Device and Method for Bonding of substrates

Specification

This invention relates to a device for especially temporary bonding, especially prebonding of a first substrate to a second substrate and a corresponding method.

In the semiconductor industry mounting apparatus or sample holders (so called chucks) are used as handling apparatus for supporting and fixing flat semiconductor substrates, especially wafers. The wafers lie flat, are supported thereby, fixed and can be transported to various handling steps and processing stations.

Here it is to some extent necessary to transfer the wafer from one mounting apparatus to another so that not only reliable and flat support/fixing, but also detachment of the wafer as simple and careful as possible play a major part.

The fixing takes place for example by applying a vacuum between the wafer and the mounting apparatus, by electrostatic charging or by other controllable chemical-physical adhesion properties, the detachment of the wafer becoming technically more and more difficult due to the increasingly thinner wafer which is sometimes even polished on both sides, and the optionally existing inherent adhesion of the wafer to the sample holder. The surfaces on which fixing takes place can also be provided with a pattern, grooving or any other topography which further reduces the contact surface in order to obtain a mounting surface as small as possible.

Avoiding contamination is also an important aspect.

The latter plays an important part in methods and devices for bonding of two substrates (wafers), especially in the critical step of contact-making of the aligned contact surfaces of the two opposite substrates since the requirement is for more and more exact alignment accuracy or offset of less than 2 μm, especially less than 250 nm, preferably less than 150 nm, more preferably less than 50 nm. For these alignment accuracies many influencing factors must be considered. But the deposition/contact-making of the substrates is especially critical since faults can occur here, and the faults can add up and thus a reproducible alignment accuracy cannot be maintained. This leads to considerable scrap.

Embodiments of this invention provide a device and a method for bonding of two substrates, mainly for prebonding or temporary bonding, with which alignment accuracy as good as possible is achieved everywhere on the wafer, if possible also contamination of the substrate being avoided.

Hereinafter the words bonding, temporary bonding and prebonding will be used synonymously. It is clear to one skilled in the art that the invention was developed preferably, but not in a limiting manner, in order to join two wafers to one another by a prebond, as much as possible in a blanketing manner, free of distortions and strain.

For prebonding to produce a temporary or reversible bond between the substrates, there are several methods which are known to one skilled in the art. The prebond thicknesses are below the permanent bond thicknesses, at least by the factor of 2 to 3, especially by the factor 5, preferably by the factor 15, still more preferably by the factor 25. Guideline values are prebond thicknesses of

pure, nonactivated, hydrophilized silicon with roughly 100 mJ/m^2 and of pure, plasma-activated, hydrophilized silicon with roughly 200 - 300 mJ/m^2. The prebonds between the molecule-wetted substrates arise mainly due to the van-der-Waals interactions between the molecules of the different sides of the wafers.

Bonding means for bonding and/or prebonding and/or temporary bonding are intended for bonding as per embodiments of the invention.

According to a first aspect, there is provided a device for especially temporary bonding of a first semiconductor substrate with a second semiconductor substrate with the following features: a mounting apparatus for mounting of the first semiconductor substrate on a mounting contour with an active mounting surface of the mounting apparatus with a) an outer ring section for controllable fixing of the first semiconductor substrate and b) an inner ring section which is set back in one at least largely relative to the mounting surface, deformation means for controllable deformation of the first semiconductor substrate, the deformation means being made to act within the outer ring section and bonding means for bonding of the first semiconductor substrate to the second semiconductor substrate by removal of the deformed first semiconductor substrate from the mounting apparatus, wherein the mounting contour in the inner ring section has at least one support surface for supporting the first semiconductor substrate, the support surface being included in the mounting surface, wherein the ring width b_A of the outer ring section is smaller than the ring width b_1 of the inner ring section, wherein the ratio of the ring width b_A to b_1 is less than 1 to 3, wherein the projection surface of the mounting contour is at least twice,

especially three times, as large as the active mounting surface.

