Singapore Patent Application No.: 201001180-7
J 2010-PCT-SG

Mounting Device for Disk-Shaped Substrates such as Solar Wafers

The invention relates to a mounting device for disc-shaped substrates, such as solar cell wafers comprising at least one comb-like holder having an elongated web, on which provision is made along the longitudinal extension thereof (X-axis) for a plurality of comb elements arranged at the same distance to one another, which in each case tower perpendicularly (Z-axis) beyond a same height to the longitudinal extension of the web and which in each case encompass an identical depth t perpendicular (Y-axis) to the plane, which is formed by the X-axis and the Z-axis, wherein at least one recess is formed between the respective surfaces of adjacent comb elements, which face one another, for the solar cell wafer, which is to be accommodated so as to be mounted, comprising an outer contour u_A, the central axis A of which runs in the direction of the Z-axis and which encompasses a support surface and a guiding surface for the solar wafer, which is to be accommodated in the recess so as to be mounted as well as a slanted surface section on the web side, which is located in a plane, which runs slanted to the plane of the support surface of the outer contour u_A of the recess under an acute angle α, such that when the bottom edge of the solar wafer, which is to be inserted into the recess and the slanted surface section of the outer contour u_A become engaged, it must be glidingly displaced thereon into a predetermined position due to gravity by overcoming the static friction, with a tolerance between the recess of the surface of the solar cell wafer facing away from the support surface and the guiding surface of the outer contour u_A being provided in said position,

Such a mounting device for disk-shaped substrates, which is known from WO 03 041880 A1 is made on a web, which has a wedge-shaped profile for two comb-like holders, which are arranged in the longitudinal extension thereof parallel and at a distance to one another. The recesses between the respective surfaces of adjacent comb elements, which face one another, are designed in a V-shaped manner - viewed in the top view - as can be seen from Figures 11 and 12. The V-shaped recesses of the first comb-like holder are arranged so as to be offset relative to one another in longitudinal extension of the common web relative to the V-shaped recesses of the second comb-like holder, which is arranged on the common web at a distance to the first comb-like holder such that a disc-shaped substrate, which is inserted into two V-shaped recesses, which are assigned to one another, of the two comb-like holders, which are arranged at a distance to one another on the common web, is pressed with one surface against the support surface of a first recess of the two V-shaped recesses, which are assigned to one another and which are offset relative to one another in longitudinal extension of the common web and is not in contact with the guide surface of this first recess by means of the opposite surface. Viewed in the direction of the Z-axis, the central axis of the disc-shaped substrate, which is inserted into the two V-shaped recesses, which are assigned to one another and which are offset relative to one another in longitudinal direction of the common web, of the two comb-like holders, which are arranged at a distance to one another, is hereby in alignment with the central axis of the second recess of the two recesses, which are assigned to one another, and is not in alignment with the central axis of the first of the two V-shaped recesses, which are assigned to one another. This known mounting device may not provide a guarantee that all of the disc-shaped substrates, which must be inserted into the two comb-like holders, which are arranged on the common

web at a distance to one another, must be provided so as to be fixed and mounted precisely parallel to one another.

For the mounting requirement of disc-shaped substrates in a comb-like holder, it is furthermore known from US 2001/00488874 A1 to embody the recesses thereof between comb elements, which are adjacent to one another, in each case with a mounting gap, which - viewed in cross section - encompasses at least one support surface, which runs parallel to the insertion direction of the disc-shaped substrate.

JP 6 232239 further discloses a mounting device for disc-shaped substrates, in which the disc-shaped substrates are mounted by two comb-like holders on the outer side and must be fixed by a third comb-like holder, which is arranged centrally and which is capable of being moved.

Further, one transfer device for chip components shaped like a rectangular cuboid known from DE 199 13 134 A1 provides a mounting device in the form of a transfer disk, the periphery of which exhibits a plurality of recesses arranged at equal distances from each other in the form of transfer grooves, in which a cuboidal chip element is held via aspirated air and moved to another operating position when turning the transfer disk. The peripheral edge section of each transfer groove incorporates a stepped hole-shaped cavity, which can hold only one chip component. Since the radial length of the cavity is shorter than the long side of the chip component, a portion of the chip component contained in the cavity projects from the peripheral surface side of the transfer disk. One step in the lower surface between the cavity and transfer groove is smaller than the width of the short side of the chip component. This controls the movement of sequential chip components toward the outer diameter of the transfer disk.

