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(54) **Method and device for cutting resin film, and cutter used therein**

Verfahren und Vorrichtung zum Schneiden von Kunststofffolie und dafür verwendetes Schneidewerkzeug

Procédé et dispositif de découpe de film en résine, et découpeur utilisé avec celui-ci

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Description

[0001] The present invention relates to a method and device for cutting one sheet of, or two or more sheets of resin film laminated on one surface of a brittle material plate by a cutter, and a cutter to be used in the method and device.

Background Information

[0002] In the case where resin film is cut that is laminated on brittle material plates, generally, cutters are used to cut the resin film. Fig. 8 shows a conventional cutting device. In the conventional cutting device shown in this Figure, a disk-shaped cutter 1' is mounted to a cutter holder 2, and has a cutting edge on its outer periphery. The cutter 1' is moved relative to the brittle material plate 3 to cut resin film 4 with the cutter 1' being lowered in the thickness direction to be engaged in the resin film 4 (for example, Patent Document 1, etc.).

[0003] In this case, if the edge of the cutter 1' comes in contact with the surface of the brittle material plate 3, the brittle material plate 3 may get scratched, or the cutting edge of the cutter 1' may become chipped. For this reason, the cutter 1' is aligned to be spaced at a predetermined gap away from the surface of the brittle material plate 3.

Patent Document

[0004] Patent Document 1: Japanese Patent Laid-Open Publication No. H03-43189.

Summary of the Invention

Problems Solved by the Invention

[0005] To finely cut the resin film 4 laminated on the brittle material plate 3 by the cutter 1', it is preferable to reduce the gap between the edge of the cutter 1' and the surface of the brittle material plate 3 as small as possible so that the cutter 1' deeply cut the resin film 4. However, since the brittle material plate 3 unavoidably has small unevenness on its surface, if the gap between the edge of the cutter 1' and the surface of the brittle material plate 3 is reduced, this reduction increases the possibility of contact between the edge of the cutter 1' and the surface of the brittle material plate 3.

[0006] Further, the document EP 1 903 599 A2 teaches an adhesive tape cutting method and an adhesive tape joining apparatus having a cutter blade fixed in a cutter holder being provided with the reference plane to be brought into contact with the adhesive tape during the cutting operation. The reference plane is further used for precisely measuring the amount of protrusion of the cutting blade.

[0007] The present invention is devised to solve this conventional problem. The object of the present invention is to finely cut resin film laminated on a brittle material plate by a cutter without scratching the surface of the brittle material plate or chipping a cutting edge of the cutter.

Means to Solve the Problems

[0008] To achieve the aforementioned object, a cutting method according to the present invention is a method for cutting one sheet of, or two or more sheets of resin film laminated on one surface of a brittle material plate by a cutter, wherein said cutter has a flat surface perpendicular to an edge line of its cutting edge, and wherein said cutter is moved relative to said brittle material plate to cut said resin film with the flat surface of said cutter and the surface of said brittle material plate being in contact with each other, or being opposed in substantially parallel to each other and spaced at a small gap away from each other.

[0009] In this method, from the viewpoint of finely cutting the resign film and further preventing the surface of the brittle material plate from being scratched, it is preferable that the hardness of the cutting edge of said cutter be lower than said brittle material plate, and higher than said resin film.

[0010] According to the present invention, a device for cutting one sheet of, or two or more sheets of resin film laminated on one surface of a brittle material plate by a cutter is provided that includes a cutter that has a flat surface perpendicular to an edge line of its cutting edge, an actuating mechanism that moves said cutter relative to said brittle material plate, and an adjuster that adjusts the gap between the flat surface of said cutter and the surface of said brittle material plate so that the flat surface of said cutter and the surface of said brittle material plate are in contact with each other, or are opposed in substantially parallel to each other and spaced at a small gap away from each other, wherein said cutter is moved relative to said brittle material plate to cut said resin film.

[0011] Also, according to the present invention, a cutter for cutting one sheet of, or two or more sheets of resin film laminated on one surface of a brittle material plate is provided that includes a flat surface that is perpendicular to an edge line of a cutting edge of the cutter, the flat surface being in contact with the surface of said brittle material plate or being opposed in substantially parallel to and spaced at a small gap away from the surface of said brittle material plate.

[0012] From the viewpoint of chipping prevention, durability and the like of the cutting edge, it is preferable that said cutter be a disk-shaped cutter that has the cutting edge formed around its outer periphery, and a part of the disk-shaped cutter be cut out to form the flat surface perpendicular to the edge line of the cutting edge. Also, from the viewpoint of reducing resistance when the cutter is relatively moved, the cutter can include a second flat surface that is arranged radially inward of said flat surface and in parallel to said flat surface.

Effects of the Invention

[0013] According to a cutting method and device of the present invention, since a cutter is used that has a flat surface perpendicular to an edge line of its cutting edge, and said cutter is moved relative to said brittle material plate to cut said resin film with the flat surface of said cutter and the surface of said brittle material plate being in contact with each other, or being opposed in substantially parallel to each other and spaced at a small gap away from each other, it is possible to remarkably keep the surface of the brittle material plate from being scratched and the cutting edge of the cutter from being chipped, and it is possible to finely cut resin film laminated on the brittle material plate.

[0014] In the case where the hardness of the cutting edge of said cutter is lower than said brittle material plate, and higher than said resin film, it is possible to finely cut the resign film and to further prevent the surface of the brittle material plate from being scratched.

[0015] In the case where said cutter is a disk-shaped cutter that has the cutting edge formed around its outer periphery, and a part of the disk-shaped cutter is cut out to form the flat surface perpendicular to the edge line of the cutting edge, the cutting edge of the cutter is kept from being chipped, and the durability of the cutting edge of the cutter is also improved. Also, in the case where the cutter includes a second flat surface that is arranged radially inward of said flat surface and in parallel to said flat surface, it is possible to reduce resistance when the cutter is relatively moved, and to facilitate smooth relative movement.

