

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.

20 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.

The TCP handler as above is generally provided with a pusher body for pressing a carrier tape against probes and pusher sprockets for supporting the carrier tape on both sides of the pusher body and conveying the carrier
10 tape. When testing TCP, the pusher body and the pusher sprockets move downward while supporting the carrier tape and press the TCP on the carrier tape against probes of a probe card.

The former stage side and latter stage side of the
15 sprockets, a tension guide is provided, and a tension of the carrier tape is adjusted by displacement of the tension guide. In a conventional TCP handler, the tension guide is provided to the handler body, wherein a displacement amount of the tension guide has to be large
20 according to a vertical movement of the pusher sprockets and an excessive tension is applied to the carrier tape. Therefore, conveying mistakes due to dropping of the tape from the tension guide arise and TCP on the carrier tape may be damaged in some cases.

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 effectively reducing a tension applied to a carrier tape caused by a movement of pusher sprockets.

A first aspect of the present invention provides a TCP handling apparatus capable of conducting tests successively on a plurality of TCP by supporting and pressing a carrier tape, which is a tape with a plurality of TCP formed thereon, by a pusher unit against a contact portion electrically connected to a test head to bring external terminals of the TCP contact with said contact portion; wherein: said pusher unit comprises a pusher body, a pusher sprocket for supporting/conveying the carrier tape on the former stage side and/or latter stage side of said pusher body, and a guide member for guiding the carrier tape on the former stage side and/or latter stage side of said pusher sprocket, and is configured to press said carrier tape against said contact portion by moving to said contact portion side; and said guide member is attached to a frame for supporting said pusher sprocket to be able to displace in a direction of reducing a tension applied to the carrier tape.

In the TCP handling apparatus according to the example embodiments of the invention, the guide member moves to the contact portion side together with the pusher sprockets and is able to displace in the direction of reducing a tension applied to the carrier tape, so that a displacement amount of the guide member can be reduced comparing with that in the case of providing the guide member to a body of the TCP handling apparatus, consequently, a tension applied to the carrier tape can be effectively reduced.

In the example embodiments, preferably, the guide member is attached to the frame so as to displace along a moving direction of the frame.

In example embodiments, it is possible that a tension applied to the carrier tape caused by a movement of the pusher sprockets can be reduced effectively by the guide member displacing in the opposite direction of the pusher sprockets.

In the example embodiments, preferably, the guide member is attached to the frame via an elastic body (invention 3).

In example embodiments, the guide member can be effectively displaced by an elastic body to the direction of reducing a tension applied to

the carrier tape. Also, vibration and impact arising when the guide member displaces can be reduced, and a transfer of the vibration and impact to the carrier tape can be suppressed.

In the example embodiments, the guide member comprises a sprocket.

In example embodiments, a friction is not given to the carrier tape by rotation of the sprockets, and a tension applied to the carrier tape can be adjusted.

BRIEF DESCRIPTION OF DRAWINGS

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

FIG. 2 is a front view of a pusher unit in the TCP handler according to the same embodiment.

FIG. 3 is a front view of a tension guide in the TCP handler according to the same embodiment.

FIG. 4 is a view from the side of the tension guide in the TCP handler according to the same embodiment.

FIG. 5 is an explanatory view showing an operation of the tension guide in the TCP handler according to the same embodiment.

FIG. 6 is an explanatory view showing an operation of the tension guide in the TCP handler according to the same embodiment.

5 BEST MODE FOR CARRYING OUT THE INVENTION

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

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

The TCP testing apparatus 1 comprises a not shown tester body, a test head 10 electrically connected to the tester body, and a TCP handler provided above the test head 10.

15 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
20 of TCP arranged in the serial direction and/or parallel direction on the carrier tape 5 may be tested at a time.

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
25 fed from the feeding reel 21, subjected to a test, and

rewound around the winding reel 22.

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 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, 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 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 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 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 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 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 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 an actuator provided to the camera stage 61.

As shown in FIG. 1 and FIG. 2, 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 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 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. Hereinafter, the tension sprocket 35a and the main sprocket 35b are also

collectively referred to as pusher sprockets 35a and 35b.

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 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 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

5 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

10 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

15 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.

20 [Tension Guide]

FIG. 2 is a front view of a pusher unit and a tension guide of the TCP handler shown in FIG. 1. FIG. 3 and FIG. 4 are a front view (FIG. 3) and a view from the side (FIG. 4) of the tension guide shown in FIG. 2. FIG.

25 5 and FIG. 6 are explanatory views showing an operation

of the tension guide shown in FIG. 2. In FIG. 6, (a) shows a state before the pusher unit 3 moves downward, and (b) shows a state where the pusher unit 3 moves downward and the carrier tape 5 is pressed against the probe card 8.

