

DRESSER BOARD AND METHOD OF DRESSING CUTTING BLADE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a dresser board for use in correcting the shape of a cutting blade for cutting a workpiece and a method of dressing a cutting blade by use of such a dresser board.

Description of the Related Art

Device chips including respective devices are fabricated by dividing or segmenting a wafer having those devices. Packaged devices are manufactured by mounting a plurality of device chips on a predetermined substrate, covering the mounted device chips with a sealing material of resin, i.e., molding resin, to produce a packaged substrate, and dividing or segmenting the packaged substrate into a plurality of packaged devices having respective packaged device chips. The device chips and the packaged devices will be incorporated in various pieces of electronic equipment such as mobile phones, personal computers, etc.

Workpieces such as wafers and packaged substrates are divided by a cutting apparatus. The cutting apparatus includes a chuck table for holding a workpiece thereon

and a cutting unit for performing a cutting process on the workpiece held on the chuck table. The cutting unit includes an annular cutting blade. In operation, the cutting blade is rotated about its central axis and cuts into the workpiece held on the chuck table, cutting and dividing the workpiece.

As a cutting blade is continuously used to cut workpieces, the cutting blade has its distal cutting edge worn gradually into a round cross-sectional shape. If a workpiece is cut and divided into a plurality of chips by the worn cutting blade, the chips reflect the round cross-sectional shape of the cutting edge of the cutting blade, and hence come somewhat out of shape and have their quality lowered. Therefore, it has been customary in the art to perform a dressing process on a worn cutting blade to correct its shape by intentionally abrading the distal cutting edge of the cutting blade into a desired sharp edge before the cutting blade is used to cut a workpiece. The dressing process is carried out by holding a member for dressing the worn cutting blade, referred to as a dresser board, on a chuck table of a cutting apparatus and causing the worn cutting blade to cut into the dresser board. For example, Japanese Patent Laid-open No. 2019-18254 discloses a method of

shaping the distal cutting edge of a cutting blade into a flat configuration by causing the cutting blade to cut into a projecting portion of a dresser board.

SUMMARY OF THE INVENTION

As described above, a dresser board having a projecting portion is used to shape the distal cutting edge of a cutting blade into a flat configuration. Such a dresser board having a projecting portion is manufactured by cutting a dresser board shaped as a flat plate with a cutting blade to form a plurality of straight grooves, i.e., recesses, in a face side of the dresser board. The grooves are formed to a depth larger than the depth to which a cutting blade to be dressed will cut into the dresser board.

However, when deep grooves are formed in a dresser board, the dresser board has its rigidity lowered, developing a stress difference between face and reverse sides of the dresser board that tends to allow the dresser board to warp. Especially, a dresser board that is made thinner for material reduction or the like is more likely to warp when grooves are formed in the dresser board. As a result, a dresser board with warpage cannot be held flatwise on a chuck table, making it

difficult for a cutting blade to cut accurately into a projecting portion of the dresser board.

The present invention has been made in view of the above difficulties. It is an object of the present invention to provide a dresser board that is capable of adequately dressing a cutting blade and a method of dressing a cutting blade by use of such a dresser board.

In accordance with an aspect of the present invention, there is provided a dresser board for use in correcting a shape of a cutting blade, including a first layer including first abrasive grains and a first binding material that holds the first abrasive grains, and a plurality of second layers stacked on the first layer in sandwiching relation thereto. A thickness of the first layer is smaller than a width of the cutting blade, and the second layer includes second abrasive grains whose average diameter is smaller than that of the first abrasive grains and a second binding material that holds the second abrasive grains.

Preferably, the first abrasive grains and the second abrasive grains are made of green carborundum or white alundum, and each of the first binding material and the second binding material includes a resin bond. Preferably, the average diameter of the first abrasive

grains is in a range from 1 to 200 μm , and the average diameter of the second abrasive grains is in a range from 0.1 to 20 μm .

