

DRESSING BOARD AND DRESSING METHOD FOR CUTTING BLADE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a dressing board for dressing a cutting blade for cutting a workpiece and also to a cutting blade dressing method using this dressing board.

Description of the Related Art

In a device chip fabrication process, a wafer having a plurality of devices such as integrated circuits (ICs) and large scale integrations (LSIs) on the front side is used, in which the plural devices are individually formed in a plurality of separate regions defined by a plurality of crossing division lines (streets) set on the front side of the wafer. By dividing this wafer along the division lines, a plurality of device chips respectively including the plural devices are obtained. These device chips are mounted in various electronic equipment such as mobile phones and personal computers. The wafer is divided by using a cutting apparatus including a chuck table for holding the wafer and a cutting unit for cutting the wafer. The cutting unit in the cutting apparatus includes an annular cutting

blade for cutting the wafer. For example, the cutting blade is formed by fixing abrasive grains of diamond or the like with a bond such as metal (see JP-A-2000-87282). By rotating the cutting blade mounted on a spindle included in the cutting unit and then making the cutting blade cut the wafer held on the chuck table, the wafer is cut to be divided.

Prior to cutting the wafer by using the cutting blade, dressing of the cutting blade is performed in such a manner that the outer circumferential portion of the cutting blade is intentionally worn to suitably expose the abrasive grains from the bond. In such a dressing operation, a dressing wafer (dummy wafer) formed of the same material as that of the wafer as a workpiece is used, and the cutting blade being rotated is made to linearly cut this dummy wafer. This linear cutting of the dummy wafer by the cutting blade is repeated until the bond in the outer circumferential portion of the cutting blade is worn to suitably project the abrasive grains from the bond. As a result, a condition of the cutting blade becomes a good condition suitable for the cutting of the wafer as a workpiece.

However, in the case of using such a dummy wafer to perform the dressing of the cutting blade, it is

necessary to repeat the cutting of the dummy wafer with the cutting blade many times (e.g., approximately 400 times), thus expending much time and effort in the dressing operation. Accordingly, when the dressing operation is performed, the processing (cutting) of the wafer by the cutting apparatus is suspended for a long period of time, causing a reduction in processing efficiency. To cope with this problem, there has been proposed a technique of dressing the cutting blade by using a dressing board containing abrasive grains and making the cutting blade cut this dressing board (see JP-A-2011-11280). By using this dressing board, the amount of wear of the cutting blade is increased as compared with the case of using the dummy wafer. Accordingly, the number of repetitions of cutting required for the dressing of the cutting blade can be reduced to thereby greatly reduce the number of steps and time required for the dressing operation.

SUMMARY OF THE INVENTION

As described above, the dressing operation can be performed efficiently by using the dressing board containing abrasive grains to dress the cutting blade. However, when the cutting blade is made to cut this

dressing board, the bond in the outer circumferential portion of the cutting blade tends to be largely worn by the dressing board, so that the abrasive grains are prone to excessively project from the bond. As a result, when the wafer is cut by this cutting blade in a condition where an amount of projection of the abrasive grains in the cutting blade is large, there is a possibility that defective processing of the wafer such as chipping may occur to cause a reduction in quality of the device chips.

It is therefore an object of the present invention to provide a dressing board which can suppress occurrence of defective processing of a workpiece by the cutting blade. It is another object of the present invention to provide a cutting blade dressing method using this dressing board.

In accordance with an aspect of the present invention, there is provided a dressing board for dressing a cutting blade for cutting a workpiece, the dressing board being adapted to be cut by the cutting blade, thereby dressing the cutting blade, the dressing board including a substrate not containing abrasive grains, and a dressing member provided on the substrate and containing abrasive grains, the substrate and the dressing member coming into contact with the cutting

blade in dressing the cutting blade, thereby wearing the cutting blade.

Preferably, the substrate is formed of the same material as that of the workpiece. Preferably, the thickness of the substrate is in a range of 0.2 to 1 mm; and the thickness of the dressing member is in a range of 0.05 to 1 mm.

In accordance with another aspect of the present invention, there is provided a dressing method for dressing a cutting blade for cutting a workpiece, by using a dressing board including a substrate not containing abrasive grains and a dressing member provided on the substrate and containing abrasive grains, the dressing method including a holding step of holding the substrate side of the dressing board on a chuck table included in a cutting apparatus, and a dressing step of making the cutting blade cut the dressing member side of the dressing board after performing the holding step, thereby cutting both the dressing member and the substrate by using the cutting blade.

