

Method and device for supplying and discharging carriers with electronic components

The invention relates to methods for displacing a carrier with electronic components
5 from a supply container to a processing station, methods for displacing a carrier with
electronic components from a storage container to a supply container, as well as to
methods for supplying carriers with electronic components to a processing station and
discharging them from a processing station. The invention also relates to a device for
10 displacing a carrier with electronic components between a supply container and a
processing station and to an assembly of such a device with a processing station for
carriers with electronic components.

In the processing of carriers with electronic components, and more in particular carriers
provided with semiconductor circuits, use is made of voluminous and complex
15 equipment. Possible processes of such carriers are inter alia: arranging connections
(wire bounding, soldering), encapsulating the components (moulding), removing
superfluous material (degating), inspecting the components, and so on. The carriers can
consist of a metal layer (lead frames) or have a more complex layered structure
(boards). Such carriers are usually supplied and discharged in supply containers
20 (cassettes) in which the carriers can be stored in stacked state without making contact
with each other. It is usual to place the carrier in an unloading device (off loader) in
which a carrier is removed from the supply container and is then placed on a conveyor
belt for subsequently being moved in the direction of a processing station using the
conveyor belt. Once the carrier has reached the processing station the carrier is, using a
25 manipulator which is displaced simultaneously to the carrier, placed in the processing
station and removed from the processing station after the process is carried out, and
finally, the processed carrier is discharged to a loading device which is usually disposed
on the side of the conveyor belt opposite to the unloading device, where the carrier is
removed from the conveyor belt and is placed in a supply container for processed
30 products. With such an existing supply and discharge system it is also possible to
operate a number of adjacently positioned processing stations; the conveyor belt then
runs along all the processing stations for operating. With such an existing system the
supply and discharge of carriers can be carried out in reliable manner and the supply

and discharge of the carriers can be uncoupled (at least substantially) from the separate processing stations.

American patent US 6,069,034 describes an automatically functioning device for curing the material whereby components are fixed on a lead frame. A container (cassette) with stacked lead frames is placed at such a height by a vertically displaceable lift plate that an intermittently moving blade can each time push a lead frame from the cassette. The lead frames pushed from the cassette are then, still in the same plane, displaced to a curing chamber.

The object of the present invention is to simplify, as compared to the prior art, the loading and unloading in a plane of processing stations for carriers with electronic components wherein this was heretofore not obvious, and to provide the means required herefor.

For this purpose the invention provides methods for displacing a carrier from a supply container to a processing station according to claim 1 and claim 8. The first and second planes are mutually parallel and can optionally mutually coincide. Differently than in the prior art, it is thus possible when encapsulating electronic components to make use of "sliding" of the carrier into the encapsulating device. Heretofore this was only done using manipulators which placed a carrier in the encapsulating device (mould) in a processing position using a gripper. The teaching herein consists of it only being possible with a gripper to accurately place the carrier and to enable the encapsulation. By means of the present method it however becomes possible to slide the carrier into the encapsulating device, which makes a considerable simplification of the supply (and similarly also the discharge) of carriers possible. Since it is only required of all the manipulating means for the separate carriers to provide freedom of movement in a single plane, it is possible for work to be carried out more rapidly, more reliably and at reduced costs. The freedom of movement of the manipulating means, which is limited relative to the prior art, makes it possible for them to take a relatively simple form and moreover also enables them to work with great speed and accuracy. Another important advantage is that this makes it possible to carry out the supply of the carriers in a very limited space. In addition, it is also possible that the displacement of carriers during processing steps B) and C) is guided by guides being present for this purpose.

It is further advantageous if the carrier is supported by a gas stream during at least one of the processing steps B) and C), respectively at least one of the processing steps F) and G). Advantages of the carrier being supported by a gas stream, and more specifically an air stream, are that a uniform heating or cooling of the carrier are thus possible. Very thin carriers (for instance in the form of substrates with a thickness of 0,1 – 0,25 mm) can thus also be slid without this having to result in undesired deformation of the carrier.

10 As an extra functionality it is possible that the carrier with electronic components is rotated between processing steps A) and C) in a plane parallel to the first and the second planes; it is for example possible to rotate a carrier over for instance 180°.

