

CARRIER TAPE RUNNING APPARATUS

TECHNICAL FIELD

5 The present disclosure relates to a carrier tape running apparatus device to be used for causing electronic components to be contained in a carrier tape.

BACKGROUND ART

Processes, such as various inspections, are
10 performed to electronic components after they are separated into pieces by each assembly processes, such as dicing, mounting, bonding, and sealing, etc. The processes are performed by an electronic component inspection apparatus generally called a test handler. In this apparatus, a main
15 table is rotated, and the electronic components in a carrying portion are held by holders such as suction nozzles, carried to inspection devices, and are inspected. After the inspections, the electronic components are inserted in pockets of the carrier tape by a taping apparatus.

20 The taping apparatus is an apparatus that intermittently runs the carrier tape to a reel that takes up the carrier tape (refer, for example, Japanese Patent Application 2007-137426). The pockets of the carrier tape are formed by embossing along a longitudinal direction of the
25 carrier tape. A manipulator, etc., inserts the electronic components into the pockets while the taping apparatus keep the carrier tape stopped. The taping apparatus seals the electronic components inserted in the pockets by laying and pressure attaching a seal tape on the carrier tape.

30 Related Technical Documents

Patent Documents

Patent Document 1: JP 2007-137426 A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

35 The taping apparatus as described above includes a guide portion that guides running of the carrier tape from

both lateral edges of the carrier tape in the longitudinal direction. The guide portion is manufactured in accordance with a width of the carrier tape. However, there are standard carrier tapes with different widths of, for example, 8 mm, 12mm, 16 mm, and 24 mm.

In cases of using the carrier tapes having different widths, the guide portion needs to be replaced with guide portions having respective widths, or the taping apparatus itself needs to be replaced. Hence, long work times were required when changing the utilized carrier tapes to the one with different widths. In addition, a large number of dedicated parts are needed to be prepared for the guide portions corresponding to the carrier tapes having the different widths. As a result, costs are increased, and a storage therefor are needed to be secured.

The present disclosure has been proposed to solve the problems as described above, and has an object to provide a carrier tape running apparatus adaptable to carrier tapes having different widths without the replacement of parts.

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SOLUTION TO THE PROBLEM

In order to solve the problems as described above, according an embodiment of the present disclosure, a carrier tape running apparatus that runs a carrier tape in a longitudinal direction of the carrier tape, the carrier tape having pockets that are arrayed in the longitudinal direction to hold electronic components, the carrier tape running apparatus including:

a pair of side guides that are arranged on both sides sandwiching the carrier tape so as to form a running path in the longitudinal direction, and are moved in directions of coming close to and apart from lateral edges of the carrier tape; and

a fixing device that fixes, in a stepwise manner, the pair of side guides at positions where the transport path has

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widths corresponding to a plurality of types of widths of the carrier tape, wherein the fixing device includes:

a fixed stage that is provided immovably to a base;

a movable stage that is arranged at a position
5 overlapping with the fixed stage, and is moved together with the side guides;

a plurality of first locking holes that are formed on the fixed stage at positions with different distance from a center line of a running path;

10 a plurality of second locking holes that are formed on the movable stage with the same number to the first locking holes on a straight line parallel to the running path; and

a fastener that is selectively inserted into any one of a pair of the first locking holes and the second locking
15 holes to fix the side guides. In addition, according an embodiment of the present disclosure, a carrier tape running apparatus that runs a carrier tape in a longitudinal direction of the carrier tape, the carrier tape having pockets that are arrayed in the longitudinal
20 direction to hold electronic components, the carrier tape running apparatus including:

a pair of side guides that are arranged on both sides sandwiching the carrier tape so as to form a running path in the longitudinal direction, and are moved in directions
25 of coming close to and apart from lateral edges of the carrier tape; and

a fixing device that fixes, in a stepwise manner, the pair of side guides at positions where the transport path has widths corresponding to a plurality of types of widths
30 of the carrier tape, wherein the fixing device includes:

a fixed stage that is provided immovably to a base;

a movable stage that is arranged at a position overlapping with the fixed stage, and is moved together with the side guides;

5 a plurality of first locking holes that are formed on the movable stage at positions with different distance from a center line of a running path;

a plurality of second locking holes that are formed on the fixed stage with the same number to the first locking holes on a straight line parallel to the running path; and

10 a fastener that is selectively inserted into any one of a pair of the first locking holes and the second locking holes to fix the side guides.

At least one of side guides may include an auxiliary guide that is interposed between the side guides and the carrier tape so as to come into contact with the lateral edges of the carrier and guide the movement of the carrier tape.

The auxiliary guide may include a guide member that is elastically supported by the side guides and comes into contact with the lateral edges of the carrier tape and displaces the carrier tape in a width direction of the carrier tape.

The guide member may rotate in contact with the lateral edges of the carrier tape that runs.

25 Marks for identifying to which of the plurality of types of widths the first locking holes and the second locking holes correspond to may be provided. Diameters of the first locking holes and the second locking holes may have sizes that can visually recognize how much a mutual overlap is. The first locking holes and the second locking holes may be through holes.

A part of the fastener may be exposed to an outside when the fastener is inserted into any one of the pair of the first locking holes and the second locking holes.

5 An inner surface of at least either one of the first locking holes and the second locking holes may include a first tapered portion having a surface inclined with relative to a vertical direction. At least the part of the fastener may include a second tapered portion having a surface inclined along the first tapered portion. The
10 first tapered portion and the second tapered portion may be a conical shape.

The carrier tape running apparatus may further include a restricting portion that restricts displacement of the position of the inserted fastener. The restricting portion
15 may include fitting portions that are formed on at least either one of the first locking holes and the second locking holes, and on the part of the fastener, so as to be fitted to each other.

The carrier tape running apparatus may further include
20 a linear guide that guides movement of the pair of side guides.

The carrier tape running apparatus may further include a bottom guide that is arranged at a position facing a bottom surface of the carrier tape that runs the running
25 path, and is moved in directions coming close to and going away from the carrier tape. The carrier tape running apparatus may further include a lifting and lowering device that raises and lowers the bottom guide. The bottom guide

may include a sucking portion that sucks the electronic components through suction holes formed in bottom surfaces of the pockets. The bottom guide may have a width shorter than the widths of the carrier tape. Between the bottom guide
5 and the pair of side guides, clearance that allows the side guides to move in the width direction may be formed.

A taping apparatus of the present disclosure including the carrier tape running apparatus, the taping device including:

- 10 a sprocket that hooks and runs the carrier tape;
- a motor that turns the sprocket;
- a reel wound with a seal tape attaching the carrier tape;
- a pair of blocks that can move close to and apart from the running paths of the carrier tape and bonds the seal tape
15 to the carrier tape by sandwiching the seal tape pulled out from the reel, and the carrier tape; and
- a press roller that can move close to and apart from the running paths of the carrier tape;
- in which:
- 20 the taping apparatus pulls out the seal tape from the reel, approximates the press roller to the running paths of the carrier tape, approximate the pair of blocks, and seals the carrier tape by the seal tape.

25 ADVANTAGEOUS EFFECTS OF INVENTION

The present disclosure can adapt to the carrier tape with different widths without the replacement of the parts by the fixing device moving and fixing the clearance of the pair of the side guides in accordance with the widths of the
30 carrier tape.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an external perspective view of a taping apparatus including a carrier tape running apparatus;

35 FIG. 2 is a schematic view illustrating a configuration and an operation of the carrier tape running apparatus;

FIG. 3 is a partially enlarged perspective view of the carrier tape running apparatus;

FIG. 4 is another partially enlarged perspective view of the carrier tape running apparatus;

5 FIG. 5A and FIG. 5B are plan views illustrating how a carrier tape is run between side guides;

FIG. 6A, FIG. 6B, FIG. 6C, and FIG. 6D are plan views illustrating alignment between first locking holes and second locking holes of a fixing device;

10 FIG. 7A, FIG. 7B, FIG. 7C, and FIG. 7D are schematic views illustrating how a fastener of the fixing device is inserted;

FIG. 8A, FIG. 8B, FIG. 8C, and FIG. 8D are schematic views illustrating movements of the side guides and a bottom guide in accordance with widths and thicknesses of the carrier tape;

15 FIG. 9A and FIG. 9B are sectional views illustrating an example of the fixing device to which a tapered surface is applied;

FIG. 10A and FIG. 10B are sectional views illustrating another example of the fixing device to which a restricting portion is applied; and

20 FIG. 11A and FIG. 11B are each a sectional view illustrating another example of the fixing device to which another restricting portion is applied.

