

METHOD AND APPARATUS FOR ADHERING ELECTRONIC COMPONENTS

FIELD

The disclosure relates to an adhering method and
5 apparatus, more particularly to a method and an
apparatus for adhering one electronic component to
another electronic component.

BACKGROUND

There are many kinds of electronic components, and
10 more than two kinds of electronic components are
connected according to the requirement. For example,
a component adhered to a flexible substrate or a
flexible printed circuit (FPC), where the component may
be another flexible substrate, a passive component, or
15 other component which must be attached to the flexible
substrate. The method of adhering the component to the
flexible substrate is already disclosed in Taiwanese
Patent Publication Number I546234, entitled "Element
Conveying Method and Device in Electronic Element
20 Fitting Process" and Taiwanese Patent Publication
Number I567011, entitled "Element Conveying Method and
Device for Fitting Process." In both disclosures, a
first electronic component and a second electronic
component are placed in two different carrier trays,
25 and the carrier trays are transported using two
transport paths. The first electronic component on one

of the carrier trays is then transferred to the other carrier tray so as to adhere with the second electronic component.

5 However, the technology disclosed in the aforesaid disclosures is applicable only if the first and second electronic components are respectively placed on the carrier trays. Further, although the aforesaid disclosures can reduce the consumption of human resources and improve the adhering quality, there is still room for
10 improvement in terms of production efficiency. Because during the transfer of the first electronic component on one of the carrier trays to the other carrier tray, it has to go through many inspection procedures, the back and forth movement of the first electronic
15 component will consume a lot of time, thereby adversely affecting the production.

SUMMARY

Therefore, an object of the present disclosure is to provide a method for adhering electronic components
20 that is capable of alleviating at least one of the drawbacks of the prior arts.

According to this disclosure, a method for adhering two electronic components includes: placing a plurality of first electronic components on a carrier
25 tray in a matrix arrangement; releasably packaging a plurality of second electronic components in a carrier

tape assembly having a carrier tape and a cover tape peelably adhered to the carrier tape; picking up and transferring one of the first electronic components to a fixture by a first transfer mechanism; and picking
5 up and transferring one of the second electronic components to the fixture by a second transfer mechanism so as to adhere the one of the second electronic components to the one of the first electronic components and form an assembly.

10 Another object of this disclosure is a method for adhering electronic components that is capable of alleviating at least one of the drawbacks of the prior arts.

According to this disclosure, a method for adhering
15 two electronic components includes: providing a transport device, the transport device providing an intermittent rotation flow path and including a fixture intermittently movable along the intermittent rotation flow path; picking up and transferring a first
20 electronic component to the fixture by a first transfer mechanism; picking up and transferring a second electronic component to the fixture by a second transfer mechanism so as to adhere the second electronic component to the first electronic component and form
25 an assembly.

Still another object of this disclosure is to provide an apparatus for adhering together two

electronic components that is capable of alleviating at least one of the drawbacks of the prior arts.

According to this disclosure, an apparatus is used for adhering together a first electronic component and a second electronic component. A plurality of the first electronic components are placed on a carrier tray. A plurality of the second electronic components are releasably packaged in a carrier tape assembly. The apparatus includes a fixture, a storage mechanism for storage of the carrier tray, a first transfer mechanism provided with a first transfer unit which is movable between the fixture and the carrier tray for picking up and transferring one of the first electronic components to the fixture, and a second transfer mechanism provided with a second transfer unit which is movable between the fixture and the carrier tape assembly for picking up and transferring one of the second electronic components to the fixture so as to adhere the one of the second electronic components to the one of the first electronic components and form an assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiment with reference to the accompanying drawings, of which:

Fig. 1 is a perspective view of a plurality of first electronic components disposed on a carrier tray;

Fig. 2 is a perspective view of a plurality of second electronic components releasably packaged in a carrier tape assembly;

Fig. 3 is an enlarged perspective view of the second electronic component;