In accordance with another aspect of the present invention, there is provided a dresser board for use in correcting a shape of a cutting blade, including a first layer including abrasive grains and a binding material that holds the abrasive grains, and a plurality of second layers stacked on the first layer in sandwiching relation thereto. A thickness of the first layer is smaller than a width of the cutting blade, and the second layer is devoid of abrasive grains.

In accordance with a further aspect of the present invention, there is provided a method of dressing a cutting blade to correct a shape of the cutting blade by use of a dresser board, the dresser board including a first layer including abrasive grains and a binding material that holds the abrasive grains and a plurality of second layers stacked on the first layer in sandwiching relation thereto, a thickness of the first layer being smaller than a width of the cutting blade, the second layer including second abrasive grains whose average diameter is smaller than that of the first abrasive grains and a second binding material that holds

the second abrasive grains. The method includes the steps of holding the dresser board on a chuck table such that the dresser board has an upper surface facing upwardly where the first layer and the second layers are exposed, and moving the cutting blade and the dresser board relatively to each other to cause a distal cutting edge of the cutting blade to cut into the upper surface of the dresser board along the first layer, thereby bringing a lower surface of the cutting blade into contact with the first layer and bringing both side surfaces of the distal cutting edge of the cutting blade into contact with the second layers thereby to correct a shape of the distal cutting edge of the cutting blade.

In accordance with a still further aspect of the present invention, there is provided a method of dressing a cutting blade to correct a shape of the cutting blade by use of a dresser board, the dresser board including a first layer including abrasive grains and a binding material that holds the abrasive grains and a plurality of second layers stacked on the first layer in sandwiching relation thereto, a thickness of the first layer being smaller than a width of the cutting blade, the second layer being devoid of abrasive grains. The method includes the steps of holding the dresser board on

a chuck table such that the dresser board has an upper surface facing upwardly where the first layer and the second layers are exposed, and moving the cutting blade and the dresser board relatively to each other to cause a distal cutting edge of the cutting blade to cut into the upper surface of the dresser board along the first layer, thereby bringing a lower surface of the cutting blade into contact with the first layer and bringing both side surfaces of the distal cutting edge of the cutting blade into contact with the second layers thereby to correct a shape of the distal cutting edge of the cutting blade.

Each of the dresser boards according to the aspects of the present invention includes the first layer including the first abrasive grains and the plurality of second layers stacked on the first layer in sandwiching relation thereto. The dresser board makes it possible to dress the cutting blade without forming deep grooves in advance therein. Therefore, the dresser board is prevented from warping. As a result, the dresser board can appropriately be held on the chuck table for suitably correcting the shape of the cutting blade when the dresser board dresses the cutting blade.

The above and other objects, features and advantages of the present invention and the manner of

realizing them will become more apparent, and the invention itself will best be understood from a study of the following description and appended claims with reference to the attached drawings showing a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a dresser board according to an embodiment of the present invention;

FIG. 2A is a perspective view of a first layer sheet and two second layer sheets that are to be alternately stacked together;

FIG. 2B is a perspective view of first layer sheets and second layer sheets that are alternately stacked together and cut;

FIG. 3 is a perspective view of the dresser board that is supported on an annular frame;

FIG. 4 is a perspective view of a cutting apparatus that is used to dress a cutting blade on the dresser board;

FIG. 5 is a front elevational view, partly in cross section, of the dresser board that is held on a chuck table of the cutting apparatus in a holding step;

FIG. 6A is an enlarged front elevational view,

partly in cross section, of the dresser board and the cutting blade in a dressing step; and

FIG. 6B is a front elevational view of the cutting blade after the dressing step.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will be described hereinbelow with reference to the accompanying drawings. First, a configuration example of a dresser board according to the present embodiment will be described below. The dresser board according to the present embodiment is used to shape, i.e., dress, a cutting blade. The cutting blade is an annular machining tool for cutting a workpiece by making cuts therein.

