Device for separating and positioning module bridges

Description

The invention relates to a device for separating module bridges arranged in a module bridge strip or module bridge set and for positioning the separated module bridges on a support element, according to the preamble of Claim 1.

Module bridges, which are arranged in rows as interposers in the form of an interposer strip or module bridge strip, have until now been cut by means of a dividing device in such a way that the module bridges are cut out separately from the module bridge strip. The module bridges are then positioned above a stationary support element by means of a further device and deposited individually onto the stationary support element by means of a downward displacement movement of this device. Alternatively, the positioning device can be kept above the support element without any downward movement, while the support movement is moved towards the stationary module bridges by means of an upward displacement movement.

Once a module bridge has been deposited on the support element, the support element is moved further in its running direction by a predefined distance, so as to be able to receive another module bridge at a new location.

Such devices require that the support element is kept stationary while a module bridge is deposited thereon. Because of this, the throughput of a placement device which includes such devices is reduced. Moreover, the separate arrangement of the dividing device and of the positioning device requires that the module bridge has to be aligned each time a separated module bridge is picked up by the positioning device.

Accordingly, embodiments of the present invention provide a device for separating module bridges from a module bridge strip and then positioning them with respect to a support element, which allows a higher throughput during a module bridge placement operation.

In accordance with the present invention, there is provided a device for separating module bridges arranged in a module bridge strip or module bridge set and for positioning the separated module bridges on a support element, characterised by a dividing device for dividing the module bridge strip in the edge regions thereof between in each case two module bridges, and a placement wheel for separately receiving and transporting in a slip-free manner the separated module bridges on its peripheral edge side and for depositing the module bridges onto the moving support element after a rotational movement of the placement wheel has been carried out about an axis oriented parallel to the module bridge plane.

In embodiments of the invention, in a device for separating module bridges arranged in a module bridge strip or module bridge set and for positioning the separated module bridges on a support element, there is a dividing device for dividing the module bridge strip in the edge regions thereof between in each case two module bridges, and a placement wheel for separately receiving the separated module bridges on its peripheral edge side, wherein the placement wheel is provided for depositing the module bridges onto the moving support element after a rotational movement of the placement wheel has been carried out about an axis oriented parallel to the module bridge plane. By virtue of such a device, module bridge strips which are perforated in such a way that they continue to have holding webs only in their edge regions between the module bridges can be cut in a continuous

operating procedure in order to separate the module bridges and then can be deposited by the placement wheel, the rotational speed of which is adapted to a speed of the support element, onto the moving support element, which may for example be designed in a belt-like manner. Such an equipping of the support element therefore does not require the support element to be kept stationary for the positioning of the module bridge, which results in an increased throughput of a placement device.

Since the perforated module bridge strip has through-apertures, preferably holes, between the module bridges

which serve for the engagement of pins or webs, for transporting the module bridge strip to a feed unit for feeding it to the dividing device, a precise alignment of the module bridge strip in the region of a cutting blade can be achieved. In this way, there is no need for a detection camera, which has until now been customary, for aligning the module bridge strip and the subsequently separated module bridges.

According to one preferred embodiment, the placement wheel has, on its peripheral edge side, preferably spring-loaded holding elements which are spaced apart from one another and are designed as carriers and are provided for holding individual module bridges on the peripheral edge side. These holding elements also serve to align the separated module bridges on the placement wheel and with respect to the support element, on which they are ultimately deposited.

The placement wheel may have, on its peripheral edge side, a width dimension which corresponds to a length dimension of a module bridge, so that, by means of additional guide elements which are arranged on a brake shoe of a brake device which is of complementary shape to the peripheral edge side of the placement wheel and bears against the latter, lateral guidance and simultaneous alignment of the module bridges is possible during the rotational movement of the placement wheel.

Preferably, the placement wheel is designed in such a way that it has, on its peripheral edge side, at least in the region in which the module bridges are received, between a web arranged on the left side and on the right side, recesses for receiving components arranged on the module bridges. Damage to the components when the module bridges are placed on the peripheral edge side is thus prevented.

