

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to a film bonding method and an apparatus for performing such a method, and more particularly to a method of and apparatus for thermocompression-laminating a laminate film (thin sheet) composed of a photosensitive resin layer and a light-permeable resin film, from a continuous roll onto discrete boards for printed circuits.

2. Description of the Prior Art

In conventional film bonding machines, boards for printed circuits are conveyed by a conveyor or the like, to a bonding station and a laminate film is fed from a continuous roll to the bonding station where it is cut to length corresponding to the length of the board and is bonded thereto. As a device for cutting this laminate film, a movable cutter, comprising a rotary disc blade reciprocally movable transversely of the laminate film, is used.

Such a film bonding machine is described in earlier application EP-A2-0 360269 (published on 28.03.90 and thus falling within the terms of article 54(3) EPC). In this bonding machine an auxiliary suction plate is provided which is a holding member for cutting off the laminate film. In the central portion of the suction plate a guide groove for guiding the rotary disc blade is disposed across the feed passage of the film. The blade is moved along the width of the film and acts so that the continuously supplied film is cut to a prescribed length.

With the above conventional movable cutter, however, in order that the transversely-movable rotary disc blade can accurately cut the moving laminate film in a direction perpendicular to the laminate film, it is necessary that the reciprocal movement of the movable cutter should be effected quite rapidly. More specifically, the laminate film ordinarily has a considerable width of about 600 mm, and therefore the rotary disc blade cutter must be moved a distance of about 700 mm.

The above conventional movable cutter has a limited speed of movement and, therefore, the feed rate or speed of the laminate film is necessarily limited. For example, if the maximum speed of the movement of the rotary cutting disk is such that it takes about a half second for the disc to be moved by 700 mm, the maximum speed of the movement of the laminate film can only be about 3 m/min. Further, when the rotary disc blade cutter is abruptly moved and then stopped, a great impact is

applied to guide members for the cutter. This impact results in damage to parts of the apparatus and results in a high cost for the maintenance of the device.

SUMMARY OF THE INVENTION

It is the object of the invention to provide a film bonding method and apparatus according to claims 1 and 5 respectively, which overcome the above mentioned problems.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of the overall construction of a preferred embodiment of an apparatus of the present invention;

Fig. 2 is an enlarged view of an important portion of the apparatus of Fig. 1;

Fig. 3 is a cross-sectional view taken along the line 3-3 of Fig. 2;

Fig. 4 is a cross-sectional view taken along the line 4-4 of Fig. 2;

Figs. 5, 6 and 7 are respectively a side-elevational view, a plan view and a front-elevational view of a portion of the apparatus of Fig. 1 including a rotary cutter;

Fig. 8 is an exploded perspective view, showing a lower cutting device;

Fig. 9 is a perspective view of a rotary cutter shown in Figs. 5 to 7;

Figs. 10 to 16 are schematic views illustrative of a laminating operation of the apparatus of Fig. 1; Fig. 17 is a schematic view of an overall construction of an alternative embodiment of the apparatus of the present invention; and

Figs. 18 and 19 show modifications according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will now be described by way of a preferred embodiment thereof with reference to the drawings.

In all the figures of the drawings, the parts performing the same functions are denoted by the same reference numerals, respectively, and a repetition of explanation of the similar parts will be omitted.

Fig. 1 schematically shows a preferred embodiment of a film bonding apparatus of the invention for thermocompression-laminating a laminate film, composed of a photosensitive resin layer and a light-permeable resin film, onto each side (i.e., front and reverse sides) of a board 14 for a printed circuit.

As shown in Fig. 1, the film bonding apparatus of this embodiment comprises a pair of supply rollers 2 each having the laminate film 1 being composed of three layers (i.e., a light-permeable resin film, a photosensitive resin layer and a light-permeable resin film). The laminate film 1 on each supply roller 2 is separated by a film separating roller 3 into the light-permeable resin film 1A (protective film) and a laminate film 1B composed of the other light-permeable resin film and the photosensitive resin layer having one side (adhesive surface) exposed.

The light-permeable resin film 1A thus separated is taken up by a take-up roller 4. The pair of supply rollers 2 as well as the pair of take-up rollers 4 are arranged respectively on the upper and lower sides of a path of travel of boards indicated by I-I and spaced equidistantly therefrom.

The leading end of the separated laminate film 1B in the direction of its feed is fed to a main vacuum plate (film feed member) 6 via a tension roller 5, as shown in Fig. 1. As shown in Fig. 1, Fig. 2 (enlarged view of an important portion of Fig. 1) and Fig. 3 (cross-sectional view taken along the line-3-3 of Fig. 2), the main vacuum plate 6 is designed to be movable toward and away from a film bonding position in directions indicated by double-head arrow A. More specifically, the main vacuum plate 6 is mounted on support integrally connected to support member 9 slidably mounted on guide rails 8 which are mounted on a body 7 of the apparatus (i.e., a frame of the film bonding apparatus). The pair of main vacuum plates 6 are arranged respectively on the upper and lower sides of the board travel path I-I and are spaced equidistantly therefrom, the two main vacuum plates being moved toward and away from each other by a rack-and-pinion mechanism which comprises racks 7A and a pinion 7B in mesh with the racks 7A. Reference numeral 7F denotes a channel formed by a body 7. A drive source 7C comprises, for example, an air cylinder. Each main vacuum plate 6 is moved by a respective drive source 7C, mounted on the apparatus body 7 and a rack-and-pinion mechanism connected to the drive source. This rack-and-pinion mechanism comprises a pinion 7D connected to a rod of the drive source 7C, a rack 7E mounted on the apparatus body 7 and a rack 7E mounted on the reverse side of the main vacuum plate 6 which is not a suction surface for holding the laminate film 1B, as seen in Fig. 3. Thus, the main vacuum plates 6 can move in the directions of the arrow A independently of each other.

A forward end portion 6D of the main vacuum plate 6 disposed near the film bonding position has the film suction surface of an arcuate shape, and a plurality of film suction apertures are formed there-

in. Against the resiliency of the laminate film 1B, the leading end of the laminate film 1B in the direction of feed thereof can be held on the arcuate surface of the forward end portion 6D by suction. The leading end held on the forward end portion 6D by suction is fed to the film bonding position when the main vacuum plate 6 is moved in the direction of the arrow A.

In the vicinity of the path of feed of the laminate film 1B, a film leading-end-holding member 10 is provided between the main vacuum plate 6 and the film bonding position. The pair of film leading-end-holding members 10 are arranged respectively on the upper and lower sides of the board travel path I-I and spaced equidistantly therefrom. As shown in Fig. 4 which is a cross-sectional view taken along the line 4-4 of Fig. 2, the film leading-end-holding member 10 is designed to hold the cutting portion of the laminate film 1B and also to enable the forward end portion 6D of the main vacuum plate 6 to hold by suction a fresh leading end of the laminate film 1B from which the preceding length of the film has been cut. More specifically, the film leading-end-holding member 10 is movable toward and away from the path of feed of the laminate film 1B as indicated by a double-head arrow C. In Fig. 4, reference numerals 10B denote suction pipes. The film leading-end-holding member 10 is mounted on the apparatus body 7 through a drive source 10A. The drive source 10A comprises, for example, an air cylinder.

