

CHUCK TABLE FOR CUTTING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a chuck table for use in a cutting apparatus.

Description of the Related Art

There has been known a cutting apparatus for cutting resin-packaged substrates such as chip scale packages (CSPs) or Quad Flat Non-leaded (QFN) packages with a cutting blade to divide them into device chips. A cutting process for dividing a resin-packaged substrate into device chips may use a jig dicer for cutting the resin-packaged substrate fixed as a workpiece to a chuck table that has clearance grooves defined therein in alignment with projected dicing lines on the resin-packaged substrate and also has suction ports defined therein for holding device chips under suction on the chuck table (see, for example, JP2015-093335A). Such a chuck table is advantageous compared with a conventional process that processes a workpiece fixed to an annular frame by an adhesive tape, because the chuck table makes it unnecessary to use adhesive tapes as consumables and hence reduces the manufacturing cost of device chips.

SUMMARY OF THE INVENTION

However, in a case where device chips to be produced need to be changed in design, for example, in a case where the size of device chips needs to be changed, it is necessary to fabricate a new chuck table adapted to the changed design, and hence the cost of the new chuck table is incurred, increasing the overall production period for device chips. Moreover, the chuck table includes a metal plate made of stainless steel or the like with clearance grooves and suction ports defined therein and a rubber sheet affixed to a portion of the metal plate on which a workpiece is to be placed, for protecting the workpiece placed on the metal plate. Since the metal plate made of stainless steel is difficult to machine, it is necessary to outsource metal plate machining to a machining professional. The need for outsourcing makes it difficult to reduce the processing cost of the chuck table and shorten the delivery period for the chuck table.

It is therefore an object of the present invention to provide a chuck table for use in a cutting apparatus that can be processed at a reduced cost and delivered in a shortened delivery period.

In accordance with an aspect of the present invention, there is provided a chuck table for holding under suction a plate-shaped workpiece with a plurality of intersecting projected dicing lines formed thereon, for use in a cutting apparatus including a cutting unit for cutting the workpiece held on the chuck table with a cutting blade to divide the workpiece into a plurality of device chips, and a table base to which the chuck table is to be fixed, the chuck table including a main body having an air-permeable hard plate and a rubber plate fixed to a face side of the hard plate, and a frame fitted over an outer circumference of the main body such that a holding surface of the rubber plate and a reverse side of the hard plate are exposed, the frame securing the main body detachably to the table base. In the chuck table, the rubber plate of the main body includes the holding surface for holding the workpiece thereon, cutting blade clearance grooves corresponding to the projected dicing lines on the workpiece held on the holding surface, and suction holes defined in areas demarcated by the cutting blade clearance grooves, and a negative pressure from the table base is transmitted through the hard plate into the suction holes in the rubber plate.

Preferably, the hard plate is made of an air-permeable hard resin or porous ceramic.

According to the present invention, the processing cost of the chuck table is reduced and the delivery period for the chuck table is shortened.

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 illustrating a structural example of a cutting apparatus according to an embodiment of the present invention;

FIG. 2 is a perspective view illustrating the appearance of a workpiece to be processed by the cutting apparatus illustrated in FIG. 1;

FIG. 3 is a perspective view illustrating the appearance of the workpiece illustrated in FIG. 2, as viewed from its reverse side;

FIG. 4 is an exploded perspective view illustrating

a structural example of a chuck table and a table base of the cutting apparatus illustrated in FIG. 1;

FIG. 5 is a cross-sectional view illustrating a cutting process carried out by the cutting apparatus illustrated in FIG. 1; and

FIG. 6 is an exploded cross-sectional view illustrating the manner in which a main body of the chuck table of the cutting apparatus illustrated in FIG. 1 is replaced with another main body.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will hereinafter be described in detail with reference to the drawings. The present invention is not limited to the details of the embodiment described below. The components described below cover those which could easily be envisaged by those skilled in the art and those which are essentially identical to those described above. Moreover, the arrangements described below can be used in appropriate combinations. Various omissions, replacements, or changes of the arrangements may be made without departing from the scope of the present invention.

