lines.

The dispensing unit may have a number of dispensing nozzles corresponding to a number of support positions for lines of photovoltaic cells of the transfer unit. In this way it is possible to provide all of the lines of photovoltaic cells that are arranged on the transfer unit during the transfer with electrically conductive adhesive.

In one embodiment of the device it is provided that the dispensing unit, in particular at least one dispensing nozzle of the dispensing unit, from which electrically conductive adhesive can be applied to lines of photovoltaic cells is movable in the longitudinal direction of support positions of the transfer unit for lines, and thus in the longitudinal direction of lines arranged on the transfer unit. This allows electrically conductive adhesive to be applied to lines of photovoltaic cells that are fed to the cell-fitting operation with the aid of a transfer unit, wherein the transfer unit carries out a transfer movement that is aligned transversely or at right angles to the longitudinal direction of the lines of photovoltaic cells arranged on the transfer unit. Here, the movement of the dispensing unit, in particular its dispensing nozzles, may then be aligned transversely or correspondingly at right angles to the transfer movement of the transfer unit.

The device may have a magazine for providing photovoltaic cells. The magazine may for example comprise a conveying means, for example a conveyor belt, on which a supply of photovoltaic cells and/or offsetting elements can be moved into a removal position. This is conducive to particularly efficient and largely uninterrupted provision of photovoltaic cells for the production of solar modules.

The device may also have a transfer unit, in particular with a handling robot, for example a swivel-arm robot, with which photovoltaic cells can be arranged in lines on the transfer unit.

With the aid of the transfer unit, the photovoltaic cells and/or offsetting elements can for example be removed from the already previously mentioned magazine.

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The transfer unit, in particular the previously mentioned handling robot, may have at least one suction gripper. With the aid of a suction gripper, photovoltaic cells can be gripped particularly gently and also released again.

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For monitoring photovoltaic cells, the device may have a monitoring unit. The monitoring unit may comprise at least one optical monitoring means, for example a camera. In one embodiment of the device, the monitoring unit is provided between a magazine for providing photovoltaic cells and the transfer unit, in particular between the magazine for providing photovoltaic cells and the already previously mentioned transfer unit of the device, with which photovoltaic cells can be removed from the magazine and arranged in lines on the transfer unit. This allows the photovoltaic cells taken out of the magazine to be checked before they are arranged in lines on the transfer unit.

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The magazine may comprise at least one belt conveyor, with which the photovoltaic cells can be brought into a removal position.

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The device may also have a cell-fitting unit, in particular with at least one gripper, preferably with at least one suction gripper. The cell-fitting unit may be adapted to receive at least one or more or all of the lines of photovoltaic cells which are provided by the transfer unit at a unloading point and/or to transfer them to a downstream processing step and/or handling step, in particular to a downstream transporting unit of the device. With the aid of the cell-fitting unit, it is possible to fit the lines of photovoltaic cells provided by the transfer unit into the solar module.

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The device may have a transporting unit downstream of the transfer unit. With the aid of the transporting unit, at least one solar module fitted with lines of photovoltaic cells can be fed to a downstream processing station. A downstream processing station may for example be an oven in which electrically conductive adhesive which can be used to connect the lines of photovoltaic cells of a module to one another is cured. A downstream processing station may also be for example a packaging and/or loading station. For example, a layup, which may be set up for matrix transfer, may be used as a packaging and/or loading station.

In one embodiment of the device it is provided that a transfer movement of the transfer unit is aligned transversely, in particular at right angles, to a longitudinal direction of support positions for lines of photovoltaic cells on the transfer unit or in the longitudinal direction of support positions for lines on the transfer unit.

In one embodiment of the device it is provided that a transfer movement of the transfer unit is aligned transversely, in particular at right angles, to a transporting movement of the transporting unit. In the case of another embodiment of the device it is provided that a transfer movement of the transfer unit is aligned in the direction of a transporting movement of the transporting unit. In this embodiment of the device, it may be advantageous if the previously mentioned dispensing unit, at least at least one dispensing nozzle of the dispensing unit, with which electrically conductive adhesive can be applied to the lines of photovoltaic cells can be moved relative to the transfer unit and in the longitudinal direction of the support positions for lines, and thus in the longitudinal direction of the lines of photovoltaic cells that are arranged on the transfer unit, and/or relative to the transfer unit and/or transversely

or at right angles to the support positions and/or lines of photovoltaic cells.

