

A SYSTEM AND METHOD FOR INSPECTING SIDE EDGE OF SEMICONDUCTOR DEVICE

1. TECHNICAL FIELD OF THE INVENTION

The present invention provides a system for inspecting bottom side edge of
5 semiconductor device, configured to capture at least one image comprising of a
plurality of sub-images; wherein said sub-images are of the bottom side edge of a
plurality of semiconductor devices, whereby said system comprises of a plurality of
light sources configured to emit infra-red lights towards a bottom side edge of a
plurality of semiconductor devices rotated on at least one turntable. The present
10 invention also provides a method of performing said inspection using said system.

2. BACKGROUND OF THE INVENTION

In the process of wafer dicing to cut said wafer into a plurality of die before
sorting said die to be packaged, there is possibility of defect at the bottom side edges
of the die due to said dicing or cutting process which is done by cutting said wafer
15 using laser from the top. The defects are generally inspected and identified in a
process called laser groove defect detection. However, the system of inspecting said
bottom side edges of said die of the prior art is inefficient as certain defects can be
missed out.

Furthermore, the die or semiconductor device is generally transferred from the
20 turret to the inspection station through a linear shuttle system, which is slow, highly
inefficient and creates low units per hour (UPH).

Furthermore, the system of the prior art comprises of image capturing devices which are capable of capturing one bottom side edge of said semiconductor devices per image, making it highlight inefficient in capturing all four sides of large number of semiconductor devices.

5 YINGLING MICHAEL MURRAY et al, US11164765B2, disclosed a die handling system and method of use for preparing or processing dies from multiple types of pre-expanded wafer materials. Although the prior art comprises of a camera which has a three-dimensional view of each extracted die, the die is rotated by the pick-up head instead of using a turntable as done in the present invention. The prior
10 art also does not show concurrent inspection of two bottom side edges of different dies to be shown in a single image, as proposed by the present invention.

Hence, it would be advantageous to alleviate the shortcomings by having a system and method for inspecting bottom side edge of semiconductor device, configured to capture at least one image comprising of a plurality of sub-images;
15 wherein said sub-images are of the bottom side edge of a plurality of semiconductor devices.

3. SUMMARY OF THE INVENTION

Accordingly, it is the primary aim of the present invention to provide a system
20 and method for inspecting bottom side edge of semiconductor device which is able to perform concurrent inspection on the bottom side edge of a plurality of semiconductor devices, hence increasing the UPH of the vision inspection.

It is yet another objective of the present invention to provide a system and method for inspecting bottom side edge of semiconductor device which is capable of detecting more defects on said bottom side edges, hence a more quality of vision of inspection.

5 It is yet another objective of the present invention to provide a system and method for inspecting bottom side edge of semiconductor device which is able to filter out noise, which will prevent over-rejection during vision inspection.

Additional objects of the invention will become apparent with an understanding of the following detailed description of the invention or upon
10 employment of the invention in actual practice.

According to the preferred embodiment of the present invention the following is provided:

A system for inspecting bottom side edge of semiconductor device, comprising
of:

15 at least one first light source, at least one second light source, at least one third light source or combination thereof;

at least one first light manipulating device;

wherein said first light source is configured to emit at least one first infra-red light to a bottom side edge of a first semiconductor device

through a top surface of said first semiconductor device; wherein said first infra-red light upon reaching said bottom side edge of said first semiconductor device is at an acute angle from a bottom surface of said first semiconductor device;

5 said system further comprising of at least one first image capturing device configured to capture at least one image of said bottom side edge of said first semiconductor device;

characterized in that

10 said second light source configured to emit at least one second infra-red light to said bottom side edge of said first semiconductor device through a first side surface of said first semiconductor device; wherein said second infra-red light upon reaching said bottom side edge of said first semiconductor device is at an obtuse angle from the bottom surface of said first semiconductor device;

