

An arrangement for providing a stamp element, a stamp element for such an arrangement, a storage device for such an arrangement, a system for such an arrangement and a method for producing and handling such an arrangement

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The present invention relates to an arrangement for providing a stamp element, a stamp element for such an arrangement, a storage device and a system for such an arrangement, as well as a method for producing the arrangement and a method for handling the arrangement.

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One of the most important technologies in the field of the manufacture of electronic components, in particular for structuring, in recent years is imprint lithography, which is increasingly replacing or at least expanding classical photolithography. With the help of imprint lithography, structure sizes in the nanometer range can already be made in HVM

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(high volume manufacturing) methods.

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The advantage of imprint lithography is its throughput, low cost and the quality and reproducibility of the structures. Classic photolithography equipment that is supposed to create structure sizes in the nanometer range is becoming increasingly more expensive. Furthermore, mask production is complex and expensive.

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In imprint lithography, on the other hand, a produced stamp is used that can be reused several times. A distinction is made between hard stamps and soft stamps. Hard stamps are created from materials that are difficult to deform, primarily metals, metal alloys, more rarely ceramics or glass. They are dimensionally stable, but like all tools, they wear out over time. Since the production of hard stamps is very expensive, wear is a significant problem. As an alternative, soft stamps are very often used. These stamps are molded as a negative by a previously created hard stamp. This hard stamp is also called a master stamp or simply a master. The material for the soft stamp is usually a polymer. Soft stamps also wear out over time, but they can be quickly and cost-effectively re-molded from the master stamp.

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It has been shown that the production of a high-quality and expensive master stamp and several soft stamps molded from the master stamp is not only economically worthwhile, but also has technical advantages. The imprinting structures of the soft stamp, which represent the negative of the structures to be produced in an imprinting mass, are flexible
5 due to the use of a soft polymer as the soft stamp material. This flexibility makes it easier to remove them from the imprinting mass. Furthermore, soft stamps are usually transparent to the electromagnetic radiation used to preferably cure an imprinting mass.

10 In the prior art, the soft stamps are usually provided on a support element. In the field of imprint lithography, the support element is sometimes also referred to as a backplane. The support element should be sufficiently rigid for the transportation and handling of the soft stamp, but thin enough to still be elastic and flexible. In most cases, the thicknesses of the support elements are very low, preferably in the millimeter or submillimeter range.

15 In addition, they must fulfil certain chemical and physical properties, especially with regard to the possibility of cleaning. The soft stamp, which is produced on a support element, should be easily removable from the support element after a certain number of uses.

20 The problem is that the support elements are usually made of brittle material, preferably glass, silicon or another material frequently used in the semiconductor industry that is as cheap as possible. At the same time, the support elements are difficult to handle.

Therefore, an objective of the invention is to provide a functional stamp element that can be produced and provided relatively easily and at low cost. The stamp element should
25 also be easy to handle, for example, it should be as easy as possible to use in a stamping device, in particular an imprinting device.

The present invention solves the problem with an arrangement according to claim 1, a stamp element according to claim 10, a storage device according to claim 11, a system
30 according to claim 13, a method for handling the arrangement and a method for producing the arrangement according to claim 15. The scope of the invention also includes all combinations of at least two features indicated in the description, claims and/or drawings. Where ranges of values are given, values within the stated limits shall also be deemed to be disclosed as limit values and shall be claimable in any combination.

According to a first aspect of the present invention, an arrangement for providing a stamp element which, when used, is intended to leave a pattern in an imprinting mass, is provided, comprising:

- 5 - a profile element which, when the stamp element is used, acts on the imprinting mass, the profile element preferably being designed in the form of a soft stamp element, and
- a support element which supports the profile element and, in particular, serves as a counter bearing when the stamp element is used,

10 the profile element and the support element being arranged on and/or at a carrier substrate for transportation.

