Flexible Carrier Mount, Device and Method for Detaching a Carrier Substrate

Specification

The invention relates to a flexible carrier mount, a device for detaching a carrier substrate from a product substrate in one detachment direction L, a corresponding method and a use of a flexible carrier mount for mounting a carrier substrate in the debonding of a carrier substrate from a product substrate.

In the semiconductor industry structure wafers or product wafers are often temporarily bonded to carrier wafers or carrier substrates in order to be able to handle them. After processing of the product substrates, they should be removed from the carrier substrate as easily, promptly, economically and cleanly as possible. The most frequently used method for bonding of product wafers on a carrier wafer is the application of an adhesion layer to one of the two substrates (or both substrates) and making contact under pressure. During debonding, the carrier wafer is debonded from the product wafer after reducing the adhesion force of the cement (temperature, UV radiation, etc.), for example by parallel shifting of the wafers against one another. The wafers are held by so-called chucks by negative pressure.

During debonding, a plurality of critical factors must be considered and the top priority is to expose the brittle product wafer which is very expensive due to preprocessing to as little stress as possible and to not damage it. The carrier substrate should be debonded on the other hand economically and promptly with as little energy consumption as possible. In a plurality of known debonding processes it is necessary, especially for breaking up the adhesion properties of the adhesion layer between the wafers, to heat the stack of carrier wafers and structure wafers/product

wafers to a temperature which is specific to the cement.

Embodiments of the present invention develop the generic devices and methods for debonding of carrier substrates such that careful debonding which is at the same time much quicker is enabled. At the same time the energy consumption will be reduced.

In a first aspect, there is provided a flexible carrier mount for mounting of a carrier substrate when the carrier substrate is detached from a product substrate, detachment means being provided for debonding of the product substrate with bending of the carrier substrate, wherein the carrier mount is designed to allow bending of the carrier substrate and made as an open ring with an adjustable diameter (D_k).

In a second aspect, there is provided device for detaching a carrier substrate from a product substrate in one detachment direction (L) with the following features: a carrier mount which is flexible in the detachment direction (L) for mounting of the carrier substrate, a substrate mount for mounting of the product substrate and detachment means for debonding of the carrier substrate from the product substrate with bending of the carrier substrate, wherein the carrier mount is designed to allow bending of the carrier substrate and made as an open ring with an adjustable diameter (D_k).

In a third aspect, there is provided a method for detaching a carrier substrate from a product substrate in one detachment direction (L) with the following steps, especially the following sequence: mounting of the product substrate with a substrate mount and mounting of the carrier substrate with a carrier mount which is flexible in the detachment direction (L) and which is

designed to allow bending of the carrier substrate and made as an open ring with an adjustable diameter (D_k), and debonding of the carrier substrate form the product substrate with bending of the carrier substrate.

In a fourth aspect, there is provided the use of a flexible carrier mount for mounting of a carrier substrate when the carrier substrate is debonded from a product substrate, wherein the carrier mount is designed to allow bending of the carrier substrate and made as an open ring with an adjustable diameter (D_k).

All combinations of at least two of the features given in the specification, the claims and/or the figures also fall within the framework of the embodiments of the invention. At the given value ranges, values within the indicated limits will also be disclosed as boundary values and will be claimed in any combination.

The basic idea as per embodiments of this invention is to engineer a carrier mount for mounting of the carrier substrate in the detachment of the carrier substrate from the product substrate such that the carrier mount is made to allow bending of the carrier substrate. The carrier mount as per embodiments of the invention has a bending stiffness which is sufficient to cause a detachment force for debonding of the carrier substrate from the product substrate, especially by lifting from the edge of the carrier substrate.

As per embodiments of the invention only a slight bowing should occur, especially < 45° bending angle, preferably < 40°, more preferably < 30°, especially preferably < 20°, even more preferably < 10°, most preferably < 5°. In this way the carrier substrate which also has a certain bending stiffness which is similar to the carrier mount, and above all the product substrate are protected against damage. Bending causes most of the detachment force on the migrating detachment front which migrates especially from the edge of the carrier substrate in the direction of the center.