The dividing device may include the cutting blade which can be displaced perpendicular to the plane of the module bridge strip and is provided for cutting through the module bridge strip in the edge regions thereof, once it has been fed little by little by the feed unit to the cutting blade, being fed in each case by a distance corresponding to the width of one module bridge.

In order to permit a clean cut by means of the cutting blade without displacing the module bridge strip, the dividing device may have a pressure ram for pressing the module bridge strip against a surface of the feed unit.

Furthermore, the feed unit may have guide elements for laterally guiding the module bridge strip.

Once the cutting blade has cut through the module bridge strip, the entire dividing device can be tilted with respect to the placement wheel during a further forward movement of the cutting blade, so that a gap is created between the remaining module bridge strip and the separated module bridge which is picked up by the placement wheel.

The brake device with the brake shoe which bears against part of the peripheral edge side of the placement wheel and is provided for braking the rotating placement wheel may be arranged between the dividing device and the support element. The brake device, in collaboration with a motor which drives the placement wheel, ensures that the placement wheel, after it has picked up a module bridge, is accelerated to the rotational speed at which the circumferential speed corresponds to the speed of the continuously moving support element.

The brake device may be additionally equipped with a heating element for heating contact adhesive points on the module bridges which are arranged on the placement wheel, so that an adhesive arranged on the module bridges is

activated in order then to enter into an adhesive bond with the support element.

The brake shoe preferably has two brake linings running along the edge, against which two pressing elements of complementary shape press, said pressing elements being arranged on the peripheral edge side of the placement wheel, wherein the module bridges are arranged between the pressing elements and the brake linings. A reliable additional fixing of the module bridges located on the placement wheel is thus possible during the rotational movement of said wheel.

In order to fix the individual module bridges on the support element, a counter-roller can be arranged on the side of the support element opposite the placement wheel and presses against the placement wheel with the support element and module bridge arranged therebetween.

Further advantageous embodiments emerge from the dependent claims.

Advantages and expedient features will become apparent from the following description in conjunction with the drawing. In the drawing:

Fig. 1 shows, in a perspective view, an already perforated interposer strip for use in a device according to the invention;

Fig. 2 shows, in a perspective view, a device for separating and positioning module bridges according to one embodiment of the invention;

Fig. 3 shows, in a plan view, the device shown in Fig. 2 according to one embodiment of the invention;

Fig. 4 shows, in a perspective view, a placement wheel with a brake device for the device according to the invention;

Fig. 5 shows, in a perspective view, a brake device with an interposer strip for the device according to the invention;

Fig. 6 shows, in a perspective view, a device according to another embodiment of the invention.

Fig. 1 shows, in a perspective view, an interposer strip 1 as can be used in the device according to the invention. The interposer strip 1 has interposers 2 arranged in a row, said interposers having a length dimension 2a, wherein the interposers have two contact adhesive surfaces 3 on the left and right side. Components 4 are arranged between the contact adhesive surfaces 3.

Such a single-row interposer strip 1, which may also be formed as a strip with multiple rows, is perforated in such a way that it has perforation holes 6 between the interposer cutting and transporting edges 5. In this way, holding webs 7 exist in the edge region of the interposer strip 1, which holding webs hold the individual interposers 2 together to form the interposer strip 1.

Fig. 2 shows, in a perspective view, the device according to the invention. As can be seen from Fig. 2, the interposer strip 1 is moved little by little along a feed unit 8 with a surface 8a, by means of webs 10 engaging in said strip, in the arrow direction 9 towards a cutting device 12. As soon as the interposer strip 1 has moved the distance corresponding to one module bridge width, a pressure ram presses against the interposer strip from above in order to fix it during the cutting operation.

A displacement of a cutting blade 13 or of cutting rollers then takes place, as shown by the double arrow 13a. The downwardly moving cutting blade 13 cuts the projecting interposer from the interposer strip 1. To this end, the cutting blade 13 is designed in such a way that it cuts through only the holding webs 7 arranged at the edge of the interposer strip 1. The rest of the strip between the interposers has already been cut through during the perforation operation. In this way, the cutting forces that have to be applied are reduced.

