SPECIFICATION

TITLE OF THE INVENTION

DICING FRAME

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a dicing frame for use in semiconductor wafer dicing work or the like.

(2) Description of the Prior Art

A conventional dicing frame is comprised of a hollow frame 1 for accommodating a semiconductor wafer W and a dicing film 10 that is adhered to the frame 1 and adhesively holds semiconductor wafer W thereon as shown in FIG. 6 (see patent document 1).

Frame 1 is formed of SUS etc., and shaped in a flat, approximately annular form, so that it can be removably vacuum-suctioned by a plurality of vacuum suctioning pads having an unillustrated, approximately funnel-shape to be transferred and conveyed. Dicing film 10 is formed of a soft vinyl chloride resin film having a flat circular shape, for example, on which an acrylic adhesive is applied and laminated.

With this dicing frame 1, semiconductor wafer W adhesively held on dicing film 10 is diced into a plurality of dies D by a diamond blade 40 as shown in FIG. 6, then is set on an unillustrated expander so that dicing film 10 is expanded radially outwardly so that dies D do not contact

with each other. Then, these dies D are picked up one by one from dicing film 10 and conveyed.

Though frames 1 of the dicing frames were previously formed using SUS or other similar materials, recently the frames have become to be formed by molding resin material in order to meet the recent demand for light-weightness, and a spot facing portion 30A having a flat rectangular shape is formed on the obverse surface as shown in FIG. 7. This spot facing portion 30A is to have a bar code or RF tag 34 of a RFID system, adhered therein with an adhesive etc. (see patent document 2).

Spot facing portion 30A is depressed with a linear and angular approximately U-shaped section so as to be greater and deeper than bar code or RF tag 34 depending on the size and thickness of the bar code or RF tag 34.

Patent document 1:

Japanese Patent Application Laid-open 2006-299266.

Patent document 2:

Japanese Patent Application Laid-open 2007-62333.

Since the conventional dicing frame is thus configured having an angular spot facing portion 30A depressed on the frame 1 surface with bar code or RF tag 34 fitted in and adhered to this spot facing portion 30A, in some cases depending on the geometry of the vacuum suctioning area (spot facing portion 30A and its peripheral portion) there may occur the problem

that a gap is formed between spot facing portion 30A and the vacuum suctioning pad, causing air to leak through the gap and hindering vacuum attraction when the dicing frame is vacuum suctioned by vacuum suctioning pads.

As a countermeasure to solve this problem, there is a method of creating a seal against the gap by forming the vacuum pad using a flexible material. However, simple change of the material is not good enough to maintain the reliability, and there is a fear that vacuum suctioning will become impossible as the vacuum suctioning pad becomes hardened due to material degradation from aging.

SUMMARY OF THE INVENTION

The present invention has been devised in view of the above, it is therefore an object of the present invention to provide a dicing frame which essentially makes sure the suctioning when it is suctioned by suctioning pads.

In order to achieve the above object, a dicing frame of the present invention includes: a hollow frame formed of resin-containing molding material for holding a semiconductor wafer therein, the frame being detachably suctioned by suctioning pads, and is characterized in that at least one of the front and rear surfaces of the frame is formed with a depressed portion, and the surface of the frame and the bottom surface of the depressed portion are joined by a slope

having an inclination angle of about 30 degrees or below.

In the above, either a bar code or an RF tag of a RFID system may be attached inside the depressed portion.

Here, the frame specified by the scope of the claims is not particular limited to its shape and may take any shape such as a ring-like form, rectangular form or the like. Though there are different types of semiconductor wafers having different diameters, e.g., 200 mm, 300 mm, 450 mm and the like, the present invention is not particularly limited by the semiconductor wafer types. The number of suctioning pads is not particularly limited, either one or plural pads may be used. It is preferred that the surface of the frame, the bottom surface of the depressed portion and the slope are formed with a smooth curved surface free from corners. The depressed portion is not limited to its shape and may take any shape such as a flat circle, ellipse, rectangle, polygon and the like. The number of depressed portions is not particularly limited. That is, one or a plurality of depressed portions may be formed on the front side of the frame or on the rear side of the frame. Also, the necessary number of depressed portions may be formed on either side of the frame.

