"Apparatus for removing or decreasing the resin flush from the metallic part of a semiconductor device".

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DESCRIPTION

The present invention relates to an apparatus for removing or decreasing the resin flush from the metallic part of a semiconductor device.

Some semiconductor devices have an outer surface consisting of both a plastic resin part and a metallic part. The main purpose of the metallic part is to form a thermal conductor, particularly in power devices.

In the manufacturing process of these devices, a metallic frame is encapsulated with resin except for the mentioned thermal conductor.

Due to imperfections in the molding stage, some resin flush can accidentally cover portion of the metallic thermal conductivity part, hence highly increasing the thermal resistance thereof. In turn, this increase in thermal resistance affects negatively the lifetime of the device.

To remove or decrease the resin flush on the top of the metallic part, a specially designed equipment is used.

Said deflushing equipment uses an abrasive material suspended in water. This mixture is "fired" under pressure onto the semiconductor device, removing any plastic resin flush from the metal part. During the deflushing process, not only the resin flush breaks down, but also the abrasive material. For this reason, the mixture is filtered to remove very small abrasive material particles since their abrasive properties are practically lost. This means that the quantity of abrasive material suspended in the water varies and has to be monitored to be kept within the process limits.

Presently, to monitor the quantity of abrasive material suspended in the water, a unit volume of the mixture is collected in a measuring cylinder. The suspended material is left to settle. At this point, one reads that value of abrasive material per unit volume.

If this value is not satisfying, abrasive material is added into the

mixture.

This method of measuring has various disadvantages e.g.:

1. If the amount of suspended material in the water is not uniform, the result will be incorrect.

2. The result obtained is neither instantaneous nor continuous.

In view of the state of the art herein described, embodiments of the present invention seek to provide an apparatus for removing or decreasing the resin flush from the top of the metallic part of a semiconductor device, without the disadvantage above described.

In accordance with a first aspect of the present invention, there is provided an apparatus for removing or decreasing the resin flush from the top of the metallic part of a semiconductor device, comprising a main reservoir and nozzles for sprinkling a solution with abrasive material suspended therein onto a semiconductor device placed in said main reservoir, characterized in that it also comprises a pressure sensor placed at the bottom of said main reservoir, a liquid level sensor associated with said main reservoir and a control unit for feeding said solution to said nozzles according to the pressure and level raised by said sensors.

Said apparatus may allow a fast, constant and right measuring of the density of the abrasive material in the solution at the bottom of the main reservoir. In this way the solution sprinkled onto the semiconductor device has a constant density of said abrasive material.

The characteristics and the advantages of the present invention will be made evident by the following detailed description of an embodiment thereof, which is illustrated as non-limiting example in the enclosed drawing, in which:

Fig. 1 shows a schematic representation of the apparatus according to the present invention.

The apparatus shown in Fig. 1 comprises a main reservoir 1 housing a semiconductor device 2 supported by arms 3, and a secondary reservoir 4

filled with a solution 5.

Said apparatus comprises also a drainage valve 30, a pressure sensor 6 arranged at the bottom of the main reservoir 1 and a liquid level sensor 7 whose measurings are processed by a control unit 8.

Said control unit 8 commands a pump 9 that is part of a solution circulating circuit 20, and pumps 10 that are comprised in a solution re-circulating circuit 13 having a filter 14.

Inside the main reservoir 1 are settled nozzles 11 of the solution circulating circuit 20, and nozzles 12 of the solution re-circulating circuit 13.

In the operation, the semiconductor device 2 with the resin flush to be removed or decreased is placed in the position of fig.1

The control unit 8 commands the start of pumps 10 which re-circulate, through the filter 14, the solution 5 accumulated in the bottom of the reservoir 1 that firstly has a right value of abrasive density.

Nozzles 12 sprinkle under pressure the solution 5 onto the semiconductor device 2 removing the resin from the metal part thereof.

During this operation the abrasive material particles reduce their dimension, and so the filter 14 removes them from the solution 5 to be re-circulated. This means that the quantity of abrasive material suspended in the solution decreases, and so the efficiency of the apparatus increases.

The pressure sensor 6 measures a different value that is processes by the unit control 8.

It is known that:

- Density = Pressure / (Gravity x Height),
- Gravity = constant,
- Height is measured by the liquid level sensor 7.

If the new density is less then a nominal density, the control unit 8 stops the pumps 10 and stars the pump 9 that captures the solution 5 with a right density from the secondary reservoir 4 to the main reservoir 1.

Nozzles 11 sprinkle under pressure the solution 5 onto the

semiconductor device 2.

When the sensors 6, 7 measure values corresponding to a right density, the control unit 8 stops pump 9 and re-start pumps 10.

At the end of the deflushing process, the solution 5 at the bottom of the reservoir 1 is substituted (using the drainage valve 30) by a new one with a correct density, and further solution 5 is added in the reservoir 4.

By this apparatus the deflushing process is always efficient without waste of time.

CLAIMS

1. Apparatus for removing or decreasing the resin flush from the top of the metallic part of a semiconductor device, comprising a main reservoir and nozzles for sprinkling a solution with abrasive material suspended therein onto a semiconductor device placed in said main reservoir, characterized in that it also comprises a pressure sensor placed at the bottom of said main reservoir, a liquid level sensor associated with said main reservoir and a control unit for feeding said solution to said nozzles according to the pressure and level raised by said sensors,

2. Apparatus according to claim 1, characterized in that it also comprises a secondary reservoir and a pump for said solution.

3. Apparatus according to claim 1, characterized in that it also comprises a re-circulating circuit for the solution accumulated at the bottom of the main reservoir.

4. Apparatus according to claim 3, characterized in that re-circulating circuit comprises at least one pump.

5. Apparatus according to claim 3, characterized in that said re-circulating circuit comprises a filter.