

A MATERIAL HANDLER FOR DEVICES ON A REEL

FIELD OF THE INVENTION

- 5 The invention relates to a material handler for moving a device on a reel to a tester for testing to be conducted on the device.

BACKGROUND OF THE INVENTION

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As consumer electronics proliferate the market, consumers are presented with more and more choices. To gain a competitive edge, the motivation for chip manufacturers is towards semiconductor devices that have high performance, speed, are small in size, and are low cost.

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Tape Carrier Packages (TCP) and Chips On Film (COF) format of packages are a way to meet small outline and high leadcount interconnections desirous of high performance devices in demand today. These devices have to be tested.

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Dedicated handlers have been designed to test these package formats referred to as devices on reel. These devices on reels are tested by moving the probe card relative to the device under test (DUT). However, the testing process suffers from signal interference due to the long signal paths encountered during the test. Further, moving the test head to the DUT lengthens the testing process.

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It is an object of the present invention to ameliorate the above problems.

SUMMARY OF THE INVENTION

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According to a first embodiment of the invention, there is provided a material handler for conveying devices on a reel to a tester for testing, said material handler including a rotatable assembly to engage and rotate the devices on reel towards a tester, the tester having a probe tip, a comparator means to compare a position of the device in
35 relation to the probe tip, an alignment means in communication with the comparator

means to position the device to the probe tip for testing, wherein the alignment means positions the device to the probe tip for testing to be performed on the device for direct docking. Advantageously, this eliminates the need to rotate the probe to the device on a test head, and further reduces signal length and therefore capacitance in the signal path.

Preferably, the rotational assembly and the alignment means are integral.

Still preferably, the rotatable assembly moves in at least an x, y and theta direction.

Preferably, the comparator means is an optical comparator, for example, an image capturing apparatus.

Preferably, the image capturing device is a first and second optical camera, where the first optical camera identifies the location of the devices on reel and the second optical camera identifies the location of the probe tip.

Preferably, the image capturing apparatus further includes a logic controller to determine the range of motions, any one or a combination of an x, y, and/ or theta direction, to move the device to the probe tip for testing.

According to a second embodiment of the invention, there is provided a material handler for conveying devices on a reel to a tester, said tester having a probe tip for testing, including a rotatable assembly capable of moving in an x, y and theta direction, a receiver connected to the rotatable assembly to receive the devices on reel, a comparator means to compare a position of the device in relation to the probe tip, wherein the comparator means communicates with the rotatable assembly to move the device to the probe tip for testing.

Preferably, the receiver is a contactor plate.

Still preferably, the contactor plate further includes alignment guides to align a received device reel.

Preferably, the comparator means is an optical comparator, for example, an image capturing apparatus.

5 Preferably, the image capturing device is a first and second optical camera, where the first optical camera identifies the location of the devices on reel and the second optical camera identifies the location of the probe tip.

10 Preferably, the image capturing apparatus further includes a logic controller to determine the range of motions, any one or a combination of an x, y, and/ or theta direction, to move the device to the probe tip for testing.

15 Preferably, the positional displacement between the device reel and the probe tip is communicated to the rotatable assembly to move the device to the probe tip for testing to be performed.

20 According to a third embodiment of the present invention, there is provided a material handler for conveying devices on a reel to a tester, said tester having a probe tip, including a rotatable assembly having a contactor plate and a device reel, and an optical comparator to identify a position of the device in relation to the probe tip, said optical comparator in communication with the rotational assembly, wherein the rotational assembly moves the device to the probe tip in response to the optical comparator.

25 According to another aspect of the invention, there is provided a method of testing a device on a reel, said method including rotating a material handler and device on reel to a probe having a probe tip, comparing a displacement of the probe tip to the device, aligning the material handler to align the device to the probe tip and performing the test.

30 Preferably, the step of comparing includes the steps of identifying a location of device pins of the device, identifying a location of probe pins of a probe card and establishing the displacement of the probe tip to the device pin.

DESCRIPTION OF THE FIGURES

In order that the present invention might be more fully understood, embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1A relates to a handler of the prior art.

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Figure 1B shows Section G of Figure 1A of the handler of the prior art.