An important condition of the accurate positioning of the carrier in the prior art encapsulating device related to the presence of positioning pins over which the carrier was placed in such a manner that the positioning pins fit precisely in openings arranged in the carrier for this purpose. Such a manner of positioning makes sliding into (and also out of) the encapsulating device non-obvious or even impossible. According to the present invention the electronic components can however be positioned in the processing station by displacing positioning elements relative to the carrier placed in the processing position. This means that, relative to the second plane, the displaceable positioning elements are movable with a movement component being perpendicular to the second plane (and therefore also to the first plane). The positioning elements (for instance positioning pins) can for instance be rigidly connected to a displaceable upper mould part (top mould) or can be displaceable in the encapsulating device.

25 The intermediate position can be translatable (for instance vertically) between the first plane and the second plane to thus compensate for differences in level without the (undesired) grippers having to be applied for this purpose. A simple table being vertically displaceable already suffices for this purpose. If the first and second planes coincide such an additional functionality is of course superfluous.

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In the displacement of the carriers with electronic components between the supply container and the processing position of the carriers they can also pass an intermediate

processing station, which can optionally be combined with the displaceable table described in the previous paragraph.

Particularly from the method described in claim 8 it is clear that the transport route from the supply container to the processing station is very simple as compared to the prior art; the complexity of the positioning lies rather in the preliminary route in the positioning of the supply container. An advantage hereof is that the (vulnerable) carrier is largely manipulated in a protected state (namely, stored in the supply container) so that the chance of damage to the carrier during or as a result of transport operations is small. Another advantage is that the transport operations are divided into sub-processes which are simpler separately than an integrated carrier manipulation according to the prior art. These separate sub-processes can be mechanized and automated relatively easily. Moreover, a supply container with a plurality of carriers can be unloaded, wherein this only has to run a very short and very simple (usually linear) transport route between two carriers to be removed from the supply container in succession. In addition to the advantages already listed in the previous paragraph, this also results in a short minimal cycle time between two carriers to be supplied successively.

For advancing a carrier protruding (at least partly) from a supply container, the carriers with electronic components can be displaced during processing step G) from the intermediate position to the processing position with interposing of at least one pair of driven rollers. It is also possible that the carriers pass an intermediate station in the displacement of the carriers between the supply container and the processing position. Such a processing station can for instance realize a (pre)heating of the carriers, such that the carriers are placed in for instance an encapsulating device in preheated state.

The invention furthermore provides a plurality of methods for displacing a processed carrier with electronic components from a processing station to a supply container according to claims 14 and 20. In a preferred application the carrier with electronic components is herein released in the processing station by displacing positioning elements relative to the carrier placed in the processing position. The advantages which have already been described above on the basis of the supply of the carriers for processing to the encapsulating device can thus also be realized in the removal of the processed carriers from the encapsulating device. In the discharge it is also possible that

the processed carrier with electronic components is rotated between processing steps K) and M) in a plane parallel to the first and second planes. The displacement of the carriers during processing steps K) and M) can be guided by guides being present for this purpose, which can also be used for the supply of the carriers. Just as this is possible in the supply of the carriers, the intermediate position can also be translatable between the first plane and the second plane in the discharge. Sliding of the carriers generally takes place in a horizontal plane. The discharging manipulating means thus only have to provide limited freedom of movement. The previously stated advantages hereof are the relatively limited freedom of movement of the manipulating means, as compared to the prior art, which can hereby take a simple form and can still function with great accuracy. Another additional advantage is that processed carriers can also be rotated in a very limited space during the discharge hereof, if desired. The displacements of the carrier during processing steps P) and Q) can lie in a straight line. The advantages of the carrier being supported by a gas stream during at least one of the processing steps K) and M), respectively at least one of the processing steps P) and Q), correspond to the above described advantages of the carrier being supported by a gas stream during the supply of the carrier.

According to the above stated advantages of the supply of carriers to a processing station, these advantages can also be realized in the discharge of a processed carrier from a processing station. The supply container can herein also be adapted to contain a number of carriers with electronic components situated one above the other, such that, after performing processing steps N) - Q), at least processing steps O) - Q) can be performed for carriers with electronic components to be supplied in succession. Again, it is possible to displace the carriers successively with interposing of at least one pair of driven rollers. In the displacement the carriers can also pass an intermediate station, for instance an intermediate station for clamping a processed carrier and/or for the controlled curing of a carrier provided with encapsulating material. An undesired deformation of a carrier and/or undesired build-up of stress in a carrier can thus be prevented.