A device known from DE 199 06 805 B4 for transporting substrates to be machined, such as wafers, further provides a position-changing device, which has a pair of essentially rectangular holders spaced apart from each other, between which the wafers are to be arranged. Each holder is here provided on the side facing the other holder with a plurality of retaining grooves spaced reasonably apart in order to hold the wafers individually. The retaining grooves essentially have V-shaped cross sections, the opening sides of which are expanded in such a way as to prevent the retaining grooves and wafers from coming into contact as much as possible.

The object of the invention is to provide disk-shaped substrates, such as solar wafers, with a mounting device having at least one comb-like holder, to be designed in a technically simple and economical way with a respective mounting gap fabricated as tightly as desired between respectively neighboring comb elements for a reliable holding and mounting of the respective solar wafer to be mounted both on a defined side of a comb element, as well as in a defined height in the comb-like holder. In addition, the mounting device according to the invention is to enable a backlash-free fixation of the solar wafers held therein.

This object is achieved according to the invention by providing that the support surface and the guiding surface of the outer contour u_A of the at least one recess between the respective surfaces of adjacent comb elements, which face one another, of the elongated web of the at least one comb-like holder are arranged parallel to one another as well as to the central axis A of the recess,

- a mounting gap, the outer contour u_S of which encompasses the support surface and the guiding surface for the solar well wafer, which is to be accommodated in the mounting gap, is in each case formed between the respective adjacent

comb elements of the elongated web of the at least one comb-like holder, having an arbitrary width b_H in X-axis of two recesses, which are offset relative to one another and encompassing an outer contour u_{A1} or u_{A2}, respectively of a respective depth t_1 or t_2, respectively, wherein the depth t_1 of the one recess and the depth t_2 of the other recess together each form a depth t_{ges}, which corresponds to the width b of the elongated web of the at least *one* comb-like holder, and which are in each case smaller than the depth t_{ges} of each comb element,

- the outer contour u_{A1} or the outer contour u_{A2} of the recesses, which are offset relative to one another in the direction of the X-axis, of the mounting gap between the respective adjacent comb elements of the elongated web of the at least one comb-like holder encompasses a groove on the web side, which encompasses the slanted surface section, and
- the solar cell wafer, which is to be inserted into the mounting gap between the respective adjacent comb elements of the at least one comb-like holder in the predetermined position, in which, when its bottom edge and the slanted surface section of the groove of the outer contour u_{A1} or of the outer contour u_{A2} become engaged, it must be glidingly displaced thereon due to gravity by overcoming the static friction, said solar cell wafer must simultaneously be brought in planar contact with the support surface with the surface thereof facing the latter upon rotating the at least one comb-like holder about a predetermined acute angle φ to the vertical line on the support surface of the outer contour u_S of the mounting gap.

The depth t_1 and depth t_2 of the first recess or second recess between the respective comb elements neighboring each other are preferably identical, and the acute angle α can range from 46° to 50°, depending on the material pairing of the comb-like holder and the solar wafer.

Measured in the direction of the X-axis, the width of the mounting gap is identical to the thickness of the solar wafer plus the tolerance.

The outer contour u_s of the mounting gap can expand like a funnel into an opening area opposite to the direction in which the solar wafer is introduced by having the respective surfaces bordering the opening area that abut the guiding surface and the contact surface of the outer contour u_s of the mounting gap as viewed in the longitudinal section of the comb-like holder be guided away from the guiding surface or from the contact surface at an acute angle β or γ within a range of 18° to 22° or within a range of 13° to 17°, wherein the opening area of the outer contour u_1 or u_2 of the first or second recess that has the groove on the web side is designed like a stepped hole.

In order to suitably ensure that each solar wafer comes to abut the contact surface of the outer contour u_s of the corresponding mounting gap in a planar manner, the lower longitudinal edge of the web of the comb-like holder can be inclined relative to the vertical line on the contact surface of the outer contour u_s of the mounting gap at an acute angle of 3°.