Brief Description of the Drawings

[0016]

Fig. 1 is a front view showing an example of a cutting device according to the present invention.
Fig. 2 is a side view of the cutting device shown in Fig. 1.
Fig. 3 is an enlarged view showing a cutter holder of the cutting device shown in Fig. 1.
Fig. 4 is a front view showing another example of a cutter according to the present invention.
Fig. 5 is a schematic view showing a cutting state in that resin film is cut by the cutter shown in Fig. 3.
Fig. 6 is a front view showing still another example of a cutter according to the present invention.
Fig. 7 is a schematic view showing a cutting state in that resin film is cut by the cutter shown in Fig. 6.
Fig. 8 is a schematic view showing a conventional cutting device.

Description of the Reference Numerals

[0017]

1a, 1b, 1c	Cutter
3	Brittle Material Plate
4	Resin Film
11	Edge Line of Cutting Edge
12	Lower Flat Surface
13	Upper Flat Surface
15	Second Lower Flat Surface

Mode for Carrying out the Invention

[0018] The following description will describe a cutting method and device, and a cutter to be used in the cutting method and device according to the present invention with reference to drawings. However, the present invention is not limited to their embodiments and the skilled person will easily find other combinations and sub-combinations of the features of the embodiments, the claims and the description without leaving the scope of protection as defined in the independent claims.

[0019] Figs. 1 and 2 show an embodiment of the cutting device according to the present invention. Figs. 1 and 2 are front and side views of the cutting device, respectively. The cutting device S shown in Fig. 1 includes a slide table 62 that is located movably in a Y-direction in this Figure on a base 61, and a rotation mechanism 63 that is located on the slide table 62. A rotating table 64 is arranged on the rotation mechanism 63. A brittle material plate 3 is arranged on and secured to the rotating table 64. Resin film 4 (shown in Fig. 5) is laminated on the surface of the brittle material plate 3. The brittle material plate 3 can be moved to any position in the horizontal plane by an actuating mechanism composed of the slide table 62 and the rotation mechanism 63.

[0020] The slide table 62 is movably mounted on a pair of guide rails 65a and 65b that are arranged in parallel to each other on the upper surface of the base 61 and spaced at a certain interval away from each other. A ball screw 66 is arranged in parallel to the guide rails 65a and 65b and between the pair of guide rails 65a and 65b, and can be rotated both in forward and reverse directions by an electric motor 68. Also, a ball nut 67 is located on the bottom surface of the slide table 62. This ball nut 67 is threadedly engaged with the ball screw 66. Rotation of the ball screw 66 in the forward or reverse direction moves the ball nut 67 in the Y-direction so that the slide table 62 mounted on the ball nut 67 is moved in the Y-direction along the guide rail 65a and 65b.

[0021] The rotation mechanism 63 is arranged on the slide table 62. Also, the rotating table 64 is arranged on the rotation mechanism 63. The brittle material plate 3 with the resin film laminated thereon is secured on the rotating table 64 by vacuum suction. The rotation mechanism 63 rotates the rotating table 64 about its center axis that extends in the vertical direction.

[0022] As shown in Fig. 2, a rail 51 horizontally extends in an X-direction above the rotating table 64. A film cutter holder head 5 is moved back and forth along the rail 51 in the X-direction in this Figure by a cutter shaft electric

motor 52. As shown in Fig. 3, a cutter holder 2 is arranged in a lower part of the film cutter holder head 5. A cutter 1a is replaceably attached to the cutter holder 2.

[0023] The cutter 1a has a disk shape upper and lower parts of which are cut out. Thus, the cutter 1a has upper and lower flat surfaces 13 and 12 perpendicular to the edge lines 11 of the cutting edges. In attachment of the cutter 1a to the cutter holder 2, the upper flat surface 13 of the cutter 1a is brought into contact with a flat part 21 of an interior upper portion of the cutter holder 2 so that the cutter 1a is positioned and attached. Needless to say, attachment of the cutter 1a to the cutter holder 2 is not limited to this. For example, as shown in Fig. 4, a cutter 1b may have a side flat surface 14 in addition to the upper flat surface 13. In this case, the upper and side flat surfaces 13 and 14 can be brought into contact with the flat part 21 of the interior upper portion and a flat part 22 of an interior side portion 22 of the cutter holder 2, respectively, so that the cutter 1b is positioned and attached. In this attachment, it is important that the lower flat surface 12 of the cutter 1b is opposed in substantially parallel to the surface of the brittle material plate 3.

[0024] Also, the cutter holder 2 is mounted to be movable, from the film cutter holder head 5, toward and away from the rotating table 64. Adjustment of the protrusion amount of the cutter holder 2 from the film cutter holder head 5 can adjust the cut depth of the cutter 1a in the resin film 4 (shown in Fig. 5) laminated on the surface of the brittle material plate 3. According to the cutting method of the present invention, the cutter 1a is engaged in the resin film 4 with the lower flat surface 12 of the cutter 1a and the surface of the brittle material plate 3 being in contact with each other, or being opposed in substantially parallel to each other and spaced at a small gap away from each other (shown in Fig. 5). For this reason, the protrusion amount of the cutter holder 2 from the film cutter holder head 5 is suitably determined in accordance with the thickness of the resin film 4 (shown in Fig. 5).

[0025] Also, as shown in Fig. 2, a pair of CCD cameras 7a and 7b are arranged above the rotating table 64. The CCD cameras 7a and 7b recognize alignment marks that are previously marked on the brittle material plate 3. The CCD cameras 7a and 7b detect the positioning deviation of the brittle material plate 3 when the brittle material plate 3 is placed. For example, in the case where clockwise and counterclockwise directions about the center of the rotating table 64 are defined as + (plus) and - (minus) directions, respectively, if the brittle material plate 3 deviates $+\theta$, the rotating table 64 is rotated $-\theta$. In addition, for example, if the brittle material plate 3 deviates a distance +Y in the Y-direction in the Figure on the rotating table 64, the slide table 62 is moved -Y.