The heart of the embodiments of the invention is therefore a flexible carrier mount for mounting of a carrier

substrate in the detachment of the carrier substrate from a product substrate, detachment means being provided for debonding of the product substrate with bending of the carrier substrate on the carrier mount.

As per embodiments of the invention therefore blanket, non-annular versions of the carrier mount, especially of a polymer with a certain elasticity or bending strength, are also conceivable. To fix and hold the carrier substrate they would have vacuum passages. In this connection, especially in addition to increasing the holding force, there can be electrostatic fixing of the carrier substrate on the carrier mount.

The carrier mount can also consist at least partially of metal, ceramic or a composite material. The materials used need allow only the functionality as per embodiments of the invention.

An embodiment of the invention is moreover a device for detaching a carrier substrate from a product substrate in one detachment direction L with the following features:

- a carrier mount which is flexible in the detachment direction L for mounting of the carrier substrate,
- a substrate mount for mounting of the product substrate,
- detachment means for debonding of the carrier substrate from the product substrate with bending of the carrier substrate.

The detachment direction L as per embodiments of the invention is essentially, in particular exactly, normal to the surface of the carrier substrate and/or product substrate. One bending axis of the bending of the carrier mount and/or of the carrier substrate held by the carrier mount is normal to the detachment direction L. The bending axis is especially parallel to the surface of the product substrate and/or of the carrier substrate.

In one advantageous version the device as per embodiments of the invention can advantageously comprise a pressure chamber which can be exposed to overpressure in order to fix a carrier substrate which has been fixed with negative pressure on the carrier mount more strongly to it. The pressure in the chamber can be > 1 bar, preferably > 2 bar, even more preferably > 5 bar, still more preferably > 10 bar, especially less than 100 bar.

According to one advantageous embodiment of the invention it is provided that the carrier mount is elastically deformable in the detachment direction L. As per embodiments of the invention the elasticity of the carrier mount makes it possible to concentrate the detachment force on the migrating detachment front, although a tensile force is applied only on the periphery of the carrier substrate.

In another advantageous embodiment of the invention it is provided that at least one tensile force acting on the periphery of the substrate mount and at least one opposing force acting against the tensile force on the periphery of the carrier mount can be applied by the detachment means to produce detachment moments along one detachment front. In this way the total load, especially at the start of debonding, can be reduced. In this way greater protection of the carrier substrate and of the product substrate is afforded. It is provided in particular that the tensile forces add up, especially by uniform application of tensile forces on the periphery of the substrate mount, to a resulting tensile force in the center of the substrate mount, while the opposing force or the opposing forces add up to a resulting opposing force on one edge of the carrier mount and corresponding detachment moments on the migrating detachment front. The carrier mount is accordingly tilted relative to the substrate mount.

For better protection of the product substrate, especially for very sensitive or very expensive

product substrates, as per embodiments of the invention it is provided that the substrate mount be made as a rigid receiver which holds the product substrate over the entire surface.

According to another advantageous embodiment of the invention, it is provided that the carrier mount be made as an especially open ring with an adjustable inside diameter D_i. The bending stiffness can be optimally adjusted to the carrier substrate due to the ring shape also by the ring geometry, especially the ring width B to the ring diameter D_a, and/or to the height H of the ring. The ring shape furthermore results in that in the region of the ring opening greater freedom of motion of the carrier substrate is allowed so that an interaction of the bending stiffness of the carrier mount and the bending stiffness of the carrier substrate is achieved. Here the bending stiffness of the carrier mount is especially at least equal to or greater than the bending stiffness of the carrier substrate.

The bending stiffness of the carrier mount is advantageously chosen as per embodiments of the invention such that it lies in a range between 1/20 to 20 times, especially between 1/10 to 10 times, preferably between 1/5 to 5 times, even more preferably between 1/2 to 2 times, the bending stiffness of the carrier substrate. The carrier substrate is especially a wafer of silicon with a thickness d between 500 μm and 750 μm, preferably of 600 μm. It can have a diameter D_t of 200 mm or 300 mm.

Here it is especially advantageous to provide holding means which run especially over the entire ring periphery, especially in the form of a rebounding peripheral shoulder. Thus, with a simple geometrical shape which can be economically produced, both the detachment force can be applied to the carrier substrate, especially on the entire periphery of the carrier substrate, and the especially critical initiation of the detachment front at the start of debonding can be concentrated at

one or more sites on the periphery of the carrier substrate.