The dressing board according to the present invention includes the substrate not containing abrasive grains and the dressing member containing abrasive grains. Both the dressing member and the substrate are cut by the

cutting blade to thereby perform dressing of the cutting blade. At this time, the cutting blade being rotated is made to cut the dressing member side of the dressing board such that the outer circumferential portion of the cutting blade reaches the substrate, so that the wearing of the outer circumferential portion of the cutting blade is reduced. Accordingly, excessive dressing of the cutting blade is prevented, and it is therefore possible to suppress the occurrence of defective processing in cutting the workpiece by using 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. 1A is a perspective view depicting a dressing board according to a preferred embodiment of the present invention;

FIG. 1B is a sectional view of the dressing board depicted in FIG. 1A;

FIG. 2 is a perspective view of the dressing board in a condition where it is supported to a ring frame;

FIG. 3 is a perspective view depicting a cutting apparatus including a cutting blade; and

FIG. 4 is a sectional view depicting a condition that the cutting blade is made to cut the dressing board.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will now be described with reference to the attached drawings. There will first be described a configuration example of a dressing board according to this preferred embodiment. The dressing board according to this preferred embodiment is used for dressing of an annular cutting blade for cutting a workpiece.

The cutting blade is a processing tool adapted to be made to cut into a workpiece, thereby cutting the workpiece. The cutting blade is formed by fixing abrasive grains with a bond such as diamond. Examples of the cutting blade include an electroformed hub blade and an annular blade (washer blade). The electroformed hub blade is composed of a hub and a cutting edge fixed to the hub, the cutting edge being formed by fixing abrasive grains with nickel plating or the like as a bond. Meanwhile, the

annular blade is a hubless blade composed only of a cutting edge formed by fixing abrasive grains with a bond such as metal, ceramic, and resin.

For example, the workpiece to be cut by the cutting blade may be a silicon wafer including a plurality of devices such as ICs and LSIs. These plural devices are individually formed in a plurality of separate regions defined by setting a plurality of crossing division lines (streets) on the front side of the wafer. By using the cutting blade to cut the silicon wafer and thereby divide the silicon wafer along the division lines, a plurality of device chips including the plural respective devices are manufactured. The workpiece is not limited in material, shape, structure, size, etc. For example, the workpiece may be a wafer formed of any semiconductors other than silicon, such as arsenide (GaAs), indium phosphide (InP), gallium nitride (GaN), silicon carbide (SiC). Further, the workpiece may be a wafer formed of glass, ceramic, resin, or metal, for example. Such a wafer may have an arbitrary shape and size. Further, the devices formed on the workpiece are not limited in kind, number, shape, structure, size, layout, etc. The devices may not be formed on the workpiece. Further, the workpiece may be a package substrate such as a chip size

package (CSP) substrate and a quad flat non-leaded package (QFN) substrate.

By rotating the cutting blade and making the outer circumferential portion of the cutting blade cut into the dressing board, the outer circumferential portion of the cutting blade comes into contact with the dressing board, and the bond contained in the cutting blade is worn by the dressing board, so that an amount of projection of the abrasive grains from the bond in the cutting blade is increased. In this manner, dressing of the cutting blade is performed to thereby improve the sharpness of the cutting blade.

FIG. 1A is a perspective view depicting a dressing board 11, and FIG. 1B is a sectional view of the dressing board 11 depicted in FIG. 1A. As depicted in FIGS. 1A and 1B, the dressing board 11 includes a plate-shaped substrate (first dressing layer) 13 and a plate-shaped dressing member (second dressing layer) 15 provided on the substrate 13. The dressing member 15 is superimposed on the substrate 13 in a direction corresponding to the thickness of the dressing board 11 in such a manner that the dressing member 15 is in contact with the substrate 13. In this preferred embodiment, both the substrate 13 and the dressing member

15 are rectangular as viewed in plan as depicted in FIGS. 1A and 1B. However, the substrate 13 and the dressing member 15 are not limited in shape in the present invention.

The substrate 13 is a plate-shaped member not containing abrasive grains. The substrate 13 has a front side (first surface) 13a and a back side (second surface) 13b. For example, the substrate 13 is formed of the same material as that of the workpiece to be cut by the cutting blade. In the case that the workpiece to be cut by the cutting blade is a silicon wafer, a plate-shaped silicon member may be used as the substrate 13.