The invention furthermore relates to combined methods for successively supplying to a processing station and then discharging from a processing station of carriers according to claim 26, wherein the first plane and the second plane can for instance coincide. The

supply container from which a carrier with electronic components for processing is supplied can herein be removed from the intermediate position of the processing station after the supply of a carrier to the processing station, and the supply container in which a processed carrier with electronic components is discharged is successively positioned
5 adjacently to the discharge position of the processing station. These two different supply containers, usually being identical supply containers, can be displaced by means of a joint support structure. It is herein also possible that a plurality of processing stations can be fed and be unloaded with a single construction.

10 The invention moreover provides a device for displacing a carrier with electronic components between a supply container and a processing station according to claim 31. By an intermittent pattern of movement such a displaceable support structure, for instance (linearly) vertically displaceable support structure, can always alternately let an alternate supply container connect at at least the height of the processing station.

15 Already stated above with reference to the methods according to the present invention are the advantages of such a device; structural simplicity, high displacement speed, great positional accuracy with relatively limited investments, and a compact construction of the device. The device is preferably provided with guides extending in parallel between the displaceable support structure and the encapsulating station. In an
20 advantageous embodiment variant gas supply means are provided for generating a gas stream for supporting the carrier. These means can for instance consist of blow nozzles placed under the guide.

The encapsulating station can be provided with positioning elements being displaceable
25 in the encapsulating device relative to a processing position of the carrier to thus enable the supply and discharge of carriers by means of sliding and yet still make a great positional accuracy of the carriers possible. More in particular, the positioning elements are displaceable relative to the plane with a movement component being perpendicular to the first plane. The positioning elements can for instance consist of positioning pins
30 or can form part of a displaceable top mould (upper mould part).

In yet another preferred embodiment the encapsulating device is provided with a guide engaging on the side to be encapsulated at least partly of the carrier, which guide is adapted to guide encapsulating material. Such a guide can be integrated with a feed of

an encapsulation to be manufactured of the side on which the encapsulation must also be arranged; also designated in jargon as top gating. The edge of the carrier is protected by the guide against being contaminated by encapsulating material, and can also enable the sliding of the carrier into and out of the encapsulating station, such as for instance a so-called transfer moulding apparatus.

It is also possible that the displaceable support structure is adapted such that it can support supply containers on at least two levels; for instance a first level for receiving carriers with electronic components for processing, and a second level for receiving processed carriers with electronic components. In stacked situation a plurality of levels is thus available on which the containers can be supported. The processing capacity of the displaceable support structure can thus be increased in simple manner. The chance of disruptions can thus also be reduced, for instance as a result of a reduced chance of contamination.

In a specific embodiment variant it is possible that the device is (linearly) displaceable along a plurality of processing stations, such that a plurality of processing stations can be linearly loaded respectively unloaded using a single device according to the present invention. A combination of the vertically displaceable support structure and the device which is displaceable along a plurality of processing stations forms an advantageous embodiment variant. For providing both the supply and discharge of carriers with a single device it is advantageous if the displaceable support structure is adapted to support at least two supply containers; a first supply container for receiving carriers with electronic components for processing, and a second container for receiving processed carriers with electronic components.

If the manipulator is heatable it becomes possible to condition (preheat) the product to be displaced during the supply in order to thus accomplish an improved quality in the treatment process (particularly in the encapsulation). In the discharge of processed products it can also be advantageous to gradually reduce the temperature of the processed carrier, or keep it above a determined temperature. This serves to further improve the quality of the final product. It is noted that other methods according to the present invention can be applied extra advantageously in the preheating and/or afterheating of the carrier, respectively in the supply of carriers yet to be processed and the discharge of processed carriers.

In an embodiment variant the displaceable support structure can be provided with at least one driven endless conveyor for displacing a supply container. The linearly displaceable manipulator has the advantage that it can take a very simple form and that, for a good functioning, it is not necessary that the manipulator has a product-related configuration; with a simple universal pusher carriers can be pushed up independently of the specific shape and dimensions of the carrier. Another important advantage is that the device according to the invention results in a considerable space-saving relative to the existing supply and discharge means for carriers of electronic components. In an arrangement of a plurality of adjacent processing stations it is heretofore usual to place a loading station and an unloading station on the opposite sides of the row of processing stations, and to connect these two stations with a guide leading along the processing station; this means that, for the supply and discharge of carriers, space is taken up on three sides of the row of processing stations. According to the present invention there remains only one occupied space on one of the sides of the row of processing stations. This results in a considerable limitation of the space occupied by the processing equipment for electronic components. This advantage of space saving is however even greater in conditions in which the treatment processes must take place in a specifically conditioned environment (for instance a clean room environment).