A chuck table of a cutting apparatus according to

the preferred embodiment of the present invention will be described below with reference to the drawings. First, an overall structure of the cutting apparatus and the structure of a workpiece to be processed by the cutting apparatus will be described below. FIG. 1 illustrates in perspective a structural example of the cutting apparatus, denoted by 1, according to the present embodiment. FIG. 2 illustrates in perspective the appearance of the workpiece designated by 100 and to be processed by the cutting apparatus 1 illustrated in FIG. 1. FIG. 3 illustrates in perspective the appearance of the workpiece 100 illustrated in FIG. 2, as viewed from its reverse side. In the description that follows, X-axis directions refer to directions in a horizontal plane; Y-axis directions refer to directions perpendicular to the X-axis directions in the horizontal plane; and Z-axis directions refer to directions perpendicular to the X-axis directions and the Y-axis directions. The cutting apparatus 1 according to the present embodiment has a processing feed direction represented by one of the X-axis directions, an indexing feed direction by one of the Y-axis directions, and a cutting feed direction by one of the Z-axis directions.

The cutting apparatus 1 is an apparatus for cutting

the workpiece 100 that is held on the chuck table, denoted by 10. As illustrated in FIG. 2, the workpiece 100 is a packaged substrate including a wiring board 101 that has an insulative plate and a ground line made of an electrically conductive metal and embedded in the insulative plate and that also has electrodes and various interconnects on a face side 102 and a reverse side 103 thereof. The workpiece 100 further has a grid of intersecting projected dicing lines 104 formed on the face side 102 of the wiring board 101 and a plurality of devices 105 formed in respective areas demarcated on the face side 102 by the grid of intersecting projected dicing lines 104.

As illustrated in FIG. 3, the workpiece 100 includes sealant pads 106 on the reverse side 103 of the wiring board 101. The sealant pads 106 seal the devices 105 and unillustrated wires formed on the devices 105 by wire bonding. The sealant pads 106 are made of a molded resin such as an epoxy resin, a silicon resin, urethane resin, an unsaturated polyester resin, an acrylic urethane resin, or a polyimide resin. The workpiece 100 has surface irregularities because of the sealant pads 106 on the reverse side 103 of the wiring board 101. The workpiece 100 will be divided along the projected dicing

lines 104 into a plurality of device chips 107 including the respective devices 105.

The number of projected dicing lines 104, the spacing between the projected dicing lines 104, the number of devices 105, and other details are not limited to those illustrated in the embodiment. Stated otherwise, workpieces 100 having different stock numbers have different numbers of projected dicing lines 104, different spacings between the projected dicing lines 104, different numbers of devices 105, and different other details.

As illustrated in FIG. 1, the cutting apparatus 1 includes a chuck table 10, a table base 50, a pair of cutting units 70, a pair of processing fluid supply units 75, an image capturing unit 80, an X-axis moving unit 91, a Y-axis moving unit 92, a pair of Z-axis moving units 93, and a rotating unit 94. The cutting apparatus 1 is called a dicing saw with the two cutting units 70, i.e., a two-spindle dicing saw or a facing dual-type cutting apparatus. The cutting apparatus 1 may also include a cleaning unit for cleaning a workpiece 100 that has been cut, a cassette for storing workpieces 100 that are to be cut and that have been cut, a delivery unit for delivering workpieces 100 between the cassette, the chuck

table 10, and the cleaning unit, and other components. The components of the cutting apparatus 1 are controlled by an unillustrated control unit in the form of a computer.

The chuck table 10 holds the workpiece 100 under suction on a holding surface 31 thereof. The chuck table 10 does not hold workpiece 100 under suction through an adhesive tape or the like, but directly holds the workpiece 100 under suction on the holding surface 31 and also holds under suction device chips 107 individually divided from the workpiece 100. According to the present embodiment, the holding surface 31 of the chuck table 10 is of a rectangular shape that is larger than the outer profile of the workpiece 100. The chuck table 10 is detachably mounted on the table base 50. The chuck table 10 is connected to a suction source 60 (see FIG. 5) through a fluid communication hole 53 defined in the table base 50. The chuck table 10 holds the workpiece 100 on the holding surface 31 under a negative pressure applied thereto through the fluid communication hole 53 by the suction source 60. Structural details of the chuck table 10 will be described later.