In one development it is provided as per embodiments of the invention that the carrier mount is made to laterally surround the carrier substrate essentially completely, especially at least to 98% of the periphery, preferably at least to 99%, even more preferably to at least 99.5%. In this way the carrier substrate is supported more or less over the entire periphery. The carrier mount is made especially as a ring which is peripherally closed preferably at least up to 98% of the periphery, even more preferably at least to 99%, still more preferably at least to 99.5%. The ring can also be composed of individual sections.

According to one advantageous embodiment, the detachment means have translational drive means for causing a translation movement of at least one peripheral section of the carrier mount in the detachment direction L.

An embodiment of the invention is a method for detaching a carrier substrate from a product substrate in one detachment direction L with the following steps, especially the following sequence:
- mounting of the product substrate with a substrate mount and mounting of the carrier substrate with a carrier mount which is flexible in the detachment direction L and
- debonding of the carrier substrate from the product substrate with bending of the carrier substrate.

Furthermore, in an embodiment the invention there is a use of a flexible carrier mount for mounting of a carrier substrate when the carrier substrate is debonded from a product substrate.

In one advantageous embodiment of the invention it is provided that the debonding takes place at a temperature $< 200^{\circ}C$, preferably $< 100^{\circ}C$, even more preferably $< 50^{\circ}C$, ideally at ambient temperature, especially without blanket heating means.

As per embodiments of the invention it is conceivable to accelerate the debonding, especially on the detachment front, by action of the detachment means, especially by separating means, locally on the detachment front. The separating means can comprise mechanical separation and/or local heating, preferably a directed hot air flow. Specifically a separating wedge, a separating blade, a separating wire or a preferably hot compressed air jet directed at the detachment front can be provided individually or in combination.

A separating wedge is defined as a tool with a preferably v-shaped profile. A separating blade is defined as a tool with an extremely sharp edge. The separating wire is a very thin, preferably high strength wire which is moved by a corresponding apparatus in the tensioned state in the plane of the intermediate layer toward it. The separating wire is made especially as a heated wire, therefore able to be heated.

One embodiment is also conceivable in which the detachment front runs more or less in a spiral during the detachment along the periphery of the product substrate to the inside toward the center. This is achieved by the detachment forces which are acting on the periphery being increased running around the periphery.

The described features apply analogously to the device as claimed in above aspect of the invention and the method as claimed in the above aspect of the invention as well as the use as claimed in the above aspect of the invention.

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

Figure 1 shows a plan view of one carrier mount as claimed in the invention with a cutting line A-A,

Figure 2 shows a cross sectional view of the carrier mount according to cutting line A-A

from Figure 1,

Figure 3 shows a view of the carrier mount according to Figure 1 from underneath,

Figure 4 shows a detailed view of detail E from Figure 2,

Figure 5a shows a side view of a stack composed of the carrier substrate, interconnect layer and product substrate,

Figure 5b shows a plan view of a stack composed of the carrier substrate, interconnect layer and product substrate,

Figure 6 shows a detailed view analogously to Figure 4 with a first embodiment of the carrier mount,

Figure 7 shows a detailed view analogously to Figure 4 with a second embodiment of the carrier mount,

Figure 8 shows a stack fixed on a film frame,

Figures 9a - 9d show a device as claimed in the invention according to a first embodiment with four method steps as claimed in the invention and

Figures 10a - 10d show a second embodiment of the device as claimed in the invention with four method steps.

The same components or components with the same function are identified with the same reference numbers in the figures.

Figure 1 shows a carrier mount 1 which can be used semiautomatically, and in which the carrier substrate 13 is held manually by the carrier mount 1. The carrier mount 1 is used for debonding the carrier substrate 13 from a product substrate 11 which is connected to the carrier substrate by an interconnect layer 12.

