Description

SEMICONDUCTOR PACKAGE SORTING METHOD

Technical Field

[1] The present invention relates to a semiconductor package sorting method, and more particularly, to a semiconductor package sorting method for improving a sorting speed and yield of semiconductor packages.

Background Art

[2] A semiconductor package vision inspection apparatus is an apparatus for physically inspecting outer characteristics, such as outer appearance, etc., of objects to be inspected, more particularly, of semiconductor packages.

[3] Semiconductor packages, such as IC chips, have a need for a high accuracy in proportion to a size reduction thereof. However, in spite of a continuous development of semiconductor package fabrication technologies, the semiconductor packages still suffer from several problems, such as poor outer appearance, defective marking, etc. For this reason, implementing a post-inspection on semiconductor packages is recognized as very important.

[4] Semiconductor packages are arranged to form a plurality of columns and rows and conveyed in a state wherein they are seated in a tray. Accordingly, a semiconductor package vision inspection is performed for each individual tray. Conventionally, 24 ~ 400 semiconductor packages are seated in a tray, and a plurality of trays can be stacked one above another.

[5] Now, a conventional semiconductor package sorting method will be explained (See FIG. 1).

[6] First, a tray, in which semiconductor packages to be inspected are received, is loaded in a loading unit 1, and an empty tray feeding unit 2 transfers empty trays to rails of defective product storage units 5 and 6 included in a sorting device 7, to use the empty trays as a second defective product tray R2 or third defective product tray R3.

[7] The tray, loaded in the loading unit 1, is subsequently transferred to positions where a first vision probe and a second vision probe are installed, to go through a vision inspection for inspecting an outer appearance of the semiconductor packages received therein.

[8] After the outer appearance vision inspection is performed by use of the first and sec ond vision probes, the tray is transferred to a rail of a buffer unit 4. In this case, the tray serves as a buffer tray B or a first defective product tray R1. Hereinafter, the buffer or first defective product tray is simply referred to as a buffer tray B/R1.

[9] After being transferred to the buffer unit 4, defective products received in the buffer tray B/R1 are shifted to the empty defective product trays R2 and R3 under operation

of pickers. Here, whether the defective products are shifted to the second defective product tray R2 or third defective product tray R3 depends on the kind of defects, such as for example, ball defects or marking defects, etc.

[10] Then, after a new tray is transferred from the loading unit and subjected to an outer appearance vision inspection by use of the first and second vision probes, the tray is transferred to a rail of an unloading unit 3. The tray is an unloading tray G to contain only normal products.

[11] Subsequently, it is determined whether or not defective products are found among the semiconductor packages received in the unloading tray G.

[12] If it is determined that no defective products are received in the unloading tray G, the tray G is unloaded into the unloading unit 3 so as to be stacked therein. Conversely, if it is determined that any defective products are received in the unloading tray G, the respective defective products are shifted to one of the defective product trays R2 and R3 under operation of the pickers on the basis of the kind of defects, such as, ball defects or marking defects, etc. Then, empty places of the unloading tray G generated after the discharge of the defective products are filled with normal products received in the buffer tray B/R1.

[13] The unloading tray G, which is filled with only the normal products, is unloaded into the unloading unit 3 so as to be stacked therein.

[14] Meanwhile, if the second defective product tray R2 or third defective product tray R3 is fully filled with the defective products, the tray is discharged to the relevant defective product storage unit 5 or 6, and an empty place generated after the discharge of the tray is filled with a new empty tray fed from the empty tray feeding unit 2.

[15] If all trays of a selected lot are completely inspected and sorted after repeatedly performing the above described sequential process, the buffer tray B/R1 and unloading tray G, in which the normal products, i.e. normal semiconductor packages, are arranged, and the second and third defective product trays R2 and R3, in which the defective products, i.e. defective semiconductor packages, are arranged, are discharged simultaneously.

[16] Thereafter, the defective product trays, which are discharged into the second and third defective product storage units 5 and 6, to be stacked therein, such that they are again subjected to the above described inspection and sorting process after the restudy of information about the relevant lot, to achieve a reduction in the yield of defective products. It will be appreciated that, if the buffer tray B/R1 is used as the first defective product tray and a last tray on the rail of the first defective product storage unit 4 has defective products, the tray is discharged into the first defective product storage unit 4, so as to be subjected to a re-inspection and sorting process for the defective products.

Disclosure of Invention

Technical Problem

[17] In the above described inspection and sorting process of the conventional semiconductor package sorting method, operation of all equipment except for the defective product trays has to be stopped after completing a primary inspection and sorting of all trays of a selected lot, and only the defective product trays are arranged and transferred for the re-inspection and sorting process for the defective products.

[18] However, stopping all equipment while the defective products received in the defective product trays are arranged during their re-inspection and sorting process has a problem of deterioration in operation efficiency.