15 said first light manipulating device disposed along the light path between said first light source and said bottom side edge of said first semiconductor device, is configured to allow said first infra-red light from said first light source to pass through towards said bottom side edge of said first semiconductor device; is configured to reflect said first
20 infra-red light and said second infra-red light reflected from said bottom side edge to said first image capturing device;

said third light source configured to emit at least one third infra-red light to said bottom side edge of said first semiconductor device; wherein said third infra-red light upon reaching said bottom side edge of said first semiconductor device is at said acute angle from the bottom surface of said first semiconductor device;

wherein said first light manipulating device is configured to reflect said third infra-red light from said third light source towards said bottom side edge of said first semiconductor device through said top surface of said semiconductor device; and is configured to reflect said third infra-red light reflected from said bottom side edge to said first image capturing device;

wherein said system further comprises of:

a turret comprising of at least one turret station at the circumference; wherein said turret is configured to rotate to transfer said semiconductor device along its circumference;

at least one turntable comprising of a turntable first station, a turntable second station, a turntable third station and a turntable fourth station arranged at the circumference of said turntable with equal distance apart; wherein said turntable first station, said turntable second station, said turntable third station or said turntable fourth station is configured to receive semiconductor device from said turret at said turret station;

wherein said turntable is configured to rotate to transfer said semiconductor device from said turntable first station, to said turntable second station, to said turntable third station, to said turntable fourth station, and back to said turntable first station;

5 at least one fourth light source, at least one fifth light source or combination thereof;

 said fourth light source configured to emit at least one fourth infra-red light to a bottom side edge of a third semiconductor device; wherein said fourth infra-red light upon reaching said bottom side edge of said third
10 semiconductor device is at an acute angle from a bottom surface of said third semiconductor device;

 said fifth light source configured to emit at least one fifth infra-red light to said bottom side edge of said third semiconductor device; wherein said fifth infra-red light upon reaching said bottom side edge of said
15 third semiconductor device is at an obtuse angle from the bottom surface of said third semiconductor device;

 said system further comprises of at least one second light manipulating device disposed along the light path between said fourth light source and said bottom side edge of said third semiconductor device, is
20 configured to allow said fourth infra-red light from said fourth light source to pass through towards said bottom side edge of said third

semiconductor device; is configured to reflect said fourth infra-red light and said fifth infra-red light reflected from said bottom side edge to said first image capturing device;

5 wherein said third light source is configured to emit at least one third infra-red light to said bottom side edge of said third semiconductor device; wherein said third infra-red light upon reaching said bottom side edge of said third semiconductor device is at said acute angle from the bottom surface of said third semiconductor device;

10 wherein said second light manipulating device is configured to reflect said third infra-red light from said third light source towards said bottom side edge of said third semiconductor device; and is configured to reflect said third infra-red light reflected from said bottom side edge to said first image capturing device;

15 wherein said first image capturing device is configured to capture an image comprising of a first sub-image and a second sub-image; wherein said first sub-image is of said bottom side edge of said first semiconductor device when said bottom side edge of said first semiconductor device is emitted with said first infra-red light from said first light source, said second infra-red light from said second light
20 source and said third infra-red light from said third light source; and while said first semiconductor device is at said turntable second station; wherein said second sub-image is of said bottom side edge of said third

semiconductor device when said bottom side edge of said third semiconductor device is emitted with said fourth infra-red light from said fourth light source, said fifth infra-red light from said fifth light source and said third infra-red light from said third light source; and
5 while said third semiconductor device is at said turntable fourth station.

In another embodiment of the invention there is provided:

A method of inspecting bottom side edge of semiconductor device, comprising the steps of:

- (i) emitting at least one first infra-red light from at least one first light
10 source to a bottom side edge of a first semiconductor device through a top surface of said first semiconductor device; wherein said first infra-red light upon reaching said bottom side edge of said first semiconductor device is at an acute angle from a bottom surface of said first semiconductor device; while emitting at least
15 one second infra-red light from at least one second light source to said bottom side edge of said first semiconductor device through a first side surface of said first semiconductor device; wherein said second infra-red light upon reaching said bottom side edge of said first semiconductor device is at an obtuse angle from said
20 bottom surface of said first semiconductor device; while emitting at least one third infra-red light from at least one third light source before reflecting from a first light manipulating device to said

bottom side edge of said first semiconductor device through said top surface of said first semiconductor device; wherein said third infra-red light upon reaching said bottom side edge of said first semiconductor device is at an acute angle from said bottom surface of said first semiconductor device;

(ii) reflecting said first infra-red light, said second infra-red light and said third infra-red light reflected from said bottom side edge of said first semiconductor device to a first image capturing device;

(iii) capturing at least one image of said bottom side edge of said first semiconductor device by said first image capturing device.

4. BRIEF DESCRIPTION OF THE DRAWINGS

Other aspect of the present invention and their advantages will be discerned after studying the Detailed Description in conjunction with the accompanying drawings in which:

Fig. 1 is a side view of the system of the present invention while inspecting one semiconductor device.

