

DESCRIPTION

TCP HANDLING APPARATUS

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TECHNICAL FIELD

The present invention relates to a TCP handling apparatus used for testing TCP (Tape Carrier Package) and COF (Chip On Film) as kinds of IC devices (hereinafter, devices produced by mounting techniques of TCP, COF and other TAB (Tape Automated Bonding) will be collectively referred to as "TCP").

BACKGROUND ART

In a production procedure of IC devices and other electronic devices, an electronic device testing apparatus is necessary for testing performance and functions of finally produced IC devices and devices in the middle of the procedure. In the case of a TCP, a TCP testing apparatus is used.

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The TCP testing apparatus generally comprises a tester body, a test head and a TCP handling device (hereinafter, also referred to as "a TCP handler"). The TCP handler has a function of conducting tests successively on a plurality of TCP by conveying a carrier tape, which is a tape (It includes a concept of a film.

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It will be the same below) with a plurality of TCP formed thereon, pressing the carrier tape against probes of a probe card electrically connected to the test head, and bringing external electrodes of TCP contact with the
5 probes.

Such a TCP handler is provided with a pusher (unit) capable of supporting the carrier tape and pressing the same against probes. At the time of testing TCP, the pusher moves downward (in the Z-axis direction) while
10 supporting the carrier tape and brings the TCP on the carrier tape contact with the probes of the probe card.

On the former stage side and the latter stage side of the pusher in the TCP handler, guides for regulating a height of the carrier tape is normally provided. However,
15 in a conventional TCP handler, these guides are provided to be fixed to the TCP handler, so that when the carrier tape deviates in the planar direction, particularly in the perpendicular direction (Y-axis direction) to the conveying direction (X-axis direction) of the carrier
20 tape or the rotation direction (θ direction) around the vertical axis due to a movement of the pusher, stress is imposed on the carrier tape supported by the guides and TCP (particularly, a lead or a test pad) on the carrier
tape and the carrier tape itself (particularly, holes for
25 teeth of sprockets to fit in or the peripheral portions)

may be damaged. Such problems are particularly easily caused when moving the pusher in the planar direction for correcting positional deviation of TCP to be tested.

DISCLOSURE OF THE INVENTION

Embodiments of the present invention were made in consideration of the above circumstances and seek to provide a TCP handling apparatus capable of reducing stress imposed on a carrier tape even when the carrier tape is deviated due to a movement, etc. of the pusher.

A first aspect of the present invention provides a TCP handling apparatus capable of conducting tests successively on a plurality of TCP by pressing a carrier tape, which is a tape with a plurality of TCP formed thereon, against a contact portion electrically connected to a test head by a pusher to bring external terminals of the TCP contact with said contact portion, wherein a guide for guiding the carrier tape is provided on the former stage side and/or the latter stage side of said pusher on a running path of the carrier tape, and said guide is capable of being displaced at least in a planar direction of the carrier tape.

Note that the "pusher" in the present specification may include any of concepts of a pusher body for pressing

the carrier tape against the contact portion, sprockets for supporting/conveying the carrier tape near the pusher body and, furthermore, a pusher unit comprising the pusher body and the sprockets.

In example embodiments, even when the carrier tape is deviated due to a movement, etc. of the pusher, stress imposed on the carrier tape can be reduced as a result that the guides for guiding the carrier tape is displaced in the planar direction of the carrier tape.

In example embodiments, preferably, the guide is provided to be able to be displaced by sliding and rotating on the planar direction of the carrier tape.

As a result that the guides are displaced as above, stress imposed on the carrier tape can be reduced even when the carrier tape is deviated in the perpendicular direction (Y-axis direction) to the conveying direction (X-axis direction) of the carrier tape or the rotation direction (θ direction) around the vertical axis due to a movement, etc. of the pusher.

In example embodiments, preferably, the guide is provided to be in a floating state via an elastic body.