One example of a workpiece that can be cut by the cutting blade is a disk-shaped silicon wafer. The silicon wafer has a plurality of areas demarcated on its face side by a grid of intersecting streets or dicing lines. The areas demarcated by the streets include respective devices formed therein that may be integrated circuits (ICs), large scale integration (LSI) circuits, light emitting diodes (LEDs), micro electro mechanical systems (MEMS) devices, etc. The cutting blade cuts such silicon wafer to divide it along the streets into a plurality of

device chips that have the respective devices. The workpiece is not limited to any particular materials, shapes, structures, sizes, etc. For example, the workpiece may include a wafer made of any of other semiconductors than silicon, e.g., GaAs, InP, GaN, SiC, and so on, glass, ceramic, resin, metal, etc. The devices formed on the workpiece are not limited to any particular kinds, quantities, shapes, structures, sizes, layouts, etc. The workpiece may even be devoid of devices. Furthermore, the workpiece may be a packaged substrate such as a chip size package (CSP) substrate, or a quad flat non-leaded package (QFN) substrate.

In preparation for processing a workpiece with a cutting blade, a dressing process is performed on the cutting blade. The dressing process is carried out by rotating the cutting blade and causing a distal cutting edge of the cutting blade to cut into the dresser board. The distal cutting edge of the cutting blade is brought into abrasive contact with the dresser board and is abraded to have its shape corrected.

FIG. 1 illustrates a dresser board 11 in perspective. As illustrated in FIG. 1, the dresser board 11 is shaped as a rectangular parallelepiped for use in dressing cutting blades. The dresser board 11 includes a

plurality of first layers 13 and a plurality of second layers 15. The first layers 13 and the second layers 15 are shaped as rectangular plate-shaped members and are alternately stacked together in thicknesswise directions of the dresser board 11, i.e., in thicknesswise directions of the first layers 13 and the second layers 15.

Each of the first layers 13 is made of abrasive grains, i.e., first abrasive grains, and a binding material, i.e., a first binding material, that holds the first abrasive grains securely together. Each of the second layers 15 is made of abrasive grains, i.e., second abrasive grains, and a binding material, i.e., a second binding material, that holds the second abrasive grains securely together. The first abrasive grains and the second abrasive grains may be made of green carborundum (GC), white alundum (WA), or the like. The average diameter of the abrasive grains, i.e., the second abrasive grains, contained in the second layers 15 is smaller than the average diameter of the abrasive grains, i.e., the first abrasive grains, contained in the first layers 13. For example, the average diameter of the first abrasive grains is in the range from 1 to 200 μm , whereas the average diameter of the second abrasive grains is in

the range from 0.1 to 20 μm .

Each of the first binding material and the second binding material can include a resin bond made of resin or a vitrified bond made of ceramic. Particularly, the first binding material and the second binding material should preferably be a resin bond as it reduces damage to the cutting blade when the cutting blade cuts into the dresser board 11. The first layers 13 and the second layers 15 that are plate-shaped are manufactured by immersing abrasive grains in a resin such as a phenol resin or an epoxy resin, then forming the resin containing the abrasive grains into a plate shape, and sintering the plate-shaped resin at a predetermined temperature in the range from 150°C to 200°C, for example. The abrasive grains contained in the first layers 13 and the second layers 15 are effective to lower the flowability of the resin bond, making it easy to keep the first layers 13 and the second layers 15 shaped as desired.

FIG. 2A illustrates in perspective a first layer sheet 13 and two second layer sheets 15 that are to be alternately stacked together. Though only one first layer sheet 13 and two second layer sheets 15 are illustrated in FIG. 2A, they are illustrated by way of example only.

The dresser board 11 is fabricated by, for example, alternately stacking the first layer sheet 13 and the second layer sheets 15 and then simultaneously cutting the first layer sheet 13 and the second layer sheets 15 of the stacked assembly. The first layer sheet 13 has a rectangular first surface, i.e., a face side, 13a and a rectangular second surface, i.e., a reverse side, 13b that lie generally parallel to each other. Similarly, each of the second layer sheets 15 has a rectangular first surface, i.e., a face side, 15a and a rectangular second surface, i.e., a reverse side, 15b that lie generally parallel to each other. The second layer sheets 15 are stacked on the first layer sheet 13 in sandwiching relation thereto. Specifically, the second surface 15b of one, depicted above the first layer sheet 13, of the two second layer sheets 15 is held against the first surface 13a of the first layer sheet 13, and the first surface 15a of the other one, depicted below the first layer sheet 13, of the two second layer sheets 15 is held against the second surface 13b of the first layer sheet 13. The first layer sheet 13 and the second layer sheets 15 thus stacked together are bonded to each other by an adhesive, for example.