In contrast to the prior art, it is provided that the stamp element is provided, in particular transported, by means of a carrier substrate. In particular, it is provided that, in contrast to the prior art, a functional separation is carried out, in which the carrier device can ensure

15 that the support element and the profile element can be transported for handling the stamp element. The main function of the support element is to serve as an abutment, in particular during the stamping process, i.e. when the stamp element is used, in order to arrange for the desired imprinting function to be applied to the imprinting mass by means of the profile element. This makes it possible to advantageously remove the necessity for

20 the support element to enable the entire stamp element to be transported. In other words, it is possible to enable a functional separation in the arrangement, in which the support element is given the task of serving as an abutment in the stamping process, and the carrier device is given the transport function in order to be able to properly place the stamp element in a stamping device and/or replace it. This in turn proves to be advantageous be-

25 cause it increases the flexibility in the design of the support element, for example with regard to the choice of material and/or geometry. In particular, this also allows easier manipulation of the stamp element during the stamping process, since, for example, increased elasticity of the support element, for example a thinner support element, allows local deformations within the entire stamp element or in the support element to be more easily ar-

30 ranged to be applied. Such deformations can have a corresponding corrective effect in the stamping process. In addition, the nature of the stamp element can help to ensure that the soft stamp element or profile part and support element can be more easily separated from one another in a later process. The carrier substrate, which is preferably designed to be larger in the lateral direction or in a direction parallel to the main extension plane than the

35 stamp element, is preferably designed in such a way that it allows the stamp element to

be transported and, in particular, also allows the stamp element to be arranged in a corresponding stamping device. It is conceivable that the carrier substrate is removed from the support element again after the transport process or also becomes part of the stamping device. It is not absolutely necessary for the support element and the profile element to be arranged on the same side of the carrier substrate, in particular stacked on top of each other. It is also conceivable that the profile element and the support element are arranged on opposite sides of the carrier substrate. Particularly preferably, the profile element and the support element are arranged on only one side of the carrier substrate. Alternatively, only one support element and only one profile element are arranged on opposite sides on the carrier substrate.

In particular, the support element and the profile element are arranged one above the other, in particular stacked, along a direction perpendicular to the main extension plane. The stamp element comprises profile element and support element.

In a particular embodiment, however, the support element and the profile element are located on opposite sides of the carrier substrate. In this particular case, the profile element is created directly on the carrier substrate and the support element stabilizes the carrier substrate and the profile element from the back of the carrier substrate and serves as an abutment, in particular by acting on the profile element via the carrier substrate.

The support element, in particular as a support substrate, is preferably a wafer, in particular a silicon wafer. Silicon wafers are readily available and easy to handle, inexpensive and the most thoroughly researched. Their physical and chemical properties are very well known. The task of the support element is to give the soft stamp a desired, precisely adjustable stability and formability. In the present case, this is preferably understood as the abutment capability of the support element. In particular, the abutment function of the support element is to be understood as follows: When the stamp element is used, forces emanating from the imprinting mass act on or back on the stamp element, in particular on the side of the profile element facing the imprinting mass, both in a direction perpendicular to the main extension plane and parallel to the main extension plane. The abutment function serves to ensure that sections of the profile element remain stationary and/or oriented. In other words, to ensure reproducibility of the structure created, sections and profile elements should not be shifted or realigned, in particular as a result of the stamping process.

Preferably, the arrangement, in particular the support element, the carrier substrate and/or the profile element, has at least one alignment marker. In a preferred embodiment, the support element has at least one alignment marker. Due to the rigidity of the support element, the alignment markers can be applied with very high precision. Alignment markers serve the particular purpose of simplifying alignment. On a foil as a carrier substrate or on the profile element, alignment markers could only be made very imprecisely, if at all. Accordingly, the profile element connected to the support element would be difficult to align with a structure to be embossed.

- 10 The rigidity of the support element also contributes significantly to the profile element remaining dimensionally stable before, during and after the stamping process. This achieves very good overlay accuracies, which is another advantage compared to the state of the art.
- 15 One of the main advantages of the support element is that countless methods known in the semiconductor industry can be performed on the support element in order to adjust the corresponding physical and/or chemical properties, particularly in relation to the profile element. Such adjustments are not always possible on carrier substrates, especially on foils. For example, it is difficult or even impossible to deposit layers, to make a foil hydrophilic or hydrophobic, to create alignment markers, etc. on a foil made of a polymer.
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The profile element, in particular in the shape of a soft stamp element, is produced from a soft stamp embossing mass, preferably by embossing with the help of a master stamp.

The soft stamp preferably consists of at least one of the following material classes

- 25
- Carbon-based polymer
 - Perfluoropolyether (PFPE)
 - Urethane acrylate
 - Silicone-based polymer
 - Polydimethylsiloxane (PDMS)
 - 30 ○ Polyhedral oligomeric silsesquioxane (POSS)
 - Tetraethyl orthosilicate (TEOS)
 - Poly(organo)siloxane (silicone)
 - Thermoplastic
 - Duroplast
 - 35 • Elastomer

The soft stamp material is generally a multicomponent material.