As a result of being provided in the above

configuration, the guides can be freely displaced at least in the planar direction of the carrier tape.

In example embodiments, alternately, the guide is provided to a position at a predetermined height and capable of regulating a height position of the carrier tape.

In example embodiments, a height of portions of the carrier tape other than a portion moved up and down by the pusher is regulated and a positional relationship between the carrier tape and other members (for example, cameras and punches, etc.) can be maintained to be normal.

In example embodiments, preferably, the guide is mounted on a rotation support member. As a result, the guides can be freely displaced, moreover, smoothly displaced in the planar direction of the carrier tape.

In example embodiments, preferably, the pusher is configured to be able to hold the carrier tape and moving the carrier tape in the planar direction and/or rotate around a vertical axis thereof, and the guide is displaced to reduce stress imposed on the carrier tape in accordance with the carrier tape moving along with a movement of the pusher.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a front view showing a TCP testing apparatus using a TCP handler according to an embodiment
5 of the present invention.

FIG. 2 is a sectional view from the front of a height regulation guide in the TCP handler according to the same embodiment.

FIG. 3 is a sectional view from the side of the
10 height regulation guide in the TCP handler according to the same embodiment.

FIG. 4 is a plan view of a bottom portion of the height regulation guide in the TCP handler according to the same embodiment.

15 FIG. 5 is a planar view of the height regulation guide in the TCP handler according to the same embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

Below, an embodiment of the present invention will
20 be explained based on the drawings.

A TCP testing apparatus using a TCP handler according to an embodiment of the present invention is shown in FIG. 1.

The TCP testing apparatus 1 comprises a not shown
25 tester body, a test head 10 electrically connected to the

tester body, and a TCP handler provided above the test head 10.

The TCP handler 2 is for giving tests successively on a plurality of TCP formed on a carrier tape 5. In the present embodiment, it is assumed that TCP is tested one by one for simplifying the explanation. Note that the present invention is not limited to this and a plurality of TCP arranged in the serial direction and/or parallel direction on the carrier tape 5 may be tested at a time.

10 The TCP handler 2 is provided with a feeding reel 21 and a winding reel 22, and the pre-test carrier tape 5 is wound in the feeding reel 21. The carrier tape 5 is fed from the feeding reel 21, subjected to a test, and rewound around the winding reel 22.

15 Between the feeding reel 21 and the winding reel 22, three spacer rolls 23a, 23b and 23c are provided for feeding a protective tape 51 peeled from the carrier tape 5 from the feeding reel 21 to the winding reel 22. Each of the spacer rolls 23a, 23b and 23c can move up and down so as to be able to adjust tension of the protective tape 51.

Below the feeding reel 21, a tape guide 24a, a feeding limit roller 25a, an inner sub sprocket 25b and an inner guide roller 25c are provided. The carrier tape 25 5 fed from the feeding reel 21 is guided by the tape

guide 24a to be conveyed to the pusher unit 3 through the feeding limit roller 25a, inner sub sprocket 25b and inner guide roller 25c.

Also, below the winding reel 22, a tape guide 24b,
5 a winding limit roller 25f, an outer sub sprocket 25e and an outer guide roller 25d are provided. The carrier tape 5 after being tested is guided by the tape guide 24b and runs through the outer guide roller 25d, the outer sub sprocket 25e and the winding limit roller 25f to be
10 rewound by the winding reel 22.

Between the inner guide roller 25c and the outer guide roller 25d, a pusher unit 3 is provided. A first camera 6a is provided to the former stage side (left side in FIG. 1) of the pusher unit 3, a second camera 6b is
15 provided below the pusher unit 3 (inside of a later explained probe card stage 7), and a third camera 6c is provided on the latter stage side (right side in FIG. 1) of the pusher unit 3. Also, between the pusher unit 3 and the third camera 6c, a mark punch 26a and a reject punch
20 26b are provided.

