

A METHOD OF INSPECTION OF BOTTOM SEALING SHIFT ON A PAPER CARRIER TAPE

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 This invention relates to an inspection system, and in particular to a method using the inspection system to inspect bottom sealing shift of passive components on a paper carrier tape being properly sealed in an individual tape pocket. This invention relates generally to vision systems for inspecting the integrity of seals on packaged goods and more particularly to an on-line machine vision system for
10 inspecting the integrity of package seals for packages including elastomer seals.

2. Description of the Related Art

Machine vision systems for inspecting the seals of packages containing various types of products moving at a relatively rapid rate along a production line are generally known and typically involve the use of one or more video cameras
15 which are located at an inspection station where the packages are viewed as they pass along a conveyor. Images are generated of the packages which are then analyzed in order to determine the existence of any defects in sealing.

US Patent No. 6475826 discloses a method for detecting integrated circuit package orientation in carrier tape packing. In accordance with these aspects, a
20 digital circuit is provided over a carrier rail of a tape and reel system. The digital circuit detects package orientation based on a chamfer side of packages within a tape on the carrier rail. The digital circuit further includes at least two optical sensors, where the optical sensors emit a light beam and sense reflection of the light beam for each package within the tape for use in determining package
25 orientation in an automated manner.

WO2012005453A3 entitled "Semiconductor Package Vision Inspection Method" discloses a method of inspecting a semiconductor package during a semiconductor package manufacturing process, and more particularly, to a method of photographing and inspecting a semiconductor package in a state in
30 which an individual semiconductor package is picked up by a picker in a

semiconductor package manufacturing apparatus. The method comprises the steps of (a) picking up a plurality of semiconductor packages from a table by a picker in a state in which a gap between pick-up members of the picker is a first pitch; (b) varying a distance between the pick-up members of the picker to a second pitch smaller than the first pitch; and (c) photographing semiconductor packages in which the vision camera is fixed to the picker while the picker and the vision camera move relatively without stopping.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) having a cover tape (12), a plurality of tape pockets (14) with or without the bottom sealing shift of passive component, arranged in alignment on said carrier tape (10), and a plurality of pitch holes (16) arranged in a row along one edge of the carrier tape (10), opposed to the alignment of the tape pocket (14), and at least an image capturing device, said method comprising the steps of:

- (i) capturing an image by the image capturing device of the carrier tape (10) together with each of the tape pocket (14) being sealed the cover tape (12) across each of the tape pockets (14);
- (ii) observing the image taken in step (i) above for the bottom of the cover tape (12) and
- (iii) distinguishing a dark color being the carrier tape (10) and a white colour being the cover tape (12) sealing the tape pocket (14);

thereby the bottom sealing shift cover tape is a failed unit if the cover tape (12) touches the pitch holes, which indicates a shift over of the cover tape on the carrier tape.

Another object of the present invention is to provide a method of visual inspection of bottom sealing shift of passive component on a carrier tape (10), wherein the

sealed unit is considered failed if one edge of the cover tape (12) covers the pitch holes partially or slightly.

Still an object of the present invention is to provide a method of visual inspection of bottom sealing shift of passive component on a carrier tape (10), wherein if the
 5 sealing mark of the cover tape (12) touches a part of the pitch hole, the bottom sealing shift cover tape is considered as a failed unit.

Yet a further object of the present invention is to provide a method of visual inspection of bottom sealing shift of passive component on a carrier tape (10), wherein if the cover tape (12) covers the tape pocket (14) and do not touch the
 10 pitch hole (14), the bottom sealing shift cover tape (20) is considered a pass unit.

Still yet another object of the present invention is to provide a method of visual inspection of bottom sealing shift of passive component on a carrier tape (10), wherein the passive component (20) is enclosed within the tape pocket (14) by the cover tape (12).

15 A further object of the present invention is to provide a method of visual inspection of bottom sealing shift of passive component on a carrier tape (10), wherein the image capturing device is a camera and the image capture device can be more than one.

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

This invention will be more readily understood when considered together with the accompanying drawings wherein:

FIG. 1 schematically shows a carrier tape structure with a cover tape in accordance with is a preferred embodiment of the subject invention;

25 FIG. 2 is an image showing the distinguishable cover tape (in white) and the carrier tape (in darker colour) in accordance with the present invention.

FIG. 3A is an image showing the bottom sealing mark of the cover tape which is the right position and the sealing of the passive component being a pass unit.

FIG. 3B is an image showing the bottom sealing mark of the cover tape being shifted over and the sealing of the bottom sealing shift of passive component being a failed unit.