Each comb-like holder of the mounting device is preferably manufactured by machining a blank, e.g., one consisting of a flexible plastic, light metal or alloy of the latter and having the exterior dimensions of the finished comb-like holder, in such a way as to use a single milling cutter to completely fabricate the milling contour of the comb-like holder, initially in part starting from the one longitudinal side of the blank in the direction of the Y-axis to depth t_1, and after subsequently turning the partially milled blank by 180° around the Z-axis, completely fabricate the milling contour from its other longitudinal side in the direction of the Y-axis to depth

t_2. It is also possible to simultaneously machine the blank for manufacturing the comb-like holder starting from both of its longitudinal sides by means of a respective milling cutter to be correspondingly positioned.

The comb-like holder according to the invention can also consist of two components to be fabricated simultaneously, the outer contour of which respectively corresponds to the outer contour $u_{Schnitt}$ of the two defined sheet metal blanks of the comb-like holder 1 given a longitudinal section of the latter, when the plane of the longitudinal section runs parallel to the X-axis at $y=t_1$ or $y=t_{ges}-t_2$, and which are detachably screwed to each other while abutting in a planar manner at their facing longitudinal sides.

As opposed to the conventional fabrication of the milling contour of a holder for thin parallel arranged substrates, e.g., silicon wafers, by means of a milling cutter in an operation in which the width of the mounting gap for each silicon wafer is defined by the thickness of the milling cutter, the comb-like holder of the mounting device according to the invention must be fabricated with as tight a mounting gap as desired. In addition, the milling contour of the comb-like holder ensures a planar abutment of all solar wafers to be held in the latter, both on a defined side of the outer contour of the mounting gap u_s, as well as at a defined height of the latter. As a result, the comb-like holder of the mounting device according to the invention for disk-shaped substrates such as solar wafers is relatively easy and economical to manufacture from a technical standpoint with a mounting gap of any width desired.

The mounting device according to the invention can have a paired arrangement of the comb-like holder, wherein the elongated webs of the two identically designed comb-like holders are to be arranged parallel at a distance from each

other and aligned precisely relative to each other in the longitudinal profile for purposes of accommodating the solar wafer. At least one additional comb-like holder can suitably be provided, which is to be shifted in a controlled fashion in the longitudinal direction relative to the other comb-like holders in such a way that the solar wafer mounted in the mutually corresponding mounting gaps of the two fixed comb-like holders and the shiftable comb-like holder can be secured in a backlash-free position by the respective contact surface of the outer contour of the respectively corresponding mounting gap of the two comb-like holders and the guiding surface of the outer contour of the corresponding mounting gap of the shiftable comb-like holder.

The elongated web of each of the two mutually spaced apart and identically designed comb-like holders can preferably be designed as a single piece with a final connecting base section, the upper surface of which incorporates a longitudinally running guide centrally between the two comb-like holders, into which the elongated web of the shiftable comb-like holder can be controllably shifted with its lower longitudinal edge parallel and aligned in longitudinal profile relative to the respective elongated web of the two outlying comb-like holders.

In the backlash-free position of the solar wafer fixed by the comb-like holders, the shiftable comb-like holder is shifted, suitably in the longitudinal direction relative to the other comb-like holders to the plane mounted by the contact surfaces of the respective mounting gap of the two comb-like holders, by a distance equal to the clearance existing between the surface of the solar wafer facing away from the contact surfaces and the contact surface-parallel guiding surface of the outer contour u_s of the mounting gap of each of the fixed comb-like holders.

The elongated comb-like web of the shiftable comb-like holder can be designed identically to the elongated web of the fixed comb-like holder. As an alternative, the mounting gaps of the elongated web of the shiftable comb-like holder can be U-shaped when viewed in longitudinal section.

Preferred embodiments of the mounting device according to the invention will now be described drawing reference to the drawings. Shown on:

Fig. 1 is a top view of a longitudinal side of a comb-like holder of an embodiment of the mounting device;

Fig. 2 is a sectional view of a detail denoted on Fig. 1 at the left ends of the comb-like holder, wherein a solar wafer is depicted in a mounting gap;

Fig. 3 is a perspective view of the detail of the comb-like holder denoted on Fig. 1, viewed from the left front on the longitudinal side of the comb-like holder;

Fig. 4 is a perspective view of the detail of the comb-like holder denoted on Fig. 1, viewed from the right on the longitudinal side of the comb-like holder, and on

Fig. 5 is a view of a section perpendicular to the longitudinal direction of another embodiment of the comb-like holder, which consists of two components, and

Fig. 6 is a perspective view of another embodiment of the mounting device with a solar wafer in a mounted position, in which the solar wafer is fixed backlash-free.