The carrier mount 1 consists of a holding handle 2 which is located on one peripheral section 26 and of a ring 3 which is opened opposite the holding handle 2. On the opening 3o of the ring 3 there are spacing means 25 for adjustment of the spacing A between the ends 24, 24' on the opposite ends 24, 24' of the ring 3. An inside diameter D_i and an outside diameter D_a of the ring 3 can be adjusted by adjusting the spacing A. The spacing means 25 in this exemplary embodiment consist of levers 4, 5, the lever 4 being attached on the end 24 and the lever 5 on the end 24'. The levers 4, 5 are penetrated by positioning elements 14 which can be operated manually here. Automatic re-positioning of the above described manual kinematics is conceivable as claimed in the invention.

The holding handle 2 is attached to the ring 3 by fixing elements 10, especially screws. As claimed in the invention the material of the ring 3 for a given geometry (ring height H, ring width B, outside diameter D_a, inside diameter D_i) should be chosen such that the ring 3 can be elastically bent by the spacing means 25 against its force caused by the bending stiffness.

The ring 3 has a peripheral shoulder 7 which projects away from a ring shoulder 6, and a step 9. The step 9 runs in a z-shape with an inside angle $45^\circ < 1 < 90^\circ$, especially $< 80^\circ$, preferably $< 70^\circ$ pointed toward the middle of the ring and thus forms an especially peripherally running wall bevel 17 which ends on a sharp inner edge 8. The inner edge 8 is at the same time a component of a face surface 7s of the peripheral shoulder 7, which surface runs parallel to the ring shoulder 6. The face surface 7s is equidistant to the ring shoulder 6 with a distance M. The distance M is chosen as claimed in the invention such that it is at most slightly larger, especially at most larger by the thickness of the interconnect layer 12, than one thickness d of the carrier substrate 13 (see Figure 7). Preferably the distance M is chosen as shown in Figure 6 such that it is smaller than the thickness d

of the carrier substrate 13. Preferably the distance M is at least half as great as the thickness d of the carrier substrate 13.

A diameter D_k which lies between the inside diameter D_i and the outside diameter D_a for holding the carrier substrate 13 and which is formed by the inner edge 8 can be increased by the spacing means 25 until the carrier substrate 13 can be inserted through an opening (diameter D_k) formed by the inner edge 8 as far as the ring shoulder 6. Then the diameter D_k can be again reduced by the spacing means 25 until one peripheral edge 13u of the carrier substrate 13 adjoins the bevel 17 of the peripheral shoulder 7 and is fixed by it. Thus the carrier substrate 13 is held by the flexible carrier mount 1. The mounting takes place more or less by clamping and/or by form fit. For clamping of the carrier substrate 13 on the bevel 17 there can be dynamometer means for control of the clamping, especially on the positioning means 14.

The product substrate 11 is only attached to the carrier mount via the interconnect layer 12. There is no direct contact between the carrier mount 1 and the product substrate 11. While avoiding contact between the carrier mount 1 and the product substrate 11 the product substrate 11 is protected to the maximum degree and contamination or damage is essentially precluded.

The product substrate 11 with the interconnect layer 12 and the carrier substrate 13 forms a stack 19 (carrier substrate - product substrate - combination). This invention is likewise suited for a combination of carrier substrate and product substrate without interposed interconnect layer, especially for so-called prebonds, in which the wafers adhere to one another especially by means of Van der Waals forces.

When fixing the stack 19 on the carrier mount 1 in the embodiment shown in Figure 7 the sharp inner edge 8 is used at the same time as a separating means or to initiate debonding by the tip

of the inner edge 8 on the peripheral edge of the interconnect layer 12 penetrating into the interconnect layer 12.

The carrier mount 1 almost completely surrounds the carrier substrate 13, except for the ring opening 3o.

Figure 8 shows the stack 19 on a film frame 23, the product substrate 11 being connected to a film 21 which is joined to the film frame 23. The stack 19, the film frame 23 and the film 21 [form] a film frame combination 20.

The carrier substrate 13 can be pulled off the product substrate 11 by means of the holding handle 2 and by fixing of the product substrate 11 or of the film frame 23. The tensile force is applied laterally to the carrier substrate 13, therefore to the peripheral section 26 by the unilateral arrangement of the holding handle 2. Initiated by the penetration of the inner edge 8 into the interconnect layer 12, the carrier substrate 13 with deformation of the carrier substrate 13 and of the ring 3 (against its force produced by the bending stiffness) is slowly debonded proceeding from the peripheral section 26 to the opposite side. Here a detachment front migrates from the peripheral section 26 to the opposite side of the carrier substrate 13 by the interconnect layer 12. Accordingly, depending on the distance of the detachment front from the holding handle 2 and the detachment force applied to the holding handle 2, defined torques act along the detachment front.