FIG. 2B illustrates in perspective first layer

sheets 13 and second layer sheets 15 that are alternately stacked together for making up dresser boards 11. The first layer sheets 13 and the second layer sheets 15 of the stacked assembly are simultaneously cut by a cutting blade or the like, producing dresser boards 11 having a desired shape and dimensions. Each of the dresser boards 11 produced by cutting the stacked assembly includes first layers and second layers that are alternately stacked together. The first layers and the second layers of the dresser boards will also be denoted respectively by 13 and 15. The first layer sheets 13 and the second layer sheets 15 to be stacked together are not limited to any numbers or quantities. However, each of the dresser boards 11 cut from the stacked assembly includes second layers 15 as uppermost and lowermost layers thereof. Therefore, each of all the first layers 13 included in the dresser board 11 is sandwiched between two second layers 15. As described later, each of the first layers 13 is used to shape the distal end face of a cutting blade. Consequently, the dresser board 11 should preferably include at least two first layers 13, making it possible to shape the distal end face of a cutting blade a plurality of times by use of one dresser board 11.

As illustrated in FIG. 1, the dresser board 11 includes a first surface, i.e., a face side, 11a and a second surface, i.e., a reverse side, 11b that lie generally parallel to each other. The first surface 11a corresponds to the first surface 15a of the uppermost second layer 15, and the second surface 11b corresponds to the second surface 15b of the lowermost second layer 15. The dresser board 11 includes a pair of third surfaces, i.e., side surfaces, 11c adjoining the longer sides of the first surface 11a and the second surface 11b and a pair of fourth surfaces, i.e., side surfaces, 11d adjoining the shorter sides of the first surface 11a and the second surface 11b. The pair of third surfaces 11c represent rectangular flat surfaces lying parallel to lengthwise directions of the dresser board 11, i.e., lengthwise directions of the first layers 13 and the second layers 15, and the thicknesswise directions of the dresser board 11. The pair of fourth surfaces 11d represent rectangular flat surfaces lying parallel to widthwise directions of the dresser board 11, i.e., widthwise directions of the first layers 13 and the second layers 15, and the thicknesswise directions of the dresser board 11.

The first layers 13 and the second layers 15 have

exposed side surfaces on the third surfaces 11c and the fourth surfaces 11d. Therefore, each of the third surfaces 11c and the fourth surfaces 11d exhibits a periodic striped pattern, i.e., a horizontal striped pattern, representing the alternate array of the side surfaces of the first layers 13 and the side surfaces of the second layers 15.

The cutting blade is dressed by use of the dresser board 11 described above. For dressing the cutting blade, the dresser board 11 is first supported on an annular frame. FIG. 3 illustrates in perspective the dresser board 11 supported that is supported on an annular frame 17.

The frame 17 is made of a metal material such as stainless steel (SUS). The frame 17 has a circular opening 17a defined therein that extends through the frame 17 in the thicknesswise directions thereof. The opening 17a has a diameter larger than the length of each of the sides of the dresser board 11. The dresser board 11 is disposed within the opening 17a. A tape 19 is attached to the dresser board 11 and the frame 17. Specifically, the tape 19 has a central portion attached to the dresser board 11 and an outer circumferential portion attached to the frame 17. As a result, the

dresser board 11 is supported on the frame 17 through the tape 19. The tape 19 includes a circular film-like base and an adhesive layer, i.e., a glue layer, disposed on the base. The base is made of a resin such as polyolefin, polyvinyl chloride, or polyethylene terephthalate, for example. The adhesive layer is made of an epoxy, acryl, or rubber adhesive, for example. The adhesive layer may alternatively be made of an ultraviolet-curable resin that can be cured upon exposure to ultraviolet rays.