The device may have a control unit, by which the device is set up for carrying out the method in accordance with one of the claims directed to such a method.

The invention is described in more detail below with reference to exemplary embodiments, but is not limited to the exemplary embodiments shown. Further exemplary embodiments result from the combination of the features of one or more claims among themselves and/or in combination of one or more features of the exemplary embodiments.

In the figures:

Figures

1 and 2 show a first exemplary embodiment of a device for producing solar modules, wherein the device has a transfer unit in the form of a movable vacuum table, which may also be referred to as a tray, with which a total of three lines of photovoltaic cells can be co-transferred into an unloading position for the operation of fitting the lines into a solar module,

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Figures

3 and 4 show a second exemplary embodiment of a device for producing solar modules, wherein here a transfer unit of the device, with which three lines of photovoltaic cells can be co-fed to the cell-fitting operation for a solar module, is designed as a belt conveyor, and

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Figures

5 and 6 show a third exemplary embodiment of a device for producing solar modules, wherein this device likewise

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has a transfer unit in the form of a belt conveyor,
wherein, however, a transfer movement of the transfer
unit is aligned transversely, specifically at right
angles, to the orientation of the lines of photovoltaic
5 cells arranged on the transfer unit.

In the following description of different embodiments of the
invention, elements that have the same function are given the
same reference numerals, even if they differ in their design or
10 shape.

All of the figures show in each case a device for producing solar
modules 2 that is denoted overall by 1.

15 Each device 1 has means by which the device 1 is set up for
carrying out the method described below for producing solar
modules 2.

Here, photovoltaic cells 3 are assembled into lines 4 and solar
20 modules 2 are constructed from the then electrically
interconnected lines 4.

In the method it is provided that at least two lines 4, in the
case of the examples shown in the figures at least three lines
25 4, are built up and that the lines 4 are then co-fed to a cell-
fitting operation for a solar module 2.

In the case of all of the embodiments of devices 1 shown in the
figures, the lines 4 are co-fed to the cell-fitting operation
30 for the solar module 2 by means of in each case a motorized
transfer unit 5.

In the case of the exemplary embodiment of such a device 1 shown
in Figures 1 and 2, a vacuum table, which is movable between a

loading point 8 and a unloading point 9, is used as the transfer unit 5.

5 The device 1 shown in Figures 3 and 4 has a belt conveyor as the transfer unit 5. By the transfer movement of the belt conveyor, the lines 4 which are built up on the belt conveyor can be co-fed to the a cell-fitting operation for the solar module 2.

10 The device 1 shown in Figures 5 and 6 is likewise equipped with a transfer unit 5, which is designed as a belt conveyor.

15 While in the case of the device 1 shown in Figures 3 and 4 a transfer movement of the transfer unit 5 takes place in the longitudinal direction of the lines 4 arranged on the transfer unit 5, the transfer movement of the transfer unit 1 of the device 1 shown in Figures 5 and 6 is aligned transversely, specifically at right angles, to the longitudinal direction of the lines 4 of photovoltaic cells 3 built up on the transfer unit 5.

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In the method, which can be carried out on all three exemplary embodiments of devices 1 shown, it is provided that a relative alignment of the photovoltaic cells 3 within a line 4, and also of the lines 4 that are built up on the transfer unit 5 to one another, is maintained during the feeding.

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A number of co-fed lines 4 is adapted here to an application rate of an electrically conductive adhesive. The electrically conductive adhesive is applied to the lines 4 of photovoltaic cells 3 in order to connect the photovoltaic cells 3 and lines 4 mechanically and electrically to one another. The application of the electrically conductive adhesive to a line 4 of photovoltaic cells 3 can be carried out with a lateral offset in relation to the longitudinal central axis of a respective line 4.

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Each of the devices 1 shown in the figures has in each case a vacuum generating unit 6, with which lines 4 of photovoltaic cells 3 can be fixed at least temporarily on the respective transfer unit 5 by a vacuum. The vacuum generating units 6 are only shown in the figures in a highly schematized form.

Each device 1 shown also has a dispensing unit 7 for dispensing electrically conductive adhesive onto lines 4 of photovoltaic cells 3 that are arranged on the transfer unit 5.