A first embodiment of the mounting device for disk-shaped substrates such as solar wafers 2 consists of two identically designed comb-like holders 1 of the kind visible from Fig. 1 to 4, which are to be spaced parallel apart and aligned precisely relative to each other in the longitudinal profile. The distance between the two comb-like holders can be smaller than the length of the lower edge 21 of the solar wafer 2, which is to be mounted in mutually corresponding mounting gaps 9 of the webs 3 of the two comb-like holders 1.

As evident from Fig. 1 to 4, the comb-like holder 1 has a web 3, on which along the longitudinal extension thereof in the direction of the X-axis a plurality of comb elements 4 arranged at an equal distance from each other are provided. The comb elements 4 relative to the longitudinal extension of the web 3 protrude in the direction of the Z-axis over a uniform height and exhibit an identical total depth t_{ges} corresponding to the width b of the elongated web 3 perpendicular—in the direction of the Y-axis—to the plane formed by the X and Z-axis.

As illustrated in particular by Fig. 2, a first recess 5 with an outer contour uA1 and a second recess 6 with an outer contour uA2 are provided between the neighboring comb elements 4, which are offset relative to each other in the direction of the X-axis. The depth t_1 and depth t_2 of the first recess 5 or second recess 6 are each smaller than the total depth t_{ges} of each comb element 4, and together form the total depth t_{ges} of each comb element 4. The depth t_1 and depth t_2 of the first recess 5 or second recess 6 can be identical.

Offsetting the first recess 4 and second recess 5 in the direction of the X-axis relative to each other forms a mounting gap 9 of arbitrary width b_H of an outer contour u_S

between the neighboring comb elements 4, which has a contact surface 7 and a guiding surface 8 for the solar wafer 2 to be accommodated in the mounting gap 9. The contact surface 7 and guiding surface 8 are arranged relative to each other and parallel to the middle axis A of the outer contour u_{A1} and the outer contour u_{A2} of the first recess 5 or the second recess 5 or 6, wherein the middle axis A essentially runs in the direction of the Z-axis. Measured in the direction of the X-axis, the width b_H of the mounting gap 9 is equal to the thickness d of the solar wafer 2 plus a tolerance 14.

The outer contour u_{A2} of the second recess 6 has a groove 10 on the web side with a slanted surface section 11 on the web side lying in a plane 12 that runs in an inclined manner at a predetermined acute angle α relative to the plane 13 of the contact surface 7 of the outer contour u_S of the mounting gap 9. The selected angle α can range from 46° to 50°, depending on the material pairing of the web 3 and the solar wafer 2.

As best visible from Fig. 2 and 4, the outer contour u_S of the mounting gap 9 expands like a funnel into an opening area 15 of the outer contour u_{A1} of the first recess 5 between the corresponding neighboring comb elements 4, opposite the insertion direction R_E of the solar wafer 2 into the mounting gap 9. Viewed in the longitudinal section of the comb-like holder 1 (Fig. 2), this opening area 15 is bordered by surfaces 16 and 17 of the neighboring comb elements, which abut the guiding surface 8 or contact surface 7 of the outer contour u_S of the mounting gap 9. The surface 16 and surface 17 are preferably outwardly guided at an acute angle β or γ to the guiding surface 8 or contact surface 7, which lies within a range of 18° to 22° or within a range of 13° to 17°. The opening area of the outer contour u_{A2} of the second recess 6 having the groove 10 on the web side is designed as a stepped hole.