In the TCP handler 2, the pusher frame 36 is provided to be able to move in the vertical direction (Z-axis direction) by working together with the pusher body 33, consequently, the pusher sprockets 35a and 35b attached to the pusher frame 36 can move in the vertical direction (illustration thereof is omitted).

Also, in the TCP handler 2, a pair of tension guides 4a and 4b are provided to the pusher frame 36 of the pusher unit 3. As for the tension guides 4a and 4b, one tension guide 4a is provided on the former stage side of the pusher sprocket 35a and the other tension guide 4b is provided on the latter stage side of the pusher sprocket 35b with respect to the conveying direction of the carrier tape 5 (refer to FIG. 1 and FIG. 2). Namely, the tension guides 4a and 4b are positioned respectively to an inlet and an outlet (on the right and left of the pusher frame 36 when seen from the front) for the carrier tape 5 of the pusher unit 3. The tension guides 4a and 4b have a function of adjusting a tension applied to the carrier tape 5 caused by a movement of the pusher unit 3

by guiding the carrier tape 5 at the inlet and outlet of the pusher unit 3.

The tension guide 4 comprises a guide sprocket 41, a bearing 42, a first base 43, a second base 44 and an elastic body 45 (refer to FIG. 3 and FIG. 4). The guide sprocket 41 is composed of a gear capable of conveying the carrier tape 5 and supported by the bearing 42 to be able to rotate. The bearing 42 is provided to be fixed on the first base 43, and the first base 43 is provided to be able to slide smoothly in the vertical direction (Z-axis direction) with respect to the second base 44. The second base 44 is provided to be fixed to the pusher frame 36. Due to the configuration, the tension guide 4 is capable of sliding smoothly in the vertical direction with respect to the pusher frame 36.

Also, the elastic body 45 in the present embodiment is a coil spring, wherein the upper end thereof is fixed to a wall portion of the pusher frame 36 by a fixing bracket 451 and the lower end is fixed to the first base 43. Due to the configuration, the tension guide 4 is provided by being hung from the wall surface of the pusher frame 36 via the elastic body 45.

Note that the sliding mechanism between the first base 43 and the second base 44 is, for example, composed of an engagement piece 431 provided to the first base 43

and an engagement groove 441 along the vertical direction provided to the second base 44, and configured by the first engagement piece 431 of the first base 43 engaging with the engagement groove 441 of the second base 44
5 (refer to FIG. 4). Then, as a result that the engagement piece 431 slides inside the engagement groove 441, the first base 43 slides up and down with respect to the second base 44. Note that the sliding mechanism between the first base 43 and the second base 44 is not limited
10 to the above configuration and may be freely selected from well-known sliding mechanisms within the knowledge of the people skilled in the art.

Also, in the TCP handler 2, a pair of height regulation guides 27a and 27b are provided to the body of
15 the TCP handler 2. As for the height regulation guides 27a and 27b, with respect to the conveying direction of the carrier tape 5, one height regulation guide 27a is provided to the former stage side of the tension guide 4a and the other height regulation guide 27b is provided to
20 the latter stage side of the tension guide 4b (refer to FIG. 1 and FIG. 2). The height regulation guides 27a and 27b have a function of regulating the carrier tape 5 to be a predetermined height on the former stage side and the latter stage side of the pusher unit 3.

25 [Operation]

In the TCP handler 2, the carrier tape 5 is put on the pusher sprockets 35a and 35b and the guide sprocket 41 of the tension guides 4a and 4b. At this time, the guide sprocket 41 of the tension guides 4a and 4b supports the carrier tape 5 from the lower face side (a face on the probes 81 side in a conveyed state and formed with external terminals of TCP).

At the time of testing, the pusher sprockets 35a and 35b support the carrier tape 5 from the upper face side, and the pusher body 33 picks up the carrier tape 5 by suction. In this state, the pusher frame 36 (pusher unit 3) moves downward (Z-axis direction) to press the TCP on the carrier tape 5 against the probe card 8, so that external terminals of the TCP contact with the probes 81. Then, a test signal is applied to the TCP and performance and functions, etc. of the TCP are tested (refer to FIG. 5).

Here, when the pusher frame 36 moves downward, a tension is applied to the carrier tape 5 supported by the pusher sprockets 35a and 35b moving downward with the pusher frame 36 and the height regulation guides 27a and 27b fixed to the body of the TCP handler 2. The tension guides 4a and 4b (guide sprocket 41) moves downward with the pusher frame 36, however, the guide sprocket 41 hung from the pusher frame 36 via the elastic body 45 slides

upward with respect to the pusher frame 36, consequently,
a tension applied to the carrier tape 5 is reduced. At
this time, the guide sprocket 41 slides by rotating, so
that there is no fear of giving friction to the carrier
5 tape 5.