The dispensing units 7 of the devices 1 are in each case arranged between the already previously mentioned loading point 8 and the likewise previously mentioned unloading point 9 of lines 4.

The dispensing units 7 of the device 1 shown in Figures 1 and 2 and also 3 and 4 have a number of dispensing nozzles 10, which corresponds to a number of support positions 11 for lines 4 of photovoltaic cells 3 on the transfer unit 5. Consequently, the dispensing units 7 of the devices 1 shown in Figures 1-4 thus have in each case three dispensing nozzles 10. Vertical projections of the dispensing nozzles 10 onto support positions 11 for photovoltaic cells 2 arranged at least temporarily under them on the transfer units 5 may have a lateral offset in relation to the longitudinal central axes of the support positions 11. This allows the application of electrically conductive adhesive onto the lines 4 with a lateral offset in relation to a longitudinal central axis of the lines 4.

The vacuum generating units 6 of the devices 1 are connected to suction openings 23, which the respective transfer unit 5 has. Each transfer unit 5 has at least one series 24 of such suction openings 23 respectively for each of its support positions 11. In this way, the lines 4 of photovoltaic cells 3 can be reliably fixed on the transfer units 5 during their feeding.

In the case of the exemplary embodiment of a device 1 for producing solar modules 2 shown in Figures 5 and 6, the dispensing unit 7 has a dispensing nozzle 10, which is movable
5 in the longitudinal direction of lines 4 of photovoltaic cells 3 arranged on the transfer unit 5. By the movement of the dispensing nozzle 10 along the lines 4 arranged on the transfer unit 5, the electrically conductive adhesive can be dispensed line by line onto the lines 4 at least temporarily arranged under
10 the dispensing unit 7. A track along which the dispensing nozzle 10 can be movable during the dispensing of electrically conductive adhesive may have here a lateral offset in relation to a longitudinal central axis of a line 4 to be provided with electrically conductive adhesive.

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During the dispensing of electrically conductive adhesive, the position of the dispensing nozzle 10 can be kept constantly transverse to the longitudinal extent of the line 4 to be provided with electrically conductive adhesive. It may be
20 provided in this context that the dispensing nozzle 10 is movable synchronously with the transfer unit 5 in the direction of the transfer movement of the transfer unit 5.

In the case of all of the devices 1 shown in the figures, offsetting elements 12 are used during the building up of the
25 lines 4 to produce an offset of adjacent lines 4 first on the respective transfer unit 5 and later also on the finished solar module 2.

30 The offsetting elements 12 are photovoltaic cells that have a shorter length compared to other photovoltaic cells which are denoted in the figures by 3 and are not designed as offsetting elements 12.

The figures show that at least two, specifically three or even more, lines 4 offset in relation to one another are co-fed to the cell-fitting operation for a solar module 2.

5 In one embodiment of the method, groups of at least two lines 4 can be built up in parallel in time and these are co-fed to a common cell-fitting operation. One of the transfer units 5 shown in the figures can also be used for this purpose.

10 For the provision of the photovoltaic cells 3 and the offsetting elements 12, each of the devices 1 shown in the figures has a magazine 13. With the aid of a transfer unit 14, which has a handling robot 15, specifically a swivel-arm robot, the offsetting elements 12 and photovoltaic cells 3 stored and
15 provided in the respective magazine 13 can be removed and arranged in lines 4 on the respective transfer unit 5. Each magazine 13 has a total of two conveyor belts 16, on which on the one hand the offsetting elements 12 and on the other hand the in comparison slightly longer, regular photovoltaic cells 3
20 are stored, arranged in stacks.

For monitoring photovoltaic cells 3 and also offsetting elements 12, each device 1 has a monitoring unit 17. The monitoring units 17 are arranged between the magazine 13 and the transfer unit 14
25 of the respective device 1 and comprise in each case at least one optical monitoring means, for example a camera 18.

With the aid of the handling robot 15 of the transfer unit 14, the photovoltaic cells 3 and/or offsetting elements 12 taken
30 from the magazine 13 can be presented to the camera 18 of the monitoring unit 17, in order to check the photovoltaic cells 3 and offsetting elements 12 before their arrangement on the respective transfer unit 5. Downstream of the respective transfer unit 5 and also the unloading point 9, each of the
35 devices 1 has a cell-fitting unit 19. Each cell-fitting unit 19

comprises a number of grippers 20, which are designed as suction grippers.