When the lower edge 21 of the solar wafer 2 to be introduced into the mounting gap 9 engages with the slanted surface section 11 of the groove 10 of the outer contour uA2 of the second recess 6, the solar wafer 2 on the slanted surface section 11 is glidingly shifted downward into a predetermined position in the force of gravity while overcoming static friction, in which the solar wafer 2, upon rotating the comb-like holder 1 around a predetermined acute angle ϕ relative to the vertical line on the contact surface 7 of the outer contour u_s of the mounting gap 9, is brought with its surface 13 facing the latter in planar contact on the contact surface 7, and in which there is simultaneously provided a tolerance 14 between the surface 22 of the solar wafer 2 facing away from the contact surface 7 and the guiding surface 8 of the outer contour u_s of the mounting gap 9 running parallel to the contact surface 7. The acute angle ϕ usually measures 3°. It is also possible to ensure planar contact between the solar wafer 2 and contact surface 7 while shifting the lower edge 21 of the solar wafer on the slanted surface section 11 of the groove 10 of the second recess 6 by fabricating the lower longitudinal edge 18 of the web 3 of the comb-like holder 1 in advance to be inclined at an acute angle of ϕ = 3° relative to the vertical line on the contact surface 7 of the outer contour u_s of the second recess 6.

In the embodiment of the comb-like holder 1 presented on Fig. 5, there are two components 19 and 20 that can be milled separately and simultaneously, the outer contour u_{19} or u_{20} of which corresponds to the respective outer contour $u_{Schnitt}$ of the two defined sheet metal blanks of the comb-like holder 1 given a longitudinal section of the latter, when the plane of the longitudinal section runs parallel to the X-axis at $y=t_1$ or $y=t_{ges}-t_w$, which are detachably secured to each other while abutting in a planar manner at their facing longitudinal sides.

Fig. 6 shows an embodiment of the mounting device with which the solar wafer 2 held by the latter can be fixed in a backlash-free position. This embodiment provides parallel identical comb-like holders 1 spaced apart from each other, the elongated web 3 of which is designed below as a single piece with a final connecting base section 24 with a planar bottom surface 25. Centrally arranged between the two fixed comb-like holders 1 in the upper surface of the base section 24 is a guide that runs in their longitudinal direction, in which the elongated web 3 of the shiftable comb-like holder 27, with its lower longitudinal edge 18 parallel and aligned in longitudinal profile relative to the respective elongated web 3 of the two outer comb-like holders 1, can be controllably guided to and fro, as denoted by the double arrow 26 on Fig. 6. For example, a robot can be used to control the process of shifting the shiftable holder 27 in the longitudinal direction from a base position, in which, to accommodate the solar wafer 2, the corresponding mounting gap 9 of the shiftable comb-like holder 27 is aligned with the respectively corresponding mounting gap 9 of the two outer comb-like holders 1, into the position in which the solar wafer 2 is fixed backlash-free by the two comb-like holders 1 and the shiftable comb-like holder 27, and back into the base position. In the backlash-free, fixed position of the solar wafer 2, the shiftable comb-like holder 27 is shifted from the base position in the longitudinal direction relative to the two comb-like holders 1 to the plane mounted by the contact surfaces 7 of the respectively corresponding mounting gap 9 of the two comb-like holders 1, by a distance equal to the clearance 14 existing between the surface 22 of the solar wafer 22 facing away from the contact surfaces 7 and the respective contact surface 7-parallel guiding surface 8 of the outer contour u_s of the mounting gap 9 of each of the two comb-like holders 1.

List of Reference Numbers:

1	Comb-like holder
2	Solar wafer
3	Web
4	Comb element
5	First recess
6	Second recess
7	Contact surface
8	Guiding surface
9	Mounting gap
10	Web-side groove
11	Web-side slanted surface section of groove
12	Plane of web-side surface section of groove
13	Solar wafer surface facing the contact surface
14	Tolerance
15	Opening area
16	Surface bordering the contact surface
17	Surface bordering the guiding surface
18	Lower longitudinal edge of the web
19	First component
20	Second component
21	Lower edge of solar wafer
22	Predetermined position in the web-side slanted surface section of the groove
23	Solar wafer surface facing away from the contact surface
24	Base section
25	Bottom surface of base section
26	Dual direction arrow for the shiftability of the shiftable comb-like holder
26	Shiftable comb-like holder
u_A	Outer contour of a recess
A	Middle axis of the recess with outer contour uA
u_{A1}	Outer contour of the first recess
u_{A2}	Outer contour of the second recess
u_S	Outer contour of the mounting gap