According to a second aspect, there is provided a method for especially temporary bonding of a first semiconductor substrate to a second semiconductor substrate with the following steps, especially the following sequence: mounting the first semiconductor substrate on a mounting contour with an active mounting surface of the mounting apparatus with a) an outer ring section for controllable fixing of the first semiconductor substrate, b) an inner ring section which is set back in one at least largely relative to the mounting surface, wherein the mounting contour in the inner ring section has at least one support surface for supporting the first semiconductor substrate, the support surface being included in the mounting surface, deforming the first semiconductor substrate within the outer ring section by deformation means for controllable deformation of the first semiconductor substrate bonding the first semiconductor substrate to the second semiconductor substrate by bonding means by removal of the deformed first semiconductor substrate from the mounting apparatus.

According to a third aspect, there is provided a device for especially temporary bonding of a first semiconductor substrate with a second semiconductor substrate with the following features: a mounting apparatus for mounting of the first semiconductor substrate on a mounting contour with an active mounting surface of the mounting apparatus with a) an outer ring section for controllable fixing of the first semiconductor substrate and b) an inner ring section which is set back at least largely relative to the mounting surface, deformation means for controllable deformation and herewith pretensioning of the first semiconductor substrate, wherein the deformation means are designed to act within the outer ring section and bonding means for automatic bonding of the first semiconductor substrate with the second semiconductor substrate due to the pretensioning, wherein the mounting contour in the inner ring section has at least one support surface for supporting the semiconductor semiconductor substrate, the support surface being included in the mounting surface, wherein the ring width b_A of the outer ring section is smaller than the ring width b_I of the inner ring section, wherein

the ratio of the ring width b_A to b_I is less than 1 to 3, wherein the projection surface of the mounting contour is at least twice, especially three times, as large as the active mounting surface.

Embodiments of invention are based on the idea of making contact between the two substrates in a manner as coordinated and at the same time as quasi-independently as possible by at least one of the substrates being exposed to pretensioning which runs radially to the outside, especially concentrically to the middle M of one contact surface of the substrates, before contact-making and then only the beginning of contact-making being influenced, while after contact-making of one section, especially of the middle M of the substrates, the substrate being exposed and bonded in a controlled manner to the opposite substrate automatically based on its pretensioning. The pretensioning is achieved by a deformation of the first substrate by deformation means, the deformation means especially based on their shape acting on the side facing away from the bond side and the deformation being controllable accordingly by using different (especially

interchangeable) deformation means. The control also takes place by the pressure or the force with which the deformation means act on the substrate. It is advantageous here to reduce the active mounting surface of the mounting apparatus with the semiconductor substrate so that the semiconductor substrate is only partially supported by the mounting apparatus. In this way the smaller contact surface yields a lower adhesion between the wafer and the sample holder or the mounting apparatus. Fixing is applied as per embodiments of the invention, especially solely, in the region of the periphery of the semiconductor substrate (first substrate) so that there is effective fixing for a mounting surface which is at the same time active as little as possible between the mounting contour of the mounting apparatus and the semiconductor substrate. Thus, at the same time careful and reliable detachment of the semiconductor substrate is possible since the detachment forces necessary for detaching the wafer are as small as possible.

The mounting contour is the region of the mounting apparatus on which the semiconductor substrate comes to rest so that the outer periphery for circular semiconductor substrates is accordingly circular with analogous dimensions. Conventional outside dimensions are diameters of 200 mm, 300 mm, or 450 mm.

At the same time, in the region of the mounting contour outside the active mounting surface elevated structures of the wafer can be accommodated so that the mounting apparatus is made at the same time CMOS-compatible.

Detachment is mainly controllable, especially by reducing the negative pressure on the mounting surface. Controllable means that after the contact of the wafer with a second wafer the wafer on the sample holder remains fixed and only by dedicated (controlled) reduction of the

negative pressure is removal of the substrate (wafer) from the sample holder (mounting apparatus) effected, especially from the inside to the outside. The embodiment of the invention leads mainly to the detachment being able to be effected by very small forces.

