

Description

The invention relates to an apparatus for conveying a base to a sheet press clamping means.

Printed circuit boards for use in electronic equipment, e.g., computers, are made in such a manner that a copper wiring or the like having a predetermined pattern is formed on the surface of an insulating base.

A printed circuit board of that type is made using the following process steps. A laminate consisting of a photosensitive resin layer (photoresist) and of a translucent resin film (protective film) for protecting the photosensitive resin layer is bonded into a conductive layer provided on an insulating base using thermocompression bonding. The thermocompression bonding of the laminate is conducted by a laminator on a mass-production basis. Then a film having a wiring pattern is superposed on the laminate, and the photosensitive resin layer is exposed to light through the wiring pattern film and the translucent resin film for a predetermined time period. The photosensitive resin layer thus exposed to light is developed to form an etching mask pattern after the translucent resin film is peeled off by a peeling device. Unnecessary portions of the conductive layer are subsequently removed by etching and the remaining photosensitive resin layer is also removed to form a printed circuit board having a predetermined wiring pattern.

Selfunderstandingly, during the process of manufacturing the printed circuit board, the step of forming a laminate has to be performed, the laminate consisting of a photosensitive resin layer and of a translucent resin film on an insulating base having conductive layers formed on both sides thereof by thermocompression bonding.

A roll of laminate continuously wound on a supply roller of a film laminator is pulled out and then out into pieces corresponding in their dimensions to those of the base to provide a laminate to be bonded thereto.

An apparatus for conveying the base to the thermocompression roller position is equipped with a plurality of rotary means formed with a plurality of discoidal rollers (pinch rollers), which are rotated to move the base. When the base approaches the thermocompression rollers, fixed guide members guide the base crosswise towards the center line in the conveyance direction and cause the thermocompression rollers to hold the base therebetween.

However, even if the base is set exactly along the center line of the conveyance path, there is still to be feared that the set position of the base would be offset from a desired position. Namely, when the base is set between the thermocompression-clamping members, a part of the base is only

clamped thereby, so that there is still to be feared that the base would be moved (forwardly or rearwardly, leftwardly or rightwardly, or upwardly or downwardly) by the collision shock of the clamping upon the initial clamping, or a leading end of the base would be likely to be bent downwardly so that the position of the base would be offset from the set position of the thin film to be laminated.

EP-A-0 163 255, which is a document within the meaning of Art. 54 (3) (4) EPC and which accordingly is not to be considered in deciding whether there has been an inventive step (cf. Art. 56 EPC), discloses an apparatus for conveying a base to a sheet press clamping means which comprises an openable gripper means. Though for the opening and closing movement part of the gripper means is movable in the vertical direction, the gripper means is only movable in the horizontal direction, when it is in engagement with the base.

The object underlying the invention is to provide an apparatus for conveying a base to a sheet press clamping means, which allows an easy and smooth introducing of the leading end of the base into the laminator or peeler without failure.

This object is solved by an apparatus having the features of claim 1. Advantageous further developments of the apparatus of the invention are subject of the subclaims.

The apparatus of the invention is in particular advantageously applied to an apparatus for conveying a base for use in a film laminator.

The conveying apparatus in accordance with the invention comprises a base holding means corresponding to the gripper means according to above mentioned EP-A-0 163 255 which is also only movable in the horizontal direction and operates so as to make the center line of the base coincide with the center line of the apparatus for conveying the base. In addition, the conveying apparatus according to the invention comprises a base holding member and a base support member. The base holding member is moved in a direction perpendicular to the plane of the base, whereas the base support member is moved in a direction parallel to the plane of the base. Thereby the base is prevented from dropping, when it reaches the starting position of the sheet press clamping means, and accordingly it can be will introduced into the laminator or peeler.

More in detail, when the base has been fed to a position where the base is to be set at the sheet press clamping means, the base holding member is projected to press the base in a stationary position. When an initial shock caused by the press-clamping means is applied to the base, the base holding member is retracted therefrom. Thus, when the base is set at the sheet press clamping means, any offset between the thin plate to be supplied

and the base plate may be prevented.