The film leading-end-holding member 10 is also designed to hold the trailing end of the cut length of the laminate film when the laminate film 1B is cut at its cutting portion. As shown in Fig. 5, a fixed blade 17 of a rotary cutter 13 is mounted on the film leading-end-holding member 10. More specifically, the rotary cutter 13 is movable toward and away from the reverse side of the laminate film 1B, together with the film leading-end-holding member 10. A rotary blade 16 of the rotary cutter 13 is mounted on the apparatus body 7 so as to be movable toward and away from the front side of the laminate film 1B.

Referring again to Figure 1, thermocompression bonding-rollers 11 are always rotated so that spots of different temperatures will not develop on their surfaces. Each thermocompression bonding-roller 11 is movable between a retracted position indicated by a solid line and the film-bonding position indicated by a broken line.

When the thermocompression bonding-rollers 11 are moved toward the bonding position, the leading end of the laminate film 1B is held and automatically fed by rotation of the rollers. The pressure applied by the rollers will cause the laminate film 1B to bond to a film-bonding surface of the board 14 from its leading to trailing end over a

predetermined distance. During the bonding process, the thermocompression bonding-rollers 11 and the board 14 are moved a predetermined distance in the direction of feed of the board 14 while the laminate film 1B is being bonded to the board under heat and pressure, and thereafter are moved in the direction opposite to the direction of feed of the board 14 so as to loosen the trailing edge of laminate film 1B.

A pair of vacuum bars 12 serve to hold by suction the trailing end of the laminate film 1B to be bonded by the thermocompression-bonding roller 11, so as to apply an appropriate tension to the laminate film 1B so that the laminate film 1B will not have wrinkles and the like. Each vacuum bar 12 is capable of rotating around a respective thermocompression-bonding roller 11. The constitution and operation of the vacuum suction bar 12 are described in detail in the Japanese Patent Application (OPI) No. 205140/86 (the term "OPI" as used herein means an "unexamined published application"), and are not described in detail herein. The pair of thermocompression rollers 11 as well as the pair of vacuum bars 12 are arranged respectively on the upper and lower sides of the board travel path I-I and spaced equidistantly therefrom.

The boards 14 for printed circuits are transferred along the board travel path I-I by a board conveying mechanism mounted within or on the film bonding apparatus. More specifically, the board conveying mechanism is designed to convey the boards 14 to the film bonding position, and then to transfer or move each board 14 from the film bonding position to an exposure position (the next stage) after the laminate film 1B is thermocompression-laminated. The board conveying mechanism broadly comprises drive rollers 15A and driven rollers 15B.

In the present invention, a rotary cutter 13 is provided as a cutter device for cutting the continuously-fed laminate film 1B to a predetermined length. Referring again to Figure 5, the rotary cutter 13 is composed of a set of rotary blade 16 and fixed blade 17 both having a predetermined length and extending transversely of the laminate film 1B. As shown in Figs. 5 to 9, the rotary blade 16 has a cutting edge 18 formed diagonally on an upper surface of its strip-like body. The rotary blade 16 has discs 19 mounted on opposite ends thereof and is rotatable about the axes of the discs 19 through a predetermined angle in normal and reverse directions, so that the rotary blade 16 cooperates with the fixed blade 17 to cut or shear the laminate film 1B disposed therebetween, the fixed blade 17 being supported on and disposed in contact with the outer peripheries of the discs 19. The fixed blade 17 is mounted on the film leading-end-holding member 10 through a sheet-like elastic

member (for example, rigid rubber), and is movable toward and away from the path of feed of the laminate film 1B in the direction of the arrow C, as seen in Figs. 1 and 8, together with the film leading-end-holding member 10.

Referring to Figs. 5, 6 and 7, showing portions of the cutter 13, and Fig. 8, showing the lower rotary cutter 13 in an exploded manner, we see that the rotary blade 16 is rotatably supported by two side plates 21 of a slide bed 20 which is movable forward and backward relative to the bonding apparatus. A crank 22 mounted on a shaft end of the rotary blade 16 is reciprocally moved by an air cylinder 23 mounted on the side plate 21 so that the rotary blade 16 can be rotated in normal and reverse directions through a predetermined angle. The slide bed 20 is supported on a transverse plate 25 fixedly mounted horizontally on the frame of the bonding apparatus through L-shaped brackets 24. Two support plates 26 extend respectively from right and left-hand portions of the reverse side of the transverse plate 25, and are engaged respectively in engaging portion 21A formed respectively on the two side plates 21. Thus, the slide bed 20 is supported by the support plates 26 and is normally fixed thereto. However, by pulling up an engaging thumb piece 27, mounted on the upper surface of the slide bed 20, against the bias of a spring mounted therein, the slide bed 20 can slide freely. A stopper 28 with a set screw is mounted on the underside of the slide bed 20, and when the slide bed 20 is moved toward the fixed blade, the distal end of the set screw abuts against a projection 29 formed on the upper surface of the support plate 26 so as to always hold the rotary blade 16 in a predetermined position relative to the fixed blade 17. Air-applying pipes 30 and 21 are mounted at their opposite ends on the two side plates 21, and have air-applying apertures formed in their outer peripheries. The air, applied from these pipes when necessary, urges the laminate film 1B against the thermocompression bonding-roller 11 and the forward end portion of the main vacuum plate 6. The film leading-end-holding member 10 in this embodiment has suction apertures for holding the laminate film 1B against movement by suction when cutting the laminate film 1B.

The cutting operation of the laminate film 1B in the film bonding apparatus of this embodiment will now be briefly described.

Initially, the leading end of the laminate film 1B separated by the film separating roller 3 is manually disposed between the front face of the fixed blade 17 on the film leading-end-holding member 10 and the rear portion of the rotary blade 16 on the slide bed 20, and the leading end of the laminate film 1B is urged against the film leading-end-

holding member 11 by the air from the air applying pipes 30 and 31. Then, the relevant parts are operated to carry out a continuous operation as is the case with a conventional apparatus.

In this case, as described above, the cutting of the laminate film 1B is carried out by rotating the rotary blade 16 and instantaneously shearing the laminate film 1B by the rotary blade 16 and the fixed blade 17. At this time, since the cutting edge 18 of the rotary blade 16 is slightly inclined relative to its axis, a resistance to the cutting is reduced, and therefore the cutting operation can be carried out quickly and positively. Further, even though the cutting edge 18 of the rotary blade 16 is thus slightly inclined relative to its axis, there is no risk that the laminate film 1B is cut obliquely, since the laminate film 1B is cut when the laminate film 1B is temporarily loosened. Further, when positioning the leading end of the laminate film 1B before starting the operation, the slide bed 20 can be easily pulled forwardly through the engaging thumb piece 27. After this pulling operation, it will suffice that the slide bed 20 is returned.

The bonding process (laminating under heat and pressure) will now be briefly described with reference to Figs. 10 to 16 which show schematically important portions of the apparatus in various steps of the process.

Initially, as shown in Fig. 10, the leading end of the laminate film 1B separated by the film separating roller 3 is manually disposed at the film suction surface 10D of the film leading-end-holding member 10.

Then, suction is applied and the leading end of the laminate film 1B is held by the film suction surface 10D of the film leading-end-holding member 10. Finally, the film leading-end-holding member 10 is moved in the direction of the arrow C by a drive source 7F shown in Fig. 1 to move the leading end of the laminate film 1B away from the path of feed of the laminate film 1B and adjacent the forward end portion 6D of the main vacuum plate 6. Suction applied by end portion 6D will cause the leading end of the laminate film 1B to be held by the forward end portion 6D of the main vacuum plate 6, and permit the suction of surface 10D to be released as shown in Fig. 11. It should be noted that when a continuous operation is being carried out, a manual operation would not be involved since the leading end of the laminate film 1B cut by the rotary cutter 13 is held by the forward end portion 6D of the main vacuum plate 6 under suction.