The thickness of the profile element can only be given as an average due to its soft stamp imprinting structures on the surface. However, the thickness can also have an effect on the deformation behavior and is therefore explicitly disclosed. The thickness of the profile element is between 100 nm and 1 mm, preferably between 500 nm and 500 μm , more preferably between 750 nm and 250 μm , most preferably between 1 μm and 200 μm , and utmost preferably between 2 μm and 100 μm .

The size of the soft stamp imprinting structures is between 1 nm and 500 μm . With the help of imprint lithography, it is therefore possible to imprint the smallest structures in the nanometer range, for example for the production of functional units, as well as structures in the micrometer range, for example for the production of microlenses. The size of the soft stamp imprinting structures therefore depends on the structure to be imprinted.

The profile element is preferably detachable from the support element. This allows the re-use of the support element and carrier substrate. In this case, the profile element would be removed from the support element, the support element and/or the carrier element would be cleaned, and then the support element would be imprinted again with a new profile element on the support element. The profile element is preferably detached from the support element by at least one of the following methods

- Physical removal
- Plasma
 - mechanical separation using
 - blade
 - wire
- chemical removal
 - solvent
 - acid
 - base

The separation of the profile element from the support element preferably starts at the edge. Therefore, it is particularly advantageous if the support element can be easily bent, i.e. has a low bending resistance, especially at the edge of the profile element. The support element can be made in such a way that the bending resistance around an axis parallel to the support element surface is a function of the location. The support element could

therefore have a high bending resistance in the center and a low bending resistance at the edge. The production of such physical properties would not be possible in the prior art with a pure carrier substrate, in particular a foil.

- 5 In particular, it is also conceivable that the modulus of elasticity of the support element can be adjusted vertically and/or horizontally, preferably as a function of location. This is conceivable by depositing different layers, as well as masking them.

10 In particular, the adhesive strength (more precisely the adhesive pull strength) between the carrier substrate and the support element should be 1.1 times, preferably 1.5 times, more preferably 2.0 times, most preferably 5.0 times, and utmost preferably 10.0 times greater than the adhesive strength between the support element and the profile element. The adhesive pull strength could, for example, be determined according to the DIN EN ISO 4624 standard. The unit of adhesive pull strength is Newton per square meter. The
15 adhesive pull strength represents the force in Newton that must be applied per square meter of surface area to cause the separation of two surfaces that are bonded to each other. In the semiconductor industry, particularly when characterizing two bonded surfaces, the unit is joules per square meter, i.e. the amount of energy required to separate two surfaces. The relative ranges for the adhesive pull strength therefore also apply to
20 other physical quantities that can be used to describe the adhesion of two surfaces to each other. A skilled person in the field is familiar with both methods.

It is preferably provided when the carrier substrate is at least partially, preferably completely, more preferably more than 50%, more than 70%, and most preferably more than
25 80%, designed as a foil. In a particularly preferred embodiment, the carrier substrate is a simple foil, in particular a foil used for the fixture of substrates for dicing. This type of foil is most commonly found in the semiconductor industry, is inexpensive, fit for purpose and able to fix other substrates. Due to its frequent use, it is also referred to as dicing tape. In principle, other foils can also be used. The foils are preferably stretched or laminated on a
30 frame. If the foil is a dicing tape, then the frame on which it is stretched is called a dicing frame. The frame can be made of plastic or metal. In the following, these two technical terms, dicing tape and cutting frame, will be used as synonyms for all types of foils and foil tensioners. The support element is preferably affixed to the foil by gluing. Most foils are already supplied with an adhesive layer, an adhesive film. Otherwise, an adhesive layer
35 can be applied to the support element and/or the carrier substrate using a well-known method from the semiconductor industry.

It is also conceivable that the carrier substrate is formed at least partially or completely from a plurality of belts and/or bands crossed over one another. The carrier substrate can also be at least partially or completely a wafer and/or a plate. The plate can be, in particular, a metal plate or a ceramic plate. In particular, the carrier substrate is designed so that the support element fixed on it can be transported with the soft stamp, in particular in a standardized way. Although the carrier substrate can also have a supporting effect on the support element and the profile element, the primary function is the transport effect.