Referring now to the drawings, the invention will be further explained by a description of an embodiment of the present invention applied to an apparatus for conveying a base for a film laminator for bonding a laminate consisting of a photosensitive resin layer and a translucent resin film onto a printed circuit board by thermocompression bonding. In the drawings:

- Fig. 1 is a perspective view of an apparatus for conveying a base according to the present invention;
- Fig. 2 is a schematic structural view of a film laminator related to the apparatus for conveying a base according to the present invention;
- Fig. 3 is a sectional view taken along line Y-Y of Fig. 1;
- Fig. 4 is a perspective structural view of the crosswise base guide of Fig. 3;
- Fig. 5 is a side view showing the construction of the base breadth detecting sensors, the holding member and the base support member shown in Fig. 1; and
- Fig. 6 is a side view showing the construction of the base support member of Fig. 1.

In all figures of the drawings like reference signs designate like elements performing the like function respectively and their description will be omitted.

Fig. 2 is a schematic structural view of a film laminator employing an apparatus for conveying a base embodying the present invention.

In the film laminator shown in Fig. 2, a three-layer laminate 1 consisting of a photosensitive resin layer and a translucent resin film is continuously wound on supply rollers 2. The laminate 1 wound on the supply roller 2 is separated by a peeling roller 3 into a translucent resin film (protective film) 1A and a laminate 1B composed of the photosensitive resin layer with one side exposed (adhesive surface) and the translucent resin film. The translucent resin film 1A thus separated is so arranged as to be rolled around a take-up roller 4.

The front end of the laminate 1B in the supply direction is absorbed by a main vacuum plate 6 through a tension roller 5 providing the proper tension. The main vacuum plate 6 is supported by a frame 8 through an air cylinder 7 whose position is variable in the direction of an arrow A. The main vacuum plate 6, together with the tension roller 5, is used to supply the laminate 1B to a base 17 without causing wrinkles thereto.

An arcuate portion 6A at the front end of the main vacuum plate 6 constitutes a part of means for clamping the base under pressure and contains

a heater 6B and bonds the front end of the laminates 1B onto the conductive layer of the base 17 by thermocompression bonding.

A rotary cutter 9 installed close to the arcuate portion 6A is used to cut the continuous laminate 1B into a piece corresponding in its dimensions to those of the base 17.

A subvacuum plate 10 for having the front end of the laminate 1B thus cut off absorbed by the arcuate portion 6A is positioned opposite to the rotary cutter 9. The subvacuum plate 10 is supported by the frame 8 through an air cylinder 11 whose position is variable in the direction of an arrow B.

The frame 8 for supporting the main vacuum plate 6 and the subvacuum plate 10 is supported by a proper frame of the apparatus through an air cylinder 12 whose position is variable in the direction of an arrow C.

The laminate 1B whose front end is bonded by the arcuate portion 6A onto the conductive layer of the base 17 through thermocompression bonding is thoroughly bonded by a thermocompression roller 14 which constitutes a part of the means for clamping the base under pressure. The thermocompression roller 14 tentatively bonds the front end of the laminate 1B onto the arcuate portion 6A through thermocompression bonding and then moves from a position shown by a dotted line marked with numeral 14' of Fig. 2 to the position shown by a solid line.

The rear end of the laminate 1B cut to size by the rotary cutter 9 is guided by a triangular rotary vacuum plate 15 in such a manner as to prevent it from wrinkling and being bonded by the thermocompression roller 14 through thermocompression bonding.

The film laminator thus constructed works to bond the laminate 1B on the base 17 supplied with the conductive layer on both sides (or one side) of the insulating base conveyed by the apparatus 16 for conveying a base comprising the conveyor rollers 16A and the presser rollers 16B. The laminate 1B is bonded onto the base 17 by thermocompression bonding so that the adhesive surface of the photosensitive resin layer whose the translucent resin film 1A has been peeled off may stick to the surface of the conductive layer. The base 17 with the laminate 1B bonded thereto through thermocompression bonding is carried out of the apparatus 18 by a base discharging device.