25 DESCRIPTION OF EMBODIMENTS

A carrier tape running apparatus according to an embodiment of the present disclosure is described in detail with reference to the drawings.

[Configuration]

30 (Basic Configuration)

With reference to FIG. 1 and FIG. 2, a basic configuration of a carrier tape running apparatus 1 according to the embodiment is described. FIG. 1 is an external perspective view of the carrier tape running apparatus 1, and FIG. 2 is a schematic view illustrating the configuration of the carrier tape running apparatus 1. The carrier tape running

apparatus 1 is provided on base 11 that is fixedly mounted to a stand installed on an installation surface. The carrier tape running apparatus runs a carrier tape 100 in a longitudinal direction to store electronic components 104 to
5 pockets 101.

A running path of the carrier tape 100 is formed between a pair of side guides 81a and 81b of a guide mechanism 8 described below. A width of the running path is set in accordance with a clearance between the side guides 81a and
10 81b, which is slightly longer than a width of the carrier tape 100. Furthermore, the running path is divided into a first half running-path on an upstream side in a running direction and a latter half running-path on a downstream side of the running direction.

The carrier tape running apparatus 1 according of the embodiment functions as a taping apparatus. The carrier tape running apparatus 1 includes a sealing tape reel 3 that wounds a sealing tape 102, and the sealing portion 2. As the taping apparatus, while running the carrier tape 100 to a reel
20 200 side, the carrier tape running apparatus 1 pulls out the seal tape 102 from the seal tape reel 3, and applies the seal tape 102 to the carrier tape 100.

The carrier tape running apparatus 1 includes two sprockets 41 and 42. The two sprockets 41 and 42 are discs
25 having the same diameter and projections 43 formed along their peripheral surfaces. The sprockets 41 and 42 are connected to output shafts of motors 51 and 52 via timing belts 51a and 52a respectively, and intermittently rotate in the same circumference direction, the same rotation amount, and the
30 same timing.

The carrier tape 100 is bridged over both sprockets 41 and 42. The carrier tape 100 has sprocket holes formed opened at equal intervals along a longitudinal direction of the carrier tape 100 on one belt side. The projections 43
35 of both the sprockets 41 and 42 are engaged with the sprocket holes. The sprockets 41 and 42 are rotated under a state in

which the projections 43 are engaged with the sprocket holes and run the carrier tape 100 in the longitudinal direction. A position of the running carrier tape 100 in the width direction is generally defined by the projection 43. The width direction is a horizontal direction orthogonal to the longitudinal direction of the carrier tape 100. The projections 43 have a round shape, and are processed into an involute shape. A diameter of the projections 43 is slightly smaller than a diameter of the sprocket holes of the carrier tape 100.

Both the sprockets 41 and 42 are arrayed in the same vertical plane, and have rotation axes that are parallel to each other at the same height. Therefore, the carrier tape 100 is run to the reel 200 side while being horizontally stretched.

A rotary pitch of the motors 51 and 52 corresponds to the arrangement intervals of the pockets 101. The carrier tape 100 has embossed pockets 101 in the longitudinal direction at equal intervals. In other words, the motors 51 and 52 stop the pockets 101 at common stop positions. One of the common stop positions is set as a receiving position 6 for the electronic components 104.

Directly above the receiving position 6, a holding device 61 described below, which can be raised and lowered, is arranged. The carrier tape running apparatus 1, as a taping apparatus, sequentially aligns the pockets 101 to the receiving position 6 and stores the electronic components 104 released from the holding device 61 to the carrier tape 100.

As illustrated in FIG. 2, the sealing portion 2 includes a heater block 21 and a base block 22. The heater block 21 and the base block 22 are arranged so as to face each other across the running path of the carrier tape 100. The heater block 21 presses the carrier tape 100 from above the running path of the carrier tape 100, and the base block 22 presses the carrier tape 100 from below the running path of the carrier tape 100. The heater block 21 is movable to be

in contact with or apart from the running path of the carrier tape 100.

To the sealing portion 2, the seal tape 102 is applied onto the carrier tape 100. The heater block 21 and the base block 22 sandwich and press contact the seal tape 102 and the carrier tape 100. In addition, the heater block 21 supplies heat to press-contacted surface of the seal tape 102 and the carrier tape 100.

As the taping apparatus, the seal tape reel 3 pulls out the seal tape 102 toward the carrier tape 100. This seal tape reel 3 is located above the running path of the carrier tape 100, and includes a motor 31 and a press roller 32.

The motor 31 rotates the seal tape reel 3 via the timing belt. The press roller 32 is located near the running path of the carrier tape 100, and guides the seal tape 102 onto the carrier tape 100.

As illustrated in FIG. 2, the press roller 32 is movable to come close to or go away from the running path of the carrier tape 100. That is, the press roller 32 comes close to the running path of the carrier tape 100, and presses the seal tape 102 onto the carrier tape 100.

(Guide Mechanism)

Next, with reference not only to FIG. 1 and FIG. 2 but also to FIG. 3 to FIG. 7D, description is made to the guide mechanism 8 of the carrier tape running apparatus 1 described above. The guide mechanism 8 is a mechanism that guides the running of the carrier tape 100. The guide mechanism 8 includes side guides 81, a fixing device 82, and a bottom guide 84.

(Side Guides)

The side guides 81 are described with reference to FIG. 3 to FIG. 5B. FIG. 3 is an enlarged perspective view of the guide mechanism 8 as viewed from one lateral surface side, and FIG. 4 is another enlarged perspective view as viewed from another lateral surface side. FIG. 5A and FIG. 5B are plan

views illustrating how the carrier tape 100 is run between the side guides 81.

As illustrated in FIG. 3 and FIG. 4, the side guides 81 are a pair of members that are arranged on both sides sandwiching the carrier tape 100, and are movable to come close to and go away from lateral edges of the carrier tape 100. In the following description, one of the pair of side guides 81 is referred to as the side guide 81a, and another is referred to as the side guide 81b. Note that, when the side guides 81a and 81b are not distinguished from each other, the side guides 81a and 81b may be collectively referred to as the side guide 81. Furthermore, as illustrated in FIG. 1, although the side guide 81 is divided into a first half running-path and a latter half running-path by the sealing portion 2, both halves have the same configuration.

The side guides 81a and 81b are arranged along the longitudinal direction of the carrier tape 100. The side guides 81a and 81b each have a guide surface 811 that faces the lateral edge of the carrier tape 100. The guide surface 811 is a vertical flat surface. The guide surfaces 811 of the pair of side guides 81a and 81b face each other at positions apart from each other across the carrier tape 100.

As illustrated in FIG. 3 and FIG. 4, the movements of the side guides 81a and 81b are guided by linear guides 815. The linear guides 815 include rails 815a and sliders 815b. The rails 815a are fixed to the base 11. The rails 815a are arranged at horizontal parts under the side guides 81a and 81b. The rails 815a are arranged in a manner extended in the width direction of the carrier tape 100. The sliders 815b are members that slidably move along the rails 815a, and are fixed to bottom surfaces of the side guides 81.