The dresser board 11 is placed on the tape 19 such that one of the third surfaces 11c is disposed on the tape 19. Therefore, when the dresser board 11 is supported on the frame 17 by the tape 19, the other third surface 11c that exhibits the periodic striped pattern is exposed upwardly, and the first surface 11a, the second surface 11b, and the fourth surfaces 11d each exhibiting the periodic striped pattern are exposed sideways.

The cutting blade is dressed by the dresser board 11 supported on the frame 17 when the cutting blade is caused to cut into the dresser board 11. The cutting blade is dressed by use of a cutting apparatus. FIG. 4 illustrates in perspective a cutting apparatus 2 that is used to dress the cutting blade on the dresser board 11. In FIG. 4, X-axis directions, i.e., processing feed

directions or first horizontal directions, and Y-axis directions, i.e., indexing feed directions or second horizontal directions, extend perpendicularly to each other. Z-axis directions, i.e., vertical directions, upward and downward directions, or heightwise directions, extend perpendicularly to the X-axis directions and the Y-axis directions.

As illustrated in FIG. 4, the cutting apparatus 2 includes a chuck table, i.e., a holding table, 4 that is capable of selectively holding a workpiece to be cut and the dresser board 11 for dressing the cutting blade. The chuck table 4 has a flat upper surface lying generally parallel to the horizontal directions, i.e., an XY plane defined by the X-axis directions and the Y-axis directions, and functioning as a holding surface 4a (see FIG. 5) for selectively holding the workpiece or the dresser board 11 thereon. The holding surface 4a is held in fluid communication with a suction source, not depicted, such as an ejector through a fluid channel, not depicted, defined in the chuck table 4 and a valve, not depicted. The chuck table 4 is operatively connected to a ball-screw moving mechanism, not depicted, for moving the chuck table 4 along the X-axis directions, and a rotary actuator, not depicted, such as an electric motor for

rotating the chuck table 4 about a rotational axis generally parallel to the Z-axis directions. A plurality of clamps 6 (see FIG. 5) for gripping and holding the frame 17 are disposed around the chuck table 4.

A cutting unit 8 for selectively cutting the workpiece and the dresser board 11 is disposed above the chuck table 4. The cutting unit 8 includes a hollow cylindrical housing 10 that houses therein a rotatable cylindrical spindle 12 (see FIG. 5) extending along the Y-axis directions. The spindle 12 has a distal end portion, i.e., an end portion, exposed out of the housing 10 and a proximal end portion, i.e., another end portion, connected to a rotary actuator, not depicted, such as an electric motor. An annular cutting blade 14, which is used to cut the workpiece or which can be dressed by the dresser board 11, is mounted on the distal end portion of the spindle 12. The cutting blade 14 is rotatable about a rotational axis generally parallel to the Y-axis directions by power transmitted from the rotary actuator by the spindle 12.

The cutting blade 14 includes a hub-type cutting blade, i.e., a hub blade, for example. The hub blade is of a unitary structure including an annular base made of metal and the like and an annular cutting edge disposed

on and extending along an outer circumferential edge of the base. The cutting edge of the hub blade can be made of an electroformed grindstone including abrasive grains of diamond, cubic boron nitride (c-BN), or the like and a binder such as a plated nickel layer that binds the abrasive grains. Alternatively, the cutting blade 14 can include a washer-type cutting blade, i.e., a washer blade. The washer blade includes only an annular cutting edge including abrasive grains and a binder such as a metal bond, a resin bond, or a vitrified bond that binds the abrasive grains.