Fig. 1 is a schematic structural view of the apparatus 16 for conveying a base.

As shown in Fig. 1, the apparatus for conveying a base is coupled to the film laminator 1. Each conveyor roller 16A is formed with a (solid or hollow: preferably hollow) fiber-reinforced plastic columnar member and a plurality of conveyor roll-

ers 16A are rotatably fitted to a proper frame 20 of the apparatus 16. The plurality of conveyor rollers 16A are arranged a predetermined space apart to prevent the thin base 17 from dropping. Moreover, only every other one out of those conveyor rollers 16A is coupled to a driving source (not shown). Every two of the conveyor rollers 16A or all of them may be coupled to the driving source, if necessary

The base 17 is mounted on the conveyor rollers 16A and conveyed while it is held by the presser rollers 16B. when a thin base is conveyed, warping and waving are remedied. Like the conveyor roller 16A, each pressure roller 16B, which is rotatably fitted to the frame 20, is also formed with a columnar member to keep the end of the base 17 from being caught by the rotary means comprising a discoidal member and stopped when the base 17 is thin enough to readily warp and wave. Although the pressure rollers 16B are not coupled to the driving source, they may also be coupled thereto. When a base 17 which is not thin and tends less to warp and wave is used, the pressure rollers 16B may be rotary means prepared by spitting a plurality of discoidal members.

A crosswise base guide 21 is intended to make the center line in the conveyance direction and the center line in the conveyance direction of the base 17. As shown in Fig. 3 (sectional view taken on line Y-Y) and Fig. 4 (perspective view), the crosswise base guide 21 is formed of crosswise base guide members 21B, 21B' supported by support members 31A, 21A'. The support members 21A, 21A' are slidably fitted to a support rod 21C. The support members 21A, 21A' are also fitted to an endless belt 21E wound on pulleys 21D, 21D' in such a manner that they are moved close to each other when the endless belt 21E moves in the direction of an arrow D. The support members 21A, 21A' are caused to slide by an air cylinder 21I installed on the support member 21A'. The pulleys 21D, 21D' are supported by inverted L-shaped support members 21F, 21F', respectively. The inverted L-shaped support members 21F, 21F' mate with a threaded rod 21G, which is equipped with a handle 21H and, by turning the handle 21H, the inverted L-shaped support members 21F, 21F' are transversely moved while a fixed distance therebetween is held by them. The moving mechanism (fine adjustment mechanism) is intended to adjust the position of the crosswise base guide 21 to make the center line in the conveyance direction of the base 17 coincide with the center line in the conveyance direction of the laminate 1B for thermocompression bonding, i.e. the center line of the apparatus 16 for conveying a base in case the former shifts from the latter. The position of the crosswise base guide 21 is fixed with a screw 21J for fixing the rotation of

the threaded rod 21G.

A base position detecting sensor 22 for detecting the front (or rear) end of the base 17 produces a signal for starting driving the crosswise base guide members 21B, 21B' of the crosswise base guide 21. The base position detecting sensor 22 is fitted to the frame 20 through a support frame 22A. A reflective optical sensor is, for instance, employed as the base position detecting sensor 22.

Base breadth detecting sensors 23A, 23B for respectively detecting both ends of the base 17 produce signals for stopping driving the crosswise base guide members 21B, 21B' of the crosswise base guide 21. The base breadth detecting sensors 23A, 23B are installed on the inner sides of the crosswise base guide members 21B, 21B' close to the front end of the conveyance direction of the support members 21A, 21A'. In other words, the base breadth detecting sensors 23A, 23B are installed in such a position as to stop the crosswise base guide members 21B, 21B' when the center line of the base coincides with the center line of the apparatus for conveying a base. The control of the crosswise base guide 21 can simply be materialized by causing the signal for stopping driving the crosswise base guide members 21B, 21B' to be produced slightly later than the time both ends of the base 17 are detected by the base breadth detecting sensors 23A, 23B using a delay circuit. As the base breadth detecting sensors 23A, 23B, optical sensors of the translucent are used.