A displacement amount of the guide sprocket 41 as
above from the original position is smaller comparing
with a displacement amount in the case of attaching the
guide sprocket 41 to the body of the TCP handler 2, so
10 that a tension applied to the carrier tape 5 can be
effectively reduced. As a result, conveying mistakes due
to dropping of the tape from the tension guide 4a and 4b
and damages on the TCP on the carrier tape 5 caused by an
excessive tension applied to the carrier tape 5 can be
15 prevented.

Note that the elastic body 45 of the tension guides
4a and 4b reduces vibration and impact arising when the
tension guides 4a and 4b displace with respect to the
pusher frame 36, and a transfer of the vibration and
20 impact to the carrier tape 5 is suppressed.

[Modification Example]

The embodiments explained above are described to
facilitate understanding of the present invention and is
not to limit the present invention. Accordingly,
25 respective elements disclosed in the above embodiments

include all design modifications and equivalents belonging to the technical scope of the present invention.

For example, in the above TCP handler 2, the tension guide 4 (guide sprocket 41) is provided to the pusher frame 36 via a sliding mechanism 441 (refer to FIG. 3 and FIG. 4). Such a configuration is preferable in terms of smoothing a displacement of the tension guide 4 with respect to the pusher frame 36. However, the present invention is not limited to that, and the tension guide 4 may be provided to the pusher frame by other displaceable configuration. Also, the tension guide 4 is not provided only in one direction (sliding direction) on the pusher frame 36 but may be provided to be displaceable in any plane direction. These displaceable configurations may be freely selected within the knowledge of people skilled in the art.

Also, in the above TCP handler 2, the tension guide 4 (guide sprocket 41) is provided to the pusher frame 36 via the elastic body 45 (refer to FIG. 3 and FIG. 4). Specifically, as a result that the elastic body 45 is provided between the pusher frame 36 and the first base 43, the tension guide 4 is held on the pusher frame 36. However, the present invention is not limited to this and, for example, the elastic body 45 may be arranged inside the engagement groove 441 of the second base to be one

body with the sliding mechanisms 441 and 431 of the
tension guide 4. As a result, there is an advantage that
the tension guide 4 can be made compact. Also, the
elastic body 45 is not limited to a coil spring and may
5 be composed of a rubber member or other elastic member,
an air cylinder or other pneumatic devices and hydraulic
device, etc.

INDUSTRIAL APPLICABILITY

10 As explained above, according to the TCP handling
apparatus of the present invention, a tension applied to
the carrier tape caused by a movement of the pusher
sprocket can be effectively reduced, so that tests can be
conducted without damaging TCP on the carrier tape.

CLAIMS

1. A TCP handling apparatus capable of
conducting tests successively on a plurality of TCP by
5 supporting and pressing a carrier tape, which is a tape
with a plurality of TCP formed thereon, by a pusher unit
against a contact portion electrically connected to a
test head to bring external terminals of the TCP contact
with said contact portion; wherein:

10 said pusher unit comprises a pusher body, a pusher
sprocket for supporting/conveying the carrier tape on the
former stage side and/or latter stage side of said pusher
body, and a guide member for guiding the carrier tape on
the former stage side and/or latter stage side of said
15 pusher sprocket, and is configured to press said carrier
tape against said contact portion by moving to said
contact portion side; and

said guide member is attached to a frame for
supporting said pusher sprocket to be able to displace in
20 a direction of reducing a tension applied to the carrier
tape.

2. The TCP handling apparatus as set forth in
claim 1, wherein said guide member is attached to said
frame so as to displace along a moving direction of said
25 frame.

3. The TCP handling apparatus as set forth in claim 1 or 2, wherein said guide member is attached to said frame via an elastic body.

4. The TCP handling apparatus as set forth in
5 any one of claims 1 to 3, wherein said guide member comprises a sprocket.

ABSTRACT

A TCP handler 2 capable of conducting tests
5 successively on a plurality of TCP by supporting and
pressing a carrier tape 5, which is a tape with a
plurality of TCP formed thereon, by a pusher unit 3
against a probe card 8 electrically connected to a test
head to bring external terminals of the TCP contact with
10 probes 81: wherein the pusher unit 3 comprises a pusher
body 33, pusher sprockets 35a and 35b for
supporting/conveying the carrier tape 5 on the former
stage side and/or latter stage side of the pusher body 33,
and tension guides 4a and 4b for guiding the carrier tape
15 5 on the former stage side and/or latter stage side of
the pusher sprockets 35a and 35b, and is configured to
press the carrier tape 5 against the probe card 8 by
moving to the probe card 8 side; and the tension guides
4a and 4b are attached to a pusher frame 36 for
20 supporting the pusher sprockets 35a and 35b to be able to
slide upward and downward via an elastic body 45.