In particular, it is provided that the carrier substrate is designed in such a way that the stamp element remains dimensionally stable in the arrangement during transport, in particular even if it itself, i.e. without a support element, is unstable in shape. This simplifies and improves the alignment and placement of the stamp element in the stamping device. Alternatively, it is conceivable that, for example, the carrier substrate together with the support element is partially deformable in a controllable manner, for example, forms a curvature and/or is partially rolled. In particular, it is to be understood that, by means of the carrier substrate, the support element is contacted or engaged at a plurality of points, whereby a controlled deformability is possible. In particular, contacting at a plurality of points or regions, preferably at more than three or four points, allows dimensionally stable transport of the stamp element. This can also simplify handling under certain circumstances, in particular during the placement process in the stamp device.

It is preferably provided that the support element is detachably attached to the carrier substrate. This has the advantage that the carrier substrate can be removed again during or after insertion of the support element. As a result, the back of the support element is exposed and can be influenced, for example, by mechanical effects. This means that the support element can also be manipulated to influence the stamping process.

Preferably, the foil is provided so that it is fixed at least in sections in or on a frame. In particular, the foil is provided so that it is clamped in the frame in order to provide the necessary stability during transportation. The frame preferably comprises opposing frame components, between which at least part of the foil and/or the carrier substrate is clamped. For example, the carrier substrate, in particular if it is designed as a foil, can be stretched by the distance between the frame elements, for example in order to be able to transport

the stamp element as planarly as possible or to apply a necessary pressure when inserting it into a stamping device. It is preferably provided that the frame element is designed to be at least partially circumferential, for example U-shaped and/or square.

- 5 Preferably, it is provided that a tensioning device is provided, with which a tension of the carrier substrate, in particular a foil tension in the case of a foil, can be set or ensured.

10 Preferably, it is provided that the foil is designed as a continuous band, in particular to make a plurality of stamp elements available on this carrier substrate provided as a continuous band. The stamp elements or hybrid stamps are then made in bulk on the continuous band and can be separated as needed. It is also conceivable that only the support elements are initially applied in series on the continuous band. Only when a carrier substrate-support element combination is needed to mold a soft stamp on it, such a part is separated from the continuous band.

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Preferably, it is provided that the carrier substrate is designed in such a way that a lateral offset of the stamp element, i.e. the support element and/or the profile element, is prevented. For this purpose, it is provided, for example, that the carrier substrate, in particular the foil, has a coating that has a preferably adhesive effect. It is also conceivable that the carrier substrate has corresponding stops and/or a clamping device and/or a fixing device that are provided to fix the stamp element to be transported laterally in order to prevent it from slipping during transport. It is also conceivable that the carrier substrate, in particular the foil, is locally deep-drawn, for example to ensure that the support element is not displaced during transport.

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It is also conceivable that the transport element has a reference marking, for example to enable an automation process by which the substrate element is integrated into a stamping device. This advantageously makes it possible to avoid having to embed a corresponding reference marking on the support element. For example, it is a barcode or a QR code that recognizes the respective stamp element. The primary purpose of the reference marking is to identify the transport element.

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It is preferably provided that the support element is transparent, for example, to cure the imprinting mass by light transmitted through the support element. If the carrier substrate is removed after the stamp element has been installed in a printing device, the choice of material for the carrier substrate is more flexible, since it no longer has to be transparent. If

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the carrier substrate remains on the stamp element or on the support element and profile element, the carrier substrate is also preferably transparent to allow the exposure from the back of the stamp element, first through the carrier substrate and support element and then through the profile element, provided that the support element and profile element
 5 are arranged on the same side of the carrier substrate.

The support element preferably comprises a material of the following material classes

- Metal
 - 10 ○ Cu, Al, Fe, Ni, Co, W, Cr, Ti, Ta
- Metal alloy
 - Steel
- Semiconductor
 - Elemental semiconductor
 - 15 ▪ Si, Ge
 - Compound semiconductor
 - GaAs, GaInP, In_xGa_{1-x}N, InSb, InAs, GaSb, AlN, InN, GaP, BeTe, ZnO, CuInGaSe₂, ZnS, ZnSe, ZnTe, CdS, CdSe, Cd Te, Hg(1-x)Cd(x)Te, BeSe, HgS, Al_xGa_{1-x}As, GaS, GaSe, GaTe, InS, InSe, InTe, CuInSe₂, CuInS₂, CuInGaS₂, SiC, SiGe
 - 20
- Ceramics
 - Nitride ceramics
 - Si₃N₄
- Glass
- 25 • Plastics