According to the present invention, since the inclination angle of the slope of the depressed portion is specified to be about 30 degrees or below, the periphery of the depressed portion has no steep rise, hence there is little risk of air

leaking between the depressed portion of the frame and the suctioning pad when the frame is suctioned by the suctioning pads.

According to the present invention, it is possible to provide a dicing frame which can be reliably suctioned when it is suctioned by suctioning pads.

When either a bar code or RF tag of a RFID system is attached to the depressed portion, it is possible to easily obtain the information as to the frame and semiconductor wafer from the bar code or the RF tag.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective illustrative view schematically showing the whole system including an embodiment of a dicing frame according to the present invention;

FIG. 2 is an illustrative top view schematically showing an embodiment of a dicing frame of the present invention;

FIG. 3 is an illustrative bottom view schematically showing an embodiment of a dicing frame of the present invention;

FIG. 4 is an illustrative view schematically showing a spot facing portion in an embodiment of a dicing frame of the present invention;

FIG. 5 is an illustrative view schematically showing a spot facing portion in another embodiment of a dicing frame

of the present invention;

FIG. 6 is an illustrative perspective view showing a conventional dicing frame; and,

FIG. 7 is an illustrative top view showing a dicing frame molded of resin material.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of a dicing frame according to the present invention will be described with reference to the drawings. As shown in FIGS. 1 to 4, the dicing frame of the present embodiment is a hollow frame 1 that is formed of a molding material for accommodating a semiconductor wafer W therein by means of a flexible dicing film 10 and is removably vacuum-suctioned by a plurality of vacuum suctioning pads 20. This dicing frame is formed with a spot facing portion 30 depressed in the rear on the obverse surface, designated at 4 of frame 1.

Frame 1 is formed of resin-containing molding material by injection molding in the form of a flat approximately ring-like plate of 2 to 3 mm thick having a diameter marginally greater than that of semiconductor wafer W. The frame is separated from the metal mold by means of a plurality of ejector pins. The molding material of this frame 1 is prepared by blending fibrous fillers, irregularly-shaped fillers in predetermined resin. For example, the molding material may

be prepared by mixing and kneading polyphenylene sulfide (PPS) resin or nylon resin which are excellent in fluidity, dimensional stability and precision moldability, with carbon fiber and/or calcium carbonate for securing rigidity and an aluminum borate whisker or the like which is excellent in chemical resistance and reinforcing effect.

As shown in FIGS. 1 to 3, frame 1 is constructed such that its inner peripheral surface 2 is formed with a slope or formed with an approximately projected V-shaped section while both the left and right sides of the outer periphery are linearly cut out in the front-to-rear direction and a pair of positioning notches 3 are cut out left and right in the front part of the outer periphery.

As shown in FIG. 1, semiconductor wafer W is of a type having a diameter of 300 mm, for example, and is adhesively and removably held on dicing film 10 that covers the hollow of frame 1 from its rear side. Then the semiconductor wafer is diced by diamond blade 40 into a plurality of dies D, thereafter the dies D are picked up one by one from dicing film 10 and conveyed.

Dicing film 10 is given in a thin flat circular form made of polyolefin film such as ethylene-vinyl acetate (EVA) or the like and a UV curable adhesive applied and laminated on the film surface. This dicing film is adhered to the rear side of frame 1 so that the film can be peeled off from the

rear side of frame 1 after usage, whereby frame 1 can be recycled. It is preferred that a UV curable adhesive that will lose its adhesiveness when exposed to UV radiation is laminated, however, an acrylic adhesive may be applied and laminated instead, if necessary.

As shown in FIGS. 1, 2 and 4, a spot facing portion 30 is indented approximately rectangularly in plan view and with an approximately dish-like section so as to be greater and deeper than bar code or RF tag 34 depending on the size and thickness of the bar code or RF tag 34 of RFID system 33. In the present embodiment, RF tag 34 is fitted and adhered with an adhesive etc.