The mark punch 26a is for forming one or a plurality of holes at predetermined positions of a corresponding TCP, and the reject punch 26b is for punching out a TCP determined to be defective based on
25 the test result.

The cameras 6a, 6b and 6c are connected to a not shown image processing device. The first camera 6a and the third camera 26c are for determining an existence of TCP on the carrier tape 5 and positions and number of
5 holes to be formed by the mark punch 26a. The second camera 26b is for obtaining information on positional deviation of the TCP on the carrier tape 5 with respect to probes. Also, the second camera 6b in the present embodiment is capable of obtaining positional deviation
10 information of a plurality of objects in its scope.

The second camera 6b is mounted on a camera stage 61 and movable in the longitudinal and transversal directions on the plan view (the X-axis and Y-axis directions) and vertical direction (Z-axis direction) by
15 an actuator provided to the camera stage 61.

A servo motor 31 capable of rotating the ball screw 32 is attached via a bracket 361 to a body portion of the TCP handler 2, and the pusher body portion 33 with a ball screw screwed therein is also attached via two linear
20 motion guides 37 in the Z-axis direction. As a result of driving the servo motor 31, the pusher body portion 33 is movable in the vertical direction (Z-axis direction) by being guided by the linear motion guides 37. Also, the pusher body portion 33 and the frame (pusher frame) 36 of
25 the pusher unit 3 are connected by a not shown

interaction mechanism and, when the pusher body portion 33 moves up and down as explained above, the pusher frame 36 also moves up and down together therewith.

At the lower end portion of the pusher body portion 33, a suction plate 34 capable of picking up and holding the carrier tape 5 by suctioning the air is provided.

On the former stage side (left side in FIG. 1) of the pusher body portion 33 in the pusher frame 36, a tension sprocket 35a is provided, and a main sprocket 35b is provided on the latter stage side (right side in FIG. 1) of the pusher body portion 33.

The main sprocket 35b is driven by a stepping motor, etc. to convey the carrier tape 5, and the tension sprocket 35a rotates in the reverse direction of the running direction of the carrier tape 5 to give a predetermined tension to the carrier tape 5 and improves positional accuracy of the carrier tape 5.

The pusher unit 3 is connected to a not shown pusher stage. The pusher stage is connected to a servo motor via a plurality of ball screws (illustration thereof is omitted). The pusher unit 3 can be moved in the horizontal direction (XY plane direction) and rotated around a vertical axis (around Z-axis) by driving the servo motor.

Below the pusher unit 3 and above the test head 10,

a probe card stage 7 loaded with a probe card 8 is provided. The probe card stage 7 is connected to a servo motor via a plurality of ball screws (illustration thereof is omitted). The probe card 8 can be moved in the
5 horizontal direction (the XY-plane direction) and rotated around the vertical axis (around the Z-axis) by driving the servo motor.

The probe card 8 provided with a plurality of probes 81 is detachably attached to a card ring of the
10 probe card stage 7 by pins (illustration thereof is omitted). Note that each of the probes 81 of the probe card 8 is electrically connected to the tester body via the test head 10. The second camera 6b is positioned below the probe card 8 and inside of the probe card stage
15 8.

In the TCP testing apparatus 1, the carrier tape 5 is conveyed so as to pass through under the pusher unit 3, and the pusher unit 3 picks up by suction and supports the carrier tape 5 to press the same against the probe
20 card 8 on the test head 10. Then, TCP on the carrier tape 5 contacts with the probes 81 of the probe card 8, a test signal is applied to the TCP, and a response signal read from the TCP is sent to the tester body through the test head 10. As a result, performance and functions, etc. of
25 the TCP are tested.

Such a test is conducted on all TCP on the carrier tape 5 successively as a result that the carrier tape 5 is conveyed. Then, based on the test results, the mark punch 26a or the reject punch 26b is driven.