It is conceivable that the carrier substrate has recesses. For example, it is conceivable that recesses, in particular a plurality of recesses, are provided that allow the support element to be acted upon. It is conceivable, for example, that recesses are provided in the carrier substrate in order to allow light to pass through the support element to the imprint-
 30 ing mass when the carrier substrate also remains attached to the support element in the stamping device, and to cause hardening, in particular partial hardening, to occur there. It is also conceivable that recesses are provided in a targeted manner in order to act mechanically on the support element when the arrangement with the carrier substrate is arranged in the stamping device. For example, it is conceivable that a grid-like and/or
 35 checkerboard-like arrangement of recesses is provided in the carrier substrate in order to

be able to act in a targeted manner in defined regions in order to arrange to be applied to the support element, which in turn is transferred to the profile element, in order to be able to act correspondingly to correct the alignment of the profile element during the stamping process and/or before the stamping process. It would also be conceivable to simplify a
 5 separation between the carrier substrate and the support element by acting on the support element.

It is also conceivable that the carrier substrate has a, in particular centric, circular recess whose diameter is slightly smaller than the diameter of the support element. As a result,
 10 the support element is held peripherally by the carrier substrate, but can be illuminated directly through the recess, so that non-transparent carrier substrates can also be used. A disadvantage of this design is that the stability of the entire stamp element is reduced.

It is also conceivable that LEDs are created on the surface of the carrier substrate in the
 15 direction of the profile element, which serve as a direct light source for the exposure of the imprinting mass. In this case, the carrier substrate no longer has to be transparent, since it itself becomes the light source. OLEDs could be used when using a foil as the carrier substrate. If the carrier substrate is a semiconductor material, corresponding inorganic LEDs are created.

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It is preferably provided that the film thickness is between 10 μm and 500 μm , preferably between 50 μm and 400 μm , more preferably between 100 μm and 350 μm , most preferably between 150 μm and 300 μm , and utmost preferably between 180 μm and 250 μm . If the carrier substrate is not a foil but a wafer, then the thickness starts at the maximum
 25 SEMI standard thickness of 525 μm . Otherwise, the preferred value ranges are similar.

In particular, it is provided that the support element is made of an elastic material and/or a thickness of the support element is between 10 nm and 525 μm , preferably between 100 nm and 525 μm , even more preferably between 500 nm and 525 μm , most preferably be-
 30 tween 1 μm and 525 μm , and utmost preferably between 10 μm and 525 μm . Such thin support elements are generally not dimensionally stable during transport. In addition, they can be deformed more easily in a localized manner.

The support element is preferably brought to its desired thickness by means of thinning
 35 and grinding processes while it is already fixed to the carrier substrate.

In general, the following method steps, which serve in particular for surface treatment, can be performed. These include, in particular,

- Thinning
 - 5 • Grinding
 - Plasma treatment
 - Hydrophilization
 - Hydrophobization
 - deposition of layers
 - 10 • generation, in particular deposition, of alignment markers
 - photolithographic patterning of a layer, in particular generation of shadow masks
 - etching
 - roughening of the substrate surfaces
- 15 In particular, the creation of alignment markers on the support element represents a significant improvement over the prior art. The rigidity of the support element allows alignment markers to be created, in particular deposited, with a high degree of accuracy and precision, which can be observed through the profile element and/or the support element and the carrier substrate. In the prior art, the focus is mainly on the soft stamp imprinting structures of the profile element or alignment markers are created directly on the profile element, which is disadvantageous for several reasons. Preferably, the alignment markers are created on the surface where the profile element is located. However, it is also conceivable to create the alignment markers on the surface facing the carrier substrate.
- 20 The creation of shadow masks on the support element allows the definition of exposure areas. This makes it possible to create exposure masks that ensure that only the desired regions of the imprinting mass are later exposed.

25 After the support element surface has been prepared, the profile element can be made on it, in particular by molding from the master stamp.

In this case, it is most preferably provided that the material from which the support element is designed has a strength or rigidity that is greater than that of the profile element. This ensures in particular that the support element is assigned the function of serving as

an abutment in order to ensure that parts or sections of the profile element do not shift when they engage in the imprinting mass.

5 A further subject-matter of the present invention is a stamp element for an arrangement according to the invention, wherein the stamp element comprises the profile element and the support element, and wherein the stamp element is unstable in shape.