With the leading edge of film 1B held by end portion 6D, the board conveying mechanism stops the leading end of the board 14 for the printed circuit at the film bonding position, which board has been conveyed by the drive rollers 15A and the

driven rollers 15B along the board travel path I-I. This stopping operation is effected by sensing the leading end of the board 14 and then by stopping the operation of the drive rollers 15A in accordance with this sensing signal. The board 14 for the printed circuit, conveyed by the board conveying mechanism, passes between the two film leading-end-holding members 10 arranged respectively on the upper and lower sides of the board travel path I-I and spaced equidistantly therefrom.

As shown in Fig. 12, the main vacuum plate 6 and hence its forward end portion 6D are then moved in the direction of the arrow A toward the leading end of the surface (film bonding surface) of the board 14 which is stopped in the film bonding position, thereby bringing the leading end of the laminate film 1B to the film bonding position.

Next, as shown in Fig. 13, the holding of the laminate film 1B by the main vacuum plate 6 and its forward end 6D under suction is released, and the main vacuum plate 6 and hence its forward end portion 6D are moved to the film bonding position, and the forward end portion 6D is caused to abut against the film bonding surface of the leading end of the board 14 for the printed circuit.

Then, as shown in Fig. 14, the main vacuum plate 6 and hence its forward end portion 6D are moved away from the film bonding position. At this time, the main vacuum plate 6 and hence its forward end portion 6D are moved beyond their positions shown in Fig. 10 toward the supply roller 2. In accordance with this operation, the thermocompression bonding roller 11 starts to move from its retracted position to the film bonding position.

When the thermocompression bonding roller 11 reaches the film bonding position, it engages the leading tip end of the laminate film 1B under a suitable pressure. Then, board 14 is fed in a direction of an arrow E by the board conveying mechanism to start the laminating (bonding) under heat and pressure.

As shown in Fig. 15, the laminate film 1B is automatically fed by the rotation of the thermocompression bonding roller 11 so that the laminate film 1B is bonded onto the film bonding surface of the board 14 over a predetermined distance from its leading end toward its trailing end. At this time, the thermocompression bonding roller 11, while bonding the laminate film 1B to the board 14, is moved a predetermined distance together with the board 14 in the direction of feed of the board 14 as far as a position X indicated by a broken line in Fig. 15.

When the thermocompression bonding roller 11 and the board 14 are being moved in the direction of feed of the board 14 while bonding the laminate film 1B to the board 14, the laminated film 1B is fed from the supply roller 2 in accordance with such movement.

When the trailing end of the laminate film 1B reaches a predetermined position of the board conveying mechanism, this is sensed by a sensor provided in the board travel path. In accordance with a sensing signal from this sensor, the following operations are effected:

(a) The film leading-end-holding member 10 moves toward the laminate film 1B, and the main vacuum plate 6 and the film leading-end-holding member 10 hold the laminate film 1B by suction. In this case, the length of the laminate film 1B extending between the front end of the fixed blade 17 and that portion of the thermocompression bonding roller 11 pressed against the laminate film 1B is substantially equal to a length of that portion of the film bonding surface of the board 14 which still remains uncovered by the laminate film 1B.

(b) Also, in synchronism with the holding of the laminate film 1B by the film leading-end-holding member 10 under suction, the thermocompression bonding roller 11 and the board 14 are moved a predetermined distance in the direction opposite to the direction of travel of the board 14 as far as a position Y indicated by a solid line in Fig. 15. As a result of this movement and the suction-holding by the film leading-end-holding member 10, the laminate film 1B extending between the film leading-end-holding member 10 and the thermocompression bonding roller 11 is loosened. The thus loosened portion of the laminate film 1B is directed in the direction of feed of the board 14 by injecting air as indicated by an arrow F (Fig. 16).

As shown in Fig. 16, the laminate film 1B is cut by the rotary cutter 13 while the laminate film 1B is kept loosened. A length of the laminate film thus cut from the continuous laminate film 1B corresponds to the length of the board 14 in the direction of feed of the board 14.

Immediately before this cutting operation, the suction-holding by the main vacuum plate 6 and the film leading-end-holding member 11 is released.

Then, the trailing end portion of the cut length of the laminate film 1B is bonded to the trailing end portion of the film bonding surface of the board 14 by the thermocompression bonding roller 11. In other words, through the rotation of the thermocompression bonding roller 11 and the movement of the board 14, the laminate film 1B is sequentially thermocompression-laminated from its leading end onto the board 14 from the leading to trailing end of the board 14. Since the main vacuum plate 6 is on its inoperative condition to cease its suction-holding operation, the laminate film 1B is automatically fed sequentially to the film bonding position through the rotation of the thermocompres-

sion roller 11 and the movement of the board 14. The vacuum bars 12 are in their operative condition to effect the suction-holding to apply an appropriate tension to the laminate film 1B to be thermocompression-laminated to thereby prevent wrinkles or the like from developing therein.

Finally, the trailing end portion of the cut length of the laminate film 1B is thermocompression-laminated to the trailing end portion of the film bonding surface of the board 14, thus completing the thermocompression-laminating. The vacuum bars 12 are rotated, and the film leading-end-holding member 10 is retracted, or the thermocompression bonding roller 11 is retracted, or the thermocompression bonding roller 11 may be slightly moved to an extent not to interfere with the operation, with the vacuum bars rotated. The suction-holding continues immediately before the thermocompression-laminating is completed, so as to apply an appropriate tension to the laminate film 1B to thereby prevent wrinkles or the like from developing therein. When the thermocompression laminating is completed, the board 14 is transferred to the next stage, that is, an exposure device.

Thus, the leading end of the continuous laminate film 1B is held by the vacuum bars 12 (film feed members) under suction, and the vacuum bars 12 are moved toward the leading end of the film bonding surface of the board 14, fed to the film bonding position, to feed the leading end of the continuous laminate film 1B and to retain the leading end of this laminate film 1B at the film bonding position. The vacuum bars 12 are moved away from the board 14, and the thermocompression bonding roller 11 is moved toward the leading end of the laminate film 1B retained at the film bonding position. The thermocompression bonding roller 11 is rotated to automatically feed the laminate film 1B and to bond the laminate film 1B to a small given area of the film bonding surface of the board 14 from the leading end of the board toward its trailing end. At this time, the thermocompression bonding roller 11, while bonding the laminate film to the board 14, is moved together with the board 14 the predetermined distance in the direction of feed of the board 14, and thereafter is moved in the direction opposite to the direction of feed of the board 14 to loosen the laminate film 1B. Then, the laminate film 1B is cut in such a manner that the thus cut length of the laminate film corresponds to the length of the board 14 in the direction of feed of the board 14. The trailing end portion of the cut length of the laminate film 1B is bonded to the trailing end portion of the film bonding surface of the board 14. Therefore, with such a simple construction, the wide laminate film 1B can be rapidly and positively cut and bonded to the board 14 for the printed circuit.