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For increasing the storage capacity it is advantageous if the device is provided with at least one buffering position for holding a supply of one or more supply containers, which buffering position can be coupled to the support structure for exchanging a supply container. An empty, respectively full supply container (in the case of the supply of carriers respectively the discharge of carriers) such a device can be replaced with a full, respectively empty supply container.

In yet another embodiment variant the device is provided with vertical displacing means for keeping stacked at least one supply container for carriers with electronic components for processing, and at least one supply container for processed carriers with electronic components. Both the supply and the discharge of the carriers can thus take place to the same position in the device. This makes it possible to make the device even smaller and limits the construction costs. It is noted that this variant with vertical displacing means for keeping stacked supply containers for being filled and emptied can

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be applied in combination with all the devices described in this patent application, and that the invention also comprises the method of vertically displacing a number of supply containers situated one above the other in order to then let the supply and discharge of carriers take place to the same location.

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Moreover, the invention provides an assembly of an encapsulating station and a device as described above according to claim 36. Such an assembly comprises a plurality of substations; an example hereof is a (pre)heating station. Yet another possibility for a substation relates to a device for limiting deformation of the carrier resulting from the processing undergone by the carrier in the processing station. An intermediate position between the processing station and a supply container can be determined by a support which is linearly displaceable in a direction having a movement component perpendicular to the parallel first and second surfaces. As already described previously, the support can also contain a number of parallel support positions situated one above the other.

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The present invention will be further elucidated on the basis of the non-limitative exemplary embodiments shown in the following figures. Herein:

figure 1 shows a perspective view of an embodiment variant of an assembly of a device and an encapsulating station according to the present invention,

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figure 2 shows a front view of a device for the supply and discharge of carriers with electronic components according to the present invention,

figure 3 shows a schematic top view of an assembly of a number of processing stations and a device for the supply and discharge of carriers,

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figure 4 shows a side view of a device for the supply and discharge of carriers with electronic components according to the present invention and a processing station consisting of several mutually connecting substations,

figure 5 shows a side view of an alternative embodiment variant of a device for the supply and discharge of carriers with electronic components according to the present invention,

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figure 6A shows a top view of an alternative embodiment variant of a device for the supply and discharge of carriers with electronic components according to the present invention,

figures 6B and 6C show a schematic side view and a schematic front view of a part of a device for the supply and discharge of carriers with electronic components as shown in figure 6A, and

Figure 6D shows a top view of a subsequent alternative embodiment variant of a device for the supply and discharge of carriers with electronic components according to the present invention.

Figure 1 shows a perspective view of an assembly 100 of three encapsulating stations 101, 102, 103 which are assembled in a joint housing 104. This housing 104 is also provided with a supply station 105 for cassettes, not shown in this figure, with carriers for processing. The supply station is for this purpose provided with a lift system whereby cassettes supplied by endless conveyor belts 106, 107, situated at two levels one above the other, can be brought to a desired height. After supply station 105 has brought a cassette to the desired height, a carrier can be slid out of the cassette (first plane) onto a translatable table 108 which is moved to supply station 105 for this purpose. Table 108 has two support levels 109, 110 onto which carriers can be slid. Translatable table 108 is then moved to one of the encapsulating stations 101, 102, 103 to there either receive a processed carrier (provided with encapsulating material) on an empty support level 109 or 110, or respectively to supply the entrained carrier(s) to one of the encapsulating stations 101, 102, 103. For this purpose translatable table 108 is provided with a lift installation whereby table 108 is vertically displaceable.

Encapsulating stations 101, 102, 103 are adapted such that a carrier can be slid in respectively slid out in the horizontal plane of table 108. A vertical displacement during loading and unloading of encapsulating stations 101, 102, 103 is omitted. Incidentally, any vertical displacement of the carrier is also omitted when a processed carrier is slid onto and off table 108 respectively out of and into a cassette; this is however less revolutionary than that the loading and unloading of encapsulating stations 101, 102, 103 can be realized with only a horizontal displacement of the carrier. Table 108 can also be embodied in such a manner that it is provided on one of the levels 109, 110 with an anti-warpage unit or any other, for instance thermal processing station. It is furthermore noted that table 108 can also take such a form that it is rotatable round a vertical axis.