The cutting blade 13 then continues to move downwards, while the entire cutting device 12 is tilted with respect to the placement wheel, in order in this way to create a gap between the rest of the interposer strip and the interposer that has been cut off.

The cutting blades are designed in such a way that the cutting forces during the operation of cutting the holding webs 7 act inwards, that is to say towards the centre of the strip, so as to prevent the formation of burs on the outer edge of the interposer.

A placement wheel 14 picks up the separated interposers 2 on its peripheral edge side 14a by means of carrier claws and rotates about an axis 15.

The placement wheel 14 has a width which is smaller than the intermediate space between the cutting blades, which are formed in two parts, so that the cutting blades 13 are moved past the placement wheel 14 on the right and left side thereof during the cutting operation and the tilting operation.

Fig. 3 shows, in a plan view, the embodiment of the device that was shown in Fig. 2. The placement wheel has, at predefined sections of its peripheral edge side,

carrier claws 16 which serve to fix the interposers 2 on the placement wheel. Such carrier claws are equipped with a spring element and serve to transfer the separated interposers once they have been cut from the interposer strip 1.

The width of the placement wheel 14 corresponds to a length dimension 2a of an interposer, preferably to a length dimension of the transporting edge 5.

The placement wheel 14 has two webs 18 and 19 which run along the edge thereof and against which the interposers bear. Arranged between these webs are recesses which serve to receive the components arranged on the interposers.

The webs 18, 19 may be used as pressing elements for the fixing of attachment points, which correspond to the adhesive surfaces 3, to the moving support element.

Fig. 4 shows, in a perspective view, a placement wheel with a brake device for the device according to the invention. The brake device 20 has a brake shoe 21 which is of complementary shape to the peripheral edge side 14a of the placement wheel 14. Also installed in the brake device is a heating element 22 which, by conducting or radiating heat, activates the adhesive surface 3 at an attachment point 17 of the interposer 2.

As soon as the placement wheel 14 in conjunction with the brake device 20 has reached a rotational speed which corresponds to a speed of a support element 23, the interposer 2 is deposited on the support element and fixed by means of a counter-roller 24 by applying pressure and activating the adhesive surfaces.

Fig. 5 shows, in a perspective view, the brake device with the interposer strip 1. The brake shoe 21 has brake

linings 25 and 26 running along the left and right side, against which the pressing elements 27 and 28 press, said pressing elements being fixed to the placement wheel. The interposers 2 are clamped in an aligned position between the pressing elements 27, 28 and the brake linings 25, 26.

Fig. 6 shows, in a perspective view, a further embodiment of the invention. As can be seen from this figure, the placement wheel 14 is coupled to a belt 29 which conveys the separated interposers.

In order to fix the interposers on the moving support element in a precise manner, accurate position determination in the X and Y direction of the interposers is required. Such an alignment is achieved by movement on defined edges of the interposer. For the fixing in the Y direction, lateral guides are mounted on the brake shoe 21. The individual interposer is transported in the X direction by the carrier claw 16 on the placement wheel, wherein the carrier claw must always bear against the defined transport edge 5 of the interposer. Slipping of the interposer is prevented by the pressing elements 27, 28 pressing the interposer against the brake linings 25, 26.

The fixing of the individual interposers between the counter-roller 24 and the placement wheel 14 takes place in such a way that the pressure on the adhesive attachment points 17 and thus a degree of pre-fixing is achieved by pushing the individual interposer into a gap between the support element 23 bearing against the counter-roller 24 and the webs 18, 19 of the placement wheel 14. The gap is adjustable, as a result of which a pressing force on the interposer is variable. It should be noted that the interposer is pushed into the gap only once it has been accelerated by means of the placement

wheel. This prevents any slip between the interposer and the support element 23.

All of the features disclosed in the application documents are claimed as essential to the invention in so far as they are novel with respect to the prior art either individually or in combination with one another.