Fig. 2 is a perspective view of the system of the present invention while inspecting a plurality of semiconductor devices on a turntable.

Fig. 3 is a top view of the system of the present invention while inspecting a plurality of semiconductor devices on a plurality of turntables.

Fig. 4 shows the image captured by said first image capturing device.

Fig .5 shows a perspective view of a semiconductor device.

5. DETAILED DESCRIPTION OF THE DRAWINGS

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In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the invention. However, it will be understood by the person having ordinary skill in the art that the invention may be practised without these specific details. In other instances, well known methods,
10 procedures and/or components have not been described in detail so as not to obscure the invention.

The invention will be more clearly understood from the following description of the embodiments thereof, given by way of example only with reference to the accompanying drawings, which are not drawn to scale.

15 As shown in Fig. 1, the invention presents a system 101 for inspecting bottom side edge 103AA of semiconductor device, comprising of at least one first light source 107, at least one second light source 108, at least one third light source 109 or combination thereof. The system 101 further comprises of at least one first image capturing device 111A and at least one first light manipulating device 113A. The
20 semiconductor device can be a die.

The first light source 107 is configured to emit at least one first infra-red light 115A to a bottom side edge 103AA of a first semiconductor device 105A through a top surface 117 of said first semiconductor device 105A; wherein said first infra-red light 115A upon reaching said bottom side edge 103AA of said first semiconductor device 105A is at an acute angle 119A from a bottom surface 118 of said first semiconductor device 105A.

The first image capturing device 111A is configured to capture at least one image 401 of said bottom side edge 103AA of said first semiconductor device 105A.

The second light source 108 is configured to emit at least one second infra-red light 115B to said bottom side edge 103AA of said first semiconductor device 105A; wherein said second infra-red light 115B upon reaching said bottom side edge 103AA of said first semiconductor device 105A is at an obtuse angle 119B from the bottom surface 118 of said first semiconductor device 105A.

The first light manipulating device 113A is disposed along the light path between said first light source 107 and said bottom side edge 103AA of said first semiconductor device 105A, is configured to allow said first infra-red light 115A from said first light source 107 to pass through towards said bottom side edge 103AA of said first semiconductor device 105A; is configured to reflect said first infra-red light 115A and said second infra-red light 115B reflected from said bottom side edge 103AA to said first image capturing device 111A.

The third light source 109 is configured to emit at least one third infra-red light 115C to said bottom side edge 103AA of said first semiconductor device 105A; wherein said third infra-red light 115C upon reaching said bottom side edge 103AA of said first semiconductor device 105A is at said acute angle 119A from the bottom surface 118 of said first semiconductor device 105A.

The first light manipulating device 113A is configured to reflect said third infra-red light 115C from said third light source 109 towards said bottom side edge 103AA of said first semiconductor device 105A through said top surface 117 of said semiconductor device 105A; and is configured to reflect said third infra-red light 115C reflected from said bottom side edge 103AA to said first image capturing device 111A.

As shown in Fig. 2, the system 101 further comprises of at least one fourth light source 213, at least one fifth light source 215, or combination thereof. The system 101 further comprises of a turret 203, at least one turntable, and at least one second light manipulating device 113B.

The turret 203 comprises of at least one turret station at the circumference; wherein said turret 203 is configured to rotate to transfer said semiconductor device along its circumference.

Said at least one turntable comprises of a plurality of turntable stations arranged at the circumference of said turntable with equal distance apart; wherein each of said turntable stations is configured to receive semiconductor device from said turret 203 at said turret station; wherein said turntable is configured to rotate to

transfer said semiconductor device from one turntable station to another. The first semiconductor device 105A is disposed in one of said turntable stations.

The fourth light source 213 is configured to emit at least one fourth infra-red light 115D to a bottom side edge 103AA of a third semiconductor device 105C
5 disposed in another one of said turntable stations; wherein said fourth infra-red light 115D upon reaching said bottom side edge 103AA of said third semiconductor device 105C is at an acute angle 119A from a bottom surface 118 of said third semiconductor device 105C.

The fifth light source 215 is configured to emit at least one fifth infra-red light
10 115E to said bottom side edge 103AA of said third semiconductor device 105C; wherein said fifth infra-red light 115E upon reaching said bottom side edge 103AA of said third semiconductor device 105C is at an obtuse angle 119B from the bottom surface 118 of said third semiconductor device 105C.