In automated form this is shown in Figures 9a to 9d in a first embodiment and in Figures 10a to 10d in a second embodiment, which are detailed below.

The use of the above described carrier mount 1 for mounting of the carrier substrate 13 in a form suitable for automation is common to the two embodiments.

One important aspect of the invention consists in providing especially careful handling at

the start of debonding, therefore when debonding is initiated, especially by implementation of a mechanical debonding of the interconnect layer on the periphery or on its edge.

Figures 9 and 10 each show one base 27 and one rack 22 which is mounted on it for providing a stable base construction and for attachment of other components of the device as claimed in the invention, which are described below. On the frame 22 or the base 27, especially between a cover 22d of the rack 22 and a bottom 27b formed by the base 27, there are drive means 15' for translational movement (especially driven) of the carrier mount 1 or of peripheral sections of the carrier mount 1 and drive means 15 for translational movement (especially driven) of a substrate mount 18 (receiver) which holds the stack 19 or the film frame combination 20. The drive means 15' can have a trip-free mechanism in the direction of translation, especially formed by a movable bearing.

The substrate mount 18 in the two embodiments as shown in Figure 9 and Figure 10 can be moved up and/or down in translation in one detachment direction L, therefore in the plane of the drawing. The drive means 15 for driving the substrate mount 18 can thus be moved especially synchronously, preferably driven by motors, especially stepping motors, which are controlled by a central control device.

In the embodiment as shown in Figure 9, for the carrier mount 1 there is only one drive means 15' on the side of the carrier mount 1 opposite the peripheral section 26, while on the peripheral section 26 there is one rocker bearing 16, so that the carrier mount can be pivoted around the rocker bearing 16, but is fixed in the detachment direction L. Thus the sequence of the method is as follows:

In the method step shown in Figure 9a, the carrier mount 1 which is suitable for the film

frame combination 20, especially the carrier substrate 13, is attached to the upper drive means 15' and the rocker bearing 16. At the same time, beforehand or subsequently, the film frame combination 20 is fixed onto the substrate mount 18, in particular by application of a vacuum. The substrate mount 18 can be moved by the drive means 15 in the detachment direction L.

As claimed in the invention, it is alternatively conceivable that on the periphery of the carrier mount 1 there are several, especially two, drive means 15' on one side and several, especially two, rocker bearings 16 on the opposite side.

The carrier mount 1 can be fixed by holding means 28 which are located on the ring periphery 3u on the drive means 15' and the rocker bearing 16. The substrate mount 18 can be fixed by holding means 29 on the drive means 15.

Then the substrate mount 18 is moved into the position shown in Figure 9b (therefore in the detachment direction L toward the carrier mount 1) by the drive means 15 executing a synchronous translational movement of the substrate mount 18 until the carrier substrate 13 with its top 13o adjoins the ring shoulder 6. Control can take place via the central control device, the detection of the carrier substrate 13 striking the ring shoulder 6 taking place by force transducers which are integrated especially into the substrate mount 18. Preferably on the periphery of the substrate mount 18 there are a number n of force transducers distributed at an angular distance of $360°/n$.

So that the carrier substrate 13 can be held in the carrier mount 1, the diameter D_k must be matched accordingly beforehand to the inner edge 8 of the ring 3 so that the carrier substrate 13 with its outside contour (especially circular with a diameter D_t) can be received into the carrier mount 1. When the carrier mount 13 is received the inside diameter D_i is smaller than the diameter D_t of the carrier substrate 13 so that the carrier substrate 13 does not slip through. As soon as the

position shown in Figure 9b is reached, the inside diameter D_i can be reduced until the carrier substrate 13 is fixed in the carrier mount 1 (see Figures 6 and 7), and therefore adjoins the wall bevel 17.