List of references

1	interposer strip
2	interposer
2a	length side of the interposer
3	adhesive surfaces of the interposer
4	component region of the interposer
5	transporting edge of the interposer
6	perforation holes
7	holding webs
8	feed unit
8a	surface of the feed unit
9	transport direction of the interposer strip
10	webs, form-fitting elements
11	pressure ram
12	cutting device
13	cutting blades, cutting rollers
13a	displacement direction of the cutting blades
14	placement wheel
14a	peripheral edge side of the placement wheel
15	axis
16	carrier claw
17	attachment points of the interposer
18, 19	webs of the placement wheel
20	brake device
21	brake shoe
22	heating element
23	support element
24	counter-roller
25, 26	brake linings
27, 28	pressing elements
29	belt

Claims

1. Device for separating module bridges arranged in a module bridge strip or module bridge set and for positioning the separated module bridges on a support element, characterised by a dividing device for dividing the module bridge strip in the edge regions thereof between in each case two module bridges, and a placement wheel for separately receiving and transporting in a slip-free manner the separated module bridges on its peripheral edge side and for depositing the module bridges onto the moving support element after a rotational movement of the placement wheel has been carried out about an axis oriented parallel to the module bridge plane.

2. Device according to Claim 1, characterised in that the placement wheel has, on its peripheral edge side, spring-loaded holding elements which are spaced apart from one another and are provided for holding and carrying individual module bridges on the peripheral edge side.

3. Device according to Claim 1 or 2, characterised in that the placement wheel has, on its peripheral edge side, a width dimension which corresponds to a length dimension of a module bridge.

4. Device according to one of the preceding claims, characterised in that the placement wheel has, on its peripheral edge side, at least in the region in which the module bridges are received, between a web arranged on the left side and on the right side, recesses for receiving components arranged on the module bridges.

5. Device according to one of the preceding claims, characterised in that the dividing device

has a cutting blade or cutting rollers which can be displaced perpendicular to the plane of the module bridge strip and is/are provided for cutting through the module bridge strip in the edge regions thereof.

6. Device according to Claim 5, characterised in that the dividing device is connected to a feed unit for feeding the module bridge strip to the cutting blade.

7. Device according to Claim 6, characterised in that the dividing device has a pressure ram for pressing the module bridge strip against a surface of the feed unit during a dividing operation.

8. Device according to Claim 6 or 1, characterised in that the feed unit has guide elements for laterally guiding the module bridge strip.

9. Device according to one of Claims 6 to 8, characterised in that the feed unit has form-fitting elements for engaging in through-apertures of the module bridge strip.

10. Device according to one of the preceding claims, characterised in that the dividing device can be tilted with respect to the placement wheel during a dividing operation.

11. Device according to one of the preceding claims, characterised in that a brake device which bears against part of the peripheral edge side of the placement wheel and is provided for braking the rotating placement wheel is arranged between the dividing device and the support element.

12. Device according to Claim 11, characterised in that the placement wheel, under the effect of the brake device and a motor, can be accelerated to a rotational speed at which the circumferential speed corresponds to a speed of the moving support element.

13. Device according to Claim 11 or 12, characterised in that the brake device includes a heating element for heating contact adhesive points on the module bridges.

14. Device according to one of Claims 11 to 13, characterised in that the brake device has, on a brake shoe which bears against the peripheral edge side of the placement wheel, guide elements for laterally guiding the module bridges during the rotational movement of the placement wheel.

15. Device according to Claim 14, characterised in that the brake shoe has two brake linings running along the edge, against which two pressing elements of complementary shape press, said pressing elements being arranged on the peripheral edge side, wherein the module bridges are arranged between the pressing elements and the brake linings.

16. Device according to one of the preceding claims, characterised by a counter-roller which is arranged on a side of the support element opposite the placement wheel and is provided for fixing the module bridges on the support element.

17. Device according to one of the preceding claims, characterised by a perforation device for perforating the module bridge strip in such a way that the module bridges are separated from one another with the

exception of the edge region of the module bridge strip, in order to minimise a cutting force of the dividing device.

18. Device according to Claim 17, characterised in that the perforation device is suitable for creating defined interposer edges for transporting the separated interposers in a slip-free and precise manner.