The second light manipulating device 113B is disposed along the light path
15 between said fourth light source 213 and said bottom side edge 103AA of said third semiconductor device 105C, is configured to allow said fourth infra-red light 115D from said fourth light source 213 to pass through towards said bottom side edge 103AA of said third semiconductor device 105C; is configured to reflect said fourth infra-red light 115D and said fifth infra-red light 115E reflected from said bottom side
20 edge 103AA to said first image capturing device 111A.

The third light source 109 is configured to emit at least one third infra-red light 115C to said bottom side edge 103AA of said third semiconductor device 105C; wherein said third infra-red light 115B upon reaching said bottom side edge 103AA of said third semiconductor device 105C is at said acute angle 119A from the bottom surface 118 of said third semiconductor device 105C.

The second light manipulating device 113B is configured to reflect said third infra-red light 115C from said third light source 109 towards said bottom side edge 103AA of said third semiconductor device 105C; and is configured to reflect said third infra-red light 115C reflected from said bottom side edge 103AA to said first image capturing device 111A.

The first image capturing device 111A is configured to capture an image 401 comprising of a first sub-image 403 and a second sub-image 405 as shown in Fig. 4; wherein said first sub-image 403 is of said bottom side edge 103AA of said first semiconductor device 105A when said bottom side edge 103AA of said first semiconductor device 105A is emitted with said first infra-red light 115A from said first light source 107, said second infra-red light 115B from said second light source 108 and said third infra-red light 115C from said third light source 109; and while said first semiconductor device 105A is at said turntable second station 207B; wherein said second sub-image 405 is of said bottom side edge 103AA of said third semiconductor device 105C when said bottom side edge 103AA of said third semiconductor device 105C is emitted with said fourth infra-red light 115D from said fourth light source 213, said fifth infra-red light 115E from said fifth light source 215 and said third infra-red

light 115C from said third light source 109; and while said third semiconductor device 105C is at said turntable fourth station 207D.

In one configuration, as shown in Fig. 2, said at least one turntable may be a first turntable 205A which comprises of a first turntable first station 207A, a first
5 turntable second station 207B, a first turntable third station 207C and a first turntable fourth station 207D; wherein said first turntable is configured to rotate to transfer said semiconductor device from said first turntable first station 207A, to said first turntable second station 207B, to said first turntable third station 207C, to said first turntable fourth station 207D, and back to said first turntable first station 207A. In this
10 configuration, the first light source 107, the second light source 108, the third light source 109 or combination thereof emits the first infra-red light 115A, the second infra-red light 115B, the third infra-red light 115C or combination thereof respectively to the bottom side edge 103AA of said first semiconductor device 105A when said first semiconductor device 105A is disposed at the first turntable first station 207A; while
15 the fourth light source 213, the fifth light source 215, the third light source 109 or combination thereof emits the fourth infra-red light 115D, the fifth infra-red light 115E, the third infra-red light 115C or combination thereof respectively to the bottom side edge 103AA of said third semiconductor device 105C when said third semiconductor device 105C is disposed at the first turntable third station 207C.

20 In another configuration, as shown in Fig. 3, said at least one turntable may further comprise of a second turntable 205B in addition to said first turntable 205A, wherein said second turntable 205B comprises of a second turntable first station 211A,

a second turntable second station 211B, a second turntable third station 211C and a second turntable fourth station 211D; wherein said second turntable is configured to rotate to transfer said semiconductor device from said second turntable first station 211A, to said second turntable second station 211B, to said second turntable third station 211C, to said second turntable fourth station 211D, and back to said second turntable first station 211A. In this configuration, a similar light source arrangement emitting infra-red light to the bottom side edge of the semiconductors disposed at the second turntable stations similar to the first turntable stations, before said infra-red lights are eventually reflected to a second image capturing device 111B disposed at a similar arrangement as the first image capturing device 111A with respect to their respectively turntables.

Referring to Fig. 2, which is an example of a configuration, it is observed that the first image capturing device 111A is configured to capture image of the first side surface 116A of the first semiconductor device 105A and the third side surface 116C of the third semiconductor device 105C simultaneously, which in effect is an image comprising of said first sub-image 403 and said second sub-image 405. This is because when the turntable rotates, the side surfaces being directed to said first image capturing device 111A through said first light manipulating device 113A and second light manipulating device 113B changes. When the first semiconductor device 105A is eventually rotated by said first turntable to the first turntable third station 207D, the first image capturing device 111A will capture the third side surface 116C of the first semiconductor device 105A. The first turntable 205A will further rotate, which transfers said first semiconductor 105A back to the turret first station 209A. The turret