$u_{Schnitt}$	Outer contour of the sheet metal blanks
u_{19}	Outer contour of the first component
u_{20}	Outer contour of the second component
t_1	Depth of the first recess
t_2	Depth of the second recess
t_{ges}	Total depth of the comb element
b	Width of the web
b_H	Width of the mounting gap
d	Thickness of the solar wafer
R_E	Insertion direction of the solar wafer into the mounting gap
α	Angle of inclination of the plane of the web-side surface section
β	Angle of inclination of the surface neighboring the guiding surface
γ	Angle of inclination of the surface neighboring the contact surface
ϕ	Angle of inclination of the lower longitudinal edge of the web

Patent Claims

1. A mounting device for disc-shaped substrates, such as solar cell wafers (2) comprising at least one comb-like holder (1) having an elongated web (3), on which provision is made along the longitudinal extension thereof (X-axis) for a plurality of comb elements (4) arranged at the same distance to one another, which in each case tower perpendicularly (Z-axis) beyond a same height to the longitudinal extension of the web (3) and which in each case encompass an identical depth (t) perpendicular (Y-axis) to the plane, which is formed by the X-axis and the Z-axis, wherein at least one recess (5 or 6, respectively) is formed between the respective surfaces of adjacent comb elements (4), which face one another, for the solar cell wafer (2), which is to be accommodated so as to be mounted, comprising an outer contour (u_A), the central axis (A) of which runs in the direction of the Z-axis and which encompasses a support surface (7) and a guiding surface (8) for the solar wafer (2), which is to be accommodated in the recess (5 or 6, respectively) so as to be mounted as well as a slanted surface section (11) on the web side, which is located in a plane (13), which runs slanted to the plane of the support surface (7) of the outer contour (u_A) of the recess (5 or 6, respectively) under an acute angle (α), such that when the bottom edge (21) of the solar wafer (2), which is to be inserted into the recess (5 or 6, respectively) and the slanted surface section (11) of the outer contour (u_A) become engaged, it must be glidingly displaced thereon into a predetermined position due to gravity by overcoming the static friction, with a tolerance (14) between the recess (5 or 6, respectively) of the surface (22) of the solar cell wafer (2) facing away from the support surface (7) and the guiding surface (8) of the outer contour (u_A) being provided in said position,

characterized in that

- the support surface (7) and the guiding surface (8) of the outer contour (u_A) of the at least one recess (5 or 6, respectively) between the respective surfaces of adjacent comb elements (4), which face one another, of the elongated web (3) of the at least one comb-like holder (1) are arranged parallel to one another as well as to the central axis (A) of the recess (5 or 6, respectively),

- a mounting gap (9), the outer contour (u_S) of which encompasses the support surface (7) and the guiding surface (8) for the solar well wafer (2), which is to be accommodated in the mounting gap (9), is in each case formed between the respective adjacent comb elements (4) of the elongated web (3) of the at least one comb-like holder (1), having an arbitrary width (b_H) in X-axis of two recesses (5 and 6), which are offset relative to one another and encompassing an outer contour (u_{A1} or u_{A2}, respectively) of a respective depth (t_1 or t_2, respectively), wherein the depth (t_1) of the one recess and the depth (t_2) of the other recess together each form a depth (t_{ges}), which corresponds to the width (b) of the elongated web (3) of the at least *one* comb-like holder (1), and which are in each case smaller than the depth (t_{ges}) of each comb element (4),

- the outer contour (u_{A1}) or the outer contour (u_{A2}) of the recesses (5 and 6), which are offset relative to one another in the direction of the X-axis, of the mounting gap (9) between the respective adjacent comb elements (4) of the elongated web (3) of the at least one comb-like holder (1) encompasses a groove (10) on the web side, which encompasses the slanted surface section (11), and

- the solar cell wafer (2), which is to be inserted into the mounting gap (9) between the respective adjacent comb elements (4) of the at least one comb-like holder (1) in the predetermined position, in which, when its bottom edge (21) and the slanted surface section (11) of the groove (10) of the outer contour (u_{A1}) or of the outer contour (u_{A2}) become engaged, it must be glidingly displaced thereon due to gravity by overcoming the static friction, said solar cell wafer must simultaneously be brought in planar contact with the support surface (7) with the surface (13) thereof facing the latter upon rotating the at least one comb-like holder (1) about a predetermined acute angle (□) to the vertical line on the support surface (7) of the outer contour (u_S) of the mounting gap (9).