Fig. 4 is a schematic top view of an apparatus for adhering together two electronic components according to the embodiment of the present disclosure;

Fig. 5 is a perspective view, illustrating a first feed station and a transport device of the embodiment;

Fig. 6 is an enlarged fragmentary perspective view of a fixture of the embodiment;

Fig. 7 is an exploded perspective view of the fixture of the embodiment;

Fig. 8 is an exploded perspective view of a first storage mechanism of the embodiment;

Fig. 9 is a front perspective view of a first transfer mechanism of the embodiment;

Fig. 10 is a rear perspective view of the first transfer mechanism of the embodiment;

Fig. 11 is a fragmentary perspective view of a second feed station of the embodiment;

Fig. 12 is another fragmentary perspective view of the second feed station of the embodiment taken from another angle;

Fig. 13 is a schematic side view of the second feed station of the embodiment;

Fig. 14 is a perspective view of a feed guide unit of the embodiment;

5 Fig. 15 is a bottom perspective view of a portion of the feed guide unit of the embodiment;

Fig. 16 is a fragmentary schematic side view of a portion of the feed guide unit of the embodiment;

10 Fig. 17 is a perspective view of a second transfer mechanism and the transport device of the embodiment;

Fig. 18 is a fragmentary schematic side view of the second transfer mechanism and the transport device of the embodiment;

15 Fig. 19 is a fragmentary perspective view of the second transfer mechanism and the transport device of the embodiment;

Fig. 20 is a perspective view of a press work station and the transport device of the embodiment;

20 Fig. 21 is an enlarged perspective view of the press work station of the embodiment; and

Fig. 22 is a fragmentary sectional view, illustrating how a press mold works.

DETAILED DESCRIPTION

25 Referring to Figs. 1 to 3, an apparatus according to the embodiment of the present disclosure is suitable for use in adhering together a first electronic

component 1 and a second electronic component 2. A plurality of the first electronic components 1 are initially placed on a carrier tray 10 in a matrix arrangement. The carrier tray 10 is formed with a plurality of cavities for receiving and positioning the first electronic components 1, respectively. Each first electronic component 1 may be a flexible substrate [or a flexible printed circuit (FPC)] provided with circuits or carrying passive components and other FPC components.

A plurality of second electronic components 2 are initially releasably packaged in a carrier tape assembly 20. The carrier tape assembly 20 includes a carrier tape 201 and a cover tape 202 that are both elongated, flat and flexible. The cover tape 202 is peelably adhered to the carrier tape 201. The second electronic components 2 are arranged equally spaced apart from each other along a length direction of the carrier tape 201, and are covered by the cover tape 202, such that the second electronic components 2 are clamped between the carrier tape 201 and the cover tape 202. The carrier tape 201 and the cover tape 202 are attached to each other by electrostatic attraction and not by adhesive. The carrier tape assembly 20 is wound around a reel 3. Each second electronic component 2 includes a film layer 21, and an adhesive layer 22 below the film layer 21. A smooth bottom surface of the film

layer 21 is peelably adhered to a top surface of the adhesive layer 22. The adhesive layer 22 of this embodiment is an optical clear adhesive (OCA), but is not limited thereto. Each second electronic component
5 2 is releasably adhered to a smooth top surface of the carrier tape 201 through the adhesive layer 22 thereof. When the carrier tape assembly 20 is unwound from the reel 3, the cover tape 202 can be peeled off from the carrier tape 201 so as to expose the second electronic
10 components 2 adhered to the carrier tape 201.

Referring to Figs. 4 to 6, in combination with Figs. 1 and 2, the apparatus of this disclosure includes a transport device 40 and a plurality of angularly spaced-apart work stations all mounted on a machine
15 table (T).