10 “Unstable in shape” is preferably understood to mean that, when the stamp element makes contact with the support element at a point, the stamp element, in particular because of the unstable in shape design of the support element, bends at least partially due to the force of gravity, in particular is bent in a non-stable manner. It is therefore not possible to handle it on one side without bending. Bending is understood to mean a deviation from a horizontal course that is greater than 2° , more preferably greater than 5° and most preferably greater than 10° . In this case, the outermost edge of the stamp element furthest from the contact point, through which the imaginary horizontal plane runs as a reference, is used as a reference.

20 In particular, it is provided that the support element is not designed to transport the stamp element independently. For example, the support element lacks a form stability that ensures that the support element can be transported alone. For example, the support element is thinly pronounced or made of a very elastic or deformable material, which would result in the support element not having the stability required for transportation.

25 A further advantage is that the stamp element can be placed without the support element or the profile element having to be contacted by an object or a handling device, thus avoiding the stamp element being damaged and/or soiled, for example by the handling device. Instead, contact is made via the easily cleaned and, in particular, easily replaceable carrier substrates with which the contact is realized.

30 A further object of the present invention is a storage device for storing a plurality of arrangements according to the invention. All the advantages and properties described for the arrangement can be transferred analogously to the storage device. In particular, it is conceivable that the arrangement, in particular with frames, is arranged one above the other in the storage device. It is preferably provided that insertion regions are designed into which the respective arrangements can be inserted. In this case, it is preferably provided that the arrangements are spaced apart in the storage device. It is also conceivable,

for example, that the frame elements are designed with such a thickness that the arrangements can be arranged on top of one another, with the frame elements touching one another, without the profile elements abutting against the carrier element located above them in each case. This avoids damaging the profile elements.

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Preferably, it is provided that the storage device is movable or mobile. This makes it possible, for example, to transport several arrangements simultaneously, for example if the respective stamp elements are to be used in another stamping device.

10 Another object of the device is a system, in particular a stamping device or imprint system, having an arrangement according to the invention. All the properties and advantages of the arrangement described can be applied analogously to the device. It is most preferably provided when the system is designed to receive the arrangement or to handle it. For example, the system comprises a handling device, such as a robot, which receives the arrangement, transports and, for example, attaches it to a destination. To do this, it could, 15 for example, use a corresponding reference on the carrier substrate. It is preferably provided that the system comprises a clean room.

Another subject-matter of the present invention is a method for handling a stamp element, 20 wherein the stamp element comprises a profile element and a support element, wherein the stamp element is carried by a carrier substrate, wherein the carrier substrate is preferably designed as a foil. All the advantages and properties described for the arrangement can be transferred by analogy to the method for handling the stamp element and vice versa.

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Furthermore, a method for producing an arrangement according to the invention is provided. All the advantages and properties described for the arrangement can be transferred by analogy to the method for producing it and vice versa. Preferably, the producing comprises:

- 30
- providing a carrier substrate
 - attaching a support element to the carrier substrate and
 - attaching the profile element to the support element and/or to the carrier substrate.
- It is conceivable that the profile element is attached to the support element when the latter is in turn attached to the carrier substrate, or the support element and 35 profile element are attached to the carrier substrate on opposite sides.

The following text describes a method for producing a hybrid stamp or stamp element.

In a first method step, a carrier substrate is provided. The carrier substrate is preferably a carrier foil that has been stretched on a carrier foil frame. The carrier substrate preferably
5 has an adhesive layer. The carrier substrate can be fixed to a substrate holder, in particular by means of fixing devices.

In a second method step, the support element is positioned relative to the carrier substrate and, if necessary, at least roughly aligned. If a carrier foil or carrier substrate frame
10 is present, the support element could be positioned and aligned as centrally as possible to the carrier foil frame.

In a third method step, the support element is attached to the carrier substrate. The support element and carrier substrate move into the vicinity of each other relative to each
15 other. Preferably, the carrier substrate, in particular if it is a carrier foil, is fixed on a substrate holder while the support element is placed on the carrier substrate, preferably from above.

In a further, optional method step, the support element is back-thinned. The back-thinning
20 allows the flexibility of the support element to be precisely adjusted. In contrast to the prior art, however, the support element is already on the carrier foil and is therefore mechanically stabilized by it, so it can be thinned to a relative low thickness.