2. The mounting device according to claim 1, characterized in that the depth (t_1) and the depth (t_2) of the first recess (5) or second recess (6) are identical.

3. The mounting device according to claim 1 and 2, characterized in that the acute angle (α) at which the plane (12) of the web-side surface section (11) of the web-side groove (10) of the outer contour (u_{A1} or u_{A2}) of the first or second recess (5 or 6) runs relative to the plane (13) of the contact surface (7) of the outer contour (u_S) of the mounting gap (7) can range from 46° to 50°, depending on the material pairing of the web (3) and solar wafer (1).

4. The mounting device according to one of the preceding claims, characterized in that the width (b_B) of the mounting gap (9) measured in the direction of the X-

axis is identical to the thickness (d) of the solar wafer (2) plus the tolerance (14).

5. The mounting device according to one of the preceding claims, characterized in that the outer contour (u_s) of the mounting gap (9) expands like a funnel into an opening area (15) opposite to the introduction direction (R_E) of the solar wafer (2) into the mounting gap (9) by having the respective surfaces (16 or 17) of the neighboring comb elements (14), which are respectively adjacent to the guiding surface (8) and contact surface (7) of the outer contour (u_s) of the mounting gap (9) and border the opening area (15), be outwardly guided in the opening area (15) at an acute angle (β) or (γ) ranging from 18° to 22° or ranging from 13° to 17° relative to the guiding surface (8) or contact surface (7), as viewed in the longitudinal section of the comb-like holder (1).

6. The mounting device according to one of the preceding claims, characterized by at least one pair of the comb-like holder (1), wherein the elongated webs (3) of the two identically designed comb-like holders (1) are arranged parallel at a distance from each other and aligned precisely relative to each other in the longitudinal profile.

7. The mounting device according to claim 6, characterized in that at least one additional comb-like holder (27) is provided, which is to be shifted

in a controlled fashion in the longitudinal direction relative to the other comb-like holders (1) in such a way that the solar wafer (2) mounted in the mutually corresponding mounting gaps (9) of the two fixed comb-like holders (1) and the shiftable comb-like holder (27) can be secured in a backlash-free position by the respective contact surface (7) of the outer contour (u_S) of the respectively corresponding mounting gap (9) of the two comb-like holders (1) and the guiding surface (8) of the outer contour (u_S) of the corresponding mounting gap (9) of the shiftable comb-like holder (27).

8. The mounting device according to claim 6 and 7, characterized in that the elongated web (3) of each of the two mutually spaced apart and identically designed comb-like holders (1) is designed as a single piece with a final connecting base section (24), the upper surface of which incorporates a longitudinally running guide centrally between the two comb-like holders (1), into which the elongated web (3) of the shiftable comb-like holder (27) can be controllably shifted back and forth with its lower longitudinal edge (18) parallel and aligned in longitudinal profile relative to the respective elongated web (3) of the two outlying comb-like holders (1).

9. The mounting device according to claim 7 or 8, characterized in that, in the backlash-free position of the solar wafer (2) fixed by the comb-like holders (1; 28), the shiftable comb-like holder (28) is shifted from its base position, in which, to accommodate the solar wafer (2), the corresponding mounting gap (9) of the shiftable comb-like holder (27) is aligned with the respectively corresponding mounting gaps (9) of the two outer comb-like holders (1), in the longitudinal direction relative to the two

comb-like holders to the plane mounted by the contact surfaces (7) of the respective mounting gap (9) of the two comb-like holders (1), by a distance equal to the clearance (14) existing between the surface (22) of the solar wafer (2) facing away from the contact surface (7) and the contact surface (7)-parallel guiding surface (8) of the outer contour (u_s) of the mounting gap (9) of each of the comb-like holders (1).

10. The mounting device according to claim 7 to 9, characterized in that the elongated web (3) of the comb-like holder (1) and the elongated web (3) of the shiftable comb-like holder (28) are identical in design.

11. The mounting device according to claim 7 to 9, characterized in that the mounting gap (9) of the elongated web (3) of the shiftable comb-like holder (28) are U-shaped viewed in the longitudinal section.