The base 17 can thus be conveyed to the starting position of thermocompression bonding readily and accurately in such a state that the center line in the conveyance direction of the base 17 is made to coincide with the center line in the conveyance direction of the apparatus for conveying a base without allowing the base 17 to bend by installing the crosswise base guide 21 for making the center line in the conveyance direction of the base 17 coincide with the center line in the conveyance direction of the apparatus for conveying a base, the base position detecting sensor 22 for starting the operation of the crosswise base guide 21 and the base breadth detecting sensors 23A, 23B for stopping the operation of the crosswise base guide 21.

A base holding member 24 shown in Fig. 1 fixes and holds the base 17 so that it may not drop when the base 17 reaches the starting position of the thermocompression bonding. As shown in fig. S (side view), the base holding member 24 is fitted to the frame 20 and moved by an air cylinder and a spring (not shown) in the direction of an arrow E. Moreover, a base support member projects in the direction of an arrow F interlockingly or not interlockingly with the operation of driving the base holding member 24. The control of the base sup-

port member 25 in the direction of the arrow E is conducted by an air cylinder 25A fitted to the frame 20. The operation of the base holding member 24 or of the base support member 25 is controlled by the signal (not shown) for starting or stopping driving the base position detecting sensor.

The base holding member 24 and the base support member 25 thus installed support the base 17 to prevent the base 17 from dropping when it reaches the starting position of the thermocompression bonding and they are capable of holding it in position until the thermocompression rollers vertically sandwich it therebetween, so that the laminate 1B is accurately bonded onto the base 17 through thermocompression bonding.

The operation of the apparatus for conveying a base according to the present invention will briefly be described.

In Fig. 1, the base 17 is conveyed towards the thermocompression rollers 14 by driving the given number of the conveyor rollers 16A. When the front end of the base 17 thus conveyed is detected by the base position detecting sensor 22, the crosswise base guide 21 starts operating according to the drive-starting signal. The crosswise base guide 21 operates so as to make the center line of the base 17 coincide with the centerline of the apparatus for conveying a base using the crosswise base guide members 21B, 21B'. When both ends of the base 17 are then detected by the base breadth detecting sensors 23A, 23B, the operation of the crosswise base guide 21 is stopped by the drive-stopping signal. The base 17 is consequently conveyed to the position of thermocompression bonding in such a state that the center line in the conveyance direction of the base 17 coincides with the center line in the conveyance direction of the apparatus for conveying a base. At this time, the conveyor rollers 16A are stopped by the base position detecting sensor (not shown) and the holding member 24 moves down and makes the base immovable. The base support member 25 simultaneously projects to support and prevent the base 17 from dropping. Then as shown in Fig. 2, the thermocompression rollers 14 move to the base 17 on the left and sandwich the base 17 through the laminate 1B thermocompression bonded. The thermocompression rollers 14 and the conveyor rollers 16A are driven so that the laminate 1B are bonded onto the laminate 1B through thermocompression bonding.

Although the present invention has above been described in its preferred form with a certain degree of particularity, it is needless to say that the invention is not limited to this specific embodiment and modifications of the embodiment are possible within the spirit and scope as set out in the claims.

For example, according to the present inven-

tion, the base holding member is provided so that the base is prevented from being undesirably moved when the base is fed to the base tentative thermocompression bonding start position and the arcuate members 6A press the base vertically. The thin film to be laminated thereon may be laminated exactly on the base. The thermocompression bonding start position is set at the same position as the thermocompression start position of the thermocompression rollers, and the base holding member is operated also upon the thermocompression start. Therefore, it is possible to exactly thermally laminate the thin film on the base.