Since the thickness of RF tag 34 is typically 0.2 to 0.4 mm, spot facing portion 30 is formed with 0.3 to 0.5 mm, or preferably 0.3 to 0.4 mm in depth. In view of preventing air leakage during vacuum suctioning, spot facing portion 30 is constructed such that the periphery of bottom 31 and the approximately flat surface 4 of frame 1 are connected by a tapered slope 32, the angle of inclination of the slope 32 being specified to be approximately 30 degrees or below (see FIG. 4).

As shown in FIG. 1, RFID system 33 comprises: RF tag 34 that moves with frame 1 and has a built-in memory accessible via radio waves; an antenna unit 35 for exchanging radio waves and electric power with the RF tag 34; a reader/writer 36

for controlling radio communication with RF tag 34; and a computer 37 for controlling the reader/writer 36. Antenna unit 35 and reader/writer 36 may be provided separately or integrated, as necessary. It is also possible to use various types of controllers instead of computer 37 as long as control of reader/writer 36 is not hindered.

According to the above configuration, instead of forming spot facing portion 30 having a linear and angular approximately U-shaped section, spot facing portion 30 is formed with a hollow having an approximately dish-like section and the inclination angle of slope 32 is specified to be approximately 30 degrees or below. That is, the periphery of spot facing portion 30 is not formed with a steep rise, so that it is possible to eliminate the problems occurring during vacuum suction by vacuum suctioning pads 20 that a large step or clearance is formed between spot facing portion 30 and vacuum suctioning pad 20, vacuum suctioning is hindered due to leakage through a gap, and the position of vacuum suctioning pad 20 is displaced. Accordingly, it is possible to expect reliable vacuum suctioning, markedly improve the positional flexibility of suctioning positions of vacuum suctioning pads 20 and smoothly transport and convey the dicing frame.

Further, since it is no longer necessary to form vacuum suctioning pad 20 with a soft material, it is possible to

eliminate the risk of vacuum suctioning pad 20 becoming hardened due to material degradation from aging and hence failing to perform vacuum suctioning. Further, in view of preventing air leakage, it is no longer necessary to use a small-diametric vacuum suctioning pad 20 that is poor in suctioning force or dedicated vacuum suctioning pad 20, hence it is possible to markedly increase the versatilities of frame 1, vacuum suctioning pad 20, the mounter, etc. Moreover, since frame 1 is made of resin instead of metal, it will not exert any adverse influence on the communication characteristics of RF tag 34.

Next, FIG. 5 shows another embodiment of the present invention. In this case, the boundaries between slope 32, and surface 4 of frame 1, and bottom 31 of spot facing portion 30 are not connected with an uncurved surface that is prone to form a step, but are connected with a smoothly continuous curved surface, so as not to form angular corners between these. Other configurations are the same as the above embodiment, so that description is omitted.

Also in this embodiment, the same operation and function as above can be expected. Further, since the surface 4 of frame 1, slope 32 and spot facing portion 30 are formed of a continuous curved surface without any corner, it is obvious that no large gap will be formed between spot facing portion 30 and vacuum suctioning pad 20.

The dicing frame of the present invention should not be limited to the above embodiment at all. For example, though in the above embodiment, RF tag 34 of RFID system 33 is attached in spot spacing portion 30 of frame 1, a bar code may be attached to spot spacing portion 30. Spot spacing portion 30 is not necessarily for attachment of RF tag 34 or bar code, but may be one that avoids generation of longitudinal burrs that would arise near ejection pins of the mold during a molding process.

WHAT IS CLAIMED IS:

1. A dicing frame comprising: a hollow frame formed of resin-containing molding material for holding a semiconductor wafer therein, the frame being detachably suctioned by suctioning pads,

characterized in that at least one of the front and rear surfaces of the frame is formed with a depressed portion, and the surface of the frame and the bottom surface of the depressed portion are joined by a slope having an inclination angle of about 30 degrees or below.

2. The dicing frame according to Claim 1, wherein either a bar code or an RF tag of a RFID system is attached inside the depressed portion.