The substrates (wafers) are aligned to one another prior to the bonding process in order to ensure uniform congruence (exact alignment, especially with an accuracy of less than 2 μm, preferably less than 250 nm, still more preferably less than 150 nm, most preferably less than 100 nm) of corresponding structures on their surfaces. In the bonding method as per embodiments of the invention the wafers are not placed flat on one another, but are brought into contact with one another first in the middle M by one of the two wafers being pressed lightly against the second wafer or being deformed according in the direction of the opposite wafer. After removing the deformed wafer which is bowed (in the direction of the opposite wafer) by the advance of a bond wave, a continuous and more uniformed bonding along the bond front takes place which is especially at least largely automatic and which is associated with minimal force and thus with minimal, preferably horizontal distortions.

According to one advantageous embodiment of the invention it is provided that the mounting contour and/or the mounting surface and/or the mounting apparatus is/are made rotationally symmetrical, especially concentric to a center Z of the mounting apparatus. This results in uniform holding and simple production of the mounting apparatus. To the extent the mounting apparatus is made rigid at least on the mounting surface, reliable fixing of the wafer which is accurate in alignment is possible.

By at least one negative pressure channel which interrupts the mounting surface being

provided in the outer ring section of the mounting contour and the mounting contour being set back in one inner ring section at least largely relative to the mounting surface, there is a geometrical arrangement which is advantageous for the implementation of embodiments of this invention and with which on the one hand deformation is perfectly executed and on the other the contact-making can be carried out in a controlled manner as described above with little effort.

Advantageously the negative pressure channel runs concentrically, especially in the shape of a circular ring, to a center Z of the mounting apparatus, especially around the entire periphery. This ensures uniform fixing.

In another advantageous embodiment of the invention it is provided that the ring width b_A of the outer, especially circular ring-shaped ring section is smaller than the ring width b_I of the inner ring section. The ratio of the ring width b_A to b_I is especially less than 1 to 3, preferably less than 1 to 5, even more preferably less than 1 to 7. The smaller the ring width b_A relative to the ring width b_I, the more easily the semiconductor substrate can be detached from the mounting apparatus.

Here it is especially advantageous if the projection surface of the mounting contour is at least twice, especially three times, as large as the active mounting surface.

According to another advantageous embodiment of the invention it is provided that the mounting contour in the inner ring section has at least one, especially circular ring-shaped support surface which is located preferably concentrically to the center Z for supporting, especially without active fixing, of the semiconductor substrates, the support surface being included in the mounting surface and being flush with it. This measure results in further planarization of the mounting apparatus during handling so that the semiconductor substrate does not bow toward the mounting

apparatus, or in general, arch.

In another embodiment of the invention it is provided that the deformation means are made to act on the semiconductor substrate on the side of the mounting surface, especially outside, preferably solely outside the mounting surface. It has been surprisingly shown that by acting on the semiconductor substrate on the side of the mounting surface (generally back of the semiconductor substrate) especially careful detachment is possible. Moreover contamination of the other (generally more important because they are for example processed) surfaces of the semiconductor substrate is avoided.

To the extent the deformation means is at least one pressure element which penetrates the mounting contour, the pressure can be applied uniformly, especially from the center Z. In this connection a mechanical design, especially by a pin, but also application of a fluid, especially a gas, is possible. For this purpose there is especially an opening, especially a bore, which penetrates the mounting body.

Bonding takes place especially effectively and with high alignment accuracy due to the smallest possible distortion when the deformation means are made such that the deformation takes place concentrically to the first substrate.