The cell-fitting units 19 are set up to receive one or more or
5 even all of the lines 4 of photovoltaic cells 3 which are
provided by the respective transfer unit 5 at the unloading point
9 and to transfer them to a downstream transporting unit 21 of
the respective device 1. The respective transporting unit 21
serves for feeding at least one solar module 2 fitted with lines
10 4 of photovoltaic cells 3 to a downstream processing station,
for example an oven.

As already previously mentioned, a transfer movement of the
transfer unit 5 of the devices 1 shown in Figures 1-4 is aligned
15 in the longitudinal direction of support positions 11, and thus
also in the longitudinal direction of lines 4 on the transfer
unit 5.

In the case of the exemplary embodiment of the device 1 shown in
20 Figures 5 and 6, the transfer movement of the transfer unit 5 is
aligned transversely, specifically at right angles, to a
longitudinal direction of support positions 11, and thus
transversely, specifically at right angles, to a longitudinal
direction of the lines 4 that are arranged on the support
25 positions 11 of the transfer unit 5.

The transfer movements of the transfer unit 5 of the devices 1
shown in Figures 1-4 are aligned transversely, specifically at
right angles, to the transporting movement of the respective
30 transporting unit 21, which is downstream of the transfer unit
5.

In the case of the exemplary embodiment of the device 1 shown in
Figures 5 and 6, the transfer movement of the transfer unit 5 is

aligned in the direction of a transporting movement of the transporting unit 21 used there.

Like the transfer unit 5, the transporting unit 21 of the device 1 shown in Figures 5 and 6 is designed as a belt conveyor.

For carrying out the previously described method, each of the devices 1 shown in the figures also has a control unit 22. By this control unit 22, the previously mentioned functional units of the respective device 1 can be actuated as provided in the method.

The invention relates to improvements in the technical field of the production of solar modules. Proposed inter alia for this purpose is a method for producing solar modules 2 in which at least two or more lines 4 of photovoltaic cells 3 are co-fed to a cell-fitting operation for a solar module 2.

/ List of reference numerals

List of reference numerals

	1	Device
	2	Solar module
5	3	Photovoltaic cell
	4	Line
	5	Transfer unit
	6	Vacuum generating unit
	7	Dispensing unit
10	8	Loading point
	9	Unloading point
	10	Dispensing nozzle
	11	Support position
	12	Offsetting element
15	13	Magazine
	14	Transfer unit
	15	Handling robot
	16	Conveyor belt
	17	Monitoring unit
20	18	Camera
	19	Cell-fitting unit
	20	Gripper
	21	Transporting unit
	22	Control unit
25	23	Suction opening
	24	Series of 23

Claims

1. A method for producing solar modules (2), wherein photovoltaic cells (3) are assembled into lines (4) and
5 wherein the solar modules (2) are constructed from electrically interconnected lines (4), **characterized in that** at least two lines (4) are built up and in that the at least two lines (4) are co-fed to a cell-fitting operation for the solar module (2).
10
2. The method as claimed in claim 1, characterized in that the at least two lines (4) are co-fed to the cell-fitting operation for the solar module (2) by means of a motorized transfer unit (5), in particular by means of a tray and/or
15 table and/or by means of a belt conveyor and/or by means of a vacuum table.
3. The method as claimed in one of the preceding claims, characterized in that a relative alignment of the photovoltaic cells (3) within one line (4) and/or two
20 different lines (4) is maintained during the feeding.
4. The method as claimed in one of the preceding claims, characterized in that a number of co-fed lines (4) is adapted
25 to an application rate of an electrically conductive adhesive and/or in that an application rate of an electrically conductive adhesive is adapted to a number of co-fed lines.
5. A method for producing solar modules (2), in particular as
30 claimed in one of the preceding claims, wherein photovoltaic cells (3) are assembled into lines (4) and wherein the solar modules (2) are constructed from electrically interconnected lines (4), characterized in that that offsetting elements (12) are used during the building up of the lines (4) to
35 form an offset of adjacent lines (4) in relation to one

another.