With such configuration, the side guides 81 move in parallel to the width direction of the carrier tape 100 while maintaining the extending direction constant. Since the movements of the side guides 81 are guided by the linear guides 815, the side guide 81 can be moved with a force as relatively

small as by hands. Note that, the one side guide 81a defines the half of the width of the running paths by its moved position, and the other side guide 81b defines the half of the width of the running paths by its moved position. In FIG. 3 and
5 FIGS. 5, the width of the running path is represented by "D", and a center line of the running path is represented by "C". The center line C of the running path corresponds to a longitudinal line linking midpoints between the side guides 81a and 81b.

10 (Fixing Device)

The fixing device 82 is described with reference not only to FIG. 3 and FIG. 4 but also to FIG. 6A, FIG. 6B, FIG. 6C, and FIG. 6D and FIG. 7A, FIG. 7B, FIG. 7C, and FIG. 7D. FIGS. 6 are plan views illustrating alignment between first locking
15 holes 822 and second locking holes 824 of the fixing device 82. FIGS. 7 are each a schematic view illustrating how a fastener 825 of the fixing device 82 is inserted.

The fixing device 82 is a device that fixes, in a stepwise manner, the side guides 81a and 81b at the positions
20 where the running path has widths that corresponds to a plurality of types of widths of the carrier tape 100. As illustrated in FIG. 1, FIG. 3, and FIG. 4, the fixing device 82 is provided to each of the side guides 81a and 81b on the first half running-path and the latter half running-path.

25 The fixing device 82 includes a fixed stage 821, a movable stage 823, and the fastener 825. The fixed stage 821 is provided immovably to the base 11. The fixed stage 821 is a member having a cuboid shape that protrudes from a lateral surface of the base 11.

30 The fixed stage 821 is provided with the plurality of first locking holes 822. As illustrated in FIGS. 6 and FIGS. 7, the first locking holes 822 are formed at positions with different distance from the center line C of the running path. The first locking holes 822 are cylindrical
35 through-holes having a vertical axis. As described below, the differences between the plurality of first locking holes

822 in distance from the center line C of the running path correspond to differences in width of the running path.

The movable stage 823 is arranged at a position that overlaps with the fixed stage 821, and is moved together with the side guide 81. That is, the movable stage 823 is fixed to the side guide 81, relative positional relationship between the movable stage 823 and the fixed stage 821 is always constant, and a displacement amount of the movable stage 823 and a displacement amount of the side guide 81 are equal to each other. The movable stage 823 is a member having a cuboid shape protruding from an outer surface of the side guide 81 to overlap the fixed stage 821.

As illustrated in FIGs. 6 and FIGs. 7, the movable stage 823 is provided with the plurality of second locking holes 824. The second locking holes 824 are formed in the same number as the plurality of first locking holes 822 along a straight line parallel to the running path. The second locking holes 824 are cylindrical through-holes having a vertical axis. Arrangement intervals between the second locking holes 824 in the longitudinal direction are the same as those of the first locking holes 822. Therefore, as illustrated in FIG. 6A to FIG. 6D, when the position of the side guide 81 is changed in the width direction, either one of the second locking holes 824 can be aligned with one of the first locking holes 822.

In this embodiment, depending on which one of the first locking holes 822 and one from the second locking holes 824 aligns with, to which of the widths of the carrier tape 100 does the clearance of the guide surface 811 of the side guides 81a and 81b corresponds to is determined. In other words, moving movement of the side guides 81a and 81b to align the second locking holes 824 to the first locking holes 822 changes the width of the running path in a stepwise manner.

In the following, this principle is described. First, the differences of the plurality of first locking holes 822 in distance from the center line C are set to correspond

respectively to the differences in width of the carrier tape 100. For example, in this setting, as the distance from the center line C becomes longer, the clearance formed between the side guides 81a and 81b becomes larger. As the distance becomes shorter, the clearance formed between the side guides 81a and 81b becomes smaller.

More specifically, an example in which the fixed stage 821 is provided with four first locking holes 822a, 822b, 822c, and 822d is given with reference to FIGS. 6. A position of the first locking hole 822a corresponds to a standard width of 24 mm of the carrier tape 100, a position of the first locking hole 822b corresponds to a standard width of 16 mm, a position of the first locking hole 822c corresponds to a standard width of 12 mm, and a position of the first locking hole 822d corresponds to a standard width of 8 mm.

Meanwhile, the movable stage 823 is similarly provided with four second locking holes 824a, 824b, 824c, and 824d. The second locking hole 824a corresponds to the standard width of 24 mm of the carrier tape 100, the second locking hole 824b corresponds to the standard width of 16 mm, the second locking hole 824c corresponds to the standard width of 12 mm, and the second locking hole 824d corresponds to the standard width of 8 mm. The second locking holes 824 and the first locking holes 822 are aligned with each other in the following pairs: a pair of the second locking hole 824a and the first locking hole 822a; a pair of the second locking hole 824b and the first locking hole 822b; a pair of the second locking hole 824c and the first locking hole 822c; and a pair of the second locking hole 824d and the first locking hole 822d.

When the second locking holes 824a to 824d are aligned respectively with the first locking holes 822a to 822d, the side guide 81 comes to positions corresponding standard widths of the carrier tape 100, respectively.

Note that, in this setting, the clearances formed between the guide surfaces 811 of the pair of side guides 81a

and 81b are not set perfectly equal to but slightly larger than the respective standard widths of the carrier tape 100. This is because, when the clearances are set perfectly equal to the widths of the carrier tape 100, the lateral edges of the carrier tape 100 always rub the guide surfaces 811, and adversely hinder the transportation. For this reason, play parts need to be formed. In other words, the clearances corresponding to the plurality of types of widths of the carrier tape 100 are clearances that are respectively slightly larger than the widths of the carrier tape 100.

Furthermore, near the second locking holes 824, there are marks to distinguish to which of the pairs of the second locking holes 824 corresponds which ones of the plurality of types of widths of the carrier tape 100. For example, as illustrated in FIGS. 6, near the second locking holes 824a to 824d on a top surface of the movable stage 823, numbers of the respective corresponding standard widths are indicated. In this example, numerals "8," "12," "16," and "24" are indicated by, for example, stamping, printing, or labeling.

In addition, diameters of the first locking holes and the second locking holes may have sizes that can visually recognize how much a mutual overlap is. That is, by looking in the second locking holes 824 from a planar direction, whether or not the second locking holes 824 are aligned with the first locking holes 822 can be recognized by the naked eye.

As illustrated in FIGS. 7, the fastener 825 is a member that is selectively inserted into any one of the pairs of the second locking holes 824 and the first locking holes 822 to fix the side guide 81. That is, when any one of the second locking holes 824 is aligned with the corresponding first locking holes 822, the fastener 825 is inserted to fix a position of the movable stage 823 to the fixed stage 821, and the position of the side guide 81 is fixed in a stepwise manner.

The fastener 825 is a columnar pin. An insertion portion 825a of the fastener 825 on its end side has a diameter to pass through the second locking hole 824 and fit in the first locking hole 822. Although a gap to ensure the
5 insertion portion 825a to slide is formed, an outer diameter of the insertion portion 825a of the fastener 825 is substantially equal to an inner diameter of the first locking hole 822 and an inner diameter of the second locking hole 824. Therefore, the position of the side guide 81 do not wobble
10 or such, and is securely fixed. Furthermore, a head portion 825b of the fastener 825 is radially expanded such that the head portion 825b hits against a surface around the second locking hole 824, and certain insertion distance is maintained. Thus, even when the fastener 825 is inserted into
15 the second locking hole 824, a part of the fastener 825 is exposed to the outside. In this embodiment, the head portion 825b of the fastener 825 is exposed to the outside.

(Auxiliary Guide)

An auxiliary guide 83 is described with reference to FIG.
20 3 and FIGs. 5. As illustrated in FIG. 3 and FIGs. 5, the auxiliary guide 83 is provided to one of the side guide 81a interposed between the side guide 81a and the carrier tape 100 to come into contact with the lateral edge of the running carrier tape 100, and guides the movement of the carrier tape
25 100.