5 DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a plan view showing the layout of a carrier tape (10) with a cover tape (12) in accordance with a preferred embodiment of the present invention, wherein reference numeral 10 designates the carrier tape; reference numeral 12 designates the cover tape; reference numeral 14 designate tape pockets formed on the carrier tape (10); reference numeral 16 designates pitch holes on the carrier tape (10); and reference 20 designates a chip component. As shown in the figure, the carrier tape (10) is elongated and is a flat structure, and a plurality of tape pockets (14) and a plurality of pitch holes (16) are formed on the carrier tape (10). The plurality of the tape pockets (14) are in alignment and the pitch holes (16) are arranged in a row opposite to the tape pocket (14) alignment and along the edge of the carrier tape (10). Each of the tape pocket (14) contains a passive component (20), such as chip. The cover tape (12) is translucent or the like and is provided with adhesive on one side of the cover tape (12). The cover tape (20) has a first edge (21) and a second edge (22), as shown in Fig. 1. The first edge of the cover tape (12) is in alignment to the edge of the carrier tape (10). In other words, when the cover tape (12) seals the tape pockets (14) together with the chip component (20) within the tape pocket, the first edge (21) of the cover tape (12) is in alignment to the edge of the carrier tape (10), and the second edge (22) will touch the pitch holes (16) at one point of the pitch holes (16).

FIG. 2 is an image showing the distinguishable cover tape (in white) and the carrier tape (in darker colour) in accordance with the present invention. The image as shown is captured by using a camera onto the carrier tape (10), and the chip component (20) is within the tape pocket (14). In the image, the cover tape (12) is appeared to be in white color and the chip component (20) and the carrier tape (10) is with a darker color.

FIG. 3A is an image showing the bottom sealing mark of the cover tape (12) which is the right position and the sealing of the bottom sealing shift of passive component being a pass unit. In the image, the second edge (22) of the cover tape (12) touches the pitch holes (16) just at the circumference of the hole (16) and does not shift over to the hole (16). This image shows that the cover tape (12) has performed a proper sealing of the tape pocket (14).

FIG. 3B is an image showing the bottom sealing mark of the cover tape (12) being shifted over and the sealing of the bottom sealing shift of passive component being a failed unit. In the image, the second edge (22) of the cover tape (12) shifts over the pitch holes (16). This image shows that the cover tape (12) has performed an improper sealing of the tape pocket (14) and therefore the sealing of the tape pocket (14) is a failed unit.

The cover tape (12) for inspection by this invention is translucent, and the images taken are under sufficient light exposure. The inspection of the cover tape (12) is provided with a computer screen or monitor screen to distinguish the color of the cover tape and the darker colour of the carrier tape.

Having thus shown and described what is considered to be the preferred method and embodiments for implementing the subject invention, it is to be noted that the same has been made by way of illustration and not limitation. Accordingly, all modifications, alterations and changes coming within the spirit and scope of the invention are herein meant to be included.

CLAIMS

1. A method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) having a cover tape (12), a plurality of tape pockets (14) with or without the bottom sealing shift of passive component (20), arranged in alignment on said carrier tape (10), and a plurality of pitch holes (16) arranged in a row along one edge of the carrier tape (10), opposed to the alignment of the tape pocket (14), and at least an image capturing device, said method comprising the steps of:

 - (i) capturing an image by the image capturing device of the carrier tape (10) together with each of the tape pocket (14) being sealed with the cover tape (12) across each of the tape pockets (14);
 - (ii) observing the image take in step (i) above for the bottom of the cover tape (12) and
 - (iii) distinguishing a dark color being the carrier tape (10) and a white colour being the cover tape (12) sealing the tape pocket (14);

thereby the bottom sealing shift of passive component is a failed unit if the cover tape (12) touches the pitch holes (16), which indicates a shift over of the cover tape (12) on the carrier tape (10).
2. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 1, wherein the bottom sealing shift unit is considered failed if one edge of the cover tape (12) covers the pitch holes (16) partially or slightly.
3. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 1, wherein if a sealing mark of the cover tape (12) touches a part of the pitch hole (16), the bottom sealing shift cover tape is considered as a failed unit.
4. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 1, wherein if the

cover tape (12) covers the tape pocket (14) and do not touch the pitch hole (16), the bottom sealing shift cover tape (12) is considered a pass unit.

- 5 5. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 4, wherein the bottom sealing shift of passive component (20) is enclosed within the tape pocket (14) by the cover tape (12).
6. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 1, wherein the image capturing device is a camera.
- 10 7. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 1, wherein the image capture device can be more than one.
8. The method of visual inspection of bottom sealing shift of passive component on a carrier tape (10) as set forth in Claim 1, further comprises
15 utilizing the image capturing device to generate images on a computer screen for inspection of the fail unit.