As soon as the position which is shown in Figure 9b is reached, the upper fixable drive means 15' is released so that it has a degree of freedom in the detachment direction L and the side of the carrier mount 1 attached to the drive means 15' can move freely in the detachment direction L. In this embodiment the drive means 15' is made driveless. But as claimed in the invention here a control of the motion by the central device is also conceivable so that the drive means 15' is made not passive (as in the preferred embodiment), but active.

Then, on the two drive means 15 which are provided opposite on the substrate mount 18 one drive force F_1 (tensile force) which is pointed away from the carrier mount 1 and one drive force F_2 (tensile force) which is especially identical to the drive force F_1 are applied especially synchronously to the substrate mount 18 for debonding of the carrier substrate 13 which is fixed on the carrier mount 1 from the product substrate 11.

Acting opposite the drive forces F_1 and F_2 and especially parallel to them, an opposing force G (or several opposing forces G, if there are several rocker bearings 16) is applied to the rocker bearing 16.

In this way the debonding process which has been initiated from the inner edge 8 is continued, with increasing bending of the carrier mount 1 and of the carrier substrate 13 a detachment front running from the rocker bearing 16 to the opposite side of the carrier mount 1. In equilibrium with the drive forces F_1 and F_2 as well as the opposing force G (caused by the interconnecting force of the interconnect layer 12), torques act along the detachment front as

detachment moments K_1 to K_n which are distributed infinitesimally along the detachment front.

In the position shown in Figure 9c, the carrier substrate 13 is debonded by more than half, debonding taking place by both the carrier substrate 13 and also the carrier mount 1 deforming (against the bending strength of the carrier mount 1 and of the carrier substrate 13).

In the position shown in Figure 9d, the carrier substrate 13 is debonded completely from the product substrate 11. The interconnect layer 12 in the figure adheres to the product substrate 11, but can also adhere partially or completely to the carrier substrate 13.

During the debonding, the carrier mount 1 and the carrier substrate 13 bend by an (average, especially measured at half debonding of the carrier substrate 13 from the product substrate 11) bending angle $1^\circ < W < 45^\circ$, especially $W < 35^\circ$, here roughly 6°.

In the second embodiment as shown in Figure 10a to Figure 10d, instead of the drive means 15' there is a rocker bearing 16 on the carrier mount 1 so that the carrier mount 1 on the peripheral sections 26 and an opposite peripheral section 26' (therefore where the rocker bearings 16 are attached to holding means 28 of the carrier mount 1) is fixed in the detachment direction L (as claimed in the invention there can be several rocker bearings 16 on the periphery of the carrier mount 1). In sections between the peripheral sections 26 the carrier mount 1 is movable within the framework of its flexibility against the bending stiffness. Thus when the drive forces are applied in the method step according to 10c, a detachment front which runs essentially (rippled) concentrically from the periphery of the interconnect layer 12 arises to the middle of the interconnect layer 12. Here the initiation by the inner edge 8 of the carrier mount plays an important part for overcoming the initial interconnecting force of the interconnect layer 12.

The detachment moments K_1 to K_n act in the embodiment as shown in Figures 10a to 10d

each predominantly on one (rippled) circular section along the detachment front as the detachment front progresses. While the bending angle W according to Figure 9c to the side edge opposite the rocker bearing is measured, the bending angle W' is measured from the center of the carrier substrate 13 to the edge due to the detachment force K which acts on the periphery from all sides, the bending angle W' in this case being correspondingly smaller due to the shorter distance, insofar as the material of the carrier mount 1 and of the carrier substrate 2 as well as their dimensions are otherwise identical. By reducing the ring width B and/or the ring height H the bending stiffness of the ring 3 can be reduced so that the bending angle W' would be increased.

Reference number list

1	carrier mount
2	holding handle
3	ring
3o	opening
3u	ring periphery
4	lever
5	lever
6	ring shoulder
7	peripheral shoulder
7s	face surface
8	inner edge
9	step
10	fixing means
11	product substrate
12	interconnect layer
13	carrier substrate
13o	top
13u	peripheral edge
14	positioning elements
15, 15'	drive means
16	rocker bearing

17	bevel
18	substrate mount
19	stack
20	film frame combination
21	foil
22	rack
22d	cover
23	film frame
24, 24'	ends
25	spacing means
26	peripheral section
27	base
27b	bottom
28	holding means
29	holding means
A	spacing
B	ring width
D_i	inside diameter
D_a	outside diameter
D_k	diameter
H	ring height
M	distance