That is, the width of the running path, which is set in a stepwise manner by the fixing device 82 as described above, is not set perfectly equal to the width of the carrier tape 100. It is difficult to match the width of the running path
30 to the width of the carrier tape 100. Therefore, between the lateral edge of the carrier tape 100 and the guide surface 811 of the side guide 81a, a gap that allows displacement of the carrier tape 100 is formed. The auxiliary guide 83 is interposed in this gap to auxiliary guide the lateral edge
35 of the carrier tape 100.

As illustrated in FIGs. 5, a plurality of auxiliary guides 83 is arranged in a longitudinal direction of the side guide 81a. Each of the auxiliary guides 83 include a guide member 831 that is elastically supported by the side guide 81a and comes into contact with the lateral edge of the running carrier tape 100 displacing the carrier tape 100 in the width direction. The guide member 831 also rotates in contact with the lateral edge of the running carrier tape 100.

More specifically, the guide member 831 is a cylindrical member that rotates about vertical axis. The guide member 831 is arranged at one end of a rotary plate 832. The guide member 831 and the rotary plate 832 are placed in a groove 833 formed through an edge portion of a top surface of the side guide 81a. Another end of the rotary plate 832 is mounted rotatably to an inner bottom surface of the groove 833. The groove 833 is opened on the guide surface 811 side such that when the guide member 831 protruding through this opening comes into contact with the lateral edge of the carrier tape 100, the guide member 831 is displaced in a direction entering the groove 833 side.

The rotary plate 832 is biased by an elastic member such as a spring (not shown) to a direction the guide member 831 protrudes from the guide surface 811 of the side guide 81a. Therefore, the guide member 831 in contact with the lateral edge of the carrier tape 100 guides the carrier tape 100 in a manner that the displacement of the carrier tape 100 is restrained. In other words, the guide member 831 absorbs slight wobbling of the carrier tape 100 in the running path that is set by the fixing device 82.

(Bottom Guide)

The bottom guide 84 is described with reference to FIG. 2, FIG. 4, FIGs. 5, and FIG. 8A, FIG. 8B, FIG. 8C, and FIG. 8D. The bottom guide 84 is a member that is arranged at a position facing a bottom surface of the carrier tape 100 that runs the running path, and is moved in directions of coming close to and going away from the carrier tape 100.

As illustrated in FIG. 4 and FIGS. 5, the bottom guide 84 is arranged along the longitudinal direction of the carrier tape 100. The bottom guide 84 is also divided into a first half running-path and a latter half running-path, and have the same configuration. As illustrated in FIG. 5A, a width of the bottom guide 84 is smaller than the width of the carrier tape 100. For example, the width of the bottom guide 84 is smaller than the smallest of the widths of the carrier tape 100. Furthermore, between the bottom guide 84 and the pair of side guides 81a and 81b, clearances that allow the side guides 81a and 81b to move are formed.

Still further, as illustrated in FIG. 5B, a bottom surface of the pockets 101 of the carrier tape 100 is provided with a suction hole 101a. The suction hole 101a prevents the electronic components 104 from jumping out or tumbling by vacuum suction, until the seal tape seals the top surface of the pockets 101 after the electronic components 104 are inserted thereto.

In order to perform such vacuum suction, a sucking portion 841 is formed in a surface of the bottom guide 84 which is in contact with the carrier tape 100. The sucking portion 841 sucks the electronic component 104 in the pocket 101 onto the bottom surface of the pocket 101 through the suction hole 101a formed in the pocket 101 of the carrier tape 100.

The sucking portion 841 has a suction groove 842 and suction holes 843. The suction groove 842 is formed at a position corresponding to the suction hole 101a in the bottom surface of the pocket 101. In other words, the suction groove 842 is formed directly under the center line C of the running path of the carrier tape 100 and along the running path.

A width of the suction groove 842 is set equal to or larger than a diameter of the suction hole 101a of the pocket 101, and smaller than the width of the carrier tape 100. The suction holes 843 are a plurality of holes drilled on a bottom of the suction groove 842. The suction holes 843 is connected

to a pneumatic circuit including vacuum generation devices and solenoid valves (not shown).

The bottom guide 84 is provided to the base 11 so as to be raised and lowered. The bottom guide 84 is supported, for example, by the base 11 a linear guide (not shown). As illustrated in FIG. 2, FIG. 4, and FIGS. 8, the bottom guide 84 is driven upward and downward by a lifting and lowering device 85.

As illustrated in FIG. 2 and FIG. 4, the lifting and lowering devices 85 include a motor 851, a transmission belt 852, a pulley 853, a ball screw 854, and a movable member 855. The motor 851 is fixed to the base 11, and has a vertical output shaft connected to the pulley 853 via the transmission belt 852. The pulley 853 rotates about the ball screw 854 in the vertical direction as a shaft.

The movable member 855 is raised and lowered by the ball screw 854 that is rotated by the rotation of the pulley 853. Since the movable member 855 is fixed to the bottom guide 84, the bottom guide 84 is moved together with the movement of the movable member 855. With this, along with rotation of the output shaft of the motor 851, the ball screw 854 is rotated and the movable member 855 is raised and lowered. Thus, as illustrated in FIGS. 8, the bottom guide 84 is also raised and lowered.

A height position of the bottom guide 84 is controlled based on the number of pulses obtained by converting the number of revolutions of the motor 851 with a rotary encoder. In other words, since a moving distance is determined based on the number of pulses, motor 851 is controlled by setting the number of pulses to move the bottom guide 84 to a desired height position from the standard position or reference position.

(Holding Device)

The holding device 61 for storing electronic components 104 in the pockets 101 of the carrier tape 100 is described with reference to FIG. 2. The holding device 61 is a device

that holds the electronic components 104 one by one. As an example of the holding device 61, there may be given a suction nozzle extended vertically downward from a carrying apparatus (not shown).

5 The suction nozzle is a hollow cylinder opened at its downward end. An inside of the suction nozzle is connected to a pneumatic circuit including vacuum generation devices and solenoid valves (not shown). Therefore, when the vacuum generation device generates negative pressure, the
10 electronic component 104 is sucked by the end of the suction nozzle and when the vacuum generation device breaks a vacuum or generates positive pressure, the electronic component 104 is released from the end.

 The holding device 61 can be moved in the vertical
15 direction by a Z-axis mechanism (not shown). As examples of the Z-axis mechanism, there may be given various mechanisms such as a cylinder mechanism, and a cam mechanism including a cam and a spring.

 Note that, as an example of the carrying apparatus
20 provided with the holding device 61, there may be given a turntable that rotates intermittently at a predetermined angle about its rotation axis. The holding devices 61 are arranged to around the rotation axis of the turntable at intervals equal to intervals in the intermittent rotation.
25 At stop positions around the turntable, processing units that executes various processes on the electronic components 104 are arranged. The carrying apparatus holds the electronic components 104 by the holding device and carries the electronic components 104 by intermittently rotating the turntable.
30 Furthermore, at each stop positions of the intermittent rotation, the various processes are executed on the electronic components 104 by the processing units, and the electronic components 104 are stored in the pockets 101 of the carrier tape 100.

35 (Control Device)

The carrier tape running apparatus 1 is controlled by a control device 7. The control device 7 controls operation amounts, operation speed, and operation timing by transmitting electrical signals to a motor that rotates the carrying apparatus, the above-mentioned motors 31, 51, 52, and 851, the Z-axis mechanism that raises and lowers the holding device 61, and the vacuum generation devices and the solenoid valves of the pneumatic circuits.

The control device 7 includes an input device and a display device. The input device is a device, such as a switch, a touchscreen, a keyboard, and a mouse, for an operator to input information and instructions necessary for the processes in this embodiment. The output device is a device, such as a display, a lamp, and a meter, for the operator to check conditions of the processes in this embodiment.