In a further, optional method step, the support element surface is polished to adjust the
25 surface properties for the deposition of the imprinting mass from which the soft stamp is created.

In a further, optional method step, the support element surface is treated with plasma.

30 In a further, optional method step, the support element surface is hydrophilized or hydrophobized.

In a further, optional method step, layers can be deposited on the support element surface using known deposition methods. The layers can take on so many functions that they cannot be fully discussed here. Some of the tasks would be to make an improved adhesion
35 between the support element and the soft stamp, to serve as a release layer to make it

easier to remove the soft stamp from the support element after wear, to serve as a heating layer that is heated by an electromagnetic alternating field and thus heats the soft stamp and thus the imprinting mass.

5 In a further, optional, but particularly preferable method step, alignment markers may be applied to the support element. These serve to align the profile element in later method steps. If the alignment markers are created on the surface facing the carrier substrate, the alignment markers must already be made between the first and second method steps.

10 In a further method step, an imprinting mass is deposited on the support element. The deposition is preferably carried out by droplet dispense. However, other methods are also conceivable.

15 In a further method step, the profile element is molded on the support element by a master stamp, which is preferably a hard stamp.

In a further method step, the profile element is cured on the support element before the master stamp is removed again. Curing is preferably done electromagnetically. Thermal or chemical curing is also possible, but it is more complicated and expensive.

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Further advantages, features and details of the invention will become apparent from the following description of preferred embodiments and the drawings. These show in:

25 **Fig. 1** an arrangement for providing a stamp element

Fig. 2 a storage device according to an exemplary embodiment of the present invention

30 **Fig. 3** a stamping device, in particular an imprinting device, according to an exemplary embodiment of the present invention and

Fig. 4 an alternative arrangement for providing a stamp element according to an exemplary embodiment of the present invention.

35 In the figures, the same components or components with the same function are indicated by the same reference signs. The figures are not to scale. In particular, the ratios of the

thicknesses of the only components are incorrect. They are generally shown larger in order to increase clarity and the ability to represent them.

Figure 1 shows an arrangement according to an exemplary embodiment of the present invention, the arrangement comprising a carrier substrate 2 and a stamp element or hybrid stamp, i.e. a support element 3 and a soft stamp as a profile element 4. In the present case, the carrier substrate 2 comprises a foil 2f, an adhesive layer 2k, and a frame 2r on which the foil 2f has been stretched. This type of carrier substrate 2 has the advantage of being standardized and easily transportable. The profile element 4 has soft stamp imprinting structures 4p. A support element surface 3s can be treated in a variety of ways before the soft stamp is deposited. In particular, it is possible and more preferably to create alignment markers 11 on the support element 3, in particular on the support element surface 3s.

The use of a foil 2f stretched on a frame 2r enables efficient storage and transportation of the stamp element 1. The frames 2r are preferably standardized and therefore fit into corresponding storage devices, in particular transportation boxes. In this way, they can be easily fixed by robots and transported over short distances and clamped in devices. It is therefore no longer necessary to handle the profile element 4 with or without the support element 3, but the handling is carried out via a standardized carrier substrate 2, while the functionality of the stamp element 1 lies in the profile element 4 and/or the support element 3. This results in a separation of functionality and transportability.

A storage device 5, in particular a transportation box 5 (without a lid), in which several stamp elements 1 can be stored, is shown in **Figure 2**. The transportation box 5 can be transported between different modules or even between different countries.

Figure 3 shows a schematic representation of an imprinting device 6, represented by fixation elements 7 and a substrate holder 9, on which a product substrate 8 has been fixed. The carrier substrate 2 and thus the stamp element 1 are fixed by the fixation elements 7. An imprinting mass 10 has already been deposited on the product substrate 8. It can be seen that the stamp element 1 is subjected to a force F from the back. The force F can be applied by a deformation element such as a pin. It is also possible to create a vacuum or excess pressure behind the carrier substrate. The carrier substrate should preferably be able to withstand a pressure difference of at least one bar with respect to the atmosphere without being destroyed. This would be one way of pressing the soft stamp or the profile

element 4 into the imprinting mass 10. It would also be conceivable to have a relative approach of the soft stamp and the product substrate 8 towards each other, or a combination of both processes. It is advantageous that the stamp element 1 may be easily fixed as a whole over the carrier substrate 2 in an imprinting device 6. It is conceivable that a robot
 5 (not shown) removes a stamp element 1 from the transportation box 5 (see Figure 2) and loads it directly into the imprinting device 6. It can then be used there immediately.