Figure 2 shows a first embodiment of the material handler of the present invention.

10 Figure 3A shows a second embodiment of the material handler of the present invention.

Figure 3B illustrates section A-A of Figure 3A.

15 Figure 3C illustrates section B-B of Figure 3A.

Figure 4 shows the material handler of the present invention when the devices are brought to test.

20 Figure 5 illustrates a method of handling a device according to the present invention.

In each of the embodiments and variations, the same reference numerals have been used for similar components, merely for ease of understanding the specification.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. While the invention
5 will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims. Furthermore, in the following detailed description of
10 the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill of the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and features have not been described in detail as not to unnecessarily obscure
15 aspects of the present invention.

Figure 1A illustrates a handler 500 of the prior art. The handler includes devices on reels 300 to be tested on a tester 200. The devices to be tested are connected to a
20 tape or film and are reeled to convey the devices to the test head 210 of the tester 200 for testing to be conducted. The handler 500 is located proximal to the test head to minimize signal interference. The test head 210 rotates to conduct the various tests required of the device.

As can be seen in Figure 1A, during the testing process, a signal path, δ , exists
25 between the test head and the device under test (DUT). This translates to increased signal interference during testing as the signal path is long.

Figure 1B shows section A of Figure 1A. During testing, the probe card is rotated in relation to the DUT so that the various tests may be performed. The handler 500
30 moves in an x-y direction to position the devices on reel to be tested by the tester. The long signal length, δ can be seen.

Figure 2 shows a first embodiment of the material handler 100 of the present invention. The material handler handles devices 11 on a reel 12 for testing. The reel
35 rotates to advance each device 11 for testing to be performed by the tester. The

material handler 100 includes a rotatable assembly 20 to position the devices on reel towards a tester or test head 210. The material handler 100 further includes a comparator means 30 seen as an optical comparator 31 in the form of a first 32 and second 33 optical camera.

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The first optical camera 32 is directed towards the devices 11, and the second optical camera 33 is directed towards the test head 210. The first optical camera 32 identifies the location of the devices on reel, whereas the second optical camera 33 identifies the location of the probe tips 211 of the test head 210. In this embodiment,

10 the alignment means (not shown in the figures) is in communication with the comparator means, and the alignment means is integral with the rotatable assembly.

The rotatable assembly is motorized and enabled to move in an x, y and theta direction. In response to a feedback from the first and second optical cameras on the displacement of the device pins to the probe tips, the rotatable assembly is actuated

15 to position a direct dock of the devices to the probe tips for testing to be performed. This eliminates any signal interference or High Z interference suffered by the prior art.

The feedback may be performed by a logic controller to determine the range of motions necessary to accurately dock the device to the probe tips for testing to be

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Figure 3A shows a second embodiment of the material handler having a rotatable assembly, a receiver 40 and a comparator means. The receiver 40 is shown in the form of a contactor plate 40 to receive the devices on reel.

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Figure 3B shows section A-A of Figure 2, and shows the range of motions enabled by the rotatable assembly 20 in the x, y and theta directions imparted to the contactor plate 41. In this figure, four devices 11a, 11b, 11c and 11d are aligned by the rotatable assembly to the probe tip for testing to be performed. In a variation and additionally, reference points may be included on the contactor plate 41 and the test head for additional alignment to be made. Reference points A and B, on the contactor plate is then aligned with reference points C and D of the test head. (as seen in Figure 3C)

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Figure 3C shows section B-B of Figure 2, having probe tips 211 and alignment reference points C and D.

5 Figure 4 shows the handler when the four devices 11a, 11b, 11c, and 11d are brought into contact with the probe tips 211 a, 211b, 211c and 211d. The handler further includes a receiver 40 in the form of contactor plate 41 to receive the devices on the reel.

10 Figure 5 illustrates a method of testing using a material handler of the present invention. The method includes rotating a material handler and device on reel to a probe having a probe tip, comparing a displacement of the probe tip to the device for testing, aligning the material handler to align the device to the probe tip to dock the device to the probe tip, and finally performing the test.