According to another advantageous embodiment it is provided that in the inner ring section there are especially individually triggerable fixing elements for fixing of the corresponding fixing sections along the first substrate. In this way, in addition distortions and/or strains in the x, y and/or z direction of the first and/or second substrate can be influenced. The distortions and/or strains (which run primarily along the contact surface of the substrates, therefore in the surface) are recorded

especially in a prior method step, preferably in the form of stress and/or strain maps of the substrate/substrates and by switching the fixing element when contact is made between the substrates an additional sectional deformation is produced which is made such that especially local distortion/strains are compensated. This is because these distortions/strains more and more strongly influence the alignment accuracy, especially for alignment accuracies less than 250 nm. Fundamentally therefore it is possible to distinguish between horizontal and vertical distortions. The vertical distortions arise due to the evacuation process in the vertical direction, therefore in the z-direction. These distortions however necessarily also result in the horizontal, therefore the x and y distortions, which with respect to the alignment accuracy which is to be achieved constitute the actual problem.

According to the method this is achieved by distortions and/or strains of the first and/or second substrate which have been determined by an upstream measurement method being reduced by action, especially by controlled distortion and/or strain of sections of the first and/or second substrate, on the first and/or second substrate, especially by means of fixing elements for fixing of corresponding fixing sections. The distortions and/or strains can be determined by an external measurement apparatus. The external measurement apparatus is then connected accordingly as per embodiments of the invention via a data link. Advantageously a measurement apparatus for determining the distortion and/or strain maps would be located in the same module as the embodiment of the invention. Furthermore the possibility of using the same interface for triggering the apparatus for determining the distortion and/or strain maps and of the embodiment of the invention will be disclosed.

An interface is defined as any type of apparatus of control monitoring. Advantageously it is a computer with corresponding control software and a corresponding graphic user surface.

Features which have been disclosed according to the device will also apply as according to the method and vice versa.

Other advantages, features and details of the invention will become apparent from the following description of preferred exemplary embodiments and using the drawings.

Figure 1a shows a plan view of a mounting contour of a first embodiment of a device as claimed in the invention with a cutting line A-A,

Figure 1b shows a view according to cutting line A-A from Figure 1a,

Figure 2a shows a plan view of a mounting contour of a second embodiment of the device as claimed in the invention with a cutting line B-B,

Figure 2b shows a view according to cutting line B-B from Figure 2a,

Figure 3a shows a plan view of a mounting contour of a third embodiment of the device as claimed in the invention with a cutting line C-C,

Figure 3b shows a view according to cutting line C-C from Figure 3a,

Figure 4a shows a plan view of a mounting contour of a fourth embodiment of the device as claimed in the invention with a cutting line D-D,

Figure 4b shows a view according to cutting line D-D from Figure 4a,

Figure 5a shows a cross sectional view of the first embodiment according to Figure 1a shortly before detachment,

Figure 5b shows a cross sectional view according to Figure 5a when the semiconductor

substrate is being detached,

Figure 6 shows a schematic of different forms of a pin for detaching the semiconductor substrate,

Figure 7a shows a schematic plan view of a fifth embodiment of the device as claimed in the invention and

Figure 7b shows a cross sectional view of the embodiment according to Figure 7a.

Figure 8a shows a cross sectional view of two wafers which are to be bonded to one another before contact-making by a pin,

Figure 8b shows a cross sectional view of two wafers which are to be bonded to one another during contact-making of the upper wafer by a pin,

Figure 8c shows a cross sectional view of two wafers which are to be bonded to one another during elastic bowing of the upper wafer by a pin,

Figure 8d shows a cross sectional view of two wafers which are to be bonded to one another during the first contact between the upper and lower wafer,

Figure 8e shows a cross sectional view of two wafers which are to be bonded to one another during the advancing bond wave between the upper and lower wafer,

Figure 8f shows a cross sectional view of two wafers which are to be bonded to one another in which the upper wafer has already been separated from the sample holder,

Figure 8g shows a cross sectional view of two wafers which are to be bonded to one another, in the bonded state.

The same components and components with the same function are identified with the same

reference numbers in the figures.

Figure 1a shows a mounting apparatus 1 (also called a chuck in the semiconductor industry) of a device for mounting of a first semiconductor substrate 15 (wafer) on a mounting contour 8 of the mounting apparatus 1. The mounting contour 8 has a structure which has a mounting surface 7 in a mounting plane E. Only the mounting surface 7 comes into contact with the semiconductor substrate 15 (when the semiconductor substrate 15 is held on the mounting apparatus 1 (active mounting surface).