By virtue of the provision of the rotary cutter 13 which comprises the rotary blade 16 and the fixed blade 17 both arranged across the laminate film 1B, the laminate film 1B can be cut through the cooperation of the rotary blade 16 and the fixed blade 17 upon instantaneous rotation of the rotary blade 16. Therefore, the wide laminate film 1B can be rapidly and positively cut.

Further, since the members 21 rotatably supporting the rotary blade 16 are designed to be movable forwardly, the insertion of the continuous film before starting the operation can be facilitated, which improves the operability.

Finally, the rotary blade 16 is angularly movably mounted at its opposite ends on the slide bed 20 movable toward and away from the laminate film 1B on the support plates 26 extending from the base 25. The slide bed 20 can be fixed in a predetermined position relative to the support plates 26 and also can be moved forwardly away from the laminate film 1B. The fixed blade 17 is mounted on the film leading-end-holding member 10 movable toward and away from the reverse side of the laminate film 1B. Therefore, the laminate film 1B can be cut rapidly, and the guide members for the rotary cutter are prevented from being subjected to an impact.

Figure 17 shows another embodiment of an apparatus that can incorporate the present invention. In this Figure, the components having an identity with those of Figures 1 are identified by the same reference numbers; those having only a similar function but a different structure are signified by the same reference numeral primed. In Figure 17, as in Figure 1, the film 1B separated from the light-transmissible resin film 1A is fed to a main vacuum suction plate 6 along a tension roller 5. The main vacuum suction plate 6, is moved toward and away from a film bonding position in directions A shown in Fig. 1. However, the plate 6 is provided on a support member 7' attached by a guide rail member 8' to the casing 9' of the film bonding apparatus. The support member 7' is slidable on the guide rail member 8' in directions B shown in Fig. 17. A pair of main vacuum suction plates 6 and a pair of support members 7' are provided over and under the base plate conveyance passage I-I. The upper and the lower support members 7' are coupled to a rack and pinion mechanism made of racks 7A' and a pinion 7B' engaged with the racks so that the support members are moved toward and away from each other by a driver such as an air cylinder.

The main vacuum suction plate 6 can be moved in the directions A either together with the support member 7' or separately therefrom. The plate 6 can be moved in the directions A by a rack and pinion mechanism and a driver 7C' provided on the support member 7' and coupled to the

mechanism. The mechanism is made of a pinion 7D coupled to the shaft of the driver 7C', a rack 7E provided on the support member 7', and another rack 7E provided on the rear of the plate 6. The downstream end 6D of the plate 6, which is located nearer the film bonding position than the upstream end of the plate, has a film suction surface shaped as an arc, and has a plurality of film suction holes for sucking and holding the leading edge portion of the film 1B on the arc-shaped suction surface against the elasticity of the film. The leading edge portion of the film 1B sucked and held on the downstream end 6D of the plate 6 is fed to the film bonding position by moving the plate toward the position in the direction A.

A holding member 10' for the cutoff of the stratified film 1B is provided near the feed passage for the laminated film 1B between the main vacuum suction plate 6 and the film bonding position. A pair of such holding members 10' are provided over and under the base plate conveyance passage I-I. Each holding member 10' functions so that the next leading edge portion of the film, which is created due to the cutoff of the film, is sucked and held on the downstream end 6D of the main vacuum suction plate 6. For these purposes, the holding member 10' can be moved toward and away from the feed passage for the film 1B in directions C by a driver 7G such as an air cylinder and coupled between the holding member and the support member 7'. When the film 1B is to be cut off in the cutoff position, the trailing edge portion of the film is held by the holding member 10' so that while the cut-off film 1B is bonded, under heat and pressure, to the base plate 14 by the film apparatus, the trailing edge portion of the film is loosened between the holding member and a vacuum suction bar 12 which is a film pinching or holding bar. The speed of the feed of the film 1B by the main vacuum suction plate 6 is made higher than the circumferential velocity of a heat and pressure roller 11, which is equal to the speed of the bonding of the film 1B to the base plate 14, so that the trailing edge portion of the film is loosened. As a result, the film 1B can be cut off while being bonded, under heat and pressure, to the base plate 14.

As described above, according to the present invention, with a simple construction, the wide laminate film can be cut rapidly and positively and be bonded to the board.

The continuous film can be cut through the cooperation of the rotary blade and the fixed blade upon instantaneous rotation of the rotary blade. Therefore, the wide laminate film can be cut rapidly and positively and be bonded to the board.

Further, since the insertion of the continuous film before starting the operation is facilitated, an

improved operability can be achieved.

As is apparent, it is possible to separate the fixed blade 17 away from the leading-edge holding member 10. Namely, it is possible to provide the fixed blade 17 and the holding member 10 independently of each other.

In this connection, although in Fig. 5, the fixed blade 17 is fixed directly to the film leading end holding member 10, Fig. 18 shows the modification in which the fixed blade 17 is not directly fixed to the holding member but may be movable back and forth independently of the holding member 10. The fixed blade 17 is drivingly moved by the air cylinder 7F' which is provided on the apparatus body 7. In this construction, it is necessary to first move the holding member 10 and then move the fixed blade 17 in the case where the holding member 10 is to be moved rightward. Alternatively, it is possible to move substantially at the same time the fixed blade 17 and the holding member 10. In the case where the two members are to be moved leftward, it is necessary to first move the fixed blade 17 and then move the holding member 17 or otherwise to move the two members substantially at the same time. This structure may enjoy the advantage in that it is easy to set any positional relationship as desired, and it is easy to ensure the holding of the trailing end of the film.

Fig. 19 shows another modification in which the holding member 10 and the fixed blade 17 are separately provided but the two members may be moved simultaneously through a support bar 101.

Claims

1. A method of bonding to a board (14), having a leading and a trailing end and at least one film bonding surface, a film (1B), having a length corresponding to the length of the board (14), by operation of a compression bonding roller (11), comprising the steps of:

feeding said board (14) to a film bonding position;

holding the leading end of a continuous film (1B) on a film feed member (6) by suction; moving said film feed member (6) to a position close to a leading end portion of the film bonding surface of said board (14) at said film bonding position, thus feeding the leading end portion of said continuous film (1B);

holding the leading end portion of said film (1B) at said film bonding position;

moving said film feed member (6) away from the film bonding surface of said board (14) while said leading end portion of said film (1B) continues to be held in said film bonding position;

moving said compression bonding roller

(11) toward the leading end portion of said film (1B) held in said film bonding position, and automatically feeding said film (1B) through the rotation of said compression bonding roller (11) so as to bond said film (1B) to the film bonding surface of said board (14) over a first predetermined distance from the leading end of said board (14) toward the trailing end of said board (14), said compression bonding roller (11) and said board being moved a second predetermined distance in the direction of feed of said board (14) while said film (1B) is being bonded to said board (14), and thereafter being moved a third predetermined distance in a direction opposite to the direction of feed of said board (14) to loosen a portion of said film;

cutting by means of a rotary cutter (13) said continuous film (1B) in such a manner that the thus cut length of the film (1B) corresponds to the length of said board (1B) in the direction of feed of said board (1B); and

bonding the trailing end portion of the cut length of the film (1B) to the trailing end of the film bonding surface of said board (14) by said compression bonding roller (11).