The transport device 40 includes a rotating seat 41 that can rotate intermittently, and a plurality of fixtures 42 disposed on a peripheral edge of the rotating seat 41. The rotating seat 41 includes a
20 central rotating shaft 411, and a plurality of cantilevers 412 extending outwardly and radially from the rotating shaft 411 and equiangularly spaced apart from each other. Each fixture 42 is mounted on an end of a respective one of the cantilevers 412 distal from
25 the rotating shaft 411. The rotating seat 41 provides an intermittent rotation flow path, so that the fixtures 42 can pass through the work stations along

the intermittent rotation flow path. That is, each fixture 42 can move one by one through each work station. Each cantilever 412 is inclined upwardly with respect to the machine table (T). The rotating seat 41 further includes a plurality of air supply pipes 413, each of which is connected between the rotating shaft 411 and a respective one of the fixtures 42. Each air supply pipe 413 can provide a negative pressure to the respective fixture 42 for sucking and releasing the first or second electronic component 1, 2.

The work stations include a first feed station 50, a first inspection station 60, a second feed station 70, a press work station 80, a second inspection station 90 and a receiving station 100.

The first feed station 50 supplies the first electronic components 1, and includes a first storage mechanism 51 for storing the carrier trays 10 which carry the first electronic components 1, and a first transfer mechanism 52 for transferring each first electronic component 1 on each carrier tray 10 to the corresponding fixture 42.

The first inspection station 60 is located downstream of the first feed station 50, and includes a first inspection unit 61 for inspecting the first electronic component 1 on the fixture 42. The first inspection unit 61 may be made of a CCD lens.

The second feed station 70 is located downstream of

the first inspection station 60, and includes a feed mechanism 71 for supplying the second electronic components 2, and a second transfer mechanism 72 for transferring each second electronic component 2
5 between the carrier tape 201 and the cover tape 202 of the carrier tape assembly 20 to the corresponding fixture 42.

The press work station 80 is located downstream of the second feed station 70, and is used for pressing
10 the first and second electronic components 1, 2 that have been placed one after the other on the corresponding fixture 42 so as to press and adhere together the first and second electronic components 1, 2 and form an assembly. The press work station 80
15 includes a press mechanism 81 disposed above the corresponding fixture 42, and a positioning module 82 supporting the corresponding fixture 42 from below.

The second inspection station 90 is located downstream of the press work station 80, and includes
20 a second inspection unit 91 for inspecting the assembly of the first and second electronic components 1, 2 on the corresponding fixture 42 after being pressed.

The receiving station 100 is located downstream of the second inspection station 90, and includes a second
25 storage mechanism 101, a third storage mechanism 102 and a third transfer mechanism 103. The second and third storage mechanisms 101, 102 are parallel to each other.

The second storage mechanism 101 is used to receive and store the assemblies of the first and second electronic components 1, 2 that pass through the second inspection unit 91 and that are inspected and determined to be good.

5 The third storage mechanism 102 is used to receive and store the assemblies of the first and second electronic components 1, 2 that pass through the second inspection unit 91 and that are inspected and determined to be defective. The third transfer mechanism 103 is used for
10 transferring the good and the defective assemblies of the first and second electronic components 1, 2 to the respective second and third storage mechanisms 101, 102.

Below is a detailed description of the aforesaid
15 devices and mechanisms.

Referring to Fig. 7, in combination with Figs. 5 and 6, since the structures of the fixtures 42 are identical, only one fixture 42 will be described hereinafter for the sake of clarity.

20 The fixture 42 includes a fixed seat 421, a base seat 422, a cushion seat 423, two clamping members 424, a push member 425, a cover 426, and an elastic member 427.

The fixed seat 421 has a first side surface 4211 fixed to an outer side of a fixed portion 4121 that
25 protrudes upwardly from an end of the cantilever 412, a second side surface 4211' opposite to the first side surface 4211, a protrusion 4212 protruding from the

second side surface 4211', and two spaced-apart guide rails 4213 provided on the second side surface 4211' and extending in a Z-direction (or top-bottom direction). The protrusion 4212 is located between the
5 guide rails 4213.

