Device and Method for Stripping a Product Substrate Off a Carrier Substrate

Specification

The invention relates to a device ~~as claimed in Claim 1~~ and a method ~~as claimed in Claim 10~~ for stripping a product substrate off a carrier.

The back-grinding of product substrates is often necessary in the semiconductor industry and can take place mechanically and/or chemically. For purposes of back-grinding in general the product substrates are temporarily fixed on a carrier, there being various methods for the fixing. The carrier material can be for example films, glass substrates or silicon wafers.

Depending on the carrier materials used and the bonding layer used between the carrier and the product substrate, different methods for dissolving or destroying the bonding layer are known, such as for example the use of UV light, laser beams, the action of temperature, or solvents.

Stripping increasingly constitutes one of the most critical process steps since thin substrates with substrate thicknesses of a few microns easily break during stripping/peeling or are damaged by the forces which are necessary for the stripping process.

Moreover thin substrates have hardly any stability of shape or none at all and typically curl without support material. During handling of back-ground wafers therefore fixing and support of the wafers are essentially indispensable.

Embodiments~~Therefore the object~~ of this invention disclose~~is to devise~~ a device and a method to detach a product substrate from a carrier as nondestructively and easily as possible.

According to a first aspect, there is provided a method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer; mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive; receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir; delivering the solvent into the solvent reservoir; and at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir, wherein said bonding layer connecting the product substrate to the carrier substrate is comprised of a plurality of different adhesive layers.

According to a second aspect, there is provided a method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer, said method comprising: receiving the product substrate on a flexible film having an adhesive layer, said adhesive layer holding the product substrate on a contacting surface section of the flexible film; connecting an attachment section of the flexible film to the film frame, said attachment section surrounding the contacting surface section; and detaching the product substrate from the carrier substrate, wherein the detaching step includes: applying a force F_s that acts on the flexible film, and applying a force F_f that acts on the film frame, said force F_f directed against the force F_s, wherein said bonding layer connecting the product substrate to the carrier substrate is comprised of a plurality of different adhesive layers.

According to a third aspect, there is provided a method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer; fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section; receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer; applying a force F_s to the carrier substrate that is transferred to the flexible film; applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s; and tilting the film frame, wherein applying the force Fs and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section.

According to a fourth aspect, there is provided a method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer; mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive; receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the

solvent reservoir; delivering the solvent into the solvent reservoir; at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir; and detaching the product substrate from the carrier substrate after delivering of the solvent into the solvent reservoir and at least partially dissolving the bonding layer, wherein detaching the product substrate from the carrier substrate takes place concentrically from a periphery of said product substrate to a center of said product substrate.

According to a fifth aspect, there is provided a method tor stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer; mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive; receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir; delivering the solvent into the solvent reservoir; and at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir, wherein said bonding layer is comprised of a plurality of bonding layers, said method including selectively dissolving a specific bonding layer of the plurality of bonding layers.

According to a sixth aspect, there is provided a method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween,

wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer; mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive; receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir; delivering the solvent into the solvent reservoir; and at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir, wherein a plurality of bonding layers connect the carrier substrate to the product substrate, said method including selectively dissolving more than one bonding layer.

According to a seventh aspect, there is provided a method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer, said method comprising: receiving the product substrate on a flexible film having an adhesive layer, said adhesive layer holding the product substrate on a contacting surface section of the flexible film; connecting an attachment section of the flexible film to the film frame, said attachment section surrounding the contacting surface section; and detaching the product substrate from the carrier substrate, wherein the detaching step includes: applying a force F_s that acts on the flexible film, and applying a force F_f that acts on the film frame, said force F_f directed against the force F_s, wherein said product substrate is detached from the carrier substrate concentrically from a periphery of the product substrate to a center of the product substrate.

According to an eighth aspect, there is provided a method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer, said

method comprising: receiving the product substrate on a flexible film having an adhesive layer, said adhesive layer holding the product substrate on a contacting surface section of the flexible film; connecting an attachment section of the flexible film to the film frame, said attachment section surrounding the contacting surface section; and detaching the product substrate from the carrier substrate, wherein the detaching step includes: applying a force F_s that acts on the flexible film, applying a force F_f that acts on the film frame, said force F_f directed against the force F_s, exposing at least a portion of the bonding layer to a solvent, and at least partially dissolving the bonding layer, wherein said bonding layer is comprised of a plurality of different bonding layers, each of said plurality of different bonding layers selectively dissolved by a solvent having a different fluid agent.

According to a ninth aspect, there is provided a method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer; fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section; receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer; applying a force F_s to the carrier substrate that is transferred to the flexible film; and applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s, wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed

between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and wherein the at least one force F_f includes a first force F_{f1} applied to the film frame and a second force F_{f2} applied to the film frame, wherein the first force F_{f1} is applied at a first location of the film frame and the second force F_{f2} is applied at a second location of the film frame, the first force F_{f1} being greater than the second force F_{f2} to strip the product substrate from the carrier substrate starting at a peripheral edge of the product substrate.

According to a tenth aspect, there is provided a method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer; fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section; receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer; applying a force F_s to the carrier substrate that is transferred to the flexible film; and applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s, wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and wherein the at least one force F_f includes a plurality of different forces F_{f1}, F_{f2} to F_{fn} applied to the film frame, each of said plurality of different forces

F_{f1}, F_{f2} to F_{fn} applied at different locations of the film frame to strip the product substrate from the carrier substrate concentrically from the periphery of the product substrate to a center of the product substrate.

According to an eleventh aspect, there is provided a method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combinations said method comprising: mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer; fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section; receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer; applying a force F_s to the carrier substrate that is transferred to the flexible film; and applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s, wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, increases a volume of the solvent reservoir to increase capacity of the solvent reservoir to receive the solvent.

According to a twelfth aspect, there is provided a method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-

product substrate combination, said method comprising: mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer; fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section; receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer; applying a force F_s to the carrier substrate that is transferred to the flexible film; and applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s, wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and wherein the force F_s and the at least one force F_f are applied to deform at least the stripping section of the flexible film, in first and second operating modes, wherein in the first operating mode the contacting surface section of the flexible film is moved in a first direction, and in the second operating mode the contacting surface section of the flexible film is moved in a second direction that is opposite of the first direction.

According to a thirteenth aspect, there is provided a method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising: mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer; fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the

outer periphery of the contacting surface section; receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer; applying a force F_s to the carrier substrate that is transferred to the flexible film; and applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s, wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, moves the flexible film between (i) an initial position, wherein the contacting surface section and the attachment surface section are substantially in the same plane, (ii) a detachment position, wherein the contacting surface section is located in a plane below the attachment surface section, and (iii) a stripping position, wherein the contacting surface section is located in a plane above the attachment surface section.

~~This object is achieved with the features of Claims 1 and 10. Advantageous developments of the invention are given in the dependent claims.~~ The framework of the invention also

encompasses all combinations of at least two of the features given in the specification, the claims, and/or the figures. In the specified value ranges, values which lie within the indicated limits will also be disclosed as boundary values and they are to be claimed in any combination.

Embodiments of t~~T~~he invention are~~is~~ based on the idea of developing a generic device and a generic method by solvent being delivered to a solvent reservoir which is formed by the film frame and the film attached to it. Due to the elasticity or flexibility of the film which is mounted on the film frame it is at the same time possible to make the solvent tank of variable volume and the elasticity or flexibility of a film is moreover used to carefully strip the product substrate starting from the edge of the product substrate. In this way the product substrate is immediately available for other process steps directly after separation and is protected by the film and the film frame. Many process steps can be carried out directly on the product substrate mounted on the film frame.

A product substrate is defined as a product substrate, for example a semiconductor wafer, which is conventionally thinned to a thickness between 0.5 μm and 250 μm, the trend being toward thinner and thinner product substrates. Embodiments of the~~This~~ invention works especially effectively with product substrates which themselves have a flexibility similar to the film mounted on the film frame. The product substrate in the device as per embodiments of~~claimed in~~ the invention and the method as per embodiments of~~claimed in~~ the invention is peeled off the carrier substrate, especially proceeding concentrically from the periphery of the product substrate.

The carrier is for example a carrier substrate with a thickness between 50 μm and 5000 μm, especially between 500 μm and 1000 μm.

The bonding layer can be an adhesive, for example a soluble adhesive, especially a thermoplastic, which is applied for example selectively in the edge region of the carrier-product

and/or product substrate can be omitted.

To the extent the solvent reservoir is made such that the solvent acts at least at the start of detachment of the bonding layer, especially solely in the region of the periphery of the product substrate, action on the product substrate and/or carrier substrate from the top and/or bottom, especially the inner region of the product substrate which lies within the side edge, can be omitted.

In another embodiment~~configuration~~ of the invention it is provided that the stripping means are made to cause a force F_s which acts on the carrier substrate and a force F_f which acts on the film frame and which is directed against the force F_s. In this way stripping is effected in a manner which is simple and especially protective by the film. The force F_F acts on the periphery of the film frame, especially at at least two locations on the film frame which are distributed over the periphery, and the forces F_{f1} and F_{f2} can be controlled differently in one advantageous embodiment in order to strip the product substrate from the side with the greater force F_f.

Here it is especially advantageous if the film can be clamped, especially by the force Fs and force Ff in a stripping section which lies between the contacting surface section and the attachment section. In this way stripping is carefully effected on the periphery of the product substrate. Detachment by the solvent and stripping by the forces F_s and F_f mutually support one another.

According to one advantageous embodiment of the invention it is provided that there is a vibration generator which acts on the solvent and/or the bonding layer, which adjoins especially the film, and/or which can be placed in the solvent in the solvent reservoir. "Can be placed" comprises both surface contact and also at least partial immersion. This supports detachment by the solvent and accelerates the detachment process at least by a factor of 2, with an optimized configuration by a factor of 5, even more preferably by a factor of 10 to 50. Preferably the vibration generator acts by

Claims

1. Device for stripping a product substrate (4) off a carrier substrate (2) connected to the product substrate (4) by a bonding layer (6), wherein the product substrate (4) is received on with a flexible film (3) which has an adhesive layer (3s) for holding the product substrate (4) in a contacting surface section (3k) of the film (3), and wherein the film (3) being connected to the film frame (1) in an attachment section (3b) of the film (3) which surrounds the contacting surface section (3k), with the following features:

- stripping means for stripping the product substrate (4) off the carrier substrate (2) by means of a force Fs and a force Ff which is acting on the film frame (1) and which is directed against the force Fs.

2. Device as claimed in claim 1, wherein the film (3) can be clamped, especially by the force Fs and force Ff, in a stripping section (3a) which lies between the contacting surface section (3k) and the attachment section (3b).

3. Device as claimed in one of the preceding claims, wherein the stripping means are made to act concentrically from the periphery (4u) of the product substrate (4) to the center (4z) of the product substrate (4).

4. Method for stripping a product substrate (4) off a carrier substrate (2) connected with the product substrate (4) by means of a bonding layer (6), wherein the product substrate (4) is received on with a flexible film (3) which has an adhesive layer (3s) for holding the product substrate (4) in a contacting surface section (3k) of the film (3), and wherein the film (3) being connected to the film frame (1) in an attachment section (3b) of the film (3) which surrounds the contacting surface section (3k), with the following steps:

- detaching the product substrate (4) from the carrier substrate (2) by means of a force Fs and a force Ff which is acting on the film frame (1) and which is directed against the force Fs.

5. Method as claimed in Claim 4, wherein the stripping means is effected concentrically from the periphery (4u) of the product substrate (4) to the center (4z) of the product substrate (4).

6. Method as claimed in Claim 4 or 5, wherein the product substrate (4) is bonded to the carrier substrate (2) by means of a bonding layer containing different adhesives.

7. Combination of a carrier substrate (2) and a product substrate being bonded to the carrier substrate (2) by means of a bonding layer (6), wherein the product substrate (4) is received on with a flexible film (3) which has an adhesive layer (3s) for holding the product substrate (4) in a contacting surface section (3k) of the film (3), and wherein the film (3) being connected to the film frame (1) in an attachment section (3b) of the film (3) which surrounds the contacting surface section (3k), and wherein the bonding layer (6) is at least partially dissolved.

8. Combination as claimed in Claim 7, wherein the bonding layer (6) contains several different bonding layers, which can be dissolved selectively.

Claims:

1. Method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer;

mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive;

receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir;

delivering the solvent into the solvent reservoir; and

at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir,

wherein said bonding layer connecting the product substrate to the carrier substrate is comprised of a plurality of different adhesive layers.

2. Method as claimed in claim 1, wherein, at least at the start of dissolving the bonding layer, the solvent acts solely in a region of a periphery of the product substrate.

3. Method as claimed in claim 1, wherein the step of receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir includes:

(i) applying a force F_s acting on the carrier substrate that is transferred to the flexible film, and

(ii) applying a force F_f acting on the film frame, said force F_f directed against the force F_s.

4. Method as claimed in claim 1, wherein the step of at least partially dissolving the bonding layer includes dissolving the bonding layer in the solvent reservoir starting from a periphery of the product substrate.

5. Method as claimed in claim 1, wherein said method further comprises:

detaching the product substrate from the carrier substrate after delivering of the solvent into the solvent reservoir and at least partially dissolving the bonding layer.

6. Method as claimed in claim 5, wherein detaching the product substrate from the carrier substrate is caused by a force Fs acting on said carrier substrate and a force Ff acting on said film frame and which is directed against the force Fs.

7. Method as claimed in claim 5, wherein detaching the product substrate from the carrier substrate takes place concentrically from a periphery of said product substrate to a center of said product substrate.

8. Method as claimed in claim 1, wherein the solvent comprises a fluid that selectively dissolves the bonding layer, for at least partial detachment of the bonding layer.

9. Method as claimed in claim 1, wherein the bonding layer is dissolved in defined regions.

10. Method as claimed in claim 1, wherein said bonding layer is comprised of a plurality of bonding layers, said method including selectively dissolving a specific bonding layer of the plurality of bonding layers.

11. Method as claimed in claim 1, wherein a plurality of bonding layers connect the carrier substrate to the product substrate, wherein said method further comprises selectively dissolving more than one bonding layer.

12. Method as claimed in claim 1, wherein the solvent acts solely in the region of the periphery of the product substrate.

13. Method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer, said method comprising:

receiving the product substrate on a flexible film having an adhesive layer, said adhesive layer holding the product substrate on a contacting surface section of the flexible film;

connecting an attachment section of the flexible film to the film frame, said attachment section surrounding the contacting surface section; and

detaching the product substrate from the carrier substrate, wherein the detaching step includes:

applying a force F_s that acts on the flexible film, and

applying a force F_f that acts on the film frame, said force F_f directed against the force F_s,

wherein said bonding layer connecting the product substrate to the carrier substrate is comprised of a plurality of different adhesive layers.

14. Method as claimed in claim 13, wherein said product substrate is detached from the carrier substrate concentrically from a periphery of the product substrate to a center of the product substrate.

15. Method as claimed in claim 13, wherein the detaching step includes:

exposing at least a portion of the bonding layer to a solvent; and

at least partially dissolving the bonding layer

16. Method as claimed in claim 15, wherein said bonding layer is comprised of a plurality of different bonding layers, each of said plurality of different bonding layers selectively dissolved by a solvent having a different fluid agent.

17. Method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer;

fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section;

receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer;

applying a force F_s to the carrier substrate that is transferred to the flexible film;

applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s; and

tilting the film frame,

wherein applying the force Fs and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section.

18. Method as claimed in claim 17, wherein the method further comprises engaging a carrier substrate holder with the carrier substrate to apply the force F_s to the carrier substrate.

19. Method as claimed in claim 17, wherein the method further comprises engaging a film frame holder with the film frame to apply the at least one force F_f to the film frame.

20. Method as claimed in claim 17, wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, varies the volume of the solvent reservoir.

21. Method as claimed in claim 17, wherein the method further comprises:

producing acoustic waves that are transmitted to at least one of: (i) the solvent received in the solvent reservoir, and (ii) the bonding layer.

22. Method as claimed in claim 21, wherein the method further comprises:

producing said acoustic waves using a vibration generator.

23. Method as claimed in claim 17, wherein said solvent reservoir is trough-shaped.

24. Method as claimed in claim 17, wherein the method further comprises:

dissolving the bonding layer from a periphery of the product substrate using the solvent received in the solvent reservoir.

25. Method as claimed in claim 17, wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, moves the contacting surface section of the flexible film to a different plane than the attachment surface section of the flexible film.

26. Method as claimed in claim 17, wherein the at least one force F_f is uniformly distributed on the film frame.

27. Method as claimed in claim 17, wherein the at least one force F_f includes a first force F_{f1} applied to the film frame and a second force F_{f2} applied to the film frame, wherein the first force F_{f1} is applied at a first location of the film frame and the second force F_{f2} is applied at a second location of the film frame, the first force F_{f1} being greater than the second force F_{f2} to strip the product substrate from the carrier substrate starting at a peripheral edge of the product substrate.

28. Method as claimed in claim 17, wherein the at least one force F_f includes a plurality of different forces F_{f1}, F_{f2} to F_{fn} applied to the film frame, wherein each of said plurality of different forces F_{f1}, F_{f2} to F_{fn} is applied at different locations of the film frame to strip the product substrate from the carrier substrate concentrically from the periphery of the product substrate to a center of the product substrate.

29. Method as claimed in claim 17, wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, increases a volume of the solvent reservoir to increase capacity of the solvent reservoir to receive the solvent.

30. Method as claimed in claim 17, wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, strips the product substrate from the carrier substrate.

31. Method as claimed in claim 17, wherein said method further comprises:

applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, in first and second operating modes, wherein in the first operating mode the contacting surface section of the flexible film is moved in a first direction, and in the second operating mode the contacting surface section of the flexible film is moved in a second direction that is opposite of the first direction.

32. Method as claimed in claim 17, wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, moves the flexible film between (i) an initial position, wherein the contacting surface section and the attachment surface section are substantially in the same plane, (ii) a detachment position, wherein the contacting surface section is located in a plane below the attachment surface section, and (iii) a stripping position, wherein the contacting surface section is located in a plane above the attachment surface section.

33. Method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer;

mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive;

receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir;

delivering the solvent into the solvent reservoir;

at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir; and

detaching the product substrate from the carrier substrate after delivering of the solvent into the solvent reservoir and at least partially dissolving the bonding layer, wherein detaching the product substrate from the carrier substrate takes place concentrically from a periphery of said product substrate to a center of said product substrate.

34. Method tor stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer;

mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive;

receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir;

delivering the solvent into the solvent reservoir; and

at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir,

wherein said bonding layer is comprised of a plurality of bonding layers, said method including selectively dissolving a specific bonding layer of the plurality of bonding layers.

35. Method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

connecting a flexible film to a film frame to form a solvent reservoir that receives a solvent for dissolving the bonding layer;

mounting the carrier-product substrate combination to the flexible film by fixing the product substrate to a contacting surface section of the flexible film using an adhesive;

receiving at least the product substrate and the bonding layer of the carrier-product substrate combination into the solvent reservoir;

delivering the solvent into the solvent reservoir; and

at least partially dissolving the bonding layer between the carrier substrate and the product substrate by exposing the bonding layer of the carrier-product substrate combination to the solvent received by the solvent reservoir.

wherein a plurality of bonding layers connect the carrier substrate to the product substrate, said method including selectively dissolving more than one bonding layer.

36. Method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer, said method comprising:

receiving the product substrate on a flexible film having an adhesive layer, said adhesive layer holding the product substrate on a contacting surface section of the flexible film;

connecting an attachment section of the flexible film to the film frame, said attachment section surrounding the contacting surface section; and

detaching the product substrate from the carrier substrate, wherein the detaching step includes:

applying a force F_s that acts on the flexible film, and

applying a force F_f that acts on the film frame, said force F_f directed against the force F_s, wherein said product substrate is detached from the carrier substrate concentrically from a periphery of the product substrate to a center of the product substrate.

37. Method for stripping a product substrate off a carrier substrate connected to the product substrate by a bonding layer, said method comprising:

receiving the product substrate on a flexible film having an adhesive layer, said adhesive layer holding the product substrate on a contacting surface section of the flexible film;

connecting an attachment section of the flexible film to the film frame, said attachment section surrounding the contacting surface section; and

detaching the product substrate from the carrier substrate, wherein the detaching step includes:

applying a force F_s that acts on the flexible film,

applying a force F_f that acts on the film frame, said force F_f directed against the force F_s,

exposing at least a portion of the bonding layer to a solvent, and at least partially dissolving the bonding layer,

wherein said bonding layer is comprised of a plurality of different bonding layers, each of said plurality of different bonding layers selectively dissolved by a solvent having a different fluid agent.

38. Method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer;

fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section;

receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer;

applying a force F_s to the carrier substrate that is transferred to the flexible film; and

applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s,

wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and

wherein the at least one force F_f includes a first force F_{f1} applied to the film frame and a second force F_{f2} applied to the film frame, wherein the first force F_{f1} is applied at a first location

of the film frame and the second force F_{f2} is applied at a second location of the film frame, the first force F_{f1} being greater than the second force F_{f2} to strip the product substrate from the carrier substrate starting at a peripheral edge of the product substrate.

39. Method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer;

fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section;

receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer;

applying a force F_s to the carrier substrate that is transferred to the flexible film; and

applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s,

wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and

wherein the at least one force F_f includes a plurality of different forces F_{f1}, F_{f2} to F_{fn} applied to the film frame, each of said plurality of different forces F_{f1}, F_{f2} to F_{fn} applied at different locations of the film frame to strip the product substrate from the carrier substrate concentrically from the periphery of the product substrate to a center of the product substrate.

40. Method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combinations said method comprising:

mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer;

fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section;

receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer;

applying a force F_s to the carrier substrate that is transferred to the flexible film; and

applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s,

wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and

wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, increases a volume of the solvent reservoir to increase capacity of the solvent reservoir to receive the solvent.

41. Method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer;

fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section;

receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer;

applying a force F_s to the carrier substrate that is transferred to the flexible film; and

applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s,

wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and

wherein the force F_s and the at least one force F_f are applied to deform at least the stripping section of the flexible film, in first and second operating modes, wherein in the first operating mode the contacting surface section of the flexible film is moved in a first direction, and in the second operating mode the contacting surface section of the flexible film is moved in a second direction that is opposite of the first direction.

42. Method for stripping a product substrate off a carrier substrate fixed to the product substrate by a bonding layer therebetween, wherein said carrier substrate connected to the product substrate by a bonding layer forms a carrier-product substrate combination, said method comprising:

mounting the product substrate of the carrier-product substrate combination to a contacting surface section of a flexible film, said contacting surface section including an adhesive layer;

fixing a film frame to an attachment surface section of the flexible film, wherein the attachment surface section is disposed at the outer periphery of the contacting surface section;

receiving the bonding layer in a solvent reservoir defined by the film frame and the flexible film, said solvent reservoir receiving a solvent for dissolving at least a portion of the bonding layer;

applying a force F_s to the carrier substrate that is transferred to the flexible film; and

applying at least one force F_f to the film frame, said at least one force F_f directed against the force F_s,

wherein applying the force F_s and the at least one force F_f deforms at least a stripping section of the flexible film that is disposed between the contacting surface section and the attachment surface section, the flexible film being elastic at least in the stripping section, and

wherein applying the force F_s and the at least one force F_f to deform at least the stripping section of the flexible film, moves the flexible film between (i) an initial position, wherein the

contacting surface section and the attachment surface section are substantially in the same plane, (ii) a detachment position, wherein the contacting surface section is located in a plane below the attachment surface section, and (iii) a stripping position, wherein the contacting surface section is located in a plane above the attachment surface section.