[19] In the above described conventional method, furthermore, there is a problem in that, when a re-inspection process for defective products is performed after completing a primary inspection and sorting of a selected lot, a last tray is a so-called remnant tray in which semiconductor packages are not received fully. This has a need for an operator to manually fill the remnant tray with additional semiconductor packages. It will be expected that the number of the remnant trays increase in proportion to the implementation number of re-inspection processes, and accordingly, the above described conventional semiconductor package inspection and sorting method has serious deterioration in operation efficiency.

Technical Solution

[20] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a semiconductor package sorting method in which defective products are sorted and re-inspected simultaneously while normal products are arranged after completing a sorting process for a last tray of a selected lot, thereby achieving a reduction in the inspection and sorting speed of semiconductor packages.

[21] It is another object of the present invention to provide a semiconductor package sorting method in which an inspection and sorting process of a selected lot is carried out such that only one remnant tray exists regardless of the implementation number of a re-inspection process, thereby achieving an improvement in operation efficiency.

[22] In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a method for inspecting semiconductor packages and sorting the semiconductor packages into defective products and normal products based on results of inspection, comprising: performing a vision inspection on a first tray transferred from a loading unit; transferring the first tray, having passed through the vision inspection, to a buffer unit; shifting defective products, received in the first tray serving as a buffer tray of the buffer unit, to at least one defective product

tray; performing a vision inspection on a second tray transferred from the loading unit; transferring the second tray, having passed through the vision inspection, to an unloading unit; determining whether or not defective products are found among semiconductor packages received in the second tray serving as an unloading tray of the unloading unit; if it is determined that the unloading tray receives defective products, shifting the defective products of the unloading tray to empty places of the defective product tray, and shifting normal products received in the buffer tray to fill empty places of the unloading tray; if a vision inspection for a last tray of a selected lot is completed after repeatedly performing all the foregoing steps and the last tray is transferred to the unloading unit, shifting the defective products received in the unloading tray to the defective product tray; discharging the defective product tray into a defective product storage unit, and determining whether or not a re-inspection for the defective products is performed; and if the implementation of a re-inspection for the defective products is determined, performing a re-inspection for the defective product tray simultaneously while the normal products are arranged.

Description of Drawings

[23] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[24] FIG. 1 is a flow chart illustrating the sequence of a semiconductor package sorting method according to the present invention; and

[25] FIG. 2 is a plan view illustrating an apparatus for inspecting and sorting semiconductor packages, which is used in the semiconductor package sorting method according to the present invention.

Best Mode

[26] The present invention will be more clearly understood by preferred embodiments of the present invention, which will described hereinafter, with reference to the accompanying drawings. Now, the preferred embodiments of the present invention will be explained in detail for the sake of a better understanding by those skilled in the art.

[27] FIG. 1 is a flow chart illustrating the sequence of a semiconductor package sorting method according to the present invention. FIG. 2 is a plan view illustrating an apparatus for inspecting and sorting semiconductor packages, which is used in the semiconductor package sorting method according to the present invention. In the following description, the same element as those in the above description of the prior art will be designated as the same reference numerals.

[28] First, a tray, in which semiconductor packages to be inspected are received, is loaded in a loading unit 1, and an empty tray feeding unit 2 transfers empty trays to

rails of defective product storage units 5 and 6 included in a sorting device 7, to use the empty trays as a second defective product tray R2 or third defective product tray R3.

[29] The tray, loaded in the loading unit 1, is subsequently transferred to positions where a first vision probe and a second vision probe are installed, to go through a vision inspection for inspecting an outer appearance of the semiconductor packages received therein (S100).

[30] After the outer appearance vision inspection is performed by use of the first and second vision probes (S100), the tray is transferred to a rail of a buffer unit 4 (S200). In this case, the tray serves as a buffer tray B or a first defective product tray R1. Hereinafter, the buffer or first defective product tray is simply referred to as a buffer tray B/R1.

[31] After being transferred to the buffer tray rail, defective products received in the buffer tray B/R1 are shifted to the empty defective product trays R2 and R3 under operation of pickers (S210). Here, whether the defective products are shifted to the second defective product tray R2 or third defective product tray R3 depends on the kind of defects, such as for example, ball defects or marking defects, etc.

[32] After a new tray, transferred from the loading unit 1, is subjected to an outer appearance vision inspection by use of the first and second vision probes (S300), the tray is transferred to a rail of an unloading unit 3 (S400). In this case, the tray is an unloading tray G to contain only normal products.

[33] Subsequently, it is determined whether or not defective products are found among the semiconductor packages received in the unloading tray G (S500).