6. The method as claimed in one of the preceding claims,
characterized in that at least two lines (4) offset in
5 relation to one another are co-fed to the cell-fitting
operation.

7. The method as claimed in one of the preceding claims,
characterized in that groups of at least two lines (4) are
10 built up in parallel in time and these are fed to a common
cell-fitting operation.

8. A device (1) for producing solar modules (2), wherein the
device (1) comprises means by which the device (1) is set up
15 for carrying out a method as claimed in one of the preceding
claims.

9. The device (1) as claimed in the preceding claim, wherein
the device has a motorized transfer unit (5), in particular
20 a tray and/or a table and/or a belt conveyor and/or a vacuum
table, with which at least two lines (4) of photovoltaic
cells (3) can be fed to a cell-fitting operation for a solar
module (2) to be produced, in particular wherein the
motorized transfer unit (5) is set up to move the
25 photovoltaic cells (3) of the lines (4) from a loading point
(8) to an unloading point (9).

10. The device (1) as claimed in the preceding claim, wherein
the transfer unit (5) has at least two support positions
30 (11) for lines (4) of photovoltaic cells (3), preferably
wherein the transfer unit has at least one line (24) of
suction openings (23) for each support position (11).

11. The device (1) as claimed in one of the preceding claims,
35 wherein the device (1) has a vacuum generating unit (6),

with which lines (4) of photovoltaic cells (3) can be fixed on the transfer unit (5) by a vacuum, in particular wherein the vacuum generating unit (6) is connected to suction openings (23) of the transfer unit (5).

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12. The device (1) as claimed in one of the preceding claims, wherein the device (1) has a dispensing unit (7) for dispensing electrically conductive adhesive onto lines (4) of photovoltaic cells (3), in particular those that are
10 arranged on the transfer unit (5), preferably wherein the dispensing unit (7) is arranged between a loading point (8) and an unloading point (9) of the device (1) for lines (4).

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13. The device (1) as claimed in the preceding claim, wherein the dispensing unit (7) has a number of dispensing nozzles (10) which corresponds to a number of support positions (11) for lines (4) of photovoltaic cells (3) of the transfer unit (5), and/or wherein the dispensing unit (7), in particular dispensing nozzles (10) of the dispensing unit (7), is
20 movable in the longitudinal direction of lines (4) arranged on the transfer unit (5).

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14. The device (1) as claimed in one of the preceding claims, wherein the device (1) has a magazine (13) for providing photovoltaic cells (3) and/or a transfer unit (14), in particular with a handling robot (15), with which photovoltaic cells (4) can be removed from a or the magazine (13) and/or arranged in lines (3) on the transfer unit (5).

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15. The device (1) as claimed in one of the preceding claims, wherein, for monitoring photovoltaic cells (3), the device (1) has a monitoring unit (17), in particular wherein the monitoring unit (17) comprises at least one optical monitoring means, for example a camera (18).

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16. The device (1) as claimed in one of the preceding claims, wherein the device (1) has a cell-fitting unit (19), in particular with at least one gripper (20), preferably with at least one suction gripper, wherein the cell-fitting unit (19) is set up to receive at least one or more or all of the lines (4) of photovoltaic cells (3) which are provided by the transfer unit (5) at a unloading point (9) and/or to transfer them a downstream processing step and/or handling step, in particular to a downstream transporting unit (21).

17. The device (1) as claimed in one of the preceding claims, wherein the device (1) has a transporting unit (21) downstream of the transfer unit (5), with which at least one solar module (2) fitted with lines (4) of photovoltaic cells (3, 12) can be fed to a downstream processing station.

18. The device (1) as claimed in one of the preceding claims, wherein a transfer movement of the transfer unit (5) is aligned transversely, in particular at right angles, to a longitudinal direction of support positions (11) for lines (4) on the transfer unit (5) or in the longitudinal direction of support positions (11) for lines (4) on the transfer unit (5).

19. The device (1) as claimed in one of the preceding claims, wherein a transfer movement of the transfer unit (5) is aligned transversely, in particular at right angles, to a transporting movement of the transporting unit (21) or in the direction of a transporting movement of the transporting unit (21).

20. The device (1) as claimed in one of the preceding claims with a control unit (22), by which the device (1) is set up for carrying out the method as claimed in one of the preceding claims.