The operator operates the input device to activate the motor 851 of the lifting and lowering device 85, and moves the bottom guide 84 to a height position corresponding to the bottom surface of the carrier tape 100. This movement may be performed steplessly from the starting operation to the stopping operation by the input device, or performed to be in height position that corresponds to any one of the plurality of the preset thickness selected by the input device. The plurality of types of thicknesses or heights to be selected may be displayed on the output device. In a case where which type of the carrier tape 100 is used has been determined, height positions corresponding to thicknesses of a plurality of types of the carrier tapes 100 to be used may be preset, and when which of the carrier tapes is used is selected by the input device, the bottom guide 84 may be moved to corresponding one of the height positions. Alternatively, after the bottom guide 84 is moved to any one of the height positions corresponding to the preset thicknesses, the bottom guide 84 may be raised or lowered steplessly so that the height position thereof may be finely adjusted to correspond with

the actual height position of the bottom surface of the carrier tape 100.

[Action]

The above-described action in this embodiment are
5 described in more detail.

(Operation of Positioning Guide Mechanism)

(Positioning of Side Guides)

First, an operation of positioning the guide mechanism
8 in accordance with the widths of the carrier tape 100 is
10 described with reference to FIGS. 6 and FIGS. 7. FIGS. 6 and
FIG. 7 illustrate how the width of the running path is set
in a stepwise manner. The widths in FIG. 6A to FIG. 6D and
the widths in FIG. 7A to FIG. 7D correspond to each other.
In FIG. 7A to FIG. 7D, the left diagrams are simplified
15 perspective views, and the right diagrams are simplified
sectional views. In the left diagrams, for ease of
understanding the movement, the fixed stage 821 and the
movable stage 823 are separated upward and downward from each
other, however, as illustrated in the right diagrams, the
20 fixed stage 821 and the movable stage 823 are actually held
in contact with each other.

As illustrated in FIGS. 6, the operator manually
moves the side guides 81a and 81b. Then, as illustrated in
FIGS. 7, the operator fixes the positions of the side guides
25 81a and 81b in accordance with the widths of the carrier tape
100 to be used by using the fixing device 82.

That is, as illustrated in FIGS. 6, while looking
through the second locking hole 824 corresponding to a desired
width, the operator moves the side guide 81 to align the second
30 locking hole 824 to the first locking hole 822 of the fixed
stage 821. Then, as illustrated in FIGS. 7, the insertion
portion 825a of the fastener 825 is inserted into the aligned
second locking hole 824, and fitted to the first locking hole
822, so that the movable stage 823 is fixed to the fixed stage
35 821. In this way, the position of the side guide 81 is fixed.

For example, as illustrated in FIG. 6A, the second locking hole 824a is aligned with the first locking hole 822a, and then, as illustrated in FIG. 7A, the fastener 825 is inserted. With this, the side guides 81 are fixed at
5 positions where the running path has a width d1 corresponding to the standard width of 24 mm of the carrier tape 100. Furthermore, as illustrated in FIG. 6B, the second locking hole 824b is aligned with the first locking hole 822b, and then, as illustrated in FIG. 7B, the fastener 825 is inserted.
10 In this case, between the side guides 81, the running path has a width d2 corresponding to the standard width of 16 mm.

As illustrated in FIG. 6C, the second locking hole 824c is aligned with the first locking hole 822c, and then, as illustrated in FIG. 7C, the fastener 825 is inserted. In
15 this case, between the side guides 81, the running path has a width d3 corresponding to the standard width of 12 mm. As illustrated in FIG. 6D, the second locking hole 824d is aligned with the first locking hole 822d, and then, as illustrated in FIG. 7D, the fastener 825 is inserted. In this
20 case, between the side guides 81, the running path has a width d4 corresponding to the standard width of 8 mm.

The widths d1 to d4 of the running path are respectively slightly larger than the corresponding standard widths of 24 mm to 8 mm. Thus, by using the fixing device
25 82 in this way, the width of the running path can be set in a stepwise manner correspondingly to the widths of the carrier tape 100.

(Positioning of Bottom Guide)

Meanwhile, an operation of positioning the guide
30 mechanism 8 in accordance with the thicknesses of the carrier tape 100 is described with reference to FIGs. 8. FIG. 8A to FIG. 8D are simplified sectional views in which the height positions of the bottom guide 84 are changed to correspond with the bottom surfaces of the carrier tapes 100 having the
35 different widths.

The operator operates the input device to activate the lifting and lowering device 85, and the bottom guide 84 is moved to the height position contacting the bottom surface of the carrier tape 100 to be used. This may be done by raising and stopping the bottom guide 84 by sight at a height position contacting the bottom surface of the carrier tape 100. Alternatively, the bottom guide 84 may be moved to a preset height position, and then brought into contact with the bottom surface of the carrier tape 100 by fine adjustment.

Now, with regard to the example described above with reference to FIGs. 6 and FIGs. 7, a description is made on the premise that the pockets 101 become deeper as the carrier tape 100 becomes wider, and that the pockets 101 become shallower as the carrier tape 100 becomes narrower. Then, as illustrated in FIG. 6A, FIG. 7A, and FIG. 8A, in the case where the carrier tape 100 having the width of 24 mm is used, since the pockets 101 are deep, the height position of the bottom guide 84 is set lower. Then, as illustrated in FIG. 6B to FIG. 6D, FIG. 7B to FIG. 7D, and FIG. 8B to FIG. 8D, since the pockets 101 become shallower as the width becomes smaller in an order of 16 mm, 12 mm, and 8 mm, the height position of the bottom guide 84 is set sequentially larger. The reference letter "H" in FIGs. 8 indicates a vertical variation range among FIG. 8A to FIG. 8D.

Note that, the thickness of the carrier tape 100 is not necessarily proportionate to its width. Since the thickness of the carrier tape 100 depends on a thickness, a material, and shape of the material tape, and the types of electronic components 104, etc., the height of the bottom guide 84 may be adjusted in accordance with the actual thickness of the carrier tape 100.

(Taping Operation)

With reference to FIG. 2, a taping operation by the carrier tape running apparatus 1 is described. In the carrier tape running apparatus 1, the motors 51 and 52 are rotated forward to transport the timing belts 51a and 52a and the

sprockets 41 and 42 are also rotated forward. The projections 43 of the sprockets 41 and 42 are engaged with the sprocket holes, and runs the carrier tape 100 to the reel 200 side.

The carrier tape running apparatus 1 intermittently
5 rotates the motors 51 and 52 to send the carrier tape 100 to the reel 200, and sequentially moves the empty pockets 101 to the receiving position 6. Each of the holding devices 61 holding the electronic component 104 are sequentially stopped at the receiving position 6, and the electronic components
10 104 are stored into the empty pockets 101 at the receiving position 6. The stored electronic components 104 are sucked by the sucking portions 841 through the suction holes 101a formed in the pockets 101 and thus, the electronic components 104 are sucked to the bottom surfaces of the pockets 101, and
15 are stabilized in position.

The seal tape reel 3 pulls out seal tape 102 to the carrier tape 100 side by the forward rotation of the motor 31. The press roller 32 guides the seal tape 102 pulled out of the sealing tape reel 3 onto a surface of the carrier tape
20 100, and gradually applies the seal tape 102 onto the surface of the carrier tape 100, in which the pockets 101 are opened.

In the sealing portion 2, the heater block 21 is held in contact with the running path of the carrier tape 100 in advance. In the sealing portion 2, the sealing tape 102 and
25 the carrier tape 100 are shared while being overlapped with each other. The sealing portion sandwiches the carrier tape 100 and the seal tape by the heater block 21 and the base block 22, and bonds the seal tape 102 to the carrier tape 100 by heating and pressurizing. In this way, the electronic
30 components 104 in the pockets 101 are sealed by the seal tape 102 and inner walls of the pockets 101.

After the carrier tape 100 is sealed by the seal tape 102, the carrier tape 100 continues to be intermittently guided to the reel 200, and is taken up by the reel 200.

35 (Guide Operation)

A position of the carrier tape 100 that is run as described above in the width direction is basically restricted by the projections 43 of the sprockets 41 and 42. Wobbling in the width direction during the running is restricted because the lateral edges of the carrier tape 100 come into contact with the guide surfaces 811 of the side guides 81. Note that, as described above, the slight gaps are formed between the guide surfaces 811 of the side guides 81 to be fixed in a stepwise manner and the lateral edges of the carrier tape 100. Therefore, those gaps correspond to a wobbling width of the carrier tape 100.

In this embodiment, as illustrated in FIGs. 5, the auxiliary guides 83 interposed in those gaps are held in contact with the lateral edges of the carrier tape 100 so as to guide the movement of the carrier tape 100. That is, as illustrated in FIG. 5B, the elastically supported guide members 831 are held in contact with the lateral edges of the carrier tape 100 and restrain the carrier tape 100 from wobbling. With this, the carrier tape 100 is run more stably. In particular, since the guide members 831 are elastically supported, the guide members 831 function as buffers that reduce impact from the carrier tape 100. That is, the guide members 831 are held in contact with the lateral edges of the carrier tape 100 and follow its displacement, reducing the wobbling width. In addition, since the guide members 831 are rotated, the carrier tape 100 is smoothly run.

(Effect)

As described above, the embodiment includes the carrier tape running apparatus 1 running in the longitudinal direction the carrier tape 100 having the pockets 101 formed at equal intervals for storing the electronic components 104. In addition, the present embodiment includes a pair of side guides 81a and 81b that are arranged on both sides sandwiching the carrier tape 100 so as to form a running path in the longitudinal direction, and are moved in directions of coming close to and going away from lateral edges of the carrier tape

100, and a fixing device that fixes, in a stepwise manner, the pair of side guides 81a and 81b at positions where the running path has widths corresponding to a plurality of types of widths of the carrier tape 100.

5 Therefore, when using the carrier tape 100 with different width, a pair of the side guides 81a and 81b are moved to the position corresponding to the carrier tape 100 used, and fixed by the fixing device. With this, without replacement of parts, the carrier tape running apparatus 1
10 can be easily adapted to the carrier tapes 100 having the different widths in a short period of time. In addition, there is no need to prepare a large number of parts dedicated for the carrier tapes 100 having the different widths, and as a result, cost is reduced, and storage for those parts do
15 not have to be secured.

 The side guide 81a on the one side is provided with the auxiliary guides 83 that are interposed between the side guide 81a and the carrier tape 100, held in contact with the lateral edge of the running carrier tape 100 and guides the
20 movement of the carrier tape 100.

 Therefore, the wobbling of the carrier tape 100 in the gaps between the side guides 81a and 81b, which are positioned in a stepwise manner by the fixing device 82, and the carrier tape 100 can be reduced by the auxiliary guides
25 83. With this, it is possible to overcome a disadvantage that a fixing of the positions of the side guides 81a and 81b in a stepwise manner cannot accurately be corresponded to the width of the carrier tape 100.

 The auxiliary guides 83 include the guide member 831
30 that is elastically supported by the side guide 81a, comes into contact with the lateral edge of the running carrier tape 100, and displaced in the width direction.

 Thus, when the elastically supported guide member 831 is held in contact with the lateral edge of the carrier
35 tape 100, the displacement of the carrier tape 100 is restrained. With this, in addition to the stepwise

adjustment of the width of the running path by the fixing device 82, stepless fine adjustment thereof can be performed. As a result, the running of the carrier tape 100 is more stabilized. The guide member 831 rotates in contact with the lateral edge of the running carrier tape 100, and hence the carrier tape 100 is smoothly run.

The fixing device 82 includes the fixed stage 821 that is provided immovably to the base 11, and the movable stage 823 that is arranged at the position being overlapped with the fixed stage 821, and is moved together with the side guide 81. The fixed stage 821 has the plurality of first locking holes 822 that are formed at the positions different distance from each other from the center line C of the running path. The movable stage 823 has the second locking holes 824 that are formed in the same number as the first locking holes 822 along the straight line parallel to the running path. In addition, the fixing device 82 includes the fastener 825 that is selectively inserted into any one of the pairs of the second locking holes 824 and the first locking holes 822 to fix the side guide 81.

Therefore, by a simple operation of moving the side guide 81, and inserting the fastener 825 into the second locking hole 824, the side guide 81 can be easily fixed at a position corresponding to a desired width of the carrier tape 100. Thus, the effort for the work is significantly reduced and the work time is shortened in comparison to the operation to a work to replace the dedicated parts or a work to adjust the position of the side guide 81 only by hand.

Furthermore, the marks to distinguish which of the pairs of the second locking holes 824 corresponds to which ones of the plurality of types of widths of the carrier tape 100 are provided. Therefore, the operator can easily and accurately determine a combination of the second locking hole 824 and the first locking hole 822 for setting a desired width.

The diameters of the first locking holes 822 and the second locking holes 824 are set so that the amount of mutual

overlap can be visually recognized. Thus, the operator can determine whether or not the first locking hole 822 and the second locking hole 824 are aligned with each other by looking through the holes. In particular, since the first locking
5 holes 822 and the second locking holes 824 are through-holes, a boundary between a region the external light enters and a region the external light is blocked is clear. Thus, the overlapping amounts of the holes can be easily recognized.

The part of the fastener 825 is exposed to the outside,
10 even when the fastener 825 is inserted into the second locking hole 824. Therefore, the operator can check a width that is currently set whenever wanted.

Furthermore, the carrier tape running apparatus 1 according to this embodiment includes the linear guides 815
15 that guide the movement of the side guides 81. With this, the side guides 81 can be manually and smoothly moved without a big force.

Still further, the carrier tape running apparatus 1 according to this embodiment includes the bottom guide 84
20 that is arranged at the position of facing the bottom surface of the carrier tape 100 running along the running path, and is moved in the directions of coming close to and going away from the carrier tape 100.

The carrier tapes 100 are different not only in width
25 but also in thickness according to the type. For example, the thickness largely varies from as thin as about 50 μm to as thick as about 2mm. Accordingly, the height positions of the bottom surfaces of the pockets 101 of the carrier tapes 100 are also different according to products. Therefore
30 conventionally, guide members that support the carrier tapes 100 from the bottom surface side are also had to be prepared in accordance with the different types of carrier tapes 100 in advance, and be replaced at the timing when the carrier tape 100 used is changed. This replacement operation
35 involves time and effort, and the large number of dedicated

parts need to be prepared. As a result, cost increases, and storage needs to be secured.

According to this embodiment, since the bottom guide 84 can be moved in accordance with the height positions of the bottom surfaces of the carrier tapes 100, the carrier tape running apparatus 1 can be easily adapted to the carrier tapes 100 that has different depth of the pockets 101 in a short period of time without the replacement of parts. Therefore, the large number of parts dedicated for the carrier tapes 100 having the different widths do not have to be prepared, and as a result, cost is reduced, and the storage for the parts need not be secured.

Furthermore, the carrier tape running apparatus 1 according to this embodiment includes the lifting and lowering device 85 that raises and lowers the bottom guide 84. With this, difficulties in positioning or adjustment by manually raising and lowering of the bottom guide 84 can be avoided. In particular, since the difference in thickness between the carrier tapes 100 is significantly smaller than the difference in width, the positioning and the adjustment are facilitated by the lifting and lowering device 85.

The bottom guide 84 is provided with the sucking portion 841 that sucks the electronic component 104 through the suction hole 101a formed in the bottom surface of each of the pockets 101 of the carrier tape 100. The width of the bottom guide 84 is smaller than the smallest widths of the carrier tapes 100. Furthermore, between the bottom guide 84 and the pair of side guides 81a and 81b, the clearances that allow the side guides 81a and 81b to move in the width direction are formed.

In order to support the bottom surfaces of the carrier tapes 100, in general, the guide members on the bottom surface side have a width large enough to support a full width of the bottom surface of the carrier tapes 100. In this embodiment, the width of the bottom guide 84 is set smaller than the width of the smallest widths of the carrier tapes

100 so that the side guides 81a and 81b are allowed to move. In addition, by forming the sucking portion 841, the vacuum suction of the electronic components 104 in the pockets 101 can be reliably performed.

5 The sprockets 41 and 42 have the projections 43 formed along their peripheral surfaces, and are rotated by engaging the projections 43 to the sprocket holes formed through the carrier tape 100. In the first stage, the wobbling of the carrier tape 100 in the width direction is
10 restrained by the sprockets 41 and 42. In the second stage, the wobbling of the carrier tape 100 in the width direction is restrained by the guide surfaces 811 of the side guides 81a and 81b. In addition, in the third stage, the auxiliary guides 83 restrain the wobbling of the carrier tape 100 in
15 the width direction. In this way, the wobbling of the carrier tape 100 during running is significantly reduced, the electronic components 104 in the pockets 101 can be prevented from jumping out and production efficiency is improved.

[Other Embodiments]

20 With regard to the above-described embodiment of the present disclosure, various omissions, replacements, and modifications may be made without departing from the spirit of the present disclosure. In addition, the embodiment and the modifications thereof are encompassed not only within the
25 scope and the spirit of the present disclosure, but also within the scope of the appended claims and the equivalents thereof.

 The number of types of the width of the carrier tape 100 is not limited to that in the embodiment described above
30 as long as there are plurality of types of widths. Similarly, specific sizes of the width are not limited to those exemplified in the embodiment described above.

 For example, the auxiliary guides 83 may be provided to either one or both of the side guides 81a and 81b. An
35 example of the auxiliary guides 83 may be a protruding portion that has a smooth curved surface and comes into contact with

and goes away from the lateral edge of the carrier tape 100. Furthermore, this protruding portion may be a roller. In addition, an elastic member may be provided so that the protruding portion protrudes from the guide surface 811 of the side guide 81.

Still further, in the fixing device 82, the first locking holes 822 may be formed on the movable stage 823, and the second locking holes 824 may be formed on the fixed stage 821. In the movable stage 823, the first locking holes 822 are formed at the positions with different distance from each other from the center line C of the running path. In the fixed stage 821, the second locking holes 824 are formed as the same number as the first locking holes 822 along the straight line parallel to the running path. The side guides 81a and 81b are fixed by the fastener 825 selectively inserted into one of the pairs of the first locking holes 822 and the second locking holes 824. In this configuration, since the plurality of first locking holes 822 are displaced from each other, the operator can intuitively distinguish the difference of the widths. Note that, the end of the insertion portion 825a of the fastener 825 may be protruded from the first locking hole 822 or the second locking hole 824.

Furthermore, the movable stage 823 and the fixed stage 821 to be overlapped with each other may be arranged below and above, respectively. The either one of the first locking holes 822 or the second locking holes 824, which the fastener 825 is not inserted, do not necessarily be the through-holes. A luminous member may be arranged, or a fluorescent agent may be applied to the in or around the holes in order to facilitate a determination of the overlap of the first locking holes 822 and the second locking holes 824, or a selection to which the fastener 825 is inserted. The fluorescent agent may be applied to the width identification marks so that the marks are conspicuous. In addition, the fastener 825 itself may be formed of the luminous member, or

the fluorescent agent may be applied thereto so that its insertion position can be easily recognized.

Still further, as illustrated in FIG. 9A and FIG. 9B, inner surfaces of the first locking hole 822 and the second locking hole 824 may be provided with first tapered portions 822t and 824t having a surface inclined relative to the vertical direction. The insertion portion 825a of the fastener 825 may be provided with a second tapered portion 825t having a surface inclined in conformity with the first tapered portions 822t and 824t. In the example illustrated in FIGS. 9, the first tapered portions 822t and 824t and the second tapered portion 825t are each formed into a conical shape.

With this configuration, as illustrated in FIG. 9B, when the insertion portion 825a of the fastener 825 is inserted, since the inclined surfaces of the first tapered portions 822t and 824t, and the inclined surface of the second tapered portion 825t contact with each other, a vertical force is converted to a horizontal force, and a horizontal position of the fastener 825 in the holes is fixed. With this, play between the fastener 825, and the first locking hole 822 and the second locking hole 824 can be reduced, and an accurate positioning can be performed. Furthermore, even when the first locking hole 822 and the second locking hole 824 are slightly misaligned with each other, this misalignment can be corrected by forcing the fastener 825 thereinto. In addition, since the first tapered portions 822t and 824t and the second tapered portion 825t are each formed into the conical shape, an axis of the fastener 825 can be easily aligned with centers of the holes, and the positioning can be performed more strictly. Note that, the first tapered portions may only be formed in either one of the first locking hole 822 and the second locking hole 824. Alternatively, the fastener 825 may overall be formed into the conical shape.

Yet further, as illustrated in FIG. 10A, FIG. 10B FIG. 11A, and FIG. 11B, the fastener 825 may include a

restricting portion 826 that restricts displacement of the fastener 825 after the insertion. Note that, the displacement includes linear movement and rotation. With this, the displacement of the fastener 825 by vibration can
5 be prevented. As an example of the restricting portion 826, there may be given fitting portions that fitted with each other. That is, as illustrated in FIG. 10A and FIG. 10B, recess portions 824p and 822p are formed by recessing part of the inner surfaces of the second locking holes 824 and the
10 first locking holes 822 into a cuboid shape. Meanwhile, as illustrated in FIG. 10B, the insertion portion 825a of the fastener 825 is provided with a protruding portion 825d protruding into a cuboid shape to fit to the recess portions 824p and 822p. At the time of inserting the fastener 825,
15 the protruding portion 825d is aligned with the recess portions 824p and 822p, and then the insertion portion 825a is inserted. With this, the fastener 825 is restricted, for example, from rotating, and is restrained from being displaced by the vibration. Furthermore, a workability of
20 aligning the second locking hole 824 and the first locking hole 822 with each other efficiency is improved. Note that, as illustrated in FIGS. 11, the second locking holes 824 and the first locking holes 822 may be provided with protruding portions 824q and 822q, and the fastener 825 may be provided
25 with a recess portion 825e.

In a case where relationships between the widths and the thicknesses of the carrier tapes 100 are predetermined, the movement of the bottom guide 84 may be associated with the adjustment of the width with the side guides 81. For
30 example, a table containing data indicating the relationships between the widths and the thicknesses of the carrier tapes 100 is pre-stored in a storage unit of the control device 7. A sensor that detects the positions of the side guides 81, or a sensor that identifies a pair of the first locking hole
35 822 and the second locking hole 824 in which the fastener 825 is inserted is arranged. Based on detected positions of the

side guides 81, or pair of the first locking hole 822 and the second locking hole 824 by the sensor, the control device 7 determines corresponding widths of the carrier tapes 100. Based on the above-described table and the determined width
5 of the carrier tape 100, the control device 7 determines a thickness of the carrier tape 100. Then, the control device 7 moves the side guides 81 to positions corresponding to the thickness determined in this way. Thus, the width can be determined by moving the side guides 81, and the height
10 position of the bottom guide 84 can be determined.

The center line C of the running path of the above-described embodiment is defined as an intermediate line between the side guides 81a and 81b. This center line C may be slightly displaced by, for example, the wobbling of the
15 carrier tape 100, but substantially aligned with a center line of the width of the carrier tape 100. This center line C may be defined as a line extending in the longitudinal direction between the sprockets 41 and 42.

In the above description, the suction nozzle is given
20 as an example of the holding device 61. Alternatively, there may be arranged a chuck mechanism of an electrostatic attraction type or a Bernoulli chuck type, or a chuck mechanism that mechanically holds the electronic components 104. Furthermore, the electronic components 104 may be any
25 type of electronic component that can be packaged into the carrier tape 100. For instance, as examples of the electronic components 104, there may be given semiconductor devices, and devices other than the semiconductor devices, such as resistors and capacitors. As examples of the semiconductor
30 devices, there may be given transistors, diodes, LEDs, discrete semiconductors such as a thyristor, and integrated circuits such as ICs and LSIs.

Still further, in the above-described embodiment, the carrier tape 100 is run by the two motors 51 and 52.
35 Alternatively, either one of the two motors 51 and 52 can be provided, and run the carrier tape 100. In addition, either

one of the sprockets 41 and 42 can be provided, with the other being a smooth surface roller that guides the carrier tape 100.

5 REFERENCE SIGNS LIST

	1	Carrier tape running apparatus
	2	Sealing portion
	21	Heater block
	22	Base block
10	3	Seal tape reel
	31	Motor
	32	Pressure roller
	41	Sprocket
	42	Sprocket
15	43	Projection
	51	Motor
	51a	Timing belt
	52	Motor
	52a	Timing belt
20	6	Receiving position
	61	Holding device
	7	Control device
	8	Guide mechanism
	81, 81a, 81b	Side guide
25	811	Guide surface
	815	Linear guide
	815a	Rail
	815b	Slider
	82	Fixing device
30	821	Fixed stage
	822, 822a to 822d	First locking hole
	822p, 824p, 825e	Recess portion
	822q, 824q, 825d	Protruding portion
	822t, 824t	First tapered portion
35	823	Movable stage
	824, 824a to 824d	Second locking hole

	825 Fastener
	825a Insertion portion
	825b Head portion
	825t Second tapered portion
5	826 Restricting portion
	83 Auxiliary guide
	831 Guide member
	832 Rotary plate
	833 Groove
10	84 Bottom guide
	841 Sucking portion
	842 Suction groove
	843 Suction hole
	85 Lifting and lowering device
15	851 Motor
	852 Transmission belt
	853 Pulley
	854 Ball screw
	855 Movable member
20	100 Carrier tape
	101 Pocket
	101a Suction hole
	102 Seal tape
	104 Electronic component
25	200 Reel

CLAIMS

1. A carrier tape running apparatus that transports a carrier tape in a longitudinal direction of the carrier tape, the carrier tape having pockets that are arrayed in the longitudinal direction and contain electronic components, the carrier tape running apparatus comprising:

a pair of side guides that are arranged on both sides of sandwiching the carrier tape so as to form a running path in the longitudinal direction, and are moved in directions of coming close to and going away from lateral edges of the carrier tape; and

a fixing device that fixes, in a stepwise manner, the pair of side guides at positions where the running path has widths corresponding to a plurality of types of widths of the carrier tape, wherein the fixing device includes:

a fixed stage that is provided immovably to a base;

a movable stage that is arranged at a position overlapping with the fixed stage, and is moved together with the side guides;

a plurality of first locking holes that are formed on the fixed stage at positions with different distance from a center line of a running path;

a plurality of second locking holes that are formed on the movable stage with the same number to the first locking holes on a straight line parallel to the running path; and

a fastener that is selectively inserted into any one of
5 a pair of the first locking holes and the second locking holes to fix the side guides.

2. A carrier tape running apparatus that transports a carrier tape in a longitudinal direction of the carrier tape,
10 the carrier tape having pockets that are arrayed in the longitudinal direction and contain electronic components, the carrier tape running apparatus comprising:

a pair of side guides that are arranged on both sides of sandwiching the carrier tape so as to form a running path in
15 the longitudinal direction, and are moved in directions of coming close to and going away from lateral edges of the carrier tape; and

a fixing device that fixes, in a stepwise manner, the pair of side guides at positions where the running path has widths
20 corresponding to a plurality of types of widths of the carrier tape, wherein the fixing device includes:

a fixed stage that is provided immovably to a base;

a movable stage that is arranged at a position overlapping with the fixed stage, and is moved together with the side guides;

a plurality of first locking holes that are formed on the movable stage at positions with different distance from a center
5 line of a running path;

a plurality of second locking holes that are formed on the fixed stage with the same number to the first locking holes on a straight line parallel to the running path; and

a fastener that is selectively inserted into any one of
10 a pair of the first locking holes and the second locking holes to fix the side guides.

3. The carrier tape running apparatus according to claim 1 or 2, wherein at least one of side guides comprises an auxiliary
15 guide that is interposed between the at least one of the pair of side guides and the carrier tape so as to come into contact with the lateral edges of the carrier tape and guide the movement of the carrier tape.

20 4. The carrier tape running apparatus according to any one of claims 1 to 3, wherein the auxiliary guide comprises a guide member that is elastically supported by the side guides and comes into contact with the lateral edges of the carrier

tape and displaces the carrier tape in a width direction of the carrier tape.

5. The carrier tape running apparatus according to any
5 one of claims 1 to 4, wherein the guide member rotates in contact with the lateral edges of the carrier tape that runs.

6. The carrier tape running apparatus according to any
one of claims 1 to 5, wherein the carrier tape running apparatus
10 comprises marks for distinguishing to which of the plurality of types of widths the first locking holes and the second locking holes correspond to may be provided.

7. The carrier tape running apparatus according to any
15 one of claims 1 to 6, wherein diameters of the first locking holes and the second locking holes may have sizes that can visually recognize how much a mutual overlap is.

8. The carrier tape running apparatus according to any
20 one of claims 1 to 7, wherein the first locking holes and the second locking holes are through-holes.

9. The carrier tape running apparatus according to any one of claims 1 to 8, wherein, a part of the fastener exposes to an outside when the fastener is inserted into any one of the pair of the first locking holes and the second locking holes.

5

10. The carrier tape running apparatus according to any one of claims 1 to 9, wherein:

an inner surface of at least either one of each of the first locking holes and each of the second locking holes comprises
10 a first tapered portion having a surface inclined relative to a vertical direction; and

at least the part of the fastener comprises a second tapered portion having a surface inclined along the first tapered portion.

15

11. The carrier tape running apparatus according to claim 10, wherein the first tapered portion and the second tapered portion are a conical shape.

20 12. The carrier tape running apparatus according to any one of claims 1 to 11, further comprising a restricting portion that restricts a displacement of the position of the fastener that is inserted, the restricting portion may include fitting

portions that are formed on at least either one of the first locking holes and the second locking holes, and on the part of the fastener, so as to be fitted to each other.

5 13. The carrier tape running apparatus according to claim 12, wherein the restricting portion comprises fitting portions that are formed on at least either one the first locking holes and the second locking holes, and on the part of the fastener so as to be fitted to each other.

10

 14. The carrier tape running apparatus according to any one of claims 1 to 13, further comprising a linear guide that guides a movement of the side guides.

15 15. The carrier tape running apparatus according to any one of claims 1 to 14, further comprising a bottom guide that is arranged at a position facing a bottom surface of the carrier tape runs the running path, and is moved in directions of coming close to and going away from the carrier tape.

20

 16. The carrier tape running apparatus according to claim 15, further comprising a lifting and lowering device that raises and lowers the bottom guide.

17. The carrier tape running apparatus according to claim
15 or 16, wherein:

the bottom guide comprises a sucking portion that sucks
5 the electronic components through suction holes formed in
bottom surfaces of the pockets;

the bottom guide has a width smaller than widths of the
carrier tape; and,

between the bottom guide and the pair of side guides,
10 clearances that allow the side guides to move in the width
direction are formed.

18. The carrier tape running apparatus according to any
one of claims 1 to 17, further comprising:

15 a sprocket that hooks and runs the carrier tape;
a motor that turns the sprocket;
a reel wound with a seal tape attaching the carrier tape;
a pair of blocks that can move close to and apart from the
running paths of the carrier tape and bonds the seal tape to
20 the carrier tape by sandwiching the seal tape pulled out from
the reel, and the carrier tape; and

a press roller that can move close to and apart from the
running paths of the carrier tape;

wherein:

the taping apparatus pulls out the seal tape from the reel,
approximates the press roller to the running paths of the
carrier tape, approximate the pair of blocks, and seals the
5 carrier tape by the seal tape.