[34] If it is determined in the operation S500 that any defective products are received in the tray, the respective defective products are shifted to one of the defective product trays R2 and R3 under operation of the pickers on the basis of the kind of defects, such as, ball defects or marking defects, etc. Then, empty places of the unloading tray G generated after the discharge of the defective products are filled with normal products received in the buffer tray B/R1 (S600).

[35] The unloading tray G, which is filled with only the normal products, is unloaded into the unloading unit 3 so as to be stacked therein (S610).

[36] Conversely, if it is determined in the operation S500 that no defective products are received in the unloading tray G, the tray G is unloaded into the unloading unit 3 so as to be stacked therein (S610).

[37] Meanwhile, if the second defective product tray R2 or third defective product tray R3 is fully filled with the defective products (S620), the tray is discharged to the relevant defective product storage unit 5 or 6, and an empty place generated after the discharge of the tray is filled with a new empty tray fed from the empty tray feeding unit 2 (S630).

[38] If a last tray of a selected lot is subjected to a vision inspection and transferred to the unloading unit 3 after repeatedly performing the above described sequential process, any defective products received in the unloading tray G are shifted to the second and/or third defective products trays, on the basis of the kind of defective products received in the unloading tray G (S700).

[39] The second and third defective product trays R2 and R3 are discharged into the second and third defective product storage units 5 and 6 (S710).

[40] Then, it is determined whether or not a re-inspection process for the defective products will be performed (S800). If the implementation of the re-inspection process is determined, while the normal products received in the buffer tray B/R1 and unloading tray G are arranged, simultaneously, the trays loaded in the second and third defective product storage units are loaded into the loading unit and again subjected to a vision inspection (S900). In this case, if the buffer tray B/R1 is used as a defective product tray, the buffer tray B/R1 is also discharged to the defective product storage unit such that it can be loaded into the loading unit simultaneously while the normal products are arranged, so as to be again subjected to the vision inspection.

[41] On the other hand, if it is determined not to perform the re-inspection process on the defective products, the normal products received in the buffer tray B/R1 and unloading tray G are arranged, and the buffer tray B/R1 and unloading tray G are discharged (S810).

[42] Performing the above described re-inspection process on the defective product tray is effective to reduce the yield of defective products. Moreover, by performing the re-inspection of the defective products simultaneously while the normal products are arranged, the inspection and sorting time can be shortened, and consequently, the inspection and sorting efficiency can be improved.

[43] According to the present invention, when the re-inspection process is performed after completing the inspection and sorting of a selected lot, there remains only one remnant tray in which semiconductor packages are not fully filled. This eliminates a necessity for manually arranging the remnant tray every time whenever the re-inspection process is performed, resulting in an improvement in operation efficiency.

Industrial Applicability

[44] As apparent from the above description, according to the present invention, after a sorting process for a last tray of a selected lot is completed, only defective products are collected and arranged such that a re-inspection process of the defective products is performed simultaneously while normal products received in a buffer tray or normal product tray are arranged. As a result, the inspection and sorting speed of semi-conductor packages can be reduced, resulting in an improvement in operation efficiency.

[45] Further, as a result of performing a re-inspection process on semiconductor packages that are rejected in a primary inspection process, it is possible to reduce the disposal amount of semiconductor packages. This consequently causes an improvement in yield.

[46] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

[1] A method for inspecting semiconductor packages and sorting the semiconductor packages into defective products and normal products based on results of inspection, comprising:
performing a vision inspection on a first tray transferred from a loading unit;
transferring the first tray, having passed through the vision inspection, to a buffer unit;
shifting defective products, received in the first tray serving as a buffer tray of the buffer unit, to at least one defective product tray;
performing a vision inspection on a second tray transferred from the loading unit;
transferring the second tray, having passed through the vision inspection, to an unloading unit;
determining whether or not defective products are found among semiconductor packages received in the second tray serving as an unloading tray of the unloading unit;
if it is determined that the unloading tray receives defective products, shifting the defective products of the unloading tray to empty places of the defective product tray, and shifting normal products received in the buffer tray to fill empty places of the unloading tray;
if a vision inspection for a last tray of a selected lot is completed after repeatedly performing all the foregoing steps and the last tray is transferred to the unloading unit, shifting the defective products received in the unloading tray to the defective product tray;
discharging the defective product tray into a defective product storage unit, and determining whether or not a re-inspection for the defective products is performed; and
if the implementation of a re-inspection for the defective products is determined, performing a re-inspection for the defective product tray simultaneously while the normal products are arranged.

[2] The method according to claim 1, further comprising: after completing the step of shifting the normal products received in the buffer tray to fill the empty places of the unloading tray operation,
discharging the unloading tray, which is fully filled with the normal products, into the unloading unit, and determining whether or not the defectively product tray is fully filled with the defective products; and
if the defective product tray is fully filled with the defective products, discharging the defective product tray and feeding an empty tray to the defective

product storage unit.