2. A film bonding method according to claim 1, in which said board (14) comprises an electrically-insulative board having an electrically-conductive layer formed on a surface, of said electrically-insulative board, said conductive layer defining said film bonding surface, and said film (1B) being a laminate comprising a photosensitive resin layer and a light-permeable resin film.
3. A film bonding method according to claim 1 in which said board (14) has two opposite film bonding surfaces and two of said films are bonded substantially simultaneously to respective ones of the opposite film bonding surfaces of said board (14).
4. A film bonding method according to any one of claims 1 to 3, in which said cutting of said film is carried out using a rotary cutter (13).
5. A film bonding apparatus for bonding to a board (14), having a leading and a trailing end and at least one film bonding surface, a film (1B) having a length corresponding to the length of said board (14) and being provided with a continuous supply, the bonding being provided by operation of a compression bonding roller (11), said apparatus comprising:
 - a body (7) for providing stable structural support to said apparatus,
 - a board conveying mechanism (15A, 15B)

improved operability can be achieved.

As is apparent, it is possible to separate the fixed blade 17 away from the leading-edge holding member 10. Namely, it is possible to provide the fixed blade 17 and the holding member 10 independently of each other.

In this connection, although in Fig. 5, the fixed blade 17 is fixed directly to the film leading end holding member 10, Fig. 18 shows the modification in which the fixed blade 17 is not directly fixed to the holding member but may be movable back and forth independently of the holding member 10. The fixed blade 17 is drivingly moved by the air cylinder 7F' which is provided on the apparatus body 7. In this construction, it is necessary to first move the holding member 10 and then move the fixed blade 17 in the case where the holding member 10 is to be moved rightward. Alternatively, it is possible to move substantially at the same time the fixed blade 17 and the holding member 10. In the case where the two members are to be moved leftward, it is necessary to first move the fixed blade 17 and then move the holding member 17 or otherwise to move the two members substantially at the same time. This structure may enjoy the advantage in that it is easy to set any positional relationship as desired, and it is easy to ensure the holding of the trailing end of the film.

Fig. 19 shows another modification in which the holding member 10 and the fixed blade 17 are separately provided but the two members may be moved simultaneously through a support bar 101.

Claims

1. A method of bonding to a board (14), having a leading and a trailing end and at least one film bonding surface, a film (1B), having a length corresponding to the length of the board (14), by operation of a compression bonding roller (11), comprising the steps of:
 - feeding said board (14) to a film bonding position;
 - holding the leading end of a continuous film (1B) on a film feed member (6) by suction;
 - moving said film feed member (6) to a position close to a leading end portion of the film bonding surface of said board (14) at said film bonding position, thus feeding the leading end portion of said continuous film (1B);
 - holding the leading end portion of said film (1B) at said film bonding position;
 - moving said film feed member (6) away from the film bonding surface of said board (14) while said leading end portion of said film (1B) continues to be held in said film bonding position;
 - moving said compression bonding roller
 - (11) toward the leading end portion of said film (1B) held in said film bonding position, and automatically feeding said film (1B) through the rotation of said compression bonding roller (11) so as to bond said film (1B) to the film bonding surface of said board (14) over a first predetermined distance from the leading end of said board (14) toward the trailing end of said board (14), said compression bonding roller (11) and said board being moved a second predetermined distance in the direction of feed of said board (14) while said film (1B) is being bonded to said board (14), and thereafter being moved a third predetermined distance in a direction opposite to the direction of feed of said board (14) to loosen a portion of said film;
 - cutting by means of a rotary cutter (13) said continuous film (1B) in such a manner that the thus cut length of the film (1B) corresponds to the length of said board (1B) in the direction of feed of said board (1B); and
 - bonding the trailing end portion of the cut length of the film (1B) to the trailing end of the film bonding surface of said board (14) by said compression bonding roller (11).
2. A film bonding method according to claim 1, in which said board (14) comprises an electrically-insulative board having an electrically-conductive layer formed on a surface, of said electrically-insulative board, said conductive layer defining said film bonding surface, and said film (1B) being a laminate comprising a photosensitive resin layer and a light-permeable resin film.
 3. A film bonding method according to claim 1 in which said board (14) has two opposite film bonding surfaces and two of said films are bonded substantially simultaneously to respective ones of the opposite film bonding surfaces of said board (14).
 4. A film bonding method according to any one of claims 1 to 3, in which said cutting of said film is carried out using a rotary cutter (13).
 5. A film bonding apparatus for bonding to a board (14), having a leading and a trailing end and at least one film bonding surface, a film (1B) having a length corresponding to the length of said board (14) and being provided with a continuous supply, the bonding being provided by operation of a compression bonding roller (11), said apparatus comprising:
 - a body (7) for providing stable structural support to said apparatus,
 - a board conveying mechanism (15A, 15B)



for conveying said board (14) to a film bonding position and for retracting said board (14) from said film bonding position,

a film feed member (6) for holding the leading end of said continuous film (1B) by suction and for feeding said leading end to said film bonding position,

a film leading-end-holding means (10), said end-holding means (10) comprising a member having a holding surface disposed in the vicinity of said film bonding position for face-to-face contact with the leading end of said film (1B) fed by said film feeding member (6) to said film bonding position, said surface having film suction apertures formed therein for holding the leading end of said film (1B) by suction,

a rotary cutter means (13) comprising a rotary cutting member (16) and a fixed cutting member (17) which are provided in such positions as to extend across said film (1B),

means (10A) mounted on said body (7) of said apparatus for moving said film leading-end-holding means (10) toward and away from an opposite side of said film (1B), and

a compression bonding roller (11) for bonding said film (1B), held by said film feed member (6) in said film bonding position, from its leading to trailing end to said film bonding surface of said board (14) from its leading to trailing end.

6. A film bonding apparatus according to the claim 5, characterized in that the rotary cutting member (13) is supported at both ends thereof by a sliding rest (20) capable of being moved back and forth relative to the film (1B) while remaining on support plates (26) coupled to a base (7), so that said rotary cutting member (13) can be turned; said rest (20) can be either fixed in a prescribed position to said support plates (26) or moved forth away from said film (1B); and the fixed cutting member (17) is fixed in contact with or in the vicinity of a holding member (10) which is for the cutoff of said film (1B) and is moved back and forth relative to said film (1B) behind it.
7. A film bonding apparatus according to claim 6; wherein said rotary cutting member can be turned by a prescribed angle.
8. A film bonding apparatus according to claim 5, wherein said fixed cutting member (17) comprises a fixed blade (17) mounted on said film leading-end-holding member (10) and said rotary cutting member (16) comprises a rotary blade (16) mounted on or in the vicinity of said

body (7) of said apparatus so as to be movable toward and away from a first side of said film (1B).

9. A film bonding apparatus according to claim 8, in which said compression bonding roller (11) is moveable toward the leading end of said film (1B) held by said film feed member (6) in said film bonding position, and feeds automatically said film through the rotation of said compression bonding roller (11) so as to bond said film (1B) to the film bonding surface of said board (14) over a predetermined distance from the leading end of said board toward the trailing end of said board (14), said compression bonding roller (11) and said board being moved a first predetermined distance in the direction of feed of said board (14) while said film is being bonded to said board (14), and thereafter being moved a second predetermined distance in a direction opposite to the direction of feed of said board (14) to loosen said film (1B).
10. A film bonding apparatus according to claim 8 or claim 9, in which said rotary blade (16) is angularly movably mounted at its opposite ends on a slide bed (20) movable toward and away from the front side of said film (1B) on a support plate (26) extending from a base, said slide bed (20) being capable of being fixed in a predetermined position relative to said support plate (26) and also being movable forwardly away from the film (1B).
11. The apparatus of claim 9 wherein said rotary blade (16) and said fixed blade (17) have a length greater than the width of said film (1B) in the direction of feed are mounted transverse to the direction of feed.
12. A film bonding apparatus according to claim 5, wherein said rotary cutter means (13) further comprises:
 - a base (24)
 - support plates (26) coupled to said base (24);
 - a holding member (10); and
 - a sliding rest (20) capable of being moved back and forth relative to the film (1B) while remaining on said support plate (26),
 wherein said rotary blade (16) is supported at both the ends thereof by said sliding rest (20), so that said rotary cutting blade (16) can be turned by a prescribed angle; and said fixed cutting blade (17) is fixed in contact with said holding member (10).



13. A film bonding apparatus according to claim 12 wherein said sliding rest (20) is one of fixed in a prescribed position to said support plates (26) or is moveable toward and away from said film (1B).

14. A film bonding apparatus, according to claim 5 for cutting off a film, comprising:

a base (24)

support plates (26) coupled to said base (24) a sliding rest (20) capable of being moved back and forth relative to said film (1B) while remaining on said support plates (26) coupled to said base (24), said rest (20) being fixed in a prescribed position to said support plates (26) or moveable away from said film (1B);

a rotary cutting member (13) having opposite ends; and

a fixed cutting member (17)

wherein said rotary cutting member (13) is supported at the opposite ends thereof by said sliding rest (20), said rotary cutting member (13) is turnable.

Patentansprüche

1. Verfahren zum Kleben eines Films (1B), der eine Länge entsprechend der Länge einer Karte (14) hat, auf die Karte (14), die ein vorderes und ein hinteres Ende und zumindestens eine Filmankleboberfläche aufweist, durch den Betrieb einer Kompressionsklebewalze (11), das die folgenden Schritte aufweist:

Zuführen der Karte (14) zu der Filmklebposition;

Halten des vorderen Endes eines kontinuierlichen Films (1B) durch Ansaugen auf einem Filmzuführglied (6);

Bewegen des Filmzuführgliedes (6) zu einer Position nahe einem vorderen Endabschnitt der Filmankleboberfläche der Karte (14) in der Filmanklebe-position, wodurch der vordere Endabschnitt des kontinuierlichen Films (1B) zugeführt wird;

Halten des vorderen Endabschnitts des Films (1B) in der Filmanklebe-position;

Bewegen des Filmzuführgliedes (6) weg von der Filmankleboberfläche der Karte (14), während der vordere Endabschnitt des Films (1B) weiterhin in der Filmklebe-position gehalten wird;

Bewegen der Kompressionsklebewalze (11) hin zu dem vorderen Endabschnitt des Films (1B), der in der Filmanklebe-position gehalten wird, und automatisches Zuführen des Films (1B) durch die Rotation der Kompressionsklebewalze (11), so daß der Film (1B) auf die Filmankleboberfläche der Karte (14) über

einen ersten vorbestimmten Abstand von dem vorderen Ende der Karte (14) hin zu dem hinteren Ende der Karte (14) geklebt wird, wobei die Kompressionsklebewalze (11) und die Karte um einen zweiten vorbestimmten Abstand in die Zuführrichtung der Karte (14) bewegt werden, während der Film (1B) auf die Karte (14) geklebt wird, und danach um einen dritten vorbestimmten Abstand in eine Richtung entgegengesetzt zu der Karte (14) bewegt werden, um einen Abschnitt des Films zu lockern;

Abschneiden des kontinuierlichen Films (1B) mittels eines rotierenden Schneiders (13) in einer derartigen Weise, daß die so abgeschnittene Länge des Films (1B) der Länge der Karte (14) in der Zuführrichtung der Karte (14) entspricht; und

Ankleben des hinteren Endabschnitts der abgeschnittenen Länge des Films (1B) auf das hintere Ende der Filmkleboberfläche der Karte (14) durch die Kompressionsklebewalze (11).

2. Filmklebeverfahren gemäß Anspruch 1, in dem die Karte (14) eine elektrisch isolierende Karte umfaßt, die eine elektrisch leitende Schicht auf einer Oberfläche der elektrisch isolierenden Karte ausgebildet hat, wobei die leitende Schicht die Filmkleboberfläche definiert und der Film (1B) ein Laminat ist, das eine photoempfindliche Harzschicht und einen lichtdurchlässigen Harzfilm aufweist.

3. Filmklebeverfahren gemäß Anspruch 1, in dem die Karte (14) zwei gegenüberstehende Filmkleboberflächen aufweist, und zwei dieser Filme im wesentlichen gleichzeitig auf entsprechende, gegenüberstehende Filmkleboberflächen der Karte (14) geklebt werden.

4. Filmklebeverfahren gemäß einem der Ansprüche 1 bis 3, in dem das Schneiden des Films unter Verwendung eines rotierenden Schneiders (13) durchgeführt wird.

5. Filmklebevorrichtung zum Kleben eines Films (1B), der eine Länge entsprechend der Länge der Karte (14) hat und der mit einer kontinuierlichen Versorgung bereitgestellt wird, auf eine Karte (14), die ein vorderes und ein hinteres Ende und mindestens eine Filmkleboberfläche aufweist, wobei das Kleben durch den Betrieb einer Kompressionsklebewalze (11) durchgeführt wird, wobei die Vorrichtung aufweist:

einen Körper (7) zum Schaffen eines stabilen strukturellen Trägers der Vorrichtung,

einen Kartentransportmechanismus (15A,



15B) zum Transportieren der Karte (14) zu einer Filmklebeposition und zum Zurückziehen der Karte (14) aus der Filmklebeposition,

ein Filmzuführglied (6) zum Halten des vorderen Endes des kontinuierlichen Films (1B) durch Ansaugen und zum Zuführen des vorderen Endes zu der Filmklebeposition,

ein Vorderes-Filmende-Halteglied (10), wobei das Ende-Halteglied (10) ein Glied aufweist, das eine Halteoberfläche in der Umgebung der Filmklebeposition zum unmittelbaren Kontakt mit dem vorderen Ende des Films (1B) angeordnet hat, der von dem Filmzuführglied (6) zu der Filmklebeposition zugeführt wurde, wobei die Oberfläche Filmansauglöcher zum Halten des vorderen Endes des Films (1B) durch Ansaugen in sich ausgebildet hat,

ein rotierendes Schneidemittel (13), das ein rotierendes Schneideglied (16) und ein festes Schneideglied (17) aufweist, die in derartigen Positionen angeordnet sind, so daß sie sich quer zum Film (1B) erstrecken,

ein auf dem Körper (7) der Vorrichtung befestigtes Mittel (10A) zum Bewegen des Haltegliedes (10) des vorderen Filmendes hin zu und weg von den gegenüberliegenden Seiten des Films (1B), und

eine Kompressionsklebewalze (11) zum Kleben des Films (1B), der von dem Filmzuführglied (6) in der Filmklebeposition gehalten wird, von seinem vorderen zu ihrem seinem hinteren Ende auf die Filmkleboberfläche der Karte (14) von deren vorderen zu deren hinteren Ende.