The mounting apparatus 1 is formed from an especially monolithic and/or metallic and/or rigid mounting body 1k; this is especially apparent in the cross sectional view according to Figure 1b. A coating of the mounting body to prevent scratches or metal ion concentrations is possible. In terms of dimensions at least the mounting contour 8 of the mounting apparatus 1 is matched to the dimensions of the semiconductor substrate 15 which is to be mounted so that an outer ring radius R_A of the mounting contour 8 corresponds essentially to the radius of the semiconductor substrate 15 which is to be mounted. The diameters of the semiconductor substrates advantageously correspond to the standardized diameters conventional in the industry, 2", 4", 6", 8", 12" and 18" etc., but can also deviate from them if this becomes necessary. The mounting contour 8 and the mounting apparatus 1 are shaped like a circular ring in a plan view, according to the conventional shape of the semiconductor substrates 15. The radius R_k of the mounting body 1k can be greater than the outer ring radius R_A of the mounting contour 8, for the sake of simpler handling. On the periphery of the mounting body 1k as far as the periphery of the mounting contour 8 there can be a shoulder 9 which is set back relative to the mounting plane E in order to facilitate handling of the mounting apparatus

1 (especially in the loading of the semiconductor substrate 15). The periphery of the mounting body 1k and the periphery of the mounting contour 8 are concentric to one center Z of the mounting apparatus 1 or of the mounting contour 8.

From the periphery of the mounting contour 8 (therefore from the outer ring radius R_A) an outer ring section 10 of the mounting contour 8 extends to the inner ring radius R_1. The outer ring section 10 is designed for fixing of the flat semiconductor substrate 15 by means of negative pressure. The negative pressure is applied by a vacuum apparatus which is not shown to two negative pressure channels 3 which run concentrically to one another. The negative pressure channels 3 run between the outer ring radius R_A and the inner ring radius R_1, therefore completely in the ring section 10. The negative pressure channels 3 interrupt the active mounting surface 7 and by the negative pressure on the negative pressure channels 3 the semiconductor substrate 15 is fixed on the mounting surface 7 in the region of the outer ring section 10 (fixing of the first substrate 15). The negative pressure and thus the effectively acting fixing force can preferably be set in a controlled manner (via a corresponding control apparatus for control of the device). Furthermore, the sample holder (mounting apparatus 1) can advantageously be produced such that a closable seal seals the sample holder and maintains the negative pressure without continuous suction from the outside. In this way the sample holder can be removed from any machine, the fixing of the first substrate 15 being maintained at least over a certain time interval.

In the exemplary embodiment according to Figures 1a and 1b the mounting surface 7 corresponds to the surface of the outer ring section 10 in the mounting plane E. Within the outer ring section 10 (therefore in an inner ring section 11) the mounting contour 8 is set back relative to the

mounting surface 7 and forms a circular ring-shaped depression 2 whose radius corresponds to the inner ring radius R_i. Thus the depression 2 is concentric to the periphery of the mounting contour 8 and concentric to the outer ring section 10. A bottom 2b of the depression 2 runs parallel to the mounting plane E with a distance which corresponds to the height h of the depression 2. The height h of the depression 2 can advantageously correspond to the depth of the negative pressure channels 3 (easier manufacture).

So that a negative pressure does not form in the depression 2 when the semiconductor substrate 15 is mounted, there is an opening 4 which penetrates the mounting body 1k. The opening can be provided as a bore, especially concentric to the center Z or to the periphery of the mounting contour 8.

In the second embodiment according to Figures 2a and 2b the mounting surface 7' consists not only of the outer ring section 10. Rather the mounting contour 8 (or the mounting body 1k) has a circular ring-shaped support surface 12 which is located concentrically to the center Z and which is formed by a projection 5 provided directly on the opening 4.

In the third embodiment as shown in Figures 3a and 3b, the opening 4' is no longer circular and concentric to the center Z, but slotted, the opening 4' extending from the center Z to the inner ring radius R_i. The opening 4' can generally assume any shape which enables the described functionalities. The opening 4', in contrast to the other components, is not rotationally symmetrical to the center Z. Thus the support surface 12' is larger compared to the embodiment as shown in Figures 2a and 2b.

In the fourth embodiment as shown in Figures 4a and 4b, in addition to the projection 5 there

are two further projections 13, 14 which are arranged distributed especially equidistantly to one another concentrically to the first projection 5 in the inner ring section 11. Thus the support surface 12" in the fourth exemplary embodiment is still larger than in the second and third exemplary embodiment so that there is a support surface 12" which is distributed more uniformly in the surface.

In all exemplary embodiments a pin 6 (see Figures 5a and 5b) can be routed through the opening 4, 4', especially to the inner contour of the opening 4, 4' in order to detach the semiconductor substrate 15 from the mounting surface by acting on the semiconductor substrate 15 on its inner surface 15i with the mounting surface 7, 7', 7", 7"'. The pin 6 is routed preferably without contact to (the inner contour of) the opening 4, 4'. The vacuum paths 3 can be continuously evacuated and flooded, preferably by the control unit of the device.

Instead of the pin 6, pressurization of the depression 2 with a fluid, especially a gas, is conceivable as claimed in the invention; this entails a uniform/homogeneous pressure distribution on the pressurization surface within the depression 2.

The deformation (bowing) of the first substrate 15 is preferably controlled in a monitored manner and is preferably reversible up to complete detachment of the wafer 15 from the sample holder (Figure 8a-g). Fixing the first substrate 15 in the outer ring section 12 limits the amplitude of the deformation and as claimed in the invention only a slight deformation takes place, especially with an amplitude less than the height h.

The deformation of the first substrate 15 shown in Figure 5b is used as claimed in the invention for making contact with a second substrate which is aligned to the first substrate 15 before the substrates make contact and which is located opposite. The contact is made by the concentric

deformation of the first substrate 15 in the middle M of the substrates.

During action on the inner surface 15i and after the substrates make contact, the negative pressure on the negative pressure channels 3 is reduced, especially controlled. Due to the pretensioning induced by means of deformation of the first substrate 15 and/or the acting force of gravity, the first substrate 15 makes contact with the second substrate proceeding from the middle M of the first substrate 15 radially to the outside as far as the periphery of the first substrate 15 and is at least temporarily bonded, a bonding wave advancing more or less concentrically from the middle M of the first substrate 15 as far as its periphery.

Examples of the shapes of the pin 6, 6', 6", 6"' as claimed in the invention are shown in Figure 6. The pin 6, 6', 6", 6"' can be matched as claimed in the invention not only to the shape or into the contour of the opening 4, 4', but for example can be made T-shaped in cross section (pin 6') in order to act on the semiconductor substrate 15 with a larger surface and thus to treat it more carefully. The head of the pin 6' can thus be a pressure plate which extends in the depression 2 beyond the inner contour of the opening 4. Furthermore the pin 6, 6', 6", 6"' is spring-loaded according to one advantageous version.

One ring width b_A of the outer ring section 10 as claimed in the invention is smaller than the inner ring radius R_I, especially smaller than a ring width b_I of the inner ring section 11 (see Figures 1a, 1b).

Another embodiment which can be combined with the previous embodiments is shown in Figures 7a, 7b. In the region of the depression 2 there are especially honeycomb fixing elements 16 with which corresponding fixing sections of the first substrate 15 can be locally fixed on the

mounting apparatus, against the direction of action on the inner surface 15i when the first substrate 15 is deformed. The fixing elements 16 are triggered by the control apparatus. Thus the deformation of the first substrate 15 can be influenced in the direction of the second substrate in a dedicated manner. Using strain/stress maps of the first substrate 15 which is to be bonded a controlled reduction of the stresses/strains of the first substrate 15 is possible as claimed in the invention so that the given alignment accuracy of the substrates to one another (or possible structures/elements on the substrates) is not reduced by the existing stress/strains of the substrates or at least of the first substrate 15. Deformation (shearing, compressing, stretching, rotating) of the corresponding fixing sections of the first substrate 15 is possible by controlled triggering of individual fixing elements 16. At alignment accuracies of less than 250 nm, especially less than 150 nm, preferably less than 100 nm which are to be achieved, this plays an increasing larger part since distortions/strains of the substrates can cause local alignment faults of up to 100 nm.