After the cutting blade 14 has been installed on the spindle 12 of the cutting unit 8, the cutting blade 14 is covered with a blade cover 16 fixed to the housing 10. The blade cover 16 includes a pair of connectors 18 to be connected to tubes, not depicted, that are supplied with cutting fluid such as pure water and a pair of nozzles 20 (one depicted in FIG. 4) connected respectively to the connectors 18. The pair of nozzles 20 are disposed respectively on the sides of both side surfaces, i.e., face and reverse sides, of the cutting blade 14 in sandwiching relation to a lower end portion of the cutting blade 14. The pair of nozzles 20 have respective ejection ports, not depicted, that are open

toward the cutting blade 14. When the cutting fluid is supplied to the pair of connectors 18, the cutting fluid flows from the connectors 18 into the pair of nozzles 20 and is ejected from the ejection ports 20 of the pair of nozzles 20 toward the side surfaces of the cutting blade 14. The cutting fluid applied to the cutting blade 14 cools the cutting blade 14 and the workpiece or the dresser board 11 held on the chuck table 4 and cleans away filings or chips produced when the workpiece or the dresser board 11 is cut by the cutting blade 14.

The cutting unit 8 is operatively connected to a ball-screw moving mechanism, not depicted for moving the cutting unit 8. The ball-screw moving mechanism moves the cutting unit 8 along the Y-axis directions for adjusting its position in the indexing feed directions and also lifts and lowers the cutting blade 14 along the Z-axis directions for adjusting the depth to which the cutting blade 14 is to cut into the workpiece or the dresser board 11 on the chuck table 4.

The cutting apparatus 2 cuts a workpiece such as a silicon wafer. For example, the cutting blade 14 cuts a silicon wafer along dicing lines established thereon to divide the silicon wafer into a plurality of device chips. As the cutting blade 14 is continuously used to

cut workpieces, the cutting blade 14 has its distal cutting edge worn gradually into a round cross-sectional shape, as depicted in FIG. 5. If a workpiece is cut and divided into a plurality of device chips by the worn cutting blade 14, the device chips reflect the round cross-sectional shape of the cutting edge of the cutting blade 14, and hence come somewhat out of shape and have their quality lowered. To address this problem, it has been customary in the art to perform a dressing process on the worn cutting blade 14 to correct its shape by intentionally abrading the distal cutting edge of the cutting blade 14 into a desired sharp edge before the cutting blade 14 is used to cut a workpiece. The dressing process is carried out by causing the worn cutting blade 14 to cut into the dresser board 11. A specific example of the dressing process for correcting the shape of the cutting blade 14 by use of the dresser board 11 will be described below.

First, the dresser board 11 is held on the chuck table 4 (holding step). FIG. 5 illustrates in elevation, partly in cross section, the dresser board 11 that is held on the chuck table 4 in the holding step.

In the holding step, the dresser board 11 supported on the frame 17 is placed on the holding surface 4a of

the chuck table 4 with the tape 19 interposed therebetween. The frame 17 is then gripped and secured in place by the clamps 6. Then, a suction force, i.e., a negative pressure, generated by the suction source held in fluid communication with the holding surface 4a is applied to the holding surface 4a, holding the dresser board 11 under suction on the holding surface 4a with the tape 19 interposed therebetween. The dresser board 11 is now held on the chuck table 4 such that one of the third surfaces 11c (see FIG. 1, etc.) where the first layers 13 and the second layers 15 have exposed side surfaces exhibiting a periodic striped pattern faces upwardly.

Then, the cutting blade 14 cuts into the upper surface, i.e., the upwardly facing third surface 11c, of the dresser board 11, thereby correcting the shape of the cutting blade 14 (dressing step). FIG. 6A illustrates in enlarged front elevation, partly in cross section, the dresser board 11 and the cutting blade 14 in the dressing step.

In the dressing step, the chuck table 4 is first rotated to bring the lengthwise directions, i.e., longitudinal directions of the third surfaces 11c, of the dresser board 11 into alignment with the X-axis directions. The dresser board 11 is now oriented such

that its lengthwise directions extend along the X-axis directions, its thicknesswise directions extend along the Y-axis directions, and its widthwise directions extend along the Z-axis directions. The cutting unit 8 (see FIGS. 4 and 5) is moved along one of the Y-axis directions to align one of the first layers 13 of the dresser board 11 and the cutting blade 14 with each other in the Y-axis directions. For example, the cutting blade 14 is positioned to align the center of one of the first layers 13 in its thicknesswise directions, i.e., in the leftward and rightward directions of the sheet of FIG. 6A, with the center of the cutting blade 14 in its widthwise directions, i.e., in the leftward and rightward directions of the sheet of FIG. 6A, in the Y-axis directions. Furthermore, the cutting unit 8 is moved along one of the Z-axis directions to position the lower end of the cutting blade 14 below the upper surface, i.e., upwardly facing third surface 11c, of the dresser board 11.