[0026] In the case where the thus-configured cutting device cuts the resin film 4 laminated on the brittle material plate 3, the brittle material plate 3 is first placed on the rotating table 64 and secured by a suction means. Subsequently, the CCD cameras 7a and 7b catch the alignment marks arranged on the brittle material plate 3, and the brittle material plate 3 is positioned to a predetermined position based on the caught image data as discussed above.

[0027] Subsequently, the protrusion amount of the cutter holder 2 from the film cutter holder head 5 is determined in accordance with the thickness of the resin film 4 laminated on the brittle material plate 3. That is, when the cutter holder 2 protrudes from the film cutter holder head 5, the cutter 1a is deeply engaged in the resin film 4, and the lower flat surface 12 of the cutter 1a comes in contact with the surface of the brittle material plate 3 as shown in Fig. 5, for example. Thus, simultaneous or alternate movement or rotation of the film cutter holder head 5 and the rotating table 64 can cut the resin film 4 laminated on the brittle material plate 3 into a desired shape without scratching the surface of the brittle material plate 3 or chipping the cutting edge of the cutter. To effectively provide the effect of the present invention, it is desirable that the lower flat surface 12 of the cutter 1a be in contact with the surface of the brittle material plate 3. However, the lower flat surface 12 of the cutter 1a may be spaced away from the surface of the brittle material plate 3 at a small gap within a range that does not adversely affect the effect of the present invention.

[0028] Conventional film cutters cannot provide a cut that penetrates the resin film 4 without scratching the brittle material plate 3. Accordingly, it is necessary that the brittle material plate 3 is subjected to a breaking process with a very thin uncut part of the resin film 4 being left on the brittle material plate 3 side, and in addition to this the uncut part of the resin film 4 is torn apart along a vertical crack of the brittle material plate 3. Contrary to this, in the case where the cutter 1a is used, the cut that penetrates the resin film 4 can be provided without scratching the brittle material plate 3. Accordingly, after the vertical crack is formed by rotating a scribing wheel on the surface of the brittle material plate 3 or irradiating the surface of the brittle material plate 3 with laser light, a cut is provided to the resin film 4 by the cutter 1a. Thus, dividing the brittle material plate 3 along said vertical crack in a breaking process can simply provide film-laminated plates with a desired size. Therefore, it is possible to provide film-laminated plates with good-quality divided surfaces.

[0029] The shape of the cutter 1a used in the present invention is not specifically limited as long as it has the flat surface 12 perpendicular to the edge line 11 of the cutting edge as discussed above. The cutter 1a shown in Fig. 3 has the lower and upper flat surfaces 12 and 13, and a pair of edge lines 11 as the cutting edges. The cutter 1a is positioned and attached by contact of the upper flat surface 13 of the cutter 1a with the flat part 21 of the interior upper portion of the cutter holder 2. If a part of one of the edge lines 11 (a part in contact with the resin film 4) or the lower flat surface 12 wears or is damaged, the cutter 1a can be turned upside down or right-side left. Thus, as shown in Fig. 5, four parts of the edge line 11a, 11b, 11c and 11d of the edge lines 11 of the

cutter 1a can serve as a cutting edge.

[0030] The cutter 1b shown in Fig. 4 has the lower and upper flat surfaces 12 and 13, the side flat surface 14, and the edge line 11 as the cutting edge. The cutter 1b is positioned and attached by contact of the upper and side flat surfaces 13 and 14 of the cutter 1b with the flat part 21 of the interior upper portion and the flat part 22 of the interior side portion of the cutter holder 2, respectively. If one of parts of the edge line 11 (a part in contact with the resin film 4) or the lower flat surface 12 wears or is damaged, the cutter 1b can be turned upside down. Thus, another part of the edge line 11 of the cutter 1b can serve as a cutting edge.

[0031] The material of the cutter 1a is not specifically limited. However, from the viewpoint of smoothly and finely cutting the resin film 4 without scratching the surface of the brittle material plate 3, it is preferable that the hardness of the material of the cutter 1a be lower than the brittle material plate 3, and higher than the resin film 4. For example, in the case where the brittle material plate 3 is a glass plate, its Vickers hardness is about 5000 N/mm^2. Also, in the case where the resin film 4 is a polycarbonate resin film or a polyethylene terephthalate resin film, its Vickers hardness is mostly less than 500 N/mm^2. Accordingly, to cut the aforementioned resin film laminated on the glass plate, it can be required to use a cutter with Vickers hardness from 500 to less than 5000 N/mm^2.

[0032] Examples of cutter materials with Vickers hardness of this range can be provided by hard metal (1500 to 2000 N/mm^2) and hard chromium (700 to 2500 N/mm^2), hardened steel (500 to 1000 N/mm^2), SUS304 (3200 N/mm^2), SKH (790 to 820 N/mm^2), ceramics (1000 N/mm^2), and the like.

[0033] Fig. 6 shows a cutter according to another embodiment that can be used in the present invention. In the cutter 1b shown in Fig. 6, a second lower flat surface 15 is formed in parallel to the lower flat surface 12 to be spaced at a distance d radially inward away from the lower flat surface 12 of the cutter 1a shown Fig. 3. The distance d is specified greater than the thickness of the resin film 4. In the case where the thus-configured second lower flat surface 15 is formed, as shown in Fig. 7, the volume of a part of the cutter 1b that is engaged in the resin film 4 can be reduced. Therefore, it is possible to reduce the resistance of relative movement of the cutter 1b when the cutter 1b cuts the resin film 4.