6. Filmklebevorrichtung gemäß Anspruch 5, dadurch gekennzeichnet, daß das rotierende Schneideglied (13) an seinen beiden Enden von einer gleitenden Auflage (20) getragen wird, die rückwärts und vorwärts relativ zu dem Film (1B) bewegt werden kann, während sie auf mit einer Basis (7) gekoppelten Stützplatten (26) ruht, so daß das rotierende Schneideglied (13) gedreht werden kann; wobei die Auflage (20) entweder in einer vorbestimmten Position an den Tragplatten (26) befestigt oder weiter weg von dem Film (1B) bewegt werden kann; und das feste Schneideglied (17) in Kontakt mit oder in der Umgebung eines Haltegliedes (10) befestigt ist, das zum Abschneiden des Films (1B) dient und vorwärts und rückwärts relativ zu dem Film (1B) hinter ihm bewegt wird.

7. Filmklebevorrichtung gemäß Anspruch 6, worin das rotierende Schneideglied um einen vorbestimmten Winkel gedreht werden kann.

8. Filmklebevorrichtung gemäß Anspruch 5, worin das feste Schneideglied (17) eine feste Klinge (17) aufweist, die auf dem Vorderen-Filmende-Halteglied (10) befestigt ist, und das rotierende Schneideglied (16) eine rotierende Klinge (16) aufweist, die auf oder in der Umgebung des Körpers (7) der Vorrichtung befestigt ist, damit sie hin zu und weg von einer ersten Seite des Films (1B) beweglich ist.

9. Filmklebevorrichtung gemäß Anspruch 8, in der die Kompressionsklebewalze (11) hin zu dem vorderen Ende des Films (1B) beweglich ist, der von dem Filmzuführglied (6) in der Filmklebeposition gehalten wird, und in der automatisch der Film durch die Drehung der Kompressionsklebewalze (11) zugeführt wird, so daß der Film (1B) auf die Filmkleboberfläche der Karte (14) über einen vorbestimmten Abstand von dem vorderen Ende der Karte hin zu dem hinteren Ende der Karte (14) geklebt wird, wobei die Kompressionsklebewalze (11) und die Karte um einen ersten vorbestimmten Abstand in die Zuführrichtung der Karte (14) bewegt wird, während der Film auf die Karte (14) geklebt wird, und danach um einen zweiten vorbestimmten Abstand in eine Richtung entgegengesetzt zu der Zuführrichtung der Karte (14) bewegt wird, um den Film (1B) zu lockern.

10. Filmklebevorrichtung gemäß Anspruch 8 oder 9, in der die rotierende Klinge (16) in Winkelrichtung beweglich an ihren gegenüberstehenden Enden an einem Gleitbett (20) befestigt ist, das hin zu und weg von der Vorderseite des Films (1B) auf einer Tragplatte (26) beweglich ist, die sich von einer Basis erstreckt, wobei das Gleitbett (20) in einer vorbestimmten Position relativ zu der Tragplatte (26) befestigt werden kann und ebenfalls in Vorwärtsrichtung von dem Film (1B) weg beweglich ist.

11. Vorrichtung nach Anspruch 9, worin die rotierende Klinge (16) und die feste Klinge (17), die eine Länge größer als die Breite des Films (1B) in der Zuführrichtung haben, quer zu der Zuführrichtung befestigt sind.

12. Filmklebevorrichtung gemäß Anspruch 5, worin das rotierende Schneidemittel (13) weiterhin aufweist:

eine Basis (24);

mit der Basis (24) verbundene Tragplatten (26);

ein Halteglied (10) und

eine Gleitauflage (20), die nach vorne und nach hinten relativ zu dem Film (1B) bewegt werden kann, während sie auf der Tragplatte



(26) ruht,

worin die rotierende Klinge (16) an ihren beiden Enden von der Gleitauflage (20) getragen wird, so daß die rotierende Schneideklinge (18) um einen vorbestimmten Winkel gedreht werden kann; und wobei die feste Schneideklinge (17) in Kontakt mit dem Halteglied (10) befestigt ist.

13. Filmklebevorrichtung nach Anspruch 12, worin die Gleitauflage (20) entweder in einer vorbestimmten Position an den Stützplatten (26) befestigt oder hin zu und weg von dem Film (1B) beweglich ist.

14. Filmklebevorrichtung zum Abschneiden eines Films gemäß Anspruch 5, die aufweist:

eine Basis (24),

mit der Basis (24) verbundene Tragplatten (26);

eine Gleitauflage (20), die vorwärts und rückwärts relativ zu dem Film (1B) bewegt werden kann, während sie auf den Tragplatten (26) ruht, die mit der Basis (24) verbunden sind, wobei die Auflage (20) entweder in einer vorbestimmten Position an den Stützplatten (26) befestigt oder beweglich weg von dem Film (1B) ist;

ein rotierendes Schneideglied (13) mit gegenüberstehenden Enden; und

ein festes Schneideglied (17),

worin das rotierende Schneideglied (13) an seinen gegenüberstehenden Enden von der Gleitauflage (20) getragen wird, wobei das rotierende Schneideglied (13) drehbar ist.

Revendications

1. Procédé de collage, à une carte (14) ayant une extrémité avant et une extrémité arrière et au moins une surface de collage de pellicule, d'une pellicule (1B) ayant une longueur correspondant à celle de la carte (14) par commande d'un rouleau (11) de collage par compression, le procédé comprenant les étapes suivantes :

l'avance de la carte (14) en position de collage de pellicule,

le maintien de l'extrémité avant de la pellicule continue (1B) sur un organe (6) d'avance de pellicule par aspiration,

le déplacement de l'organe (6) d'avance de pellicule vers une position proche d'une partie d'extrémité avant de la surface de collage de pellicule de la carte (14) en position de collage de pellicule, si bien que la partie d'extrémité avant de la pellicule continue (1B) avance,

le maintien de la partie d'extrémité avant

de la pellicule (1B) en position de collage de pellicule,

le déplacement de l'organe (6) d'avance de pellicule afin qu'il s'écarte de la surface de collage de pellicule de la carte (14) alors que la partie d'extrémité avant de la pellicule (1B) continue à être maintenue en position de collage de pellicule,

le déplacement du rouleau (11) de collage par compression vers la partie d'extrémité avant de la pellicule (1B) maintenue en position de collage de pellicule, et l'avance automatique de la pellicule (1B) par rotation du rouleau (11) de collage par compression de manière que la pellicule (1B) soit collée à la surface de collage de pellicule de la carte (14) sur une première distance prédéterminée depuis l'extrémité avant de la carte (14) vers l'extrémité arrière de la carte (14), le rouleau (11) de collage pu compression et la carte étant déplacés d'une seconde distance prédéterminée dans la direction d'avance de la carte (14) alors que la pellicule (1B) est collée à la carte (14), puis étant déplacés d'une troisième distance prédéterminée dans le sens opposé au sens d'avance de la carte (14) afin qu'une partie de la pellicule soit détendue,

la découpe par un organe rotatif de coupe (13) de la pellicule continue (1B) de manière que le tronçon coupé de la pellicule (1B) corresponde à la longueur de la carte (14) dans la direction d'avance de la carte (14), et

le collage de la partie d'extrémité arrière du tronçon coupé de la pellicule (1B) à l'extrémité arrière de la surface de collage de pellicule de la carte (14) par le rouleau de collage par compression (11).