203 further rotates and transfers said first semiconductor device 105A to the turret second station 209B, whereby said first semiconductor device 105A is then transferred to the second turntable first station 211A, as shown in Fig. 3. At the second turntable, due to the rotation of the second turntable, the second side surface 116B of said first semiconductor device will be taken by said second image capturing device 111B before the fourth side surface 116D of said first semiconductor device 105A is being taken by said second image capturing device 111B. After the processing of transferring the first semiconductor device 105A between the turret 203, the first turntable 205A and the second turntable 205B, images of all four side surfaces of the first semiconductor device 105A can be captured. This process is repeated for all the other semiconductor devices at a much higher yield, higher output efficiency and shorter index time compared to the conventional linear transfer of semiconductor devices.

The first light manipulating device 113A and second light manipulating device 113B can be any suitable prism configuration as long as it is able to reflect said first infra-red lights from the bottom side edge of said semiconductor devices to said image capturing devices when said semiconductor devices are disposed at their predetermined turntable stations.

The invention also presents a method of inspecting bottom side edge 103AA of semiconductor device, comprising the following steps. In step (i), at least one first infra-red light 115A is emitted from at least one first light source 107 to a bottom side edge 103AA of a first semiconductor device 105A; wherein said first infra-red light 115A upon reaching said bottom side edge 103AA of said first semiconductor device

105A is at an acute angle 119A from a bottom surface 118 of said first semiconductor device 105A; while emitting at least one second infra-red light 115B from said second light source 108 to said bottom side edge 103AA of said first semiconductor device 105A; wherein said second infra-red light 115B upon reaching said bottom side edge 5 103AA of said first semiconductor device 105A is at an obtuse angle 119B from said bottom surface 118 of said first semiconductor device 105A; while emitting at least one third infra-red light 115C from at least one third light source 109 through a first light manipulating device 113A to said bottom side edge 103AA of said first semiconductor device 105A; wherein said third infra-red light 115C upon reaching said bottom side 10 edge 103AA of said first semiconductor device 105A is at an acute angle 119A from said bottom surface 118 of said first semiconductor device 105A.

In step (ii), said first infra-red light 115A, said second infra-red light 115B and said third infra-red light 115C reflected from said bottom side edge 103AA of said first semiconductor device 105A are reflected to a first image capturing device 111A;

15 In step (iii), at least one image 401 of said bottom side edge 103AA of said first semiconductor device 105A is captured by said first image capturing device 111A.

Optionally, as shown in Fig. 3, the following steps happen before step (i). In step (a), a turret 203 is rotated to transfer a first semiconductor device 105A along its circumference to a turret first station 209A. In step (b), a first semiconductor device 20 105A is received at a turntable first station 207A of at least one turntable from said turret first station 209A of said turret 203. If before performing step (b), said turntable first station 207A is with a semiconductor device, said semiconductor device is first

transferred to said turret first station 209A of said turret 203 before said first semiconductor device 105A is transferred to said turntable first station 207A. In step (c), said turret 203 is rotated to transfer a second semiconductor device 105B along its circumference to said turret first station 209A while rotating said turntable until said first semiconductor device 105A is at a turntable second station 207B of said turntable. In step (d), said second semiconductor device 105B is received at said turntable first station 207A of said turntable from said turret first station 209A of said turret 203. If before performing step (d), said turntable first station 207A is with a semiconductor device, said semiconductor device is first transferred to said turret first station 209A of said turret 203 before said second semiconductor device 105B is transferred to said turntable first station 207A. In step (e), said turret 203 is rotated to transfer a third semiconductor device 105C along its circumference to said turret first station 209A while rotating said turntable until said second semiconductor device 105B is at said turntable second station 207B of said turntable and said first semiconductor device 105A is at a turntable third station 207C. In step (f), said third semiconductor device 105C is received at said turntable first station 207A of said turntable from said turret first station 209A of said turret 203. If before performing step (f), said turntable first station 207A is with a semiconductor device, said semiconductor device is first transferred to said turret first station 209A of said turret 203 before said third semiconductor device 105C is transferred to said turntable first station 207A. In step (g), said turret 203 is rotated to transfer a fourth semiconductor device 105D along its circumference to said turret first station 209A while rotating said turntable until said third semiconductor device 105C is at said turntable second station 207B and said

second semiconductor device 105B is at said turntable third station 207C of said turntable and said first semiconductor device 105A is at a turntable fourth station 207D. In step (h), said fourth semiconductor device 105D is received at said turntable first station 207A of said turntable from said turret first station 209A of said turret 203.