The dressing member 15 is provided on the front side 13a of the substrate 13. The dressing member 15 is a plate-shaped member containing abrasive grains. The dressing member 15 has a front side (first surface) 15a and a back side (second surface) 15b. For example, the dressing member 15 is formed of resin such as phenol resin and epoxy resin, and the abrasive grains contained in the dressing member 15 are formed of SiC. The dressing member 15 is stacked on the substrate 13 in such a manner that the back side 15b of the dressing member 15 is in contact with the front side 13a of the substrate 13.

The dressing member 15 may be formed separately

from the substrate 13 and thereafter may be attached to the substrate 13. Alternatively, the dressing member 15 may be formed directly on the substrate 13. For example, the dressing member 15 may be provided on the substrate 13 in the following manner. First, abrasive grains formed of SiC are impregnated with resin such as phenol resin and epoxy resin. Thereafter, this resin containing the abrasive grains is formed into a plate-shaped member. Thereafter, this plate-shaped member is baked at a predetermined temperature (e.g., in a range of 150°C to approximately 200°C) to thereby form the dressing member 15. Thereafter, the dressing member 15 thus formed is bonded to the substrate 13 by using an adhesive, for example. As a modification, the dressing member 15 may be formed directly on the front side 13a of the substrate 13 by using screen printing or the like. By using screen printing, the dressing member 15 having a small thickness (e.g., 100 μm or less) can be easily formed on the substrate 13. As another modification, the dressing member 15 may be formed on the substrate 13 in the following manner. First, the resin containing the abrasive grains is applied to the front side 13a of the substrate 13. Thereafter, the resin is spread on the front side 13a of the substrate 13 by using a suitable

tool such as a squeegee, thereby forming a resin layer having a substantially uniform thickness on the front side 13a of the substrate 13. Thereafter, this resin layer is baked to thereby form the dressing member 15 on the substrate 13.

The substrate 13 and the dressing member 15 are not limited in thickness. For example, the thickness of the substrate 13 may be set to 0.2 mm or more and 1 mm or less. Further, the thickness of the dressing member 15 may be set to 0.05 mm or more and 1 mm or less. Specific values for the thicknesses of the substrate 13 and the dressing member 15 are suitably set according to dressing conditions as described later. Further, the abrasive grains contained in the dressing member 15 are not limited in content, grain size, etc. For example, the abrasive grains are contained in the dressing member 15 in a ratio of 55% or more and 65% or less by weight. The grain size of the abrasive grains contained in the dressing member 15 is suitably set according to the material, thickness, diameter, etc. of the cutting blade to be dressed. For example, the average grain size of the abrasive grains contained in the dressing member 15 is set to 0.1 μm or more and 50 μm or less.

By using the dressing board 11 mentioned above,

dressing of the cutting blade is performed. In performing dressing of the cutting blade, the dressing board 11 is first supported to an annular ring frame 19 depicted in FIG. 2. FIG. 2 is a perspective view depicting the dressing board 11 supported to the ring frame 19.

In supporting the dressing board 11 to the ring frame 19, a circular tape 17 is first attached to the back side of the dressing board 11 (the back side 13b of the substrate 13). The tape 17 has a size (diameter) capable of covering the whole of the back side 13b of the substrate 13. The back side 13b of the substrate 13 is attached to a central portion of the tape 17. The tape 17 is not limited in material. For example, the tape 17 includes a circular base sheet and an adhesive layer (paste layer) formed on the base sheet. The base sheet is formed of resin such as polyolefin, polyvinyl chloride, and polyethylene terephthalate. The adhesive layer is formed of epoxy, acrylic, or rubber adhesive. As a modification, the adhesive layer may be formed of UV curing resin capable of being cured by applying ultraviolet radiation.

A peripheral portion of the tape 17 is attached to the ring frame 19. The ring frame 19 is formed of metal, for example. The ring frame 19 has a circular inside

opening 19a. The diameter of the inside opening 19a is larger than the diameter of a circumscribed circle of the dressing board 11. Accordingly, the dressing board 11 is located inside the inside opening 19a of the ring frame 19. Thus, the tape 17 is attached to both the dressing board 11 and the ring frame 19 in a condition where the dressing board 11 is surrounded by the ring frame 19. Accordingly, the dressing board 11 is supported through the tape 17 to the ring frame 19.

In a condition where the dressing board 11 is supported to the ring frame 19 as mentioned above, the cutting blade being rotated is made to cut into the dressing board 11 to thereby cut the dressing board 11, thereby performing dressing of the cutting blade. This dressing of the cutting blade is performed by using a cutting apparatus 2 depicted in FIG. 3. FIG. 3 is a perspective view of the cutting apparatus 2.

As depicted in FIG. 3, the cutting apparatus 2 includes a chuck table (holding table) 4 for holding the workpiece or the dressing board 11. The chuck table 4 has an upper surface substantially parallel both to the X direction (feeding direction, forward/backward direction, or first horizontal direction) depicted by an arrow X and to the Y direction (indexing direction, right/left

direction, or second horizontal direction) depicted by an arrow Y, in which the X direction and the Y direction are perpendicular to each other in a horizontal plane. The upper surface of the chuck table 4 functions as a holding surface for holding the workpiece or the dressing board 11. This holding surface is connected through a suction passage (not depicted) to a vacuum source (not depicted) such as an ejector, in which the suction passage is formed inside the chuck table 4. A plurality of clamps (not depicted) are provided on the outer circumference of the chuck table 4. These clamps function to fix the ring frame 19 supporting the dressing board 11 in such a manner as to grasp the ring frame 19. The chuck table 4 is connected both to a moving mechanism (not depicted) for moving the chuck table 4 in the X direction and to a rotating mechanism (not depicted) for rotating the chuck table 4 about its axis substantially parallel to the Z direction (vertical direction or upward/downward direction) depicted by an arrow Z, in which the Z direction is perpendicular both to the X direction and to the Y direction.

A cutting unit 6 for cutting the workpiece or the dressing board 11 is provided above the chuck table 4. The cutting unit 6 includes a cylindrical housing 8. A

cylindrical spindle (not depicted) is rotatably supported in the housing 8. The spindle has a rotation axis extending in the Y direction. A front end portion (one end portion) of the spindle is exposed to the outside of the housing 8, and an annular cutting blade 10 is mounted on this front end portion of the spindle. A rotational drive source such as a motor (not depicted) is connected to the base end portion (the other end portion) of the spindle. The cutting blade 10 mounted on the front end portion of the spindle is rotated by the power transmitted from the rotational drive source through the spindle.

A blade cover 12 is fixed to the housing 8 so as to surround the cutting blade 10 mounted on the front end portion of the spindle. That is, the cutting blade 10 mounted on the front end portion of the spindle is covered with the blade cover 12 fixed to the housing 8. The blade cover 12 includes a pair of connecting portions 14 and a pair of nozzles 16 respectively connected to the pair of connecting portions 14 (one of the pair of nozzles 16 being depicted in FIG. 3). The connecting portions 14 are respectively connected to tubes (not depicted) for supplying a cutting fluid such as pure water from a cutting fluid source (not depicted) to the

connecting portions 14. The nozzles 16 are located so as to face both side surfaces (front and back sides) of the cutting blade 10. Each nozzle 16 has a plurality of nozzle holes (not depicted) opening toward the cutting blade 10. Accordingly, when the cutting fluid is supplied to the connecting portions 14, the cutting fluid is sprayed from the nozzle holes of the pair of nozzles 16 toward both side surfaces (front and back sides) of the cutting blade 10. This cutting fluid functions to cool the cutting blade 10 and the workpiece or the dressing board 11 held on the chuck table 4 and also to wash away any cutting dust generated in the cutting operation of cutting the workpiece or the dressing board 11 with the cutting blade 10.

A moving mechanism (not depicted) for moving the cutting unit 6 is connected to the cutting unit 6. This moving mechanism functions to move the cutting unit 6 both in the Y direction and in the Z direction. Accordingly, both the Y position of the cutting blade 10 in the Y direction and the Z position of the cutting blade 10 in the Z direction can be controlled by operating this moving mechanism.

In performing the dressing of the cutting blade 10 by using the cutting apparatus 2, the dressing board 11

is first held on the chuck table 4 in the cutting apparatus 2 (holding step). More specifically, the dressing board 11 is placed through the tape 17 on the chuck table 4 in a condition where the front side of the dressing board 11 (the front side 15a of the dressing member 15) is exposed upward and the back side of the dressing board 11 (the back side 13b of the substrate 13) is opposed to the holding surface of the chuck table 4. Further, the ring frame 19 supporting the dressing board 11 is fixed by the plural clamps (not depicted) provided on the outer circumference of the chuck table 4. Thereafter, the vacuum source connected to the chuck table 4 is operated to apply a vacuum to the holding surface of the chuck table 4, thereby sucking the dressing board 11 through the tape 17 to the holding surface of the chuck table 4. Thus, the substrate 13 side of the dressing board 11 is held on the chuck table 4 under suction.

Thereafter, the cutting blade 10 being rotated is made to cut into the dressing member 15 side of the dressing board 11 to thereby cut both the substrate 13 and the dressing member 15 of the dressing board 11 (dressing step). By using the cutting blade 10 to cut the dressing board 11, the outer circumferential portion of

the cutting blade 10 (i.e., the cutting edge) is worn by the dressing board 11 to thereby dress the cutting blade 10.

In the dressing step, the chuck table 4 is first rotated to make the direction of extension of one side of the rectangular dressing board 11 parallel to the X direction or the Y direction. Further, the chuck table 4 and the cutting unit 6 are adjusted in position such that the cutting blade 10 and the dressing board 11 are not overlapped as viewed in plan, but overlapped as viewed in elevation. Further, the Z position of the cutting unit 6 in the Z direction is adjusted such that the outer circumferential portion of the cutting blade 10 reaches the substrate 13 of the dressing board 11 in the cutting operation. More specifically, the height of the cutting unit 6 is adjusted such that the lower end 10a of the cutting blade 10 (see FIG. 4) is positioned below the front side 13a of the substrate 13 and above the back side 13b of the substrate 13.

Thereafter, the cutting blade 10 is rotated and at the same time, the chuck table 4 is moved in the X direction to thereby relatively move the dressing board 11 and the cutting blade 10 in the X direction (feeding direction). Accordingly, the cutting blade 10 is made to

cut into the dressing member 15 side of the dressing board 11. During the movement of the chuck table 4 in the X direction, the substrate 13 and the dressing member 15 of the dressing board 11 are cut by the cutting blade 10 to thereby intentionally wear the cutting blade 10. As a result, a linear cut groove 11a having a bottom is formed on the dressing member 15 side of the dressing board 11. For example, the cutting blade 10 is rotated in the direction depicted by an arrow A in FIG. 3, and the chuck table 4 is moved in the direction (backward direction) depicted by an arrow B in FIG. 3. In this case, the chuck table 4 and the cutting blade 10 are relatively moved in the X direction such that the direction of movement of the lower end of the cutting blade 10 coincides with the direction of movement of the chuck table 4. At this time, the cutting blade 10 being rotated is made to cut the dressing board 11 from the front side (from the dressing member 15) toward the back side (toward the substrate 13). That is, so-called downcut is performed.

FIG. 4 is a sectional view depicting a condition where the cutting blade 10 being rotated is made to cut the dressing board 11. The cutting blade 10 is made to cut the dressing member 15 side of the dressing board 11 to a cut depth D where the lower end 10a of the cutting

blade 10 reaches the substrate 13 as depicted in FIG. 4. The cut depth D of the cutting blade 10 into the dressing board 11 corresponds to the difference in height between the front side of the dressing board 11 (the front side 15a of the dressing member 15) and the lower end 10a of the cutting blade 10. The cut depth D of the cutting blade 10 into the dressing board 11 also corresponds to the sum of a cut depth D_1 of the cutting blade 10 into the dressing member 15 and a cut depth D_2 of the cutting blade 10 into the substrate 13. The cut depth D_1 corresponds to the thickness of the dressing member 15, and the cut depth D_2 corresponds to the difference in height between the front side 13a of the substrate 13 and the lower end 10a of the cutting blade 10. That is, when the cutting blade 10 being rotated is made to cut the dressing board 11, the dressing member 15 is first cut from the front side 15a to the back side 15b by the cutting blade 10, so that the dressing member 15 is fully cut by the cutting blade 10. Besides, the substrate 13 is partially cut from the front side 13a by the cutting blade 10. As a result, the bond contained in the cutting blade 10 is worn at the outer circumferential portion of the cutting blade 10 by the dressing board 11. Thereafter, the cutting unit 6 is moved (indexed) in the Y direction, and the cutting blade

10 is similarly made to cut another area of the dressing board 11 where the cut groove 11a has not yet been formed. Thereafter, the above operation is similarly repeated until the abrasive grains sufficiently project from the bond contained in the cutting blade 10 at its outer circumferential portion. In this manner, the cutting blade 10 is sufficiently dressed to thereby improve the sharpness of the cutting blade 10.

The substrate 13 does not contain abrasive grains, but the dressing member 15 contains abrasive grains. Accordingly, wearing of the cutting blade 10 by the substrate 13 occurs less than that by the dressing member 15. Accordingly, when the cutting blade 10 being rotated is made to cut the dressing board 11, the outer circumferential portion of the cutting blade 10 comes into contact with the dressing member 15 to become worn and next comes into contact with the substrate 13 to become slightly worn. In this manner, the substrate 13 not containing abrasive grains is provided under the dressing member 15 containing abrasive grains, and the cutting blade 10 is made to cut the dressing board 11 from the dressing member 15 in such a manner that the lower end 10a of the cutting blade 10 reaches the substrate 13. As a result, as compared with the case that

the cutting blade 10 is made to cut only the dressing member 15, wearing of the outer circumferential portion of the cutting blade 10 can be reduced. Accordingly, excessive wearing of the bond in the outer circumferential portion of the cutting blade 10 can be prevented, and excessive projection of the abrasive grains in the outer circumferential portion of the cutting blade 10 can also be prevented. As a result, in cutting the workpiece by using the cutting blade 10 dressed by using the dressing board 11, it is possible to prevent the occurrence of defective processing such as chipping in the workpiece. In another aspect, wearing of the cutting blade 10 is mainly given by the contact with the dressing member 15 containing abrasive grains. Accordingly, as compared with the conventional case that the cutting blade 10 is made to cut a dressing wafer (dummy wafer) formed of the same material as that of the workpiece and not containing abrasive grains, wearing of the cutting blade 10 can be accelerated. As a result, it is possible to reduce the number of steps and the time required for the dressing of the cutting blade 10.

Preferably, the substrate 13 is formed of the same material as that of the workpiece to be cut later by the cutting blade 10. For example, in the case that the

workpiece is a silicon wafer, the substrate 13 is preferably formed of silicon. In this case, the outer circumferential portion of the cutting blade 10 comes into contact with the substrate 13 formed of the same material as that of the workpiece, so that the outer circumferential portion of the cutting blade 10 is worn by the substrate 13. As a result, an amount of projection of the abrasive grains in the outer circumferential portion of the cutting blade 10 can be optimized according to the material of the workpiece. Accordingly, the dressing of the cutting blade 10 is performed so as to conform to the cutting of the workpiece, so that a condition of the cutting blade 10 becomes more suitable for the cutting of the workpiece. However, the material of the substrate 13 may be different from the material of the workpiece. In this case, the material of the substrate 13 is preferably selected such that the effect of wearing the cutting blade 10 by the substrate 13 becomes equivalent to the effect of wearing the cutting blade 10 by the workpiece, according to the property of the workpiece (e.g., brittleness, ductility, and toughness). For example, in the case that the workpiece is a GaAs wafer, the substrate 13 may be formed of silicon.

The values for the cut depth D and the cut depth D_2

depicted in FIG. 4 are set so that the dressing of the cutting blade 10 is suitably performed, according to the material, thickness, and diameter of the cutting blade 10 and the material of the dressing board 11, for example. According to the values for the cut depth D and the cut depth D_2 , the thickness of the dressing member 15 (corresponding to the cut depth D_1) is set. For example, in the case that the cut depth D is set to approximately 0.25 to 0.3 mm, and the cut depth D_2 is set to approximately 0.05 to 0.1 mm, the thickness of the dressing member 15 is set to approximately 0.2 mm.

The thickness of the substrate 13 is not limited on the precondition that it is larger than the cut depth D_2 . However, the thickness of the substrate 13 is preferably set such that the rigidity of the substrate 13 is high to some extent and the deformation of the dressing board 11 is hard to occur. For example, the thickness of the substrate 13 is set to a value greater than or equal to the thickness of the dressing member 15, preferably a value greater than or equal to a value three times the thickness of the dressing member 15. As a modification, a support member for supporting the dressing board 11 may be fixed to the back side 13b of the substrate 13, thereby increasing the rigidity of the dressing board 11.

As described above, the dressing board 11 according to this preferred embodiment includes the substrate 13 not containing abrasive grains and the dressing member 15 containing abrasive grains. Both the dressing member 15 and the substrate 13 are cut by the cutting blade 10 to thereby perform the dressing of the cutting blade 10. At this time, the cutting blade 10 being rotated is made to cut the dressing member 15 side of the dressing board 11 such that the outer circumferential portion of the cutting blade 10 reaches the substrate 13, so that the wearing of the outer circumferential portion of the cutting blade 10 is reduced. Accordingly, excessive dressing of the cutting blade 10 can be prevented, and it is therefore possible to suppress the occurrence of defective processing in cutting the workpiece by using the cutting blade 10.

The cutting blade 10 to be dressed is in a condition where the abrasive grains in the outer circumferential portion of the cutting blade 10 are hardly exposed. If the cutting blade 10 in this condition is made to cut the dressing board 11, the pressure (processing load) applied to the dressing board 11 and the cutting blade 10 becomes large, so that there is a possibility that the dressing board 11 and the cutting

blade 10 may be broken or chipped. To cope with this problem, the feed speed of the dressing board 11 in the first half of the dressing operation is preferably set lower than the feed speed in the second half of the dressing operation. For example, the dressing operation is preferably performed in the following manner. First, the cutting blade 10 is rotated at a predetermined rotational speed (e.g., 30000 rpm). Further, the chuck table 4 is moved at a first feed speed (e.g., 10 mm/s) to thereby perform cutting of the dressing board 11 at a first time by using the cutting blade 10 (first cutting step). Thereafter, the rotational speed of the cutting blade 10 is maintained, and the chuck table 4 is moved at a second feed speed (e.g., 40 mm/s) higher than the first feed speed to thereby perform cutting of the dressing board 11 at a second time and subsequent times by using the cutting blade 10 (second cutting step). In this manner, the feed speed of the chuck table 4 in at least the first cutting step is set to a relatively low speed, thereby reducing the processing load and preventing the occurrence of breaking and chipping of the dressing board 11 and the cutting blade 10 in the dressing operation. The number of times in the first cutting step and in the second cutting step is not limited. For example, the

number of times in the first cutting step is set to 1, and the number of times in the second cutting step is set to approximately 10 to 50.

Further, the cut depth of the cutting blade 10 into the dressing board 11 in the first cutting step may be set smaller than the cut depth of the cutting blade 10 into the dressing board 11 in the second cutting step. Also in this case, the processing load in the first cutting step can be reduced.

In addition, the structure, method, etc. according to this preferred embodiment may be suitably modified without departing from the scope of the object 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 dressing board, the dressing board comprising:

a substrate not containing abrasive grains; and
a dressing member provided on the substrate and containing abrasive grains;

the dressing board being adapted to be cut by a cutting blade when the substrate and the dressing member comes into contact with the cutting blade in dressing the cutting blade, thereby wearing the cutting blade, wherein

the cutting blade is configured to cut a workpiece;

the substrate is formed of the same material as that of the workpiece; and

the substrate is a separate member from the workpiece and the workpiece is not a part of the dressing board.

2. The dressing board according to claim 1, wherein the substrate has a thickness which is set to a value greater than or equal to the thickness of the dressing member.

3. The dressing board according to claim 1, wherein the thickness of the substrate is in a range of

0.2 to 1 mm, and

the thickness of the dressing member is in a range of 0.05 to 1 mm.

4. The dressing board according to claim 1, wherein when the cutting blade being rotated is made to cut the dressing board, the dressing member is fully cut in its thickness by the cutting blade, while the substrate is partially cut in its thickness.

5. A dressing method of dressing a cutting blade for cutting a workpiece, by using a dressing board, the dressing board comprising a substrate not containing abrasive grains and a dressing member provided on the substrate and containing abrasive grains, the dressing method comprising:

a holding step of holding the substrate side of the dressing board on a chuck table included in a cutting apparatus; and

a dressing step of making the cutting blade cut the dressing member side of the dressing board after performing the holding step, thereby cutting both the dressing member and the substrate by using the cutting blade; wherein

the substrate is formed of the same material as that of the workpiece; and wherein the substrate is a

separate member from the workpiece and the workpiece is not a part of the dressing board.

6. The dressing method according to claim 5, wherein when the cutting blade being rotated is made to cut the dressing board, the dressing member is fully cut in its thickness by the cutting blade, while the substrate is partially cut in its thickness.