The base seat 422 includes a horizontal platform 4221 extending in a Y-direction (or left-right direction) transverse to the Z-direction, a slide seat 4222, an elastic member 4225, a pivot seat 4228 and a
10 pivoting member 4229. The slide seat 4222 is disposed transversely on one end of the platform 4221, and has a slide plate 4223 extending along the Z-direction and slidable upward and downward along the guide rails 4213. Through this, the base seat 422 is slidable upward and
15 downward relative to the fixed seat 421. The slide seat 4222 further has an elongated groove 4224 extending along the Z-direction for receiving the protrusion 4212. The groove 4224 is defined by a groove-defining wall that includes opposite upper and lower wall portions
20 (4224a, 4224b). The elastic member 4225 is disposed in the groove 4224 below the protrusion 4212. The base seat 422 is stopped from moving downwardly through abutment of the upper wall portion (4224a) of the groove-defining wall against an upper end of the
25 protrusion 4212, and is restored to its original position through a restoring force of the elastic member 4225 which is compressed by the lower wall

portion (4224b) of the groove-defining wall against a lower end of the protrusion 4212 when the base seat 422 moves upwardly.

5 A connector 4131 of the air supply pipe 413 is connected to the platform 4221 to supply a negative pressure thereto. The platform 4221 has an air collecting area 4226 extending inwardly from a top surface thereof and having a sealing ring around an inner periphery thereof, and a connecting pipe 4227
10 connected between the air collecting area 4226 and the connector 4131. The pivot seat 4228 has a box shape and is disposed on a corner of the platform 4221. The pivoting member 4229 has two opposite sides pivoted to the pivot seat 4228 such that the pivoting member 4229
15 is pivotable leftward and rightward relative to the pivot seat 4228. A lower portion of the pivoting member 4428 is located within a hollow interior of the pivot seat 4228.

The cushion seat 423 is disposed above the platform
20 4221, and includes an air nozzle seat 4231 protruding upward from a top surface thereof, and an air nozzle 4232 provided in the air nozzle seat 4231 and communicating with the air collecting area 4226 to provide a negative pressure.

25 The clamping members 424 are disposed on the cushion seat 423, and cooperate with each other to define a gap 4241 for receiving the air nozzle 4232. One of the

clamping members 424 has a slide groove 4242 formed on a top surface thereof and communicating with the gap 4241.

5 The push member 425 is slidably disposed in the slide groove 4242 of the one of the clamping members 424, and has one end cooperating with the clamping members 424 to define a component receiving area 4251 for placement of the to-be-clamped first or second electronic component 1, 2, an opposite end provided with a through hole 4252 for extension of an upper portion of the pivoting member 4229 therethrough, a stop portion 4253 opposite to the component receiving area 4251 and adjacent to the through hole 4252, and a push portion 4254 protruding from a top surface thereof and located 10 between the component receiving area 4251 and the through hole 4252.

The cover 426 is disposed above the slide groove 4242 of the one of the clamping members 424, defines a limiting space 4261 for receiving the push portion 4254 and for limiting the sliding movement of the same within 20 the slide groove 4242, and has an elongated slot 4262 communicating with the limiting space 4261. The limiting space 4261 is defined by an upper wall, two sidewalls and an end wall.

25 The elastic member 427 is made of a spring, and is disposed in the limiting space 4261. The elastic member 427 has two opposite ends respectively abutting against

the push member 425 and the end wall of the limiting space 4261. The push portion 4254 is pushed by the elastic member 427 to move the push member 425 therealong forwardly so as to perform a clamping action
5 on the first electronic component 1. During the clamping action, the upper portion of the pivoting member 4229 abuts against the stop portion 4253, and the lower portion thereof pivots rearwardly.