5 [Height Regulation Guide]

FIG. 2 to FIG. 5 are a front view (FIG. 2), a side view (FIG. 3) and plan views (FIG. 4 and FIG. 5) showing a height regulation guide of the TCP handler shown in FIG. 1. Furthermore, FIG. 5 is also an explanatory view
10 showing an operation of the height regulation guide.

The TCP handler 2 has height regulation guides 4 (4a and 4b) before and after the pusher unit 3 (on the right and left in FIG. 1). The height regulation guides 4 are provided on the former stage side and the latter
15 stage side of the pusher unit 3 (an inlet side and an outlet side of the carrier tape 5) with respect to the conveying direction of the carrier tape 5, support the carrier tape 5 and regulate a height of the carrier tape 5. Specifically, a height of the carrier tape 5 at the
20 time of entering the pusher unit 3 is regulated by the height regulation unit 4a on the former stage side, and a height of the carrier tape 5 at the time of going out from the pusher unit 3 is regulated by the height regulation guide 4b on the latter stage side.

25 The height regulation guides 4 comprises a chassis

41 and a pair of guide sprockets 42a and 42b one above the other and are provided on a mount base 29 extending from a wall of the body of the TCP handler 2 toward the front (refer to FIG. 2 to FIG. 4). The chassis 41 has a
5 rectangular frame shape when seen from the side. The pair of sprockets 42a and 42b one above the other are held in the chassis 41 to be rotatable by using wall portions on the front side and the back side of the chassis 41 as bearings. Also, the guide sprockets 42a and 42b are
10 arranged one above the other in line in the chassis 41, sandwich the carrier tape 5 between them to support, and capable of rotating in accordance with the conveying direction of the carrier tape 5 (refer to FIG. 2 and FIG. 3).

15 The height regulation guides 4 are mounted on the mount base 29 and are open in the X-axis direction, so that the guide sprockets 42a and 42b sandwich the carrier tape 5 from above and below (in the Z-axis direction) while keeping the rotation axes in the Y-axis direction
20 so as to be rotatable in the conveying direction of the carrier tape 5 (refer to FIG. 1).

Also, the height regulation guides 4 are supported by four points on the bottom of the chassis 41 by a rotation support member 43 on the mount base 29 (refer to
25 FIG. 2 to FIG. 4). The rotation support member 43 is, for

example, composed of four ball wheels 431 and fixed to the mount base 29. The rotation support member 43 supports the chassis 41 to be in a horizontal position, so that the height regulation guides 4 can be displaced
5 by sliding in the horizontal direction (displacement in the XY-planar direction) and by rotating (displacement in the θ direction around the Z-axis) smoothly.

Also, the height regulation guides 4 are anchored on the mount base 29 by an anchoring mechanism 44 on the
10 bottom of the chassis 41 (refer to FIG. 3 and FIG. 4). The anchoring mechanism 44 comprises an anchor pin 441 and an elastic member 442.

The anchoring mechanism 44 fastens the high regulation guides 4 on the mount base 29 as a result that
15 the anchor pin 441 is inserted to a hole 443 formed on the bottom of the chassis 41 and fixed to the mount base 29. Here, the hole 443 on the chassis 41 is formed to be larger than a diameter of the anchor pin 441 and configured that the height regulation guides 4 can be
20 displaced by sliding or rotating on the mount base 29 in a certain range. Also, the anchor pin 441 restrains a displacement of the height regulation guides 4 in the vertical direction by fastening the chassis 41 on the mount base 29. As a result, even when the height
25 regulation guides 4 are displaced, a conveying height of

the carrier tape 5 can be maintained to be constant.

In the anchoring mechanism 44, for example, the elastic member 442 formed by a rubber ring-shaped member is provided by being fit in the anchor pin 441 and
5 sandwiched between the anchor pin 441 and the hole on the chassis 41. The elastic member 442 functions as a shock absorber for reducing an impact by contact of the chassis 41 and the anchor pin 441 when the height regulation guides 4 are displaced on the mount base 29.

10 Also, the height regulation guides 4 are held by holding members 45 on the mount base 29 so as to be able to be displaced elastically (refer to FIG. 2 to FIG. 4). The holding members 45 comprise six coil springs 451. The coil springs 451 are provided to be put over the fixing
15 pin 452a provided on the bottom of the chassis 41 and a fixing pin 452b provided on the mount base 29. Also, to explain the coil springs 451, two of them are provided in the Y-axis direction and four of them are provided in the Z-axis direction on the plane of the mount base 29 (refer
20 to FIG. 4). In this state, a force in the contraction direction is given to each of the coil springs 451. The holding members 45 elastically hold the height regulation guides 4 from four directions, consequently, the height regulation guides 4 are in a floating state.

25 [Operation]

In the above TCP handler 2, the carrier tape 5 is conveyed to run below the pusher unit 3. At this time, the height regulation guides 4a and 4b are respectively positioned on the inlet side and outlet side of the
5 pusher unit 3 to support the carrier tape 5 at a predetermined height and regulate a conveying height of the carrier tape 5, so that a height position of the carrier tape 5 is kept normal with respect to the first camera 6a, the third camera 6c, the mark punch 26a and
10 the reject punch 26b in addition to the pusher unit 3.

When the pusher unit 3 moves in the vertical direction (Z-axis direction) at the time of testing TCP or when the pusher unit 3 moves in the horizontal direction (XY-planar direction) or rotates around the
15 vertical axis (around the Z-axis) to correct positional deviation of the TCP to be tested, the carrier tape 5 supported by the pusher unit 3 (a suction plate 34 of the pusher body portion 33, the tension sprocket 35a and the main sprocket 35b) is deviated in the X-axis direction,
20 Y-axis direction or θ direction at the height regulation guides 4a and 4b.

At this time, the height regulation guides 4a and 4b in a floating state reduce stress imposed on the carrier tape by being displaced by sliding and/or
25 displaced by rotating smoothly on the rotation support

member 43. Specifically, as a result that the height regulation guides 4a and 4b are displaced in the X-axis direction, Y-axis direction or θ direction on the rotation support member 43, the supporting direction of the carrier tape 5 by the height regulation guides 4a and 4b is changed and stress imposed on the carrier tape 5 is reduced.

Here, the height regulation guides 4a and 4b are mounted horizontally on the rotation support member 43 and anchored by the anchoring mechanism 44, so that the height regulation guides 4a and 4b are displaced only in the horizontal direction (XY-planar direction). As a result, a conveying height of the carrier tape 5 is kept at a predetermined height.

Also, the height regulation guides 4a and 4b are in a floating state due to the coil springs 451, an impact arising at the time of displacement of the height regulation guides 4a and 4b is reduced by elastic forces of the coil springs 451 and they are pulled back to the original positions (positions before the displacement) by the elastic forces of the coil springs 451 when the displacement finishes.

As explained above, according to the TCP handler 2 according to the present embodiment, the height regulation guides 4 in a floating state are displaced to

reduce stress imposed on the carrier tape 5, even when the carrier tape 5 is deviated by a movement of the pusher unit 3, stress imposed on the carrier tape 5 can be effectively reduced. Particularly, even when the
5 pusher unit 3 moves in the horizontal direction (XY-planar direction) and/or moves by rotating around the vertical axis (around the Z-axis) in a state of picking up and supporting the carrier tape 5, stress imposed on the carrier tape 5 thereby can be effectively reduced by
10 the height regulation guides 4 in a floating state.

As the result, it is possible to prevent the TCP on the carrier tape 5 (particularly, a lead or a test pad) and the carrier tape 5 itself (particularly, holes for teeth of the tension sprocket 35a, main sprocket 35b, the
15 guide sprockets 42a and 42b to fit in or the peripheral portions of the holes) from being damaged by stress imposed on the carrier tape 5 on.