- 5 If before performing step (h), said turntable first station 207A is with a semiconductor device, said semiconductor device is first transferred to said turret first station 209A of said turret 203 before said fourth semiconductor device 105D is transferred to said turntable first station 207A.

Optionally, said step (i) further comprises of emitting at least one fourth infra-
 10 red light 115D from at least one fourth light source 213 to a bottom side edge 103AA of said third semiconductor device 105C; wherein said fourth infra-red light 115D upon reaching said bottom side edge 103AA of said third semiconductor device 105C is at an acute angle 119A from a bottom surface 118 of said third semiconductor device 105C; while emitting at least one fifth infra-red light 115E from a fifth light source 215
 15 to said bottom side edge 103AA of said third semiconductor device 105C; wherein said fifth infra-red light 115E upon reaching said bottom side edge 103AA of said third semiconductor device 105C is at an obtuse angle 119B from said bottom surface 118 of said third semiconductor device 105C; while emitting said third infra-red light 115C from said third light source 109 through a second light manipulating device 113B to
 20 said bottom side edge of said third semiconductor device 105A; wherein said third infra-red light 115C upon reaching said bottom side edge of said third semiconductor device 105C is at an acute angle 119A from said bottom surface 118 of said third semiconductor device 105C.

Optionally, said step (ii) further comprises of reflecting said fourth infra-red light 115D, said fifth infra-red light 115E and said third infra-red light 115C reflected from said bottom side edge of said third semiconductor device 105C to said first image capturing device 111A.

5 Optionally, said step (iii) further comprises of capturing said image 401 of said bottom side edge of said third semiconductor device 105C by said first image capturing device 111A.

While the present invention has been shown and described herein in what are considered to be the preferred embodiments thereof, illustrating the results and
10 advantages over the prior art obtained through the present invention, the invention is not limited to those specific embodiments. Thus, the forms of the invention shown and described herein are to be taken as illustrative only and other embodiments may be selected without departing from the scope of the present invention, as set forth in the claims appended hereto.

WHAT IS CLAIMED IS:

1. A system (101) for inspecting bottom side edge of semiconductor device, comprising of:

at least one first light source (107), at least one second light source (108),

5 at least one third light source (109) or combination thereof;

at least one first light manipulating device (113A);

wherein said first light source (107) is configured to emit at least one first infra-red light (115A) to a bottom side edge (103AA) of a first semiconductor device (105A) through a top surface (117) of said first semiconductor device (105A); wherein said first infra-red light (115A) upon reaching said bottom side edge (103AA) of said first semiconductor device (105A) is at an acute angle (119A) from a bottom surface (118) of said first semiconductor device (105A);

10 said system (101) further comprising of at least one first image capturing device (111A) configured to capture at least one image (401) of said bottom side edge (103AA) of said first semiconductor device (105A);

characterized in that

said second light source (108) configured to emit at least one second infra-red light (115B) to said bottom side edge (103AA) of said first

semiconductor device (105A) through a first side surface (116A) of said first semiconductor device (105A); wherein said second infra-red light (115B) upon reaching said bottom side edge (103AA) of said first semiconductor device (105A) is at an obtuse angle (119B) from the bottom surface (118) of said first semiconductor device (105A);

said first light manipulating device (113A) disposed along the light path between said first light source (107) and said bottom side edge (103AA) of said first semiconductor device (105A), is configured to allow said first infra-red light (115A) from said first light source (107) to pass through towards said bottom side edge (103AA) of said first semiconductor device (105A); is configured to reflect said first infra-red light (115A) and said second infra-red light (115B) reflected from said bottom side edge (103AA) to said first image capturing device (111A);

said third light source (109) configured to emit at least one third infra-red light (115C) to said bottom side edge (103AA) of said first semiconductor device (105A); wherein said third infra-red light (115C) upon reaching said bottom side edge (103AA) of said first semiconductor device (105A) is at said acute angle (119A) from the bottom surface (118) of said first semiconductor device (105A);

wherein said first light manipulating device (113A) is configured to reflect said third infra-red light (115C) from said third light source (109) towards said bottom side edge (103AA) of said first semiconductor

device (105A) through said top surface (117) of said semiconductor device (105A); and is configured to reflect said third infra-red light (115C) reflected from said bottom side edge (103AA) to said first image capturing device (111A).