The fixing elements 16 can be electrostatically charged or made as piezoelements.

In this embodiment, a larger effective mounting surface 7^{IV} and a mounting contour 8^{IV} which is larger compared to the embodiments described above arise so that there is better support of the first substrate 15.

Reference number list

1	mounting apparatus
1k	mounting body
2	depression
2b	bottom
3	negative pressure channel
4, 4'	opening
5, 5'	projection
6	pin
7, 7', 7", 7"', 7^{IV}	mounting surface
8, 8', 8", 8"', 8^{IV}	mounting contour
9	shoulder
10	outer ring section
11	inner ring section
12, 12', 12"	support surface
13	projection
14	projection
15	first substrate (semiconductor substrate)
15i	inner surface
16	fixing elements

b_A	ring width
b_I	ring width
R_k	radius
R_A	outer ring radius
R_I	inner ring radius
Z	center
E	mounting plane
M	middle

CLAIMS

1. A device for especially temporary bonding of a first semiconductor substrate (15) with a second semiconductor substrate (15') with the following features:

- a mounting apparatus for mounting of the first semiconductor substrate (15) on a mounting contour (8, 8', 8", 8"', 8^{IV}) with an active mounting surface (7, 7', 7", 7"', 7^{IV}) of the mounting apparatus with

a) an outer ring section (10) for controllable fixing of the first semiconductor substrate (15) and

b) an inner ring section (11) which is set back in one at least largely relative to the mounting surface (7, 7', 7", 7"', 7^{IV}),

- deformation means for controllable deformation of the first semiconductor substrate (15), the deformation means being made to act within the outer ring section and

- bonding means for bonding of the first semiconductor substrate (15) to the second semiconductor substrate (15') by removal of the deformed first semiconductor substrate (15) from the mounting apparatus, wherein the mounting contour (8, 8', 8", 8"', 8^{IV}) in the inner ring section (11) has at least one support surface (12, 12', 12") for supporting the first semiconductor substrate (15), the support surface (12, 12', 12") being included in the mounting surface (7, 7', 7", 7"', 7^{IV}),

wherein the ring width b_A of the outer ring section (10) is smaller than the ring width b_I of the inner ring section (11), wherein the ratio of the ring width b_A to b_I is less than 1 to 3,

wherein the projection surface of the mounting contour (8, 8', 8", 8"') is at least twice, especially three times, as large as the active mounting surface (7, 7', 7", 7"', 7^{IV}).

2. The device as claimed in Claim 1, wherein the mounting contour (8, 8', 8", 8"', 8^{IV}) and/or the mounting surface (7, 7', 7", 7"', 7^{IV}) and/or the mounting apparatus is/are made rotationally symmetrical, especially concentric to a center Z of the mounting apparatus.

3. The device as claimed in claim 1 or 2, wherein at least one negative pressure channel (3) which interrupts the mounting surface (7, 7', 7", 7"', 7^{IV}) is provided in the outer ring section (10) of the mounting contour (8, 8', 8", 8"', 8^{IV}).

4. The device as claimed in claim 3, wherein the negative pressure channel (3) runs concentrically, especially in the shape of a circular ring, to a center Z of the mounting apparatus, especially around the entire periphery.

5. The device as claimed in one of the preceding claims, wherein the support surface (12, 12', 12'') is circular ring shaped, preferably concentrically to the center Z.