While the chuck table 10 is in use, it is fixedly mounted on the table base 50. The table base 50 acts as a

rectangular tray in which the chuck table 10 is fitted. According to the present embodiment, the table base 50 is mounted on an X-axis movable base 4 movably disposed on an apparatus body 2. The X-axis movable base 4 is movable in the X-axis directions by the X-axis moving unit 91 between a processing area below the cutting units 70 and a loading and unloading area, spaced from the processing area, where the workpiece 100 is loaded onto and unloaded from the chuck table 10. According to the present embodiment, the table base 50 is rotatably supported on the rotating unit 94 for rotation about a central axis parallel to the Z-axis directions. The rotating unit 94 is mounted on the X-axis movable base 4 that is movable in the X-axis directions by the X-axis moving unit 91. The X-axis movable base 4 has an upper surface lying along horizontal directions, i.e., the X-axis directions and the Y-axis directions. Structural details of the table base 50 will be described later.

Each of the cutting units 70 acts as cutting means on which there is detachably mounted a cutting blade 71 for cutting the workpiece 100 held on the chuck table 10 to divide the workpiece 100 into a plurality of device chips 107. One of the cutting units 70 is disposed on a column of a portal-shaped support frame 3 erected on the

apparatus body 2, with the Y-axis moving unit 92 and one of the Z-axis moving units 93 interposed therebetween. The other of the cutting units 70 is disposed on the other column of the portal-shaped support frame 3 with the Y-axis moving unit 92 and the other of the Z-axis moving units 93 interposed therebetween. The support frame 3 includes a horizontal beam interconnecting the upper end portions of the columns thereof. Each of the cutting units 70 is movable with respect to the workpiece 100 held on the chuck table 10 in the Y-axis directions by the Y-axis moving unit 92 and in the Z-axis directions by one of the Z-axis moving units 93. Each of the cutting units 70 is able to position the cutting blade 71 at any desired position on the holding surface 31 of the chuck table 10 by being moved by the Y-axis moving unit 92 and one of the Z-axis moving units 93. Each of the cutting units 70 includes the cutting blade 71, a spindle housing 72, and a spindle 73.

The cutting blade 71 includes an ultrathin grindstone that is substantially ring-shaped. According to the present embodiment, the cutting blade 71 is of a structure known as a hub blade including an annular base mounted on the spindle 73 and an annular cutting edge disposed on an outer circumferential edge portion of the

annular base and having a predetermined thickness. The annular base is made of an electrically conductive metal. The annular cutting edge is made of abrasive grains of diamond, cubic boron nitride (CBN), or the like and a bonding material or binder made of a metal, a resin, or the like that binds the abrasive grains.

The spindle housing 72 of one of the cutting units 70 is mounted on a Z-axis movable base 6 that is movable in the Z-axis directions by one of the Z-axis moving units 93. The spindle housing 72 of one of the cutting units 70 is supported on one of the columns of the portal-shaped support frame 3 with the Y-axis moving unit 92 and one of the Z-axis moving units 93 interposed therebetween. The spindle housing 72 of the other of the cutting units 70 is supported on the other of the columns of the portal-shaped support frame 3 with the Y-axis moving unit 92 and the other of the Z-axis moving units 93 interposed therebetween. Each of the spindle housings 72 is movable with respect to the workpiece 100 held on the chuck table 10 in the Y-axis directions by the Y-axis moving unit 92 and in the Z-axis directions by one of the Z-axis moving units 93.

The spindle 73 is rotatably mounted in the spindle housing 72 for rotation about its central axis. The

spindle 73 is rotated about its central axis by an unillustrated spindle motor when it is energized. The cutting blade 71 is mounted on a distal end portion of the spindle 73. According to the present embodiment, the spindle 73 and the cutting blade 71 of the cutting units 70 have their central axes extending parallel to the Y-axis directions.

The processing fluid supply units 75 supply a processing fluid to the workpiece 100 and the cutting blades 71 while the workpiece 100 is being cut by the cutting units 70. Each of the processing fluid supply units 75 includes an unillustrated processing fluid supply source and a processing fluid supply nozzle 76. The processing fluid supply source includes a tank for storing the processing fluid and a pump for supplying the processing fluid from the tank to the processing fluid supply nozzle 76. The processing fluid supply nozzle 76 is fixed to one of the cutting units 70 so that it can move in unison with the cutting unit 70. The processing fluid supply nozzle 76 supplies the processing fluid from the processing fluid supply source to the workpiece 100 and one of the cutting blades 71.

The image capturing unit 80 is fixed to one of the cutting units 70 for movement in unison therewith. The

image capturing unit 80 includes an image capturing device for capturing an image of a predetermined area of the face side 102 of the workpiece 100 held on the chuck table 10. The image capturing device may be a charge-coupled-device (CCD) image capturing device, a complementary-metal oxide semiconductor (CMOS) image capturing device, or the like, for example. The image capturing unit 80 captures an image of the workpiece 100 for use in an alignment process for positioning the workpiece 100 held on the chuck table 10 and the cutting blades 71 with respect to each other, and outputs the captured image to the control unit, etc.