- 5 2. The system (101) for inspecting bottom side edge of semiconductor device as claimed in Claim 1, wherein said system (101) further comprises of:
- a turret (203) comprising of at least one turret station at the circumference; wherein said turret (203) is configured to rotate to
10 transfer said semiconductor device along its circumference;
- at least one turntable comprising of a plurality of turntable stations arranged at the circumference of said turntable with equal distance apart; wherein each of said turntable stations is configured to receive semiconductor device from said turret (203) at said turret station;
15 wherein said turntable is configured to rotate to transfer said semiconductor device from one turntable station to another;
- wherein said first semiconductor device (105A) is disposed in one of said turntable stations;
- said system (101) further comprising of at least one fourth light source
20 (213), at least one fifth light source (215) or combination thereof;

said fourth light source (213) configured to emit at least one fourth infra-red light (115D) to a bottom side edge (103AA) of a third semiconductor device (105C) disposed in another one of said turntable stations; wherein said fourth infra-red light (115D) upon reaching said bottom side edge (103AA) of said third semiconductor device (105C) is at an acute angle (119A) from a bottom surface (118) of said third semiconductor device (105C);

said fifth light source (215) configured to emit at least one fifth infra-red light (115E) to said bottom side edge (103AA) of said third semiconductor device (105C); wherein said fifth infra-red light (115E) upon reaching said bottom side edge (103AA) of said third semiconductor device (105C) is at an obtuse angle (119B) from the bottom surface (118) of said third semiconductor device (105C);

said system (101) further comprises of at least one second light manipulating device (113B) disposed along the light path between said fourth light source (213) and said bottom side edge (103AA) of said third semiconductor device (105C), is configured to allow said fourth infra-red light (115D) from said fourth light source (213) to pass through towards said bottom side edge (103AA) of said third semiconductor device (105C); is configured to reflect said fourth infra-red light (115D) and said fifth infra-red light (115E) reflected from said bottom side edge (103AA) to said first image capturing device (111A);

wherein said third light source (109) is configured to emit at least one third infra-red light (115C) to said bottom side edge (103AA) of said third semiconductor device (105C); wherein said third infra-red light (115B) upon reaching said bottom side edge (103AA) of said third semiconductor device (105C) is at said acute angle (119A) from the bottom surface (118) of said third semiconductor device (105C);

wherein said second light manipulating device (113B) is configured to reflect said third infra-red light (115C) from said third light source (109) towards said bottom side edge (103AA) of said third semiconductor device (105C); and is configured to reflect said third infra-red light (115C) reflected from said bottom side edge (103AA) to said first image capturing device (111A);

wherein said first image capturing device (111A) is configured to capture an image (401) comprising of a first sub-image (403) and a second sub-image (405); wherein said first sub-image (403) is of said bottom side edge (103AA) of said first semiconductor device (105A) when said bottom side edge (103AA) of said first semiconductor device (105A) is emitted with said first infra-red light (115A) from said first light source (107), said second infra-red light (115B) from said second light source (108) and said third infra-red light (115C) from said third light source (109); and while said first semiconductor device (105A) is at said turntable second station (207B); wherein said second sub-image

(405) is of said bottom side edge (103AA) of said third semiconductor device (105C) when said bottom side edge (103AA) of said third semiconductor device (105C) is emitted with said fourth infra-red light (115D) from said fourth light source (213), said fifth infra-red light (115E) from said fifth light source (215) and said third infra-red light (115C) from said third light source (109); and while said third semiconductor device (105C) is at said turntable fourth station (207D).

3. The system (101) for inspecting bottom side edge of semiconductor device as claimed in Claim 2, wherein said plurality of turntable stations comprises of a turntable first station (207A), a turntable second station (207B), a turntable third station (207C) and a turntable fourth station (207D); wherein said turntable is configured to rotate to transfer said semiconductor device from said turntable first station (207A), to said turntable second station (207B), to said turntable third station (207C), to said turntable fourth station (207D), and back to said turntable first station (207A).