2. Procédé de collage de pellicule selon la revendication 1, dans lequel la carte (14) comprend une carte isolante de l'électricité ayant une couche conductrice de l'électricité formée sur une surface de ladite carte isolante de l'électricité, la couche conductrice formant la surface de collage de pellicule, et la pellicule (1B) état un stratifié comprenant une couche de résine photosensible et une pellicule d'une résine perméable à la lumière.

3. Procédé de collage de pellicule selon la revendication 1, dans lequel la carte (14) a deux surfaces opposées de collage de pellicule et deux pellicules sont collées de manière pratiquement simultanée aux surfaces respectives opposées de collage de pellicule de la carte (14).



4. Procédé de collage de pellicule selon l'une quelconque des revendications 1 à 3, dans lequel la découpe de la pellicule est réalisée avec un organe rotatif de coupe (13).

5. Appareil de collage de pellicule destiné au collage, sur une carte (14) ayant une extrémité avant et le extrémité arrière et au moins une surface de collage de pellicule, d'une pellicule (1B) ayant une longueur qui correspond à celle de la carte (14) et provenant d'une réserve continue, le collage étant réalisé par le fonctionnement d'un rouleau de collage par compression (11), l'appareil comprenant :

un corps (7) formant un support de construction stable pour l'appareil,

un mécanisme (15A, 15B) de transport de carte destiné à transporter la carte (14) vers une position de collage de pellicule et à éloigner la carte (14) de la position de collage de pellicule,

un organe (6) d'avant de pellicule destiné à maintenir l'extrémité avant de la pellicule continue (1B) par aspiration et à faire avancer l'extrémité avant vers la position de collage de pellicule,

un dispositif (10) de maintien de l'extrémité avant de pellicule, ce dispositif de maintien (10) comprenant un organe ayant une surface de maintien placée au voisinage de la position de collage de pellicule afin qu'elle soit en contact par sa surface avec l'extrémité avant de la pellicule (1B) qui avance sous l'action de l'organe (6) d'avance de pellicule vers la position de collage de pellicule, ladite surface ayant des orifices d'aspiration de pellicule formés afin qu'ils retiennent l'extrémité avant de la pellicule (1B) par aspiration,

un dispositif rotatif de coupe (13) comportant un organe rotatif de coupe (16) et un organe fixe de coupe (17) qui ont des positions telles qu'ils sont placés sur la largeur de la pellicule (1B),

un dispositif (10A) monté sur le corps (7) de l'appareil et destiné à déplacer le dispositif (10) de maintien de l'extrémité avant de pellicule en le rapprochant ou en l'éloignant d'une face opposée de la pellicule (1B), et

un rouleau (11) de collage par compression destiné à coller la pellicule (1B) maintenue par l'organe d'avance (6) de pellicule a position de collage de pellicule, de l'extrémité avant vers l'extrémité arrière, à la surface de collage de pellicule de la carte (14), de l'extrémité avant vers l'extrémité arrière.

6. Appareil de collage de pellicule selon la revendication 5, caractérisé en ce qu'un organe rota-

tif de coupe (13) est supporté à ses deux extrémités par un socle coulissant (20) qui peut être déplacé vers l'avant et vers l'arrière par rapport à la pellicule (1B) tout en restant sur les plateaux de support (26) couplés à une base (7), si bien que l'organe rotatif de coupe (13) peut tourner, le socle (20) peut être fixé en position prédéterminée sur les plateaux de support (26) ou déplacé vers l'avant et vers l'arrière de la pellicule (1B), et l'organe fixe de coupe (17) est fixé au contact d'un organe de maintien (10) destiné à la coupe de la pellicule (1B) ou à son voisinage, et est déplacé vers l'avant et vers l'arrière par rapport à la pellicule (1B) placée derrière lui.

7. Appareil de collage de pellicule selon la revendication 6, dans lequel l'organe rotatif de coupe peut tourner d'un angle prédéterminé.

8. Appareil de collage de pellicule selon la revendication 5, dans lequel l'organe fixe de coupe (17) comporte une lame fixe (17) montée sur l'organe (10) de maintien de l'extrémité avant de pellicule et l'organe rotatif de coupe (16) comporte une lame rotative (16) montée sur le corps (7) de l'appareil ou à son voisinage afin qu'elle soit mobile en rapprochement et en éloignement d'une première face de la pellicule (1B).

9. Appareil de collage de pellicule selon la revendication 8, dans lequel le rouleau de collage par compression (11) est mobile vers l'extrémité avant de la pellicule (1B) maintenue par l'organe (6) d'avance de pellicule dans la position de collage de pellicule, et fait avancer automatiquement la pellicule par rotation du rouleau (11) de collage par compression de manière que la pellicule (1B) soit collée à la surface de collage de pellicule de la carte (14) sur une distance prédéterminée depuis l'extrémité avant de la carte vers l'extrémité arrière de la carte (14), le rouleau (11) de collage par compression et la carte étant déplacés d'une première distance prédéterminée dans la direction d'avance de la carte (14) lorsque le film est collé à la carte (14) puis d'une seconde distance prédéterminée dans le sens opposé au sens d'avance de la carte (14) afin que la pellicule (1B) soit détendue.

10. Appareil de collage de pellicule selon la revendication 8 ou 9, dans lequel la lame rotative (16) est montée à ses extrémités opposées, afin qu'elle soit mobile angulairement, sur un socle coulissant (20) mobile en translation par rapport à la face avant de la pellicule (1B) sur



un plateau de support (26) dépassant d'une base, le socle coulissant (20) pouvant être fixé en position prédéterminée par rapport au plateau de support (26) et étant aussi mobile vers l'avant à distance de la pellicule (1B).

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11. Appareil selon la revendication 9, dans lequel la lame rotative (16) et la lame fixe (17) ont une longueur supérieure à la largeur de la pellicule (1B) dans la direction d'avance et sont montées transversalement à la direction d'avance.

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12. Appareil de collage de pellicule selon la revendication 5, dans lequel le dispositif (13) à organe rotatif de coupe comporte en outre :

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une base (24),

des plateaux de support (26) couplés à la base (24),

un organe de maintien (10) et

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un socle coulissant (20) qui peut être déplacé en translation par rapport à la pellicule (1B) tout en restant sur le plateau de support (26),

si bien que la lame rotative (16) est supportée à ses deux extrémités par le socle coulissant (20) de manière que la lame rotative de coupe (18) puisse tourner d'un angle prédéterminé, et la lame fixe de coupe (17) est fixée au contact de l'organe de maintien (10).

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13. Appareil de collage de pellicule selon la revendication 12, dans lequel le socle coulissant (20) est d'un type fixé en position fixe au plateau de support (26) ou est mobile en translation par rapport à la pellicule (1B).

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14. Appareil de collage de pellicule selon la revendication 5, destiné à couper une pellicule, comprenant :

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une base (24),

des plateaux de support (26) couplés à la base (24),

un socle coulissant (20) qui peut être déplacé vers l'avant et vers l'arrière par rapport à la pellicule (1B) tout en restant sur les plateaux de support (26) couplés à la base (24), le socle (20) étant fixé en position prédéterminée aux plateaux de support (26) ou pouvant s'écarter de la pellicule (1B),

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un organe rotatif de coupe (13) ayant des extrémités opposées, et

un organe fixe de coupe (17), et

dans lequel l'organe rotatif de coupe (13) est supporté à ses extrémités opposées par le socle coulissant (20), l'organe rotatif de coupe (13) peut tourner.

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