Figure 2 shows a cassette 1 with a number of carriers 2 for processing and a cassette 3 which is intended for receiving processed carriers. Cassettes 1, 3 are held fixedly by a support structure 5 with interposing of clamping mechanism 4. Support structure 5 is vertically displaceable (see arrow P_1) by operating an endless conveyor belt 6 which is driven by a motor 7. By displacing support structure 5 a cassette 1 can be placed in such a position that a carrier 2 can be slid out at a correct height, respectively cassette 3 can be placed in such a position that a processed carrier can be slid into it. Support structure 5, conveyor belt 6 and motor 7 are connected to a frame 8, which frame 8 can be displaced in a horizontal direction (see arrow P_2) by a second belt conveyor 9 by operating a motor 10. By displacing frame 8 it is possible to let support structure 5 connect to a plurality of adjacently positioned processing stations, not shown in this figure.

Figure 3 shows a top view of three processing stations 20, adjacently to which a belt conveyor 21 is disposed. Belt conveyor 21 is driven by a motor 22 (as according to the second belt conveyor 9 and motor 10 of figure 2). By displacing belt conveyor 21 a frame 23 placed on belt conveyor 21 is moved simultaneously. Frame 23 is loaded with cassettes, only an upper cassette 24 of which can be seen in this figure. For pushing a carrier out of cassette 24 the frame is also provided with a pusher 25 which is displaceable in rectilinear, reciprocal manner. If pusher 25 is also provided with a gripper, not shown, it is also possible to displace processed carriers from a processing station 20 to a cassette 24 using pusher 25.

Figure 4 shows a device 30 for the supply and discharge of carriers with electronic components 32 according to the present invention, and a processing station 31 consisting of several mutually connecting substations 33, 34. Device 30 supplies a carrier 32 from an upper cassette 35 which, using a mechanism as described with reference to figure 2, is for this purpose brought to such a height (see arrow P_3) that carrier 32 is situated at the height of a passage opening 36 in the casing of processing station 31. A pusher 37, driven by a rotor arm 38 which is connected to an electromotor 39, then pushes carrier 32 out of cassette 35 (see arrow P_4). The carrier will hereby be engaged by a pair of rollers 40 forming part of processing station 31. The pair of rollers 40, driven by an electromotor 41, carries carrier 32 to a heating plate 42 for preheating carrier 32. After (pre)heating, carrier 32 is advanced to a transfer mould 34, where the

components situated on carrier 32 are encapsulated with epoxy resin housings 43. For the transport of heating plate 42 to transfer mould 34 use can be made of transport means (not shown) as required. After finishing the encapsulating process a second pusher 44 carries the carrier provided with encapsulating material 43 back to first
5 substation 33. The first substation 33 in this figure takes a multiple form in such a manner that it is vertically displaceable (see arrow P₅). Such a carrier with housings 43 can be clamped in the lower part of substation 33 for some time to thus prevent deformation (warpage) of the carrier with housings 43. After a sufficiently long residence time of the carrier with housings 43 in substation 33, the carrier with housings
10 43 can be discharged, for instance with interposing of pair of wheels 40, to a cassette 45 which is for this purpose of course first placed at such a height that it connects to passage opening 36 in processing station 31.

Figure 5 shows a device 50 with a stationary lift system 51 for cassettes 52, 53 which
15 connects to a buffer system 54 whereby empty cassettes 55 respectively cassettes 56 with carriers 57 yet to be processed can be supplied to lift system 51 (see respectively arrows P₆, P₇). With lift system 51 it is also possible to discharge empty cassettes 58 respectively cassettes 59 with processed carriers 60 from lift system 51 (see respectively arrows P₈, P₉). To stationary lift system 51 connects a displaceable substation 61 (see
20 arrow P₁₀) which is provided with a preheating plate 62 and a pressing construction 63 for preventing deformation of a carrier provided with encapsulating material 64. Displaceable substation 61 can carry the carrier 65 for processing to a processing station not further specified in this figure and can there respectively remove a carrier provided with encapsulating material 64 and carry this carrier back to stationary lift system 51.

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Figure 6A shows a device 70 with two processing stations 71, 72 to which a carrier 74 with electronic components 75 can be supplied from a supply container 73. For this purpose supply container 73 is placed at such a height by a lift mechanism 76 that carrier 74 is situated at the level at which the processing takes place in processing
30 stations 71, 72. By displacing a manipulator 77 in a horizontal plane according to arrow Z₁, carrier 74 is displaceable between a position adjacent to supply container 73 and processing stations 71, 72. By a linear displacer 78 (pusher and/or puller) carriers 74 can be pushed into processing stations 71, 72 and supply container 73, and be pulled out of processing stations 71, 72 and supply container 73. For the latter functions, pulling

carriers 74 out of processing stations 71, 72 and supply container 73, it is optionally also possible to apply different pushers (not shown) which can be disposed for this purpose on the rear side of processing stations 71, 72 and supply container 73.

- 5 Figure 6B shows a side view of device 70 in which, in addition to four supply containers 73, only a frame 79 can be seen. Supply containers 73 are supported by four floors 80 which form part of a lift system. It is precisely by varying the height of floors 80 that it is now possible to bring a carrier to be removed from a supply container 73 or an open position in a supply container 73 for receiving a processed carrier to the
- 10 working height of the schematically shown conveyor 81 whereby the transport in the Z_1 direction (see figure 6A) can be realized. Figure 6C shows a schematic front view of the lift installation with floors 80 on which supply containers 73 are placed. It can herein be seen that supply containers 73 in this case take a double form for holding two carriers at the same level. It is furthermore noted that supply containers 73 with carriers to still be
- 15 processed and supply containers 73 with already processed products can in this manner all be placed one above the other, whether or not in combination with empty supply containers 73. All of them can always be placed at the desired working height by means of the described lift mechanism.
- 20 Figure 6D shows a device 85 which resembles device 70 as shown in figure 6A. Corresponding components are therefore designated with corresponding reference numerals. Carriers 74 with electronic components 75 can here be supplied from supply container 73 to two processing stations 71, 72. For this purpose supply container 73 is again placed at such a height by a lift mechanism 76 that carriers 74 are situated at the
- 25 level at which the processing takes place in processing stations 71, 72. By displacing a manipulator 86 in a horizontal plane according to arrow Z_1 , carriers 74 are displaceable between a position adjacent to supply container 73 and processing stations 71, 72. By a double displacer 87 carriers 74 can be pushed into processing stations 71, 72 and supply container 73, and also be pulled out of processing stations 71, 72 and supply container
- 30 73. Unlike the device 70 shown in figure 6A, manipulator 86 as shown in this figure is provided with two holder positions for carriers 74 such that the loading and unloading of processing stations 71, 72, which also take a double form, can take place more rapidly than with device 70. Since the orientation of two carriers situated in a processing station 71, 72 is generally mirrored, the supply and discharge of carriers 74 must be

adjusted hereto. Manipulator 86 is for this purpose rotatable - as is shown in the position of manipulator 86', shown with broken lines. Manipulator 86 can thus be loaded from two sides.

Claims

1. Method for displacing a carrier with electronic components from a supply container to a processing station, comprising the processing steps of:
 - 5 A) placing the supply container with carrier with electronic components for processing at a specific height, such that the carrier with electronic components for processing lies at least substantially in one plane with an intermediate position of the processing station,
 - B) displacing the carrier with electronic components for processing from the supply
10 container to the intermediate position in a first plane, and
 - C) advancing the carrier with electronic components for processing from the intermediate position to a processing position of the processing station in a second plane which is parallel to the first plane,
characterized in that, after feeding of the carrier according to processing step C), the
15 processing station performs an encapsulating process wherein the electronic components are encapsulated at least partly.
2. Method as claimed in claim 1, characterized in that the displacement of the carrier during processing steps B) and C) is guided by guides being present for this
20 purpose.
3. Method as claimed in claim 1 or 2, characterized in that the carrier is supported by a gas stream during at least one of the processing steps B) and C).
- 25 4. Method as claimed in any of the foregoing claims, characterized in that the carrier with electronic components is rotated between processing steps A) and C) in a plane parallel to the first and the second plane.
5. Method as claimed in any of the foregoing claims, characterized in that the
30 carrier with electronic components is positioned in the processing station by displacing positioning elements relative to the carrier placed in the processing position.
6. Method as claimed in any of the foregoing claims, characterized in that the intermediate position is translatable between the first plane and the second plane.