Claims

1. An apparatus for conveying a base (17) to a sheet press clamping means (6, 14), having
 - rollers (16),
 - a base holding means (21) for temporarily holding the base in position, when the base (17) has been fed to a predetermined position of the sheet clamping means (6, 14), and
 - a base holding member (24) being projected to the base (17), when the base has been fed to the sheet press clamping means (6, 14), and being retracted, when the base is set at the sheet clamping means,

characterised in that

 - the base holding member (24) is disposed above the base (17) and movable in a direction perpendicular to a substantially horizontal plane defined by the base for holding the base at the fixed position, and
 - a base support member (25) movable in a direction parallel to the horizontal plane for supporting the base (17) from below at the fixed position.
2. The apparatus of claim 1, wherein an air cylinder and a spring are provided for moving the base holding member in the direction perpendicular to the horizontal plane.
3. The apparatus of claim 1 or 2, wherein an air cylinder is provided for controlling the base support member in the direction perpendicular to the horizontal plane.
4. The apparatus of any of claims 1 to 3, wherein the base holding member and/or the base support member are operated in accordance with a conveyance position signal.

Revendications



port member 25 in the direction of the arrow E is conducted by an air cylinder 25A fitted to the frame 20. The operation of the base holding member 24 or of the base support member 25 is controlled by the signal (not shown) for starting or stopping driving the base position detecting sensor.

The base holding member 24 and the base support member 25 thus installed support the base 17 to prevent the base 17 from dropping when it reaches the starting position of the thermocompression bonding and they are capable of holding it in position until the thermocompression rollers vertically sandwich it therebetween, so that the laminate 1B is accurately bonded onto the base 17 through thermocompression bonding.

The operation of the apparatus for conveying a base according to the present invention will briefly be described.

In Fig. 1, the base 17 is conveyed towards the thermocompression rollers 14 by driving the given number of the conveyor rollers 16A. When the front end of the base 17 thus conveyed is detected by the base position detecting sensor 22, the crosswise base guide 21 starts operating according to the drive-starting signal. The crosswise base guide 21 operates so as to make the center line of the base 17 coincide with the centerline of the apparatus for conveying a base using the crosswise base guide members 21B, 21B'. When both ends of the base 17 are then detected by the base breadth detecting sensors 23A, 23B, the operation of the crosswise base guide 21 is stopped by the drive-stopping signal. The base 17 is consequently conveyed to the position of thermocompression bonding in such a state that the center line in the conveyance direction of the base 17 coincides with the center line in the conveyance direction of the apparatus for conveying a base. At this time, the conveyor rollers 16A are stopped by the base position detecting sensor (not shown) and the holding member 24 moves down and makes the base immovable. The base support member 25 simultaneously projects to support and prevent the base 17 from dropping. Then as shown in Fig. 2, the thermocompression rollers 14 move to the base 17 on the left and sandwich the base 17 through the laminate 1B thermocompression bonded. The thermocompression rollers 14 and the conveyor rollers 16A are driven so that the laminate 1B are bonded onto the laminate 1B through thermocompression bonding.

Although the present invention has above been described in its preferred form with a certain degree of particularity, it is needless to say that the invention is not limited to this specific embodiment and modifications of the embodiment are possible within the spirit and scope as set out in the claims.

For example, according to the present inven-

tion, the base holding member is provided so that the base is prevented from being undesirably moved when the base is fed to the base tentative thermocompression bonding start position and the arcuate members 6A press the base vertically. The thin film to be laminated thereon may be laminated exactly on the base. The thermocompression bonding start position is set at the same position as the thermocompression start position of the thermocompression rollers, and the base holding member is operated also upon the thermocompression start. Therefore, it is possible to exactly thermally laminate the thin film on the base.