The X-axis moving unit 91 is a unit for moving the chuck table 10 and the cutting units 70 relatively to each other in the X-axis directions representing the processing feed direction. According to the present embodiment, the X-axis moving unit 91 moves the table base 50 to which the chuck table 10 is fixed and the rotating unit 94 in the X-axis directions through the X-axis movable base 4. The X-axis moving unit 91 includes, for example, a known ball screw rotatable about a central axis parallel to the X-axis directions, a known electric motor for rotating the ball screw about the central axis, and known guide rails supporting thereon the X-axis

movable base 4 with the table base 50 mounted thereon for movement in the X-axis directions. According to the present embodiment, the guide rails of the X-axis moving unit 91 are mounted on the apparatus body 2 of the cutting apparatus 1.

The Y-axis moving unit 92 is a unit for moving the chuck table 10 and the cutting units 70 relatively to each other in the Y-axis directions representing the indexing feed direction. According to the present embodiment, the Y-axis moving unit 92 moves the cutting units 70 and the Z-axis moving units 93 in the Y-axis directions. The Y-axis moving unit 92 includes, for example, a known ball screw rotatable about a central axis parallel to the Y-axis directions, a known electric motor for rotating the ball screw about the central axis, and known guide rails supporting thereon Y-axis movable bases 5 for movement in the Y-axis directions. According to the present embodiment, the guide rails of the Y-axis moving unit 92 are mounted on the horizontal beam interconnecting the upper end portions of the columns of the support frame 3 in the cutting apparatus 1.

Each of the Z-axis moving units 93 is a unit for moving the chuck table 10 and the cutting units 70 relatively to each other in the Z-axis directions

representing the cutting feed direction. According to the present embodiment, the Z-axis moving units 93 are associated respectively with the cutting units 70. According to the present embodiment, each of the Z-axis moving units 93 moves the Z-axis movable base 6 that supports one of the cutting units 70, in the Z-axis directions. Each of the Z-axis moving units 93 includes, for example, a known ball screw rotatable about a central axis parallel to the Z-axis directions, a known electric motor for rotating the ball screw about the central axis, and known guide rails supporting thereon one of the cutting units 70 for movement in the Z-axis directions. According to the present embodiment, the guide rails of each of the Z-axis moving unit 93 are mounted on one of the Y-axis movable bases 5.

The rotating unit 94 is a unit for rotating the chuck table 10 and the cutting units 70 about a central axis parallel to the Z-axis directions. According to the present embodiment, the rotating unit 94 rotates the chuck table 10 about the central axis parallel to the Z-axis directions through the table base 50. The rotating unit 94 can be processing-fed in the X-axis directions in unison with the X-axis movable base 4 on which the table base 50 is mounted.

Structural details of the chuck table 10 and the table base 50 according to the present embodiment will be described below. FIG. 4 illustrates in exploded perspective a structural example of the chuck table 10 and the table base 50 of the cutting apparatus 1 illustrated in FIG. 1. FIG. 5 illustrates in cross section a cutting process carried out by the cutting apparatus 1 illustrated in FIG. 1. FIG. 6 illustrates in exploded cross section the manner in which a main body 11-1 of the chuck table 10 of the cutting apparatus 1 illustrated in FIG. 1 is replaced with another main body 11-2.

As illustrated in FIG. 4, the chuck table 10 includes and is separable into a main body 11 and a frame 40. The chuck table 10 is detachably mounted on the table base 50, as described above. The main body 11 has the holding surface 31 of the chuck table 10 on which the workpiece 100 is to be held. The main body 11 has a hard plate 20 and a rubber plate 30.

The hard plate 20 is of a rectangular shape that is larger than the outer profile of the workpiece 100. The hard plate 20 is made of an air-permeable hard resin or porous ceramic, for example. The air-permeable hard resin is, for example, a resin of a material having

interconnected open cells and a low dust-raising capability, such as foamed urethane, foamed polyethylene (PE), or foamed polypropylene (PP). The hard plate 20 may also be made of a hard resin with a filler or the like added for restrained heat shrinkage.