6. The device as claimed in one of the preceding claims, wherein the deformation means are made to act on the first semiconductor substrate (15) on the side of the mounting surface (7, 7', 7", 7"', 7^{IV}) especially outside, preferably solely outside the mounting surface (7, 7', 7", 7"', 7^{IV}).

7. The device as claimed in one of the preceding claims, wherein the deformation means is at least one pressure element (6, 6', 6", 6"') which penetrates the mounting contour (8, 8', 8", 8"', 8^{IV}).

8. The device as claimed in one of the preceding claims, wherein the deformation means are made such that the deformation takes place concentrically to the first semiconductor substrate (15).

9. The device as claimed in Claim 2, wherein in the inner ring section (11) there are especially individually triggerable fixing elements (16) for fixing of the corresponding fixing sections along the first semiconductor substrate (15).

10. A method for especially temporary bonding of a first semiconductor substrate (15) to a second semiconductor substrate (15') with the following steps, especially the following sequence:

- mounting the first semiconductor substrate (15) on a mounting contour (8, 8', 8", 8"', 8^{IV}) with an active mounting surface (7, 7', 7", 7"', 7^{IV}) of the mounting apparatus (1) with

a) an outer ring section (10) for controllable fixing of the first semiconductor substrate (15),

b) an inner ring section (11) which is set back in one at least largely relative to the mounting surface (7, 7', 7", 7"', 7^{IV}), wherein the mounting contour (8, 8', 8", 8"', 8^{IV}) in the inner ring section (11) has at least one support surface (12, 12', 12") for supporting the first semiconductor substrate (15), the support surface (12, 12', 12") being included in the mounting surface (7, 7', 7", 7"', 7^{IV}),

- deforming the first semiconductor substrate (15) within the outer ring section by deformation means for controllable deformation of the first semiconductor substrate (15)

- bonding the first semiconductor substrate (15) to the second semiconductor substrate by bonding means by removal of the deformed first semiconductor substrate (15) from the mounting apparatus.

11. The method as claimed in Claim 10, wherein bonding takes place essentially concentrically proceeding from the middle M of the contact surface of the first and second semiconductor substrate by deformation of the first semiconductor substrate (15).

12. The method as claimed in one of claims 10 or 11, wherein distortions and/or strains of the first and/or second semiconductor substrate which have been determined by an upstream measurement method are reduced by action, especially by controlled distortion and/or strain of sections of the first and/or second semiconductor substrate, on the first and/or second semiconductor substrate, especially by means of fixing elements (16) for fixing of corresponding fixing sections.

13. A device for especially temporary bonding of a first semiconductor substrate (15) with a second semiconductor substrate (15') with the following features:

- a mounting apparatus for mounting of the first semiconductor substrate (15) on a mounting contour (8, 8', 8", 8"', 8^{IV}) with an active mounting surface (7, 7', 7", 7"', 7^{IV}) of the mounting apparatus with

a) an outer ring section (10) for controllable fixing of the first semiconductor substrate (15) and

b) an inner ring section (11) which is set back at least largely relative to the mounting surface (7, 7', 7", 7"', 7^{IV}),

- deformation means for controllable deformation and herewith pretensioning of the first semiconductor substrate (15), wherein the deformation means are designed to act within the outer ring section and

- bonding means for automatic bonding of the first semiconductor substrate (15) with the second semiconductor substrate (15') due to the pretensioning, wherein the mounting contour (8, 8', 8", 8"', 8^{IV}) in the inner ring section (11) has at least one support surface (12, 12', 12") for supporting the semiconductor semiconductor substrate (15), the support surface (12, 12', 12") being included in the mounting surface (7, 7', 7", 7"', 7^{IV}),

wherein the ring width b_A of the outer ring section (10) is smaller than the ring width b_1 of the inner ring section (11), wherein the ratio of the ring width b_A to b_1 is less than 1 to 3,

wherein the projection surface of the mounting contour (8, 8', 8", 8"') is at least twice, especially three times, as large as the active mounting surface (7, 7', 7", 7"', 7^{IV}).