Claims

1. An apparatus for conveying a base (17) to a sheet press clamping means (6, 14), having
 - rollers (16),
 - a base holding means (21) for temporarily holding the base in position, when the base (17) has been fed to a predetermined position of the sheet clamping means (6, 14), and
 - a base holding member (24) being projected to the base (17), when the base has been fed to the sheet press clamping means (6, 14), and being retracted, when the base is set at the sheet clamping means,

characterised in that

 - the base holding member (24) is disposed above the base (17) and movable in a direction perpendicular to a substantially horizontal plane defined by the base for holding the base at the fixed position, and
 - a base support member (25) movable in a direction parallel to the horizontal plane for supporting the base (17) from below at the fixed position.
2. The apparatus of claim 1, wherein an air cylinder and a spring are provided for moving the base holding member in the direction perpendicular to the horizontal plane.
3. The apparatus of claim 1 or 2, wherein an air cylinder is provided for controlling the base support member in the direction perpendicular to the horizontal plane.
4. The apparatus of any of claims 1 to 3, wherein the base holding member and/or the base support member are operated in accordance with a conveyance position signal.

Revendications



1. Appareil de transport destiné à transporter une base (17) à des moyens de serrage (6, 14) d'une presse à feuilles, comprenant :

- des rouleaux (16),
- des moyens (21) de retenue de base destinés à retenir temporairement la base en position lorsque la base (17) a été acheminée à une position prédéterminée des moyens de serrage (6, 14) de feuilles, et
- un organe (24) de retenue de base qui est mis en extension jusqu'à la base (17) lorsque la base a été acheminée aux moyens de serrage (6, 14) de la presse à feuilles, et qui est rétracté lorsque la base est placée dans les moyens de serrage de feuilles, caractérisé
- en ce que l'organe (24) de retenue de la base est disposé au-dessus de la base (17) et peut se déplacer dans une direction perpendiculaire à un plan sensiblement horizontal défini par la base pour retenir la base dans la position fixe, et
- en ce qu'un organe (25) support de base peut se déplacer dans une direction parallèle au plan horizontal pour supporter la base (17) par dessous dans la position fixe.

2. Appareil selon la revendication 1, dans le quel un vérin pneumatique et un ressort sont prévus pour déplacer l'organe de retenue de base dans la direction perpendiculaire au plan horizontal.

3. Appareil selon la revendication 1 ou 2, dans lequel un vérin pneumatique est prévu pour commander l'organe de support de base dans la direction perpendiculaire au plan horizontal.

4. Appareil selon une quelconque des revendications 1 à 3, dans lequel l'organe de retenue de base et/ou l'organe support de base sont commandés en fonction d'un signal de position du transport.

Patentansprüche

1. Vorrichtung zum Fördern einer Basis (17) zu einem Bogen-Press-Klemmmittel (6, 14), mit
- Rollen (16)
 - einem Basishaltermittel (21) zum zeitweisen Halten der Basis in Position, wenn die Basis (17) bis zu einer vorbestimmten Position des Bogenklemmmittels (6, 14) gefördert worden ist, und

- einem Basishalteglied (24), das zu der Basis (17) hin vorgeschoben wird, wenn die Basis bis zu dem Bogen-Press-Klemmmittel (6, 14) gefördert worden ist, und zurückgezogen wird, wenn die Basis an dem Bogenklemmmittel stillgesetzt wird, dadurch gekennzeichnet, daß
- das Basishalteglied (24) oberhalb der Basis (17) angeordnet und in einer Richtung senkrecht zu einer von der Basis definierten, im wesentlichen horizontalen Ebene beweglich ist zum Halten der Basis in der festgelegten Position und
- ein Basisstützglied (25) in einer Richtung parallel zu der horizontalen Ebene beweglich ist, um die Basis (17) von unten in der festgelegten Position abzustützen.

2. Vorrichtung nach Anspruch 1, worin ein Luftzylinder und eine Feder vorgesehen sind, um das Basishalteglied in der Richtung senkrecht zu der horizontalen Ebene zu bewegen.

3. Vorrichtung nach Anspruch 1 oder 2, worin ein Luftzylinder vorgesehen ist, um das Basisstützglied in der Richtung senkrecht zu der horizontalen Ebene zu steuern.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, worin das Basishalteglied und/oder das Basisstützglied nach einem Förderpositionssignal betätigt werden.