Thereafter, the cutting blade 14 is moved along the X-axis direction toward the dresser board 11 while being rotated about its rotational axis by the spindle 12. The dresser board 11 and the cutting blade 14 are moved relatively to each other along the processing feed

direction to cause the distal cutting edge of the cutting blade 14 to cut into the upper surface of the dresser board 11 along the first layer 13. As a result, the cutting blade 14 cuts the upper surface of the dresser board 11, forming a straight groove in the upper surface of the dresser board 11 along the aligned first layer 13. At this time, the distal cutting edge of the cutting blade 14 is worn by abrasive contact with the dresser board 11, so that a lower surface, i.e., a distal end face, 14a of the cutting blade 14 has its shape corrected.

As illustrated in FIG. 6A, a thickness d_1 of the first layer 13 is smaller than a thickness, i.e., a width, D of the cutting blade 14. Therefore, the lower surface 14a of the cutting blade 14 is held in abrasive contact with the first layer 13 that contains the abrasive grains, i.e., the first abrasive grains, that are larger in average diameter than the abrasive grains, i.e., the second abrasive grains, contained in the second layers 15, and both side surfaces of the distal cutting edge of the cutting blade 14 are held in abrasive contact with the two second layers 15 on both sides of the first layer 13 that contain the abrasive grains, i.e., the second abrasive grains, that are smaller in average

diameter than the abrasive grains, i.e., the first abrasive grains, contained in the first layer 13. Consequently, the lower surface 14a of the cutting blade 14 is more likely to wear whereas the side surfaces of the distal cutting edge of the cutting blade 14 are less likely to wear. The thicknesses of the first layers 13 and the second layers 15 can be set to suitable values depending on the thickness D of the cutting blade 14. The sum $(d_2 + 2d_1)$ of a thickness d_2 of a second layer 15 and the thickness $2d_1$ of two first layers 13 sandwiching the second layer 15 may be smaller than the thickness D of the cutting blade 14. In this case, when the cutting blade 14 cuts into the dresser board 11, the lower surface 14a of the cutting blade 14 is brought into abrasive contact with two or more first layers 13.

FIG. 6B illustrates in front elevation the cutting blade 14 after the dressing step. When the cutting blade 14 is caused to cut into the dresser board 11 along one of the first layers 13, the region of the distal cutting edge of the cutting blade 14 that is held in abrasive contact with the first layer 13 is preferentially worn, so that the roundness of the lower surface 14a of the cutting blade 14 is gradually removed. When the lower surface 14a of the cutting blade 14 is worn flatwise, the

dressing of the cutting blade 14 is completed. The number of times that the cutting blade 14 cuts into the dresser board 11 is set to a suitable value depending on the shape, material, size, etc. of the cutting blade 14. In a case in which the cutting blade 14 cuts into the dresser board 11 a plurality of times, the cutting blade 14 is caused to cut into the dresser board 11 along a first layer 13, then the cutting blade 14 is moved in one of the Y-axis directions, i.e., one of the indexing feed directions, and thereafter the cutting blade 14 is caused to cut into the dresser board 11 along a next first layer 13. The above process is repeated until the cutting blade 14 cuts into the dresser board 11 a desired number of times. When grooves are formed in the dresser board 11 along all the first layers 13 thereof, the dresser board 11 is used up and replaced with a fresh dresser board 11, i.e., an unused dresser board 11.

As described above, the dresser board 11 according to the present embodiment includes a first layer 13 containing abrasive grains and a plurality of second layers 15 stacked on the first layer 13 in sandwiching relation thereto. The dresser board 11 thus makes it possible to dress the cutting blade 14 without forming deep grooves in advance therein. Therefore, the dresser

board 11 is prevented from warping. As a result, the dresser board 11 can appropriately be held on the chuck table 4 for suitably correcting the shape of the cutting blade 14 when the dresser board 11 dresses the cutting blade 14.

According to the embodiment described above, the second layers 15 contain abrasive grains, i.e., second abrasive grains, whose average diameter is smaller than the abrasive grains, i.e., first abrasive grains, contained in the first layers 13. However, the second layers 15 can be devoid of abrasive grains. The second layers 15 that are free of abrasive grains allow the lower surface 14a of the cutting blade 14 to be corrected more easily into a flat configuration as both side surfaces of the distal cutting edge of the cutting blade 14 that are held in abrasive contact with the second layers 15 are less liable to wear.

The details of the structure and process according to the above embodiment can be changed or modified without departing from the scope of the present invention.

The present invention is not limited to the details of the above described preferred embodiment. The scope of the invention is defined by the appended claims and all

changes and modifications as fall within the equivalence of the scope of the claims are therefore to be embraced by the invention.

WHAT IS CLAIMED IS:

1. A dresser board for use in correcting a shape of a cutting blade, comprising:

a first layer including first abrasive grains and a first binding material that holds the first abrasive grains; and

a plurality of second layers stacked on the first layer in sandwiching relation thereto,

wherein a thickness of the first layer is smaller than a width of the cutting blade, and

the second layer includes second abrasive grains whose average diameter is smaller than that of the first abrasive grains and a second binding material that holds the second abrasive grains.

2. The dresser board according to claim 1,

wherein the first abrasive grains and the second abrasive grains are made of green carborundum or white alundum, and

each of the first binding material and the second binding material includes a resin bond.

3. The dresser board according to claim 1,

wherein the average diameter of the first abrasive grains is in a range from 1 to 200 μm , and

the average diameter of the second abrasive grains

is in a range from 0.1 to 20 μm .

4. A dresser board for use in correcting a shape of a cutting blade, comprising:

a first layer including abrasive grains and a binding material that holds the abrasive grains; and
a plurality of second layers stacked on the first layer in sandwiching relation thereto,

wherein a thickness of the first layer is smaller than a width of the cutting blade, and

the second layer is devoid of abrasive grains.

5. A method of dressing a cutting blade to correct a shape of the cutting blade by use of a dresser board, the dresser board including a first layer including abrasive grains and a binding material that holds the abrasive grains and a plurality of second layers stacked on the first layer in sandwiching relation thereto, a thickness of the first layer being smaller than a width of the cutting blade, the second layer including second abrasive grains whose average diameter is smaller than that of the first abrasive grains and a second binding material that holds the second abrasive grains, the method comprising the steps of:

holding the dresser board on a chuck table such that the dresser board has an upper surface facing

upwardly where the first layer and the second layers are exposed; and

moving the cutting blade and the dresser board relatively to each other to cause a distal cutting edge of the cutting blade to cut into the upper surface of the dresser board along the first layer, thereby bringing a lower surface of the cutting blade into contact with the first layer and bringing both side surfaces of the distal cutting edge of the cutting blade into contact with the second layers thereby to correct a shape of the distal cutting edge of the cutting blade.

6. A method of dressing a cutting blade to correct a shape of the cutting blade by use of a dresser board, the dresser board including a first layer including abrasive grains and a binding material that holds the abrasive grains and a plurality of second layers stacked on the first layer in sandwiching relation thereto, a thickness of the first layer being smaller than a width of the cutting blade, the second layer being devoid of abrasive grains, the method comprising the steps of:

holding the dresser board on a chuck table such that the dresser board has an upper surface facing upwardly where the first layer and the second layers are exposed; and

moving the cutting blade and the dresser board relatively to each other to cause a distal cutting edge of the cutting blade to cut into the upper surface of the dresser board along the first layer, thereby bringing a lower surface of the cutting blade into contact with the first layer and bringing both side surfaces of the distal cutting edge of the cutting blade into contact with the second layers thereby to correct a shape of the distal cutting edge of the cutting blade.