Claims

1. A wafer cutting apparatus for cutting a wafer that has dicing streets which are covered by an opaque material and an exposed peripheral area where only portions of the dicing streets are visible, the wafer cutting apparatus comprising:

a wafer inspection system comprising a camera having a field of view;

a positioning device operative to move the wafer and the wafer inspection system relative to each other, such that a centre of the camera's field of view follows a path along the exposed peripheral area of the wafer, so as to perform visual data acquisition of said dicing street portions;

a processing unit operative to analyse the visual data acquired for detecting or calculating locations and directions of the dicing streets;

a wafer cutting tool operative to cut the wafer along straight lines between the dicing street portions which have been detected or calculated by the processing unit.

2. The wafer cutting apparatus according to claim 1, wherein the processing unit is operative to calculate coordinates where a centre of the camera's field of view is expected to cross a dicing street, and to obtain an image from the camera for visual data acquisition only when the centre of the camera's field of view reaches the calculated coordinates.

3. The wafer cutting apparatus according to claim 2, wherein the camera is a triggerable camera adapted to output acquired visual data signals only on receipt of a trigger signal, and wherein the processing unit is adapted to send to the camera a trigger signal only when the centre of the camera's field of view reaches said calculated coordinates.

4. The wafer cutting apparatus according to claim 2 or claim 3, wherein the camera is adapted to output acquired visual data signals continuously, and wherein the processing unit is adapted to take one image only when the centre of the camera's field of view reaches said calculated coordinates.

5. The wafer cutting apparatus according to any one of claims 2 to 4, further comprising a controllable lighting device aimed at a position where the centre of the camera's field of view intersects the wafer surface;

wherein the processing unit is adapted to control the lighting device to be normally OFF and to produce a short light flash only when the centre of the camera's field of view reaches said calculated coordinates.

6. The wafer cutting apparatus according to claim 5, wherein the camera is a triggerable camera;

wherein the processing unit is adapted, shortly before the centre of the camera's field of view reaches said calculated coordinates, to send to the camera a first trigger signal to start receiving light and acquire visual data;

wherein the processing unit is adapted, when the centre of the camera's field of view reaches said calculated coordinates, to send to the lighting device a second trigger signal causing the lighting device to produce a short light flash;

and wherein the processing unit is adapted, shortly after the second trigger signal, to send to the camera a third trigger signal to stop receiving the light and to finalize and transmit the acquired visual data.

7. The wafer cutting apparatus according to claim 6, wherein between the first and third trigger signals, the positioning device is operative to continue the relative movement between the wafer and the wafer inspection system.

8. The wafer cutting apparatus according to any one of the preceding claims, wherein the wafer cutting apparatus is adapted to perform a street position calculation step, in which the positions and directions of extreme portions as determined during visual data acquisition are processed to provide paired start and end portions of all dicing streets;

wherein the wafer cutting apparatus is operative to perform dice separation in which the processing unit controls the positioning device and the wafer cutting tool to cut the wafer along straight lines between said paired start and end portions as calculated during street position calculation.

9. The wafer cutting apparatus according to any one of the preceding claims, wherein the positioning device comprises a rotary alignment holder that during visual data acquisition of dicing streets is operative to rotate the wafer relative to the wafer inspection system.

10. The wafer cutting apparatus according to any one of the preceding claims, wherein the positioning device comprises an XY wafer holding table that during visual data acquisition of dicing streets is operative to displace the wafer relative to the wafer inspection system according to a circular path.

11. An inspection method for detecting locations and directions of dicing streets of a wafer, wherein the wafer has dicing streets that are covered by an opaque material

and an exposed peripheral area where only portions of the dicing streets are visible, the method comprising the steps of:

acquiring visual data of said dicing street portions while moving the wafer and a wafer inspection system relative to each other, wherein the wafer inspection system comprises a camera having a field of view, and wherein a centre of the camera's field of view follows a path along the said peripheral area; and

analysing the visual data acquired for detecting or calculating the locations and directions of the dicing streets.

12. The inspection method according to claim 11, wherein estimated coordinates are calculated where the centre of the camera's field of view should cross a dicing street, and wherein an image is taken only when the centre of the camera's field of view reaches said estimated coordinates.

13. The inspection method according to claim 12, wherein shortly before the centre of the camera's field of view reaches said estimated coordinates, a visual data acquisition process is started;

wherein when the centre of the camera's field of view reaches said estimated coordinates, a short light flash is produced to illuminate the wafer surface;

and wherein shortly after the light flash has been produced the visual data acquisition process is stopped.

14. The inspection method according to any one of claims 11 to 13, wherein the step of moving the wafer and the wafer inspection system relative to each other during the step of acquiring visual data of said dicing street portions comprises the step of rotating the wafer relative to the wafer inspection system using a rotary alignment holder.

15. The inspection method according to any one of claims 11 to 14, wherein the step of moving the wafer and the wafer inspection system relative to each other during the step of acquiring visual data of said dicing street portions comprises the step of displacing the wafer relative to the wafer inspection system using an XY wafer holding table.

16. The inspection method according to any one of claims 11 to 15, wherein the wafer has a central area that is covered by a molding compound.

17. A method for cutting a wafer that has dicing streets which are covered by an opaque material and an exposed peripheral area where only portions of the dicing

streets are visible, the method comprising an inspection method according to any one of claims 11 to 17, and further comprising a dice separation step in which the wafer is cut along straight lines between the detected or calculated dicing street portions.