[Modification Examples]

The embodiments explained above are described to
20 facilitate understanding of the present invention and is not to limit the present invention. Accordingly, respective elements disclosed in the above embodiments include all design modifications and equivalents belonging to the technical scope of the present invention.

25 For example, in the above TCP handler 2, the

rotation support member 43 of the height regulation guides 4 is composed of four ball wheels 431, and the chassis 41 is supported by four points by the ball wheels 431. Such a configuration is preferable in a point that
5 the chassis 41 is stably supported on the mount base 29 and able to be displaced by smoothly sliding and rotating on the mount base 29. However, the present invention is not limited to this and kinds of the rotation support member 43 and the supporting configuration of the chassis
10 41 by the rotation support member 43 may be freely selected within knowledge of persons skilled in the art.

Also, in the above TCP handler 2, the anchoring mechanism 44 of the height regulation guides 4 is composed of an anchor pin 441 and the configuration is
15 preferable in a point that the chassis 41 can be anchored on the mount base with a simple configuration. However, the present invention is not limited to this and the anchoring mechanism 44 may be composed of other members than the anchor pin 441 or may be omitted.

20 Also, in the above TCP handler 2, the holding members 45 of the height regulation guides 4 are composed of coil springs 451, but the present invention is not limited to this and the holding member 45 may be composed of other elastic member, such as a rubber member. Also,
25 the configuration of providing the holding members 45 to

the height regulation guides 4 (chassis 41) is not limited to the configuration shown in FIG. 2 to FIG. 4 and may be, for example, the configuration that the chassis 41 is joined together with a wall portion of the TCP handler 2 by a plurality of coil springs 451.

INDUSTRIAL APPLICABILITY

As explained above, according to the TCP handling apparatus according to the present invention, even when the carrier tape is deviated by a movement, etc. of the pusher, stress imposed on the carrier tape can be reduced, so that tests can be conducted on TCP on the carrier tape without giving any damages.

CLAIMS

1. A TCP handling apparatus capable of conducting tests successively on a plurality of TCP by pressing a carrier tape, which is a tape with a plurality of TCP formed thereon, against a contact portion electrically connected to a test head by a pusher to bring external terminals of the TCP contact with said contact portion,
wherein a guide for guiding the carrier tape is provided on the former stage side and/or the latter stage side of said pusher on a running path of the carrier tape, and said guide is capable of being displaced at least in a planar direction of the carrier tape.
2. The TCP handling apparatus as set forth in claim 1, wherein said guide is provided to be able to be displaced by sliding and rotating on the planar direction of the carrier tape.
3. The TCP handling apparatus as set forth in claim 1 or 2, wherein said guide is provided to be in a floating state via an elastic body.
4. The TCP handling apparatus as set forth in any one of claims 1 to 3, wherein said guide is provided to a position at a predetermined height and capable of regulating a height position of the carrier tape.

5. The TCP handling apparatus as set forth in claim 4, wherein said guide is mounted on a rotation support member.

6. The TCP handling apparatus as set forth in
5 any one of claims 1 to 5, wherein

said pusher is configured to be able to hold the carrier tape and moving the carrier tape in the planar direction and/or rotate around a vertical axis thereof, and

10 said guide is displaced to reduce stress imposed on said carrier tape in accordance with the carrier tape moving along with a movement of said pusher.

ABSTRACT

A TCP handler 2 capable of conducting tests
5 successively on a plurality of TCP by pressing the
carrier tape 5, which is a tape with a plurality of TCP
formed thereon, against a probe card 8 by a pusher unit 3
to bring external terminals of the TCP contact with
probes 81, wherein height regulation guides 4 for guiding
10 the carrier tape 5 is provided on the former stage side
and the latter stage side of the pusher unit 3 on a
running path of the carrier tape 5, and the height
regulation guides 4 are supported by a body of the TCP
handler 2 to be in a floating state and able to be
15 displaced in a planar direction of the carrier tape 5.