7. Method as claimed in any of the foregoing claims, characterized in that the carriers pass an intermediate processing station in the displacement of the carriers with electronic components between the supply container and the processing position.

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8. Method for displacing a carrier with electronic components from a supply container to a processing station, comprising the steps of:

D) positioning the supply container with carrier with electronic components for processing adjacently to an intermediate position of the processing station,

10 E) bringing the supply container to such a height relative to the intermediate position that the carrier with electronic components for processing lies in a first plane which connects to the intermediate position,

F) displacing the carrier with electronic components for processing from the supply container to the intermediate position with a linear movement in the first plane, and

15 G) advancing the carrier with electronic components for processing from the intermediate position to the processing position of the processing station in a second plane which is parallel to the first plane, characterized in that the processing station performs an encapsulating process, wherein the electronic components are encapsulated at least partly, on the carrier placed
20 in the processing position according to processing step G).

9. Method as claimed in claim 8, characterized in that the carrier with electronic components is positioned in the processing station by displacing positioning elements relative to the carrier placed in the processing position.

25 10. Method as claimed in claims 8 or 9, characterized in that the displacement of the carrier during processing steps F) and G) is guided by guides being present for this purpose.

11. Method as claimed in any of the claims 8 - 10, characterized in that the carrier
30 is supported by a gas stream during at least one of the processing steps F) and G).

12. Method as claimed in any of the claims 8 - 11, characterized in that the carriers pass an intermediate processing station in the displacement of the carriers with electronic components between the intermediate position and the processing position.

13. Method as claimed in any of the claims 8 - 12, characterized in that the intermediate position is translatable between the first plane and the second plane.

5 14. Method for displacing a processed carrier with electronic components from a processing station to a supply container, comprising the processing steps of:

K) displacing the processed carrier with electronic components from a processing position to an intermediate position in a second plane of the processing station,

10 L) placing the supply container for a processed carrier with electronic components at a specific height, such that a receiving position of the supply container for the processed carrier with electronic components lies in a first plane, which is parallel to the second plane, and

M) displacing the processed carrier with electronic components from the intermediate position to a receiving position of the supply container in the first plane,

15 characterized in that, before the outfeed of a processed carrier according to processing step K) commences, the carrier with electronic components has undergone an encapsulating process wherein the electronic components are encapsulated at least partly.

20 15. Method as claimed in claim 14, characterized in that the carrier with electronic components is released in the processing station by displacing positioning elements relative to the carrier placed in the processing position.

25 16. Method as claimed in claim 14 or 15, characterized in that the processed carrier with electronic components is rotated between processing steps K) and M) in a plane parallel to the first and second planes.

30 17. Method as claimed in any of the claims 14 - 16, characterized in that the displacement of the carrier is guided during processing steps K) and M) by guides being present for this purpose.

18. Method as claimed in any of the claims 14 - 17, characterized in that the carrier is supported by a gas stream during at least one of the processing steps K) and M).

19. Method as claimed in any of the claims 14 - 18, characterized in that the intermediate position is translatable between the first plane and the second plane.

20. Method for displacing a carrier with electronic components from a processing station to a supply container, comprising the processing steps of:
5 N) positioning the supply container for containing a processed carrier with electronic components adjacently to an intermediate position of the processing station,
O) bringing the supply container to such a height relative to the intermediate position that an open receiving position of the supply container lies in a first plane,
10 P) displacing in a second plane, which is parallel to the first plane, of a processed carrier with electronic components from a processing position, from the processing station to the intermediate position, and
Q) displacing the processed carrier with electronic components from the intermediate position to the supply container with a linear movement in a first plane, wherein the
15 displacements of the carrier during processing steps P) and Q) are smoothly connection movements,
characterized in that, before the outfeed of a processed carrier according to processing step P) commences, the carrier with electronic components has undergone an encapsulating process wherein the electronic components are encapsulated at least
20 partly.

21. Method as claimed in claim 20, characterized in that the carrier with electronic components is released in the processing station by displacing positioning elements relative to the carrier placed in the processing position.

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22. Method as claimed in claim 20 or 21, characterized in that the displacement of the carrier is guided during processing steps P) and Q) by guides present for this purpose.

30 23. Method as claimed in any of the claims 20 - 22, characterized in that the carrier is supported by a gas stream during at least one of the processing steps P) and Q).