[0034] The resin film 4 that can be cut by the method according to the present invention is not specifically limited. Known films can be cut by the method according to the present invention. Examples of the resin film can be provided by films formed of resins including polyethylene terephthalate (PET), cellulose acetate group resin such as triacetyl cellulose (TAC), acrylics group resin, fluorine group resin such as tetrafluorinated ethylene/hexafluorinated propylene group copolymer, polycarbonate resin, polyester group resin such as polyethylene terephthalate, polyimide group resin, polysulfone group resin, polyethersulfone group resin, polystyrene group resin, polyvinyl alcohol group resin, polyvinyl chloride group resin, polyolefin resin, polyamide group resin, and the like. Two or more sheets of resin film 4 can be laminated on the surface of the brittle material plate 3. In this case, these sheets of resin film 4 can be the same as or different from each other. The thickness of one sheet of resin film 4 is not specifically limited. The typical thickness is not more than 500 μm.

[0035] Known plates can be used as the brittle material plate 3 on which the resin film 4 is laminated in the present invention. Examples of the known brittle material plates can be provided by glass, ceramics, silicon, sapphire, and the like. According to the cutting method of the present invention, even in the case of a brittle material plate made of a relatively soft material, it is possible to reliably cut the resin film 4 laminated on the surface of the plate without scratching the plate.

[0036] For example, the method for cutting resin film according to the present invention can be suitably used for cutting resin film laminated on a glass plate of a liquid crystal panel, or the like. Specifically, the method can be suitably used for cutting a panel with a polarizing sheet laminated on a glass plate. As the polarizing sheet, typically, a sheet is used that includes support film laminated on the both surfaces of a polarizer. For example, examples of the polarizers can be provided by a polarizer including a polarizer base such as polyvinyl alcohol group resin, polyvinyl acetate resin, ethylene/vinyl acetate (EVA) resin, polyamide resin and polyester resin with dichromatic dye or iodine absorbed and orientated thereon, a polarizer including polyvinyl alcohol/polyvinylene copolymer containing orientated molecule chains of dichromatic dehydrated product of polyvinyl alcohol (polyvinylene) in molecularly-orientated polyvinyl alcohol film, and the like. The thickness of the polarizeris not specifically limited. Typically, for the purpose of reducing the thickness of the polarizing sheet, the thickness of the polarizer is specified to fall within a range not more than 50 μm. Also, examples of the support film for supporting and protecting the polarizer can be provided by TAC film, norbornene group film, and the like. The thickness of the support film is not specifically limited. Typically, the thickness of the support film is specified to fall within a range not more than 300 μm.

Industrial Applicability.

[0037] According to a cutting method of the present invention, resin film laminated on a brittle material plate can be finely cut by a cutter without scratching the surface of the brittle material plate or chipping the cutting edge of the cutter. Therefore, the cutting method of the present invention is useful.

Claims

1. A method for cutting one sheet of, or two or more

sheets of resin film (4) laminated on one surface of a brittle material plate (3) by a cutter (1a - 1c)), wherein
said cutter (1a - 1c) has a disk shape, cutting edge with an edge line (11) running in a plane, **characterised by** a flat surface (12, 13) perpendicular to said plane including the edge line (11) of its cutting edge, and further **characterised in that**
said cutter (1a - 1c) is moved relative to said brittle material plate (3) to cut said resin film (4) with the flat surface (12, 13) of said cutter and the surface of said brittle material plate (3) being in contact with each other, or being arranged substantially parallel to each other with a small gap therebetween.

2. The cutting method according to Claim 1, wherein the hardness of the cutting edge (11) of said cutter (1a - 1c) is lower than said brittle material plate (3), and higher than said resin film (4).

3. The cutting method according to Claim 1 or 2, wherein said cutter (1a - 1c) is a disk-shaped cutter that has the cutting edge (11) formed around its outer periphery, and a part of the disk-shaped cutter (1a - 1c) is cut out to form the flat surface (12, 13) perpendicular to the plane including the edge line (11) of the cutting edge.

4. A cutter for cutting one sheet of, or two or more sheets of resin film (4) laminated on one surface of a brittle material plate (3), wherein
the cutter has a disk-shape and comprises **characterised by**
a cutting edge with an edge line (11) running in a plane, a flat surface (12, 13) that is perpendicular to said plane including the edge line (11) of the cutting edge of the cutter, the flat surface (12, 13) being configured to be in contact with the surface of said brittle material plate (3) or being arranged substantially parallel to each other with a small gap between the flat surface (12, 13) and the surface of said brittle material plate (3).

5. The cutter according to Claim 4, wherein the cutter (1a - 1c) is a disk-shaped cutter that has the cutting edge formed around its outer periphery, and a part of the disk-shaped cutter is cut out to form the flat surface (12, 13) perpendicular to the plane including the edge line (11) of the cutting edge.

6. The cutter according to Claim 5, further comprising a second flat surface (14) that is arranged radially inward of said flat surface (12, 13) and in parallel to said flat surface (12, 13).

7. A device for cutting one sheet of, or two or more sheets of resin film (4) laminated on one surface of a brittle material plate (3) by a cutter, **characterized in that** the cutting device comprises:

a cutter (1a - 1c) according to one of claims 1 - 6;
an actuating mechanism (52, 63) for moving said cutter (1a - 1c) relative to said brittle material plate (3); and
an adjuster for adjusting the gap between the flat surface (12, 13) of said cutter (1a - 1c) and the surface of said brittle material plate (3) so that the flat surface (12, 13) of said cutter (1a -1c) and the surface of said brittle material plate (3) are in contact with each other, or are arranged substantially parallel to each other with a small gap therebetween, wherein
said cutter (1a - 1c) is configured to be moved relative to said brittle material plate (3) to cut said resin film (4).