The rubber plate 30 is of a rectangular shape that is almost the same as the hard plate 20. The rubber plate 30 is fixed to the face side of the hard plate 20 with an adhesive or the like layered therebetween. The rubber plate 30 is made of a resin such as air-impermeable urethan rubber. The rubber plate 30 includes a holding surface 31, cutting blade clearance grooves 32, and suction holes 33. The holding surface 31 represents the face side of the rubber plate 30 that holds the workpiece 100 thereon. The cutting blade clearance grooves 32 are a plurality of grooves defined in a grid pattern in the holding surface 31 of the rubber plate 30. The cutting blade clearance grooves 32 correspond to the projected dicing lines 104 on the workpiece 100 that is supported on the holding surface 31. The suction holes 33 are through holes defined in areas demarcated by the cutting blade clearance grooves 32.

The frame 40 acts as a lid body shaped as a rectangular frame fitted over the outer circumference of

the main body 11. The frame 40 secures the main body 11 detachably to the table base 50. As illustrated in FIG. 5, the main body 11 that is secured in place by being sandwiched between the frame 40 and the table base 50 has the holding surface 31 of the rubber plate 30 and a reverse side 21 of the hard plate 20 exposed through an opening 41 in the frame 40. As illustrated in FIG. 4, according to the present embodiment, the frame 40 has screw-receiving through holes 42 defined respectively in four corners thereof and screws 43 extending through the screw-receiving through holes 42. The screw-receiving through holes 42 correspond respectively to screw holes 54 defined in the table base 50.

The chuck table 10 is fixed to the table base 50. The table base 50 that acts as a rectangular tray has a recess 51 defined in an upper surface thereof as a downward recess. The reverse side 21 of the hard plate 20 is supported on the bottom surface of the recess 51 in the table base 50. The main body 11 of the chuck table 10 is housed in the recess 51 while being placed on the bottom surface of the recess 51. The table base 50 has a negative pressure transmission chamber 52 defined in the bottom surface of the recess 51 as a downward recess, and a suction source fluid communication hole 53 defined in

the bottom surface of the negative pressure transmission chamber 52. The negative pressure transmission chamber 52 is a chamber shaped as a rectangular parallelepiped that preferably includes a region corresponding to the region of the rubber plate 30 where the suction holes 33 are defined. The negative pressure transmission chamber 52 is held in fluid communication with the recess 51. According to the present embodiment, the suction source fluid communication hole 53 is defined as a circular hole centrally in the bottom surface of the negative pressure transmission chamber 52. According to the present invention, however, the suction source fluid communication hole 53 is not limited to such details. As illustrated in FIG. 5, the suction source fluid communication hole 53 is connected to the suction source 60 through a passageway that may include an on-off valve 61. The on-off valve 61 provides fluid communication between the suction source 60 and the suction source fluid communication hole 53 only when the on-off valve 61 is energized. As illustrated in FIG. 4, according to the present embodiment, the table base 50 has screw holes 54 defined respectively in four corners thereof. The screw holes 54 correspond respectively to the screw-receiving through holes 42 in the frame 40.

As illustrated in FIG. 5, when the table base 50 houses the main body 11 therein and the frame 40 is fastened to the table base 50 by the screws 43, the negative pressure transmission chamber 52 is hermetically sealed. The chuck table 10 holds the workpiece 100 under suction when the negative pressure developed in the negative pressure transmission chamber 52 in the table base 50 by the suction source 60 is transmitted through the air-permeable hard plate 20 into the suction holes 33 in the rubber plate 30. According to the present embodiment, the chuck table 10 holds under suction the reverse side 103 of the workpiece 100 that includes the sealant pads 106. At this time, the projected dicing lines 104 of the workpiece 100 and the cutting blade clearance grooves 32 in the rubber plate 30 are positioned in alignment with each other to prevent the cutting blades 71 from cutting the rubber plate 30 when the cutting units 70 cut the workpiece 100.

The main body 11 is fabricated by affixing the rubber plate 30 to the hard plate 20 by an adhesive or the like and thereafter forming the cutting blade clearance grooves 32 and the suction holes 33 in the rubber plate 30. The main body 11 may alternatively be fabricated by forming the cutting blade clearance grooves

32 and the suction holes 33 in the rubber plate 30 and thereafter affixing the rubber plate 30 with the cutting blade clearance grooves 32 and the suction holes 33 formed therein to the hard plate 20 by an adhesive or the like.

The number of cutting blade clearance grooves 32, the spacing between the cutting blade clearance grooves 32, the number of suction holes 33, and other details of the rubber plate 30 need to be determined depending on the number of projected dicing lines 104, the spacing between the projected dicing lines 104, the number of devices 105, and other details of the corresponding workpiece 100. The chuck table 10 according to the present embodiment is able to incorporate a selected one of a plurality of main bodies 11 having different numbers of cutting blade clearance grooves 32, different spacings between the cutting blade clearance grooves 32, different numbers of suction holes 33, and different other details depending on different numbers of projected dicing lines 104, different spacings between the projected dicing lines 104, different numbers of devices 105, and different other details of different corresponding workpieces 100.

The chuck table 10 is detachably mounted on the

table base 50 and is separable into the main body 11 and the frame 40. As illustrated in FIG. 6, therefore, when the frame 40 is detached from the table base 50, the main body, herein denoted by 11-1, placed between the frame 40 and the table base 50 can be replaced with another main body 11-2. For replacing the main body 11-1, the screws 43 that secure the frame 40 to the table base 50 are removed. Then, the frame 40 is lifted off the table base 50, exposing the outer circumference of the main body 11-1 that has been used. Thereafter, the main body 11-1 housed in the table base 50 is lifted off the table base 50, and then, the other main body 11-2 is placed on the bottom surface of the recess 51 in the table base 50. The frame 40 is attached to the table base 50 and then fastened thereto by the screws 43. The replacement is now completed.

As described above, the chuck table 10 of the cutting apparatus 1 according to the present embodiment includes the main body 11 and the frame 40 by which the main body 11 is fixed to the table base 50. Inasmuch as the main body 11 has the cutting blade clearance grooves 32 and the suction holes 33 defined in the rubber plate 30, it can easily be processed. Therefore, it is possible to reduce the processing cost of the chuck table 10 and

shorten the delivery period for the chuck table 10. As the frame 40 secures the main body 11 detachably to the table base 50, only the main body 11 can easily be replaced. Consequently, even in a case where device chips to be produced need to be changed in design, for example, in a case where the size of device chips needs to be changed, the manufacturing cost of the chuck table 10 and the overall production period for device chips are prevented from increasing. Even if the hard plate 20 is loaded with swarf trapped therein and suction forces transmitted therethrough are lowered, the chuck table 10 can be fabricated inexpensively and the main body 11 can easily be replaced.

Moreover, with conventional chuck tables, the reverse side of a metal plate of stainless steel or the like that has a holding surface is positioned in facing relation to a negative pressure transmission chamber and a negative pressure from the negative pressure transmission chamber acts directly in suction holes defined in the metal plate. Since there is a cavity below the holding surface, the holding surface may possibly vibrate while the workpiece is being processed. On the other hand, with the chuck table 10 according to the present embodiment, the rubber plate 30 is fixed to the

air-permeable hard plate 20 and the hard plate 20 is housed in the recess 51 in the table base 50 and placed on the bottom surface of the recess 51, and thus, the holding surface 31 is stably secured in place. Accordingly, the device chips 107 are prevented from outer profile distortion and chipping due to the workpiece 100 being displaced while it is being processed. Furthermore, as the rubber plate 30 having the holding surface 31 is supported on the hard plate 20 that is supported on the bottom surface of the recess 51, the holding surface 31 is unlikely to be distorted when the main body 11 is secured in place by tightening the screws 43.

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 chuck table for holding under suction a plate-shaped workpiece with a plurality of intersecting projected dicing lines formed thereon, for use in a cutting apparatus including a cutting unit for cutting the workpiece held on the chuck table with a cutting blade to divide the workpiece into a plurality of device chips, and a table base to which the chuck table is to be fixed, the chuck table comprising:

a main body having an air-permeable hard plate and a rubber plate fixed to a face side of the hard plate;
and

a frame fitted over an outer circumference of the main body such that a holding surface of the rubber plate and a reverse side of the hard plate are exposed, the frame securing the main body detachably to the table base, wherein

the rubber plate of the main body includes
the holding surface for holding the
workpiece thereon,

cutting blade clearance grooves
corresponding to the projected dicing lines on the
workpiece held on the holding surface, and

suction holes defined in areas demarcated by

the cutting blade clearance grooves, and

a negative pressure from the table base is transmitted through the hard plate into the suction holes in the rubber plate.

2. The chuck table according to claim 1, wherein the hard plate is made of an air-permeable hard resin or porous ceramic.