24. Method as claimed in any of the claims 20 - 23, characterized in that the carriers pass an intermediate station in the displacement of the carriers with electronic components between the processing position and the outfeed position.

25. Method as claimed in any of the claims 20 - 24, characterized in that the
5 intermediate position is translatable between the first plane and the second plane.

26. Method for supplying to a processing station and discharging from a processing station of carriers with electronic components, wherein a carrier with electronic components for processing is supplied according to any of the claims 1 - 7, and the
10 processed carrier with electronic components is discharged according to any of the claims 14 - 19 after the processing is completed.

27. Method for supplying to a processing station and discharging from a processing station of carriers with electronic components, wherein a carrier with electronic
15 components for processing is supplied according to any of the claims 8 - 13, and the processed carrier with electronic components is discharged according to any of the claims 20 - 25 after the processing is completed.

28. Method as claimed in claim 26 or 27, characterized in that the first plane and
20 the second plane mutually coincide.

29. Method as claimed in any of the claims 26 - 28, characterized in that the supply container from which a carrier with electronic components for processing is supplied after a carrier is fed to the processing station is removed from the intermediate
25 position, and that the supply container in which a processed carrier with electronic components is discharged is subsequently positioned adjacently to the intermediate position.

30. Method as claimed in any of the claims 26 - 29, characterized in that the
30 supply container from which a carrier with electronic components for processing is supplied and the supply container in which a processed carrier with electronic components is supplied are displaced by means of a joint support structure.

31. Device for displacing a carrier with electronic components between a supply container and a processing station, comprising:

- a displaceable support structure for positioning a supply container relative to the processing station, and

5 - at least one manipulator, only displaceable in parallel planes, for displacing a carrier with electronic components between the supply container and the processing station, characterized in that the processing station is an encapsulating station for performing encapsulating processes wherein the electronic components are encapsulated at least partly.

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32. Device as claimed in claim 31, characterized in that the device is provided with guides extending in parallel between the displaceable support structure and the encapsulating station.

15 33. Device as claimed in claim 31 or 32, characterized in that the device is provided with gas supply means for supporting a carrier for displacing.

34. Device as claimed in any of the claims 31 - 33, characterized in that the encapsulating station is provided with positioning elements displaceable in the
20 encapsulating device relative to a processing position of the carrier.

35. Device as claimed in any of the claims 31 - 34, characterized in that the encapsulating device is provided with a guide engaging on the side to be encapsulated at least partly of the carrier, which guide is adapted to guide encapsulating material.

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36. Device as claimed in any of the claims 31 - 35, characterized in that the manipulator is heatable.

37. Device as claimed in any of the claims 31 - 36, characterized in that the
30 displaceable support structure is adapted to support at least two supply containers; a first supply container for receiving carriers with electronic components for processing, and a second container for receiving processed carriers with electronic components.

38. Device as claimed in any of the claims 31 - 37, characterized in that the displaceable support structure is provided with at least one driven endless conveyor for displacing a supply container.
- 5 39. Device as claimed in any of the claims 31 - 38, characterized in that the device is provided with at least one buffering position for holding a supply of a supply container, which buffering position can be coupled to the support structure for exchanging a supply container.
- 10 40. Device as claimed in any of the claims 31 - 39, characterized in that the device is provided with vertical displacing means for keeping stacked at least one supply container for carriers with electronic components for processing, and at least one supply container for processed carriers with electronic components.
- 15 41. Assembly of a processing station and a device as claimed in any of the claims 31 - 40, characterized in that the encapsulating station is provided with at least one conveyor for transporting a carrier with electronic components between substations for performing sub-processes, and that a linear direction of movement of the manipulator parallel to the parallel planes is at least substantially perpendicular to the transporting
20 direction of the conveyor of the processing station.
42. Assembly as claimed in claim 41, characterized in that a device for limiting deformation of the carrier resulting from the processing undergone by the carrier in the processing station is disposed between the processing station and the device for
25 displacing a carrier with electronic components between a supply container and a processing station.
43. Assembly as claimed in claim 41 or 42, characterized in that an intermediate position between the processing station and a supply container is determined by a
30 support which is linearly displaceable perpendicularly to the parallel planes.
44. Assembly as claimed in claim 43, characterized in that the support contains a number of parallel support positions situated one above the other.

45. Assembly as claimed in any of the claims 41 - 44, characterized in that the assembly is provided with gas supply means for supporting a carrier for displacing.