L	detachment direction
I	inner angle
d	thickness
F_1, F_2, F_n	drive forces (tensile force)
G	opposing force
K_1, K_2, K_n	detachment moments
W, W'	bending angles

Claims

1. Flexible carrier mount (1) for mounting of a carrier substrate (13) when the carrier substrate (13) is detached from a product substrate (11), detachment means (1, 28) being provided for debonding of the product substrate (11) with bending of the carrier substrate (13), wherein the carrier mount (1) is designed to allow bending of the carrier substrate (13) and made as an open ring (3) with an adjustable diameter (D_k).

2. Device for detaching a carrier substrate (13) from a product substrate (11) in one detachment direction (L) with the following features:

- a carrier mount (1) which is flexible in the detachment direction (L) for mounting of the carrier substrate (13),
- a substrate mount (18) for mounting of the product substrate (11) and
- detachment means (1, 15, 15', 16, 28) for debonding of the carrier substrate (13) from the product substrate (1) with bending of the carrier substrate (11), wherein the carrier mount (1) is designed to allow bending of the carrier substrate (13) and made as an open ring (3) with an adjustable diameter (D_k)..

3. Device as claimed in Claim 2, the carrier mount (1) being elastically deformable in the detachment direction (L).

4. Device as claimed in Claim 2 or 3, wherein at least one tensile force (F_1, F_2, F_n) acting especially on the periphery of the substrate mount (18) and at least one opposing force (G) acting against the tensile force (F_1, F_2, F_n), especially on the periphery of the carrier mount can be applied by the detachment means (1, 15, 15', 16, 28) to produce detachment moments (L_1, L_2, L_n) along one detachment front.

5. Device as claimed in one of Claims 2 to 4, wherein the substrate mount (18) is made as a rigid substrate mount (18) which accommodates the product substrate (11) over the entire

surface.

6. Carrier mount as claimed in Claim 1, wherein the carrier mount (1) is made as an open ring (3).

7. Carrier mount as claimed in one of Claims 1 or 6, which has holding means (9) which run especially over the entire ring periphery (3u), especially with a rebounding peripheral shoulder (7).

8. Carrier mount as claimed in one of Claims 1, 6 or 7, which is made to laterally enclose the carrier substrate (13) essentially completely.

9. Method for detaching a carrier substrate from a product substrate in one detachment direction (L) with the following steps, especially the following sequence:

- mounting of the product substrate with a substrate mount and mounting of the carrier substrate with a carrier mount which is flexible in the detachment direction (L) and which is designed to allow bending of the carrier substrate 813) and made as an open ring (3) with an adjustable diameter (D_k), and
- debonding of the carrier substrate from the product substrate with bending of the carrier substrate.

10. Use of a flexible carrier mount for mounting of a carrier substrate when the carrier substrate is debonded from a product substrate, wherein the carrier mount (1) is designed to allow bending of the carrier substrate (13) and mae as an open ring (3) with an adjustable diameter (D_k).

Flexible Carrier Mount, Device and Method

for Detaching a Carrier Substrate

Abstract

This invention relates to a flexible carrier mount (1) for mounting of a carrier substrate (13) when the carrier substrate (13) is detached from a product substrate (11), detachment means (1, 28) being provided for debonding of the product substrate (11) with bending of the carrier substrate (13).

Furthermore this invention relates to a device for detaching a carrier substrate (13) from one product substrate (11) in one detachment direction (L) with the following features:
- a carrier mount (1) which is flexible in the detachment direction (L) for mounting of the carrier substrate (13),
- a substrate mount (18) for mounting of the product substrate (11) and
- detachment means (1, 15, 15', 16, 28) for debonding of the carrier substrate (13) from the product substrate (1) with bending of the carrier substrate (11).

Moreover this invention relates to a method for detaching a carrier substrate from a product substrate in one detachment direction (L) with following steps, especially the following sequence:
- mounting of the product substrate with a substrate mount and mounting of the carrier substrate with a carrier mount which is flexible in the detachment direction (L) and
- debonding of the carrier substrate from the product substrate with bending of the product substrate.

Figure 9c