15 In a variation as of this method, the method of comparing includes the steps of identifying a location of device pins of the device, identifying a location of probe pins of a probe card and establishing the displacement of the probe tip to the device pin.

20 The embodiments of the invention have been advanced by way of example only, and modifications are possible within the scope of the invention as defined by the appended claims.

CLAIMS

1. A material handler for conveying devices on a reel to a tester for testing, said material handler including
 - 5 a rotatable assembly to engage and rotate the devices on reel towards a tester, the tester having a probe tip;
a comparator means to compare a position of the device in relation to the probe tip;
an alignment means in communication with the comparator means to position
10 the device to the probe tip for testing;
wherein the alignment means positions the device to the probe tip for testing to be performed on the device.
2. A material handler for conveying devices on a reel according to claim 1,
15 wherein the rotational assembly and the alignment means are integral.
3. A material handler for conveying devices on a reel according to any one of claims 1 or 2, wherein the rotatable assembly moves in at least an x, y and theta direction.
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4. A material handler for conveying devices on a reel according to claim 1, wherein the comparator means is an optical comparator.
5. A material handler for conveying devices on a reel according to claim 4,
25 wherein the optical comparator is an image capturing apparatus.
6. A material handler for conveying devices on a reel according to claim 5, wherein the image capturing device is a first and second optical camera.
- 30 7. A material handler for conveying devices on a reel according to claim 6, wherein the first optical camera identifies the location of the devices on reel.
8. A material handler for conveying devices on a reel according to claim 6, wherein the second optical camera identifies the location of the probe tip.
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9. A material handler for conveying devices on a reel according to claim 6, wherein the image capturing apparatus further includes a logic controller to determine the range of motions, any one or a combination of an x, y, and/ or theta direction, to move the device to the probe tip for testing.

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10. A material handler for conveying devices according to any one of claims 1 to 9, wherein the rotatable assembly is actuated by a motor.

11. A material handler for conveying devices on a reel to a tester, said tester having a probe tip for testing, including

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a rotatable assembly capable of moving in an x, y and theta direction;

a receiver connected to the rotatable assembly to receive the devices on reel;

a comparator means to compare a position of the device in relation to the probe tip;

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wherein the comparator means communicates with the rotatable assembly to move the device to the probe tip for testing.

12. A material handler for conveying devices on a reel to a tester according to claim 11, wherein the rotatable assembly is actuated by a motor.

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13. A material handler for conveying devices on a reel to a tester according to claim 11, wherein the receiver is a contactor plate.

14. A material handler for conveying devices on a reel to a tester according to claim 12, wherein the contactor plate further includes alignment guides to align a received device reel.

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15. A material handler for conveying devices on a reel to a tester according to claim 11, wherein the comparator means is an optical comparator.

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16. A material handler for conveying devices on a reel to a tester according to claim 14, wherein the optical comparator is an image capturing apparatus.

17. A material handler for conveying devices on a reel to a tester according to claim 15, wherein the image capturing device is a first and second optical camera.

18. A material handler for conveying devices on a reel to a tester according to claim 16, wherein the first optical camera identifies the location of the devices on reel.

19. A material handler for conveying devices on a reel to a tester according to claim 16, wherein the second optical camera identifies the location of the probe tip.

20. A material handler for conveying devices on a reel to a tester according to claim 18, wherein the positional displacement between the device reel and the probe tip is communicated to the rotatable assembly to move the device to the probe tip for testing to be performed.

21. A material handler for conveying devices on a reel to a tester, said tester having a probe tip, including
 a rotatable assembly having a contactor plate and a device reel; and
 an optical comparator to identify a position of the device in relation to the probe tip, said optical comparator in communication with the rotational assembly;
 wherein the rotational assembly moves the device to the probe tip in response to the optical comparator.

22. A method of testing a device on a reel, said method including
 rotating a material handler and device on reel to a probe having a probe tip;
 comparing a displacement of the probe tip to the device;
 aligning the material handler to align the device to the probe tip; and
 performing the test.

23. A method of testing a device on a reel according to claim 20, wherein the step of comparing includes the steps of
 identifying a location of device pins of the device;
 identifying a location of probe pins of a probe card; and
 establishing the displacement of the probe tip to the device pin.