Patentansprüche

1. Verfahren zum Schneiden von einem Blatt oder von zwei oder mehr Blättern einer Kunstharzfolie (4), die auf eine Oberfläche einer Sprödmaterialplatte (3) laminiert ist, durch ein Schneidwerkzeug (1a - 1c), wobei
das Schneidwerkzeug (1a - 1c) eine scheibenförmige Schneidkante mit einer in einer Ebene verlaufenden Kantenlinie (11) aufweist, **gekennzeichnet durch** eine flache Oberfläche (12, 13), die senkrecht zu dieser Ebene einschließlich der Kantenlinie (11) seiner Schneidkante ist, und weiterhin **dadurch gekennzeichnet, dass**
das Schneidwerkzeug (1a - 1c) relativ zu der Sprödmaterialplatte (3) bewegt wird, um die Kunstharzfolie (4) zu schneiden, wobei die flache Oberfläche (12, 13) des Schneidwerkzeugs und die Oberfläche der Sprödmaterialplatte (3) miteinander im Kontakt oder im Wesentlichen parallel zueinander mit einer kleinen Lücke zwischen ihnen angeordnet sind.

2. Schneidverfahren nach Anspruch 1, wobei die Härte der Schneidkante (11) des Schneidwerkzeugs (1a - 1 c) niedriger als bei der Sprödmaterialplatte (3) und höher als bei der Kunstharzfolie (4) ist.

3. Schneidverfahren nach Anspruch 1 oder 2, wobei das Schneidwerkzeug (1a - 1c) ein scheibenförmiges Schneidwerkzeug ist, bei dem die Schneidkante (11) um seinen Außenumfang herum ausgebildet ist und ein Teil des scheibenförmigen Schneidwerkzeugs (1a - 1c) ausgeschnitten ist, um die flache Oberfläche (12, 13) senkrecht zu der Ebene zu bilden, die die Kantenlinie (11) der Schneidkante einschließt.

4. Schneidwerkzeug zum Schneiden von einem Blatt oder von zwei oder mehr Blättern einer Kunstharz-

folie (4), die auf eine Oberfläche einer Sprödmaterialplatte (3) laminiert ist, wobei
das Schneidwerkzeug eine Scheibenform hat und umfasst, **gekennzeichnet durch**
eine Schneidkante mit einer Kantenlinie (11), die in einer Ebene verläuft, eine flache Oberfläche (12, 13) die senkrecht zu dieser Ebene einschließlich der Kantenlinie (11) der Schneidkante des Schneidwerkzeugs ist, wobei die flache Oberfläche (12, 13) dazu konfiguriert ist, mit der Oberfläche der Sprödmaterialplatte (3) in Kontakt oder im Wesentlichen parallel zueinander mit einer kleinen Lücke zwischen der flachen Oberfläche (12, 13) und der Oberfläche der Sprödmaterialplatte (3) angeordnet zu sein.

5. Schneidwerkzeug nach Anspruch 4, wobei das Schneidwerkzeug (1a - 1c) ein scheibenförmiges Schneidwerkzeug ist, bei dem die Schneidkante um seinen Außenumfang herum angeordnet und ein Teil des scheibenförmigen Schneidwerkzeugs ausgeschnitten ist, um die flache Oberfläche (12, 13) senkrecht zu der Ebene zu bilden, die die Schneidlinie (11) der Schneidkante einschließt.

6. Schneidwerkzeug nach Anspruch 5, weiterhin umfassend eine zweite flache Oberfläche (14), die radial einwärts der flachen Oberfläche (12, 13) und parallel zu der flachen Oberfläche (12, 13) angeordnet ist.

7. Vorrichtung zum Schneiden von einem Blatt oder von zwei oder mehr Blättern einer Kunstharzfolie (4), die auf eine Oberfläche einer Sprödmaterialplatte (3) laminiert ist, durch ein Schneidwerkzeug, **dadurch gekennzeichnet, dass** die Schneidvorrichtung umfasst:

ein Schneidwerkzeug (1a - 1c) nach einem der Ansprüche 1 bis 6;
einen Betätigungsmechanismus (52, 63) zum Bewegen des Schneidwerkzeugs (1a - 1c) relativ zu der Sprödmaterialplatte (3); und
eine Verstellvorrichtung zum Verstellen der Lükke zwischen der flachen Oberfläche (12, 13) des Schneidwerkzeugs (1a - 1c) und der Oberfläche der Sprödmaterialplatte (3), so dass die flache Oberfläche (12, 13) des Schneidwerkzeugs (1a - 1 c) und die Oberfläche der Sprödmaterialplatte (3) miteinander in Kontakt oder im Wesentlichen parallel zueinander mit einer kleinen Lücke zwischen ihnen angeordnet sind, wobei
das Schneidwerkzeug (1a - 1c) dazu konfiguriert ist, relativ zu der Sprödmaterialplatte (3) bewegt zu werden, um die Kunstharzfolie (4) zu schneiden.

Revendications

1. Procédé de découpe d'une feuille, ou de deux ou plusieurs feuilles, de film de résine (4) stratifié sur une surface d'une plaque de matériau fragile (3) à l'aide d'un découpeur (1a -1c), dans lequel
ledit découpeur (1a - 1c) présente une forme de disque et une arête de coupe avec une ligne d'arête (11) s'étendant dans un plan, **caractérisé par** une surface plate (12, 13) perpendiculaire audit plan incluant la ligne d'arête (11) de son arête de coupe, et **caractérisé en outre en ce que**
ledit découpeur (1a - 1c) est déplacé par rapport à ladite plaque de matériau fragile (3) pour découper ledit film de résine (4), la surface plate (12, 13) dudit découpeur et la surface de ladite plaque de matériau fragile (3) étant en contact l'une avec l'autre ou étant disposées de manière sensiblement parallèle l'une par rapport à l'autre en maintenant un petit espace entre les deux.

2. Le procédé de découpe selon la revendication 1, dans lequel la dureté de l'arête de coupe (11) dudit découpeur (1a - 1c) est inférieure à celle de ladite plaque de matériau fragile (3) et supérieure à celle dudit film de résine (4).

3. Le procédé de découpe selon la revendication 1 ou 2, dans lequel ledit découpeur (1a - 1c) est un découpeur présentant la forme d' disque dont l'arête de coupe (11) est formée autour de sa périphérie extérieure, et une partie du découpeur en forme de disque (1a - 1c) est découpée pour configurer la surface plate (12, 13) perpendiculaire au plan incluant la ligne d'arête (11) de l'arête de coupe.

4. Découpeur permettant de découper une feuille, ou deux ou plusieurs feuilles, de film de résine (4) stratifié sur une surface d'une plaque de matériau fragile (3), dans lequel
le découpeur a la forme d'un disque et comporte une arête de coupe avec une ligne d'arête (11) s'étendant dans un plan, **caractérisé par** une surface plate (12, 13) qui est perpendiculaire audit plan incluant la ligne d'arête (11) de l'arête de coupe du découpeur, la surface plate (12, 13) étant configurée pour être en contact avec la surface de ladite plaque de matériau fragile (3) ou les deux surfaces étant disposées de manière sensiblement parallèle l'une à l'autre en maintenant un petit espace entre la surface plate (12, 13) et la surface de ladite plaque de matériau fragile (3).

5. Le découpeur selon la revendication 4, dans lequel le découpeur (1a - 1c) est un découpeur en forme de disque dont l'arête de coupe est formée autour de sa périphérie extérieure, et une partie du découpeur en forme de disque est découpée pour former

la surface plate (12, 13) perpendiculaire au plan incluant la ligne d'arête (11) de l'arête de coupe.

6. Le découpeur selon la revendication 5, comprenant en outre une seconde surface plate (14) qui est disposée radialement vers l'intérieur de ladite surface plate (12, 13) et parallèlement à ladite surface plate (12, 13).

7. Dispositif permettant de découper une feuille, ou deux ou plusieurs feuilles, de film de résine (4) stratifié sur une surface d'une plaque de matériau fragile (3) à l'aide d'un découpeur, **caractérisé en ce que** le dispositif de découpe comprend :

un découpeur (1a - 1c) selon l'une des revendications 1 à 6 ;
un mécanisme d'actionnement (52, 63) permettant de déplacer ledit découpeur (1a - 1c) par rapport à ladite plaque de matériau fragile (3) ; et
un ajusteur permettant d'ajuster l'espace entre la surface plate (12, 13) dudit découpeur (1a - 1c) et la surface de ladite plaque de matériau fragile (3) de telle sorte que la surface plate (12, 13) dudit découpeur (1a - 1c) et la surface de ladite plaque de matériau fragile (3) soient en contact l'une avec l'autre ou soient disposées de manière sensiblement parallèle l'une par rapport à l'autre en maintenant un petit espace entre les deux surfaces,
ledit découpeur (1a - 1c) étant configuré pour être déplacé par rapport à ladite plaque de matériau fragile (3) pour découper ledit film de résine (4).

Fig.1

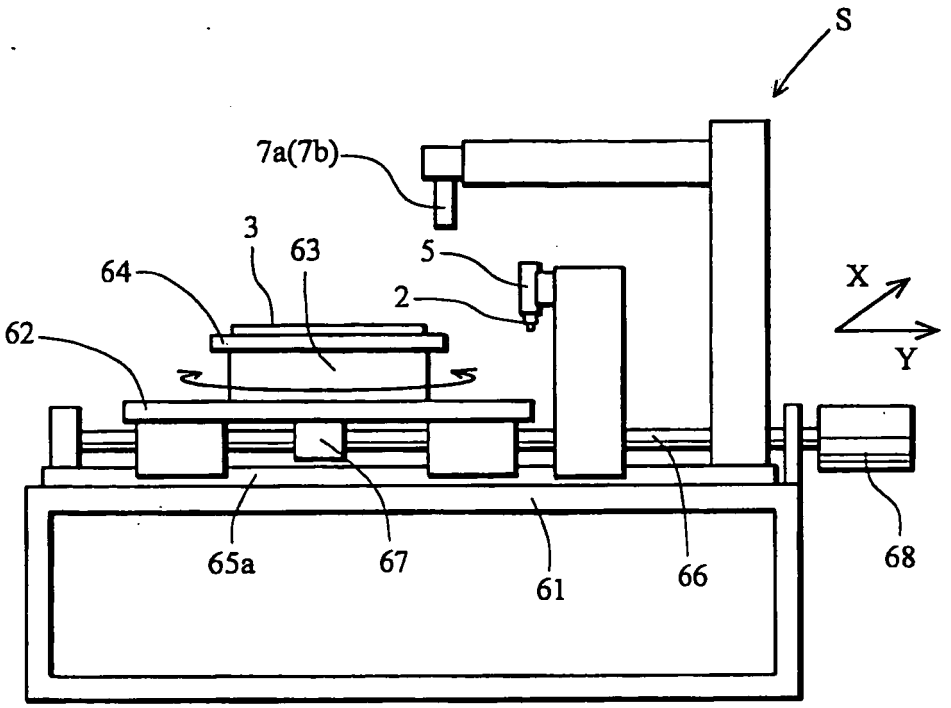

S
7a(7b)
3
63
5
64
2
62
X
Y
65a
67
61
66
68

Fig.2

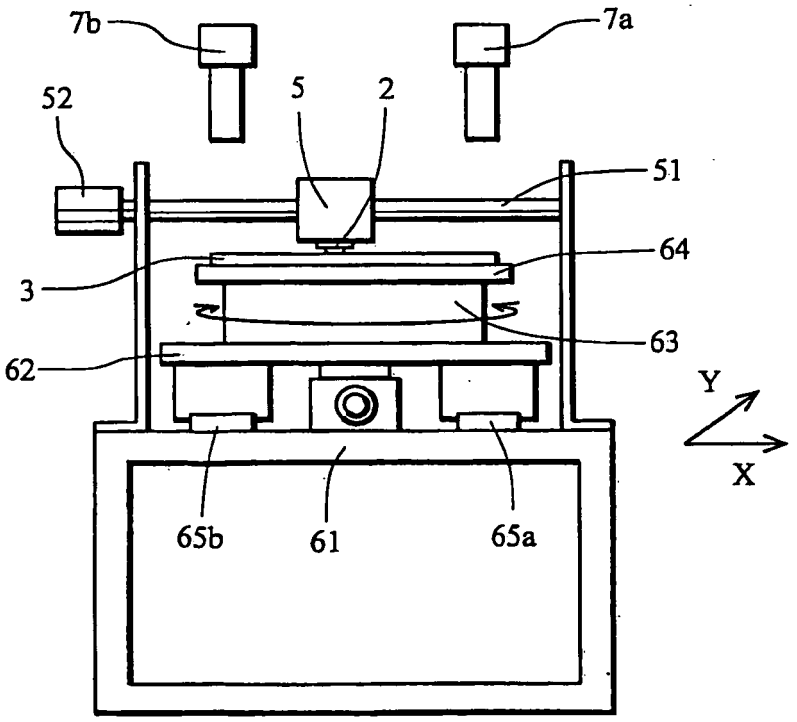

7b
7a
52
5
2
51
64
3
63
62
Y
X
65b
61
65a

Fig.3

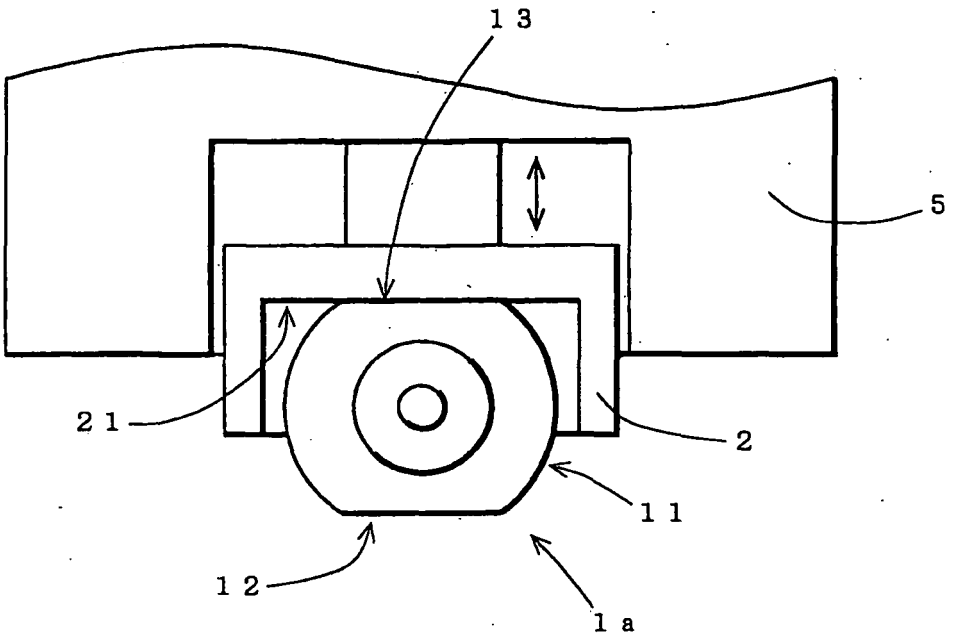


Fig.4

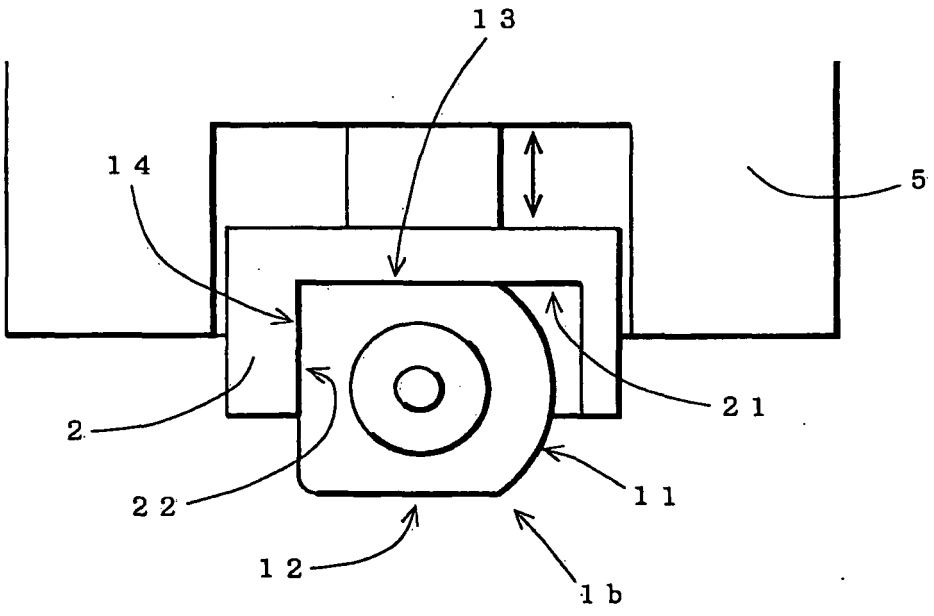


Fig.5

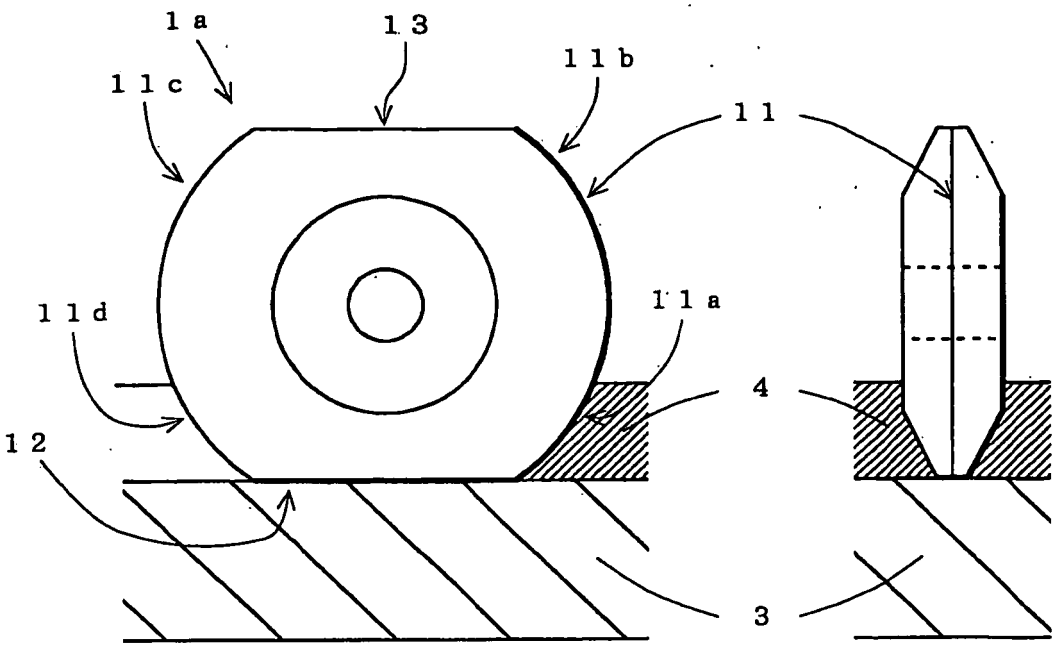


Fig.6

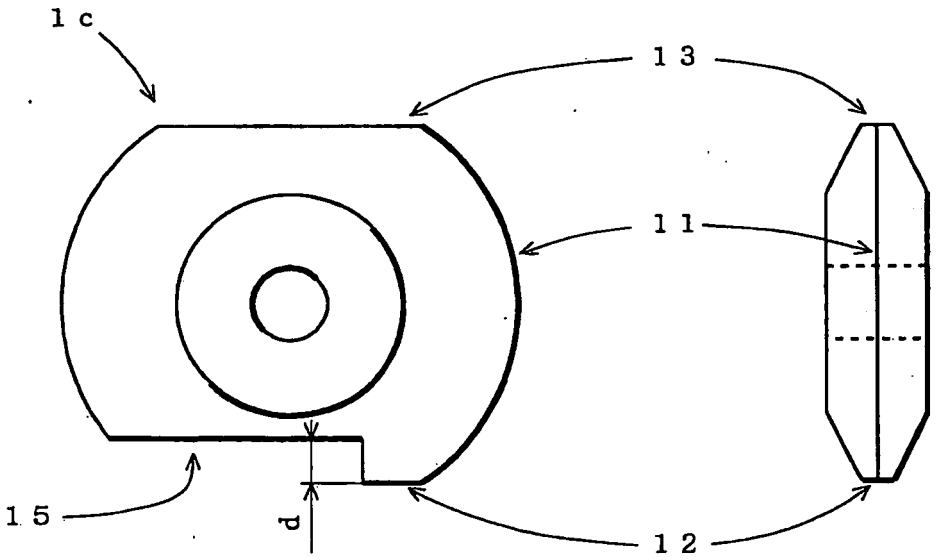


Fig.7

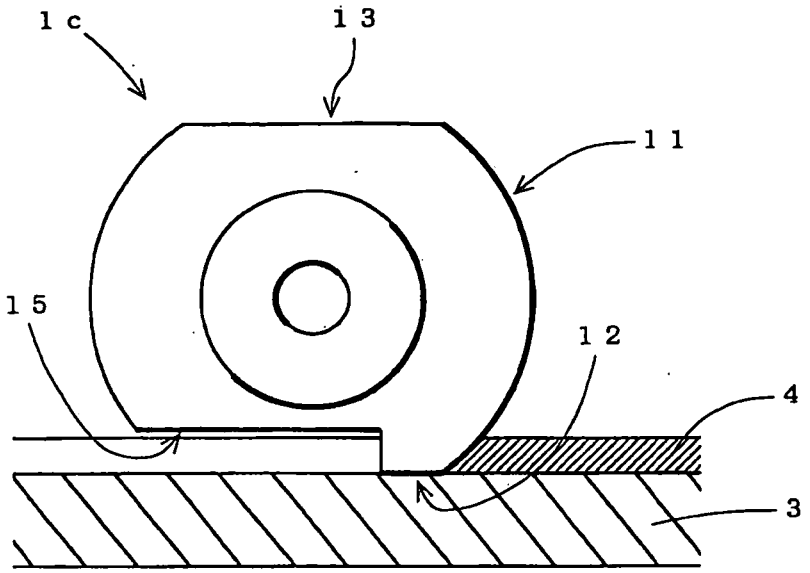
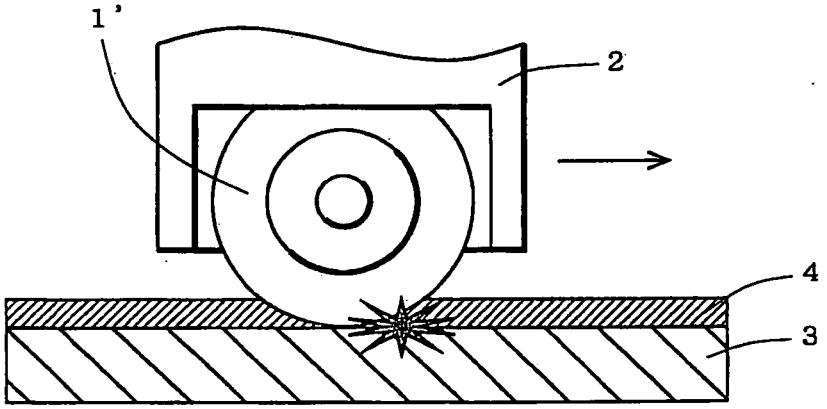


Fig.8



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 1903599 A2 **[0006]**