Figure 4 shows an arrangement according to an exemplary further embodiment of the present invention, which differs from the first embodiment of Figure 1 in that the support
 10 element 3 and the profile element 4 are located on opposite sides of the carrier substrate 2. The support element 3 can still serve to mechanically stabilize the profile element 4 or to form an abutment for the profile element 4. In this embodiment, it is advantageous if a fixture is provided between the carrier substrate 2 and the support element 3 to prevent the support element 3 from separating from the carrier substrate 2. In addition, the support
 15 element 3 has alignment markers 11 that are used for aligning the profile element 4.

List of reference signs:

	1, 1'	stamp element
20	2	carrier substrate
	2f	foil
	2k	adhesive layer
	2r	frame
	3	support element
25	4	profile element
	4p	soft stamp imprinting structures
	5	transport box
	6	imprinting device
	7	fixation elements
30	8	product substrate
	9	substrate holder
	10	imprinting mass
	11	alignment markers

Claims

1. An arrangement for providing a stamp element (1) which, when used, is intended to leave a pattern in an imprinting mass (10), comprising:
 - 5 - a profile element (4) which, when the stamp element (1) is used, acts on the imprinting mass (10), the profile element (4) preferably being in the form of a soft stamp, and
 - a support element (3) which supports the profile element (4) and, in particular, serves as a counter bearing when the stamp element (3) is used,
- 10 the profile element (4) and the support element (3) being arranged on and/or at a carrier substrate (2) for transportation.
2. The arrangement according to claim 1, wherein the carrier substrate (2) is at least partly designed as a foil (2f).
- 15 3. The arrangement according to claim 2, wherein the carrier substrate (2) is fixed at least in sections in a frame (2r).
4. The arrangement according to claim 2 or 3, wherein a tensioning device is provided for adjusting a foil tension.
- 20 5. The arrangement according to any one of claims 2 to 4, wherein the foil (2f) is designed as a continuous band.
- 25 6. The arrangement according to any one of the preceding claims, wherein the carrier substrate (2) is designed such that a lateral offset of the stamp element (1) is prevented, wherein the carrier substrate (2), in particular the foil (2f), preferably for preventing the lateral offset, has a coating, for example an adhesive layer (2k), a stop and/or a fixing device, for example a clamping device, and/or is designed to be locally deep-drawn.
- 30 7. The arrangement according to any one of the preceding claims, wherein the carrier substrate (2) has a thickness which has a value that is between 10 μm and 500 μm , more preferably between 50 μm and 400 μm , even more preferably between 100

µm and 350 µm, most preferably between 150 µm and 300 µm, or even between 180 µm and 250 µm.

- 5 8. The arrangement according to any one of the preceding claims, wherein the arrangement, in particular the support element (3), the carrier substrate (2) and/or the profile element (4), has at least one alignment marker (11).
- 10 9. The arrangement according to any one of the preceding claims, wherein a thickness of the support element (3) is between 10 nm and 525 µm, more preferably between 100 nm and 525 µm, even more preferably between 500 nm and 525 µm, most preferably between 1 µm and 525 µm, utmost preferably between 10 µm and 525 µm.
- 15 10. A stamp element (1) for the arrangement according to any one of the preceding claims, wherein the stamp element (1) comprises the profile element (4) and the support element (3), and wherein the stamp element (1) is unstable in shape.
- 20 11. The stamp element (1) according to claim 10, wherein the support element (3) has at least its alignment marker (11).
- 25 12. A storage device for storing a plurality of arrangements according to any one of the preceding claims, wherein the storage device is preferably designed to be mobile, for example as a transportation box (5).
- 30 13. A system, in particular stamping device, for example imprinting device (6), having an arrangement according to any one of Claims 1 to 9 or a stamp element according to Claim 10.
- 35 14. A method for handling a stamp element (1), wherein the stamp element (1) comprises a profile element (4) and a support element (3), wherein the stamp element (1) is carried by a carrier substrate (2), which is preferably at least partially designed as a foil (2f), in an arrangement according to any one of Claims 1 to 9.
15. A method for producing the arrangement according to any one of claims 1 to 10, preferably comprising:
 - providing a carrier substrate (2)

- attaching a support element (3) to the carrier substrate (2) and
- attaching the profile element (4) to the support element (3) and/or to the carrier substrate (2).