4. A method of inspecting bottom side edge of semiconductor device, comprising the steps of:

- (i) emitting at least one first infra-red light (115A) from at least one first light source (107) to a bottom side edge (103AA) of a first semiconductor device (105A) through a top surface (117) of said first semiconductor device (105A); wherein said first infra-red

light (115A) upon reaching said bottom side edge (103AA) of said first semiconductor device (105A) is at an acute angle (119A) from a bottom surface (118) of said first semiconductor device (105A); while emitting at least one second infra-red light (115B) from at least one second light source (108) to said bottom side edge (103AA) of said first semiconductor device (105A) through a first side surface (116A) of said first semiconductor device (105A); wherein said second infra-red light (115B) upon reaching said bottom side edge (103AA) of said first semiconductor device (105A) is at an obtuse angle (119B) from said bottom surface (118) of said first semiconductor device (105A); while emitting at least one third infra-red light (115C) from at least one third light source (109) before reflecting from a first light manipulating device (113A) to said bottom side edge (103AA) of said first semiconductor device (105A) through said top surface (117) of said semiconductor device (105A); wherein said third infra-red light (115C) upon reaching said bottom side edge (103AA) of said first semiconductor device (105A) is at an acute angle (119A) from said bottom surface (118) of said first semiconductor device (105A);

- (ii) reflecting said first infra-red light (115A), said second infra-red light (115B) and said third infra-red light (115C) reflected from

said bottom side edge (103AA) of said first semiconductor device (105A) to a first image capturing device (111A);

(iii) capturing at least one image (401) of said bottom side edge (103AA) of said first semiconductor device (105A) by said first image capturing device (111A).

5. The method of inspecting bottom side edge of semiconductor device as claimed in Claim 4, further comprising the following steps before step (i):

(a) rotating a turret (203) to transfer a first semiconductor device (105A) along its circumference to a turret first station (209A);

(b) receiving a first semiconductor device (105A) at a turntable first station (207A) of at least one turntable from said turret first station (209A) of said turret (203);

(c) rotating said turret (203) to transfer a second semiconductor device (105B) along its circumference to said turret first station (209A) while rotating said turntable until said first semiconductor device (105A) is at a turntable second station (207B) of said turntable;

(d) receiving said second semiconductor device (105B) at said turntable first station (207A) of said turntable from said turret first station (209A) of said turret (203);

(e) rotating said turret (203) to transfer a third semiconductor device (105C) along its circumference to said turret first station (209A) while rotating said turntable until said second semiconductor device (105B) is at said turntable second station (207B) of said turntable and said first semiconductor device (105A) is at a turntable third station (207C);

(f) receiving said third semiconductor device (105C) at said turntable first station (207A) of said turntable from said turret first station (209A) of said turret (203);

(g) rotating said turret (203) to transfer a fourth semiconductor device (105D) along its circumference to said turret first station (209A) while rotating said turntable until said third semiconductor device (105C) is at said turntable second station (207B) and said second semiconductor device (105B) is at said turntable third station (207C) of said turntable and said first semiconductor device (105A) is at a turntable fourth station (207D);

(h) receiving said fourth semiconductor device (105D) at said turntable first station (207A) of said turntable from said turret first station (209A) of said turret (203);

wherein if said turntable first station (207A) is with semiconductor device before performing step (b), step (d), step (f) or step (h), said

semiconductor device is transferred to said turret first station (209A) of said turret (203);

wherein said step (i) further comprising of emitting at least one fourth infra-red light (115D) from at least one fourth light source (213) to a bottom side edge (103AA) of said third semiconductor device (105C);

wherein said fourth infra-red light (115D) upon reaching said bottom side edge (103AA) of said third semiconductor device (105C) is at an acute angle (119A) from a bottom surface (118) of said third semiconductor device (105C); while emitting at least one fifth infra-red

light (115E) from at least one fifth light source (215) to said bottom side edge (103AA) of said third semiconductor device (105C); wherein said fifth infra-red light (115E) upon reaching said bottom side edge (103AA) of said third semiconductor device (105C) is at an obtuse angle (119B) from said bottom surface (118) of said third semiconductor device

(105C); while emitting said third infra-red light (115C) from said third light source (109) through a second light manipulating device (113B) to said bottom side edge (103AA) of said third semiconductor device (105A); wherein said third infra-red light (115C) upon reaching said bottom side edge (103AA) of said third semiconductor device (105C) is

at an acute angle (119A) from said bottom surface (118) of said third semiconductor device (105C);

wherein said step (ii) further comprising of reflecting said fourth infra-red light (115D), said fifth infra-red light (115E) and said third infra-red light (115C) reflected from said bottom side edge (103AA) of said third semiconductor device (105C) to said first image capturing device (111A);

5 wherein said step (iii) further comprising of capturing said image (401) of said bottom side edge (103AA) of said third semiconductor device (105C) by said first image capturing device (111A).