The transport device 40 further includes a plurality
10 of opening and closing mechanisms 43 corresponding to the work stations. Each opening and closing mechanism 43 includes a support frame 431 extending upright along the Z-direction, a slide member 432 disposed on top of the support frame 431 and driven to move forwardly and
15 rearwardly, and a control member 433 disposed above the slide member 432. The fixture 42 is located above the support frame 431 when it stops, and the control member 433 controls the opening and closing operations of the fixture 42 when the to-be-clamped object is placed in
20 or removed from the fixture 42. When the control member 433 is driven by the slide member 432 to move forwardly, it can contact and push the lower portion of the pivoting member 4229, so that the upper portion of the pivoting member 4229 can pivot rearwardly. This permits the push
25 member 425 to move rearwardly through the biasing action of the elastic member 427, thereby releasing the clamping of the object in the component receiving area

4251.

The first storage mechanism 51 of the first feed station 50 includes two side seats 511 that extend parallel along an X-direction (or front-rear direction) transverse to the Y- and Z-directions and that cooperate with each other to define a pick-up area (P_1), and a tray supporting region 513 and a tray collecting region 514 both spacedly disposed above the pick-up area (P_1). The tray supporting region 513 is used to receive the carrier tray 10 containing the first electronic components 1. The tray collecting region 514 is used to receive the empty carrier tray 10. The carrier tray 10 in the tray supporting region 513 can be conveyed to the tray collecting region 514 along the pick-up area (P_1). The first storage mechanism 51 further includes a storage bin 515 disposed on one of the side seats 511 and proximate to an operator for receiving defective products. The first transfer mechanism 52 extends across and over the pick-up area (P_1) along a direction transverse to the side seats 511, and includes a first rail seat 521 and a first transfer unit 522. The first rail seat 521 includes a base plate 5211 extending along the Y-direction, and a first slide rail 5212 connected to the base plate 5211 and extending along the Y-direction. The first transfer unit 522 is slidable along the first slide rail 5212 between the pick-up area (P_1) and the fixture 42, and sucks and transfers one

by one the first electronic components 1 on the carrier tray 10 disposed on the tray supporting region 513 to the fixtures 42 which are intermittently rotated.

Referring to Fig. 8, the tray supporting region 513 includes a rectangular frame 5131 defining a rectangular space 5132, four posts 5133 (only two are shown in Figs. 7 and 8) disposed on four corners of the frame 5131 and each having an L-shaped cross section, four spaced-apart drive members 5134 two of which are disposed on one side of the frame 5131 and the other two of which are disposed on the opposite side thereof, and four stop keys 5135 two of which are disposed on the one side of the frame 5131 and the other two of which are disposed on the opposite side thereof. Each stop key 5135 is opposite to a respective one of the drive members 5134 along the Y-direction, and is drivable by the respective drive member 5134 to move horizontally toward the space 5132. The posts 5133 cooperate to define an area for receiving and stacking the carrier trays 10 and for limiting the carrier trays 10 therein.

The tray collecting region 514 includes a rectangular frame 5141 defining a rectangular space 5142, four posts 5143 (only two are shown in Figs. 7 and 8) disposed on four corners of the frame 5141 and each having an L-shaped cross section, and two pairs of stop keys 5144 disposed on two opposite sides of the frame 5141 and spaced apart along the Y-direction. The

posts 5143 cooperate to define an area for limiting the carrier trays 10 and for receiving and stacking the carrier trays 10 therein. Each stop key 5144 extends horizontally toward the space 5142, and is pivotable
5 upward but not downward.

Each side seat 511 includes a slide rail 5111 protruding from an inner surface in proximity to a top end thereof toward the other side seat 511 and extending along the X-direction, and a slide rail 5112 disposed
10 below the slide rail 5111 and also extending along the X-direction. The first storage mechanism 51 further includes two slide plates 5101 respectively disposed on the slide rails 5112 of the side seats 511, two clamping members 5102 respectively disposed on the
15 slide plates 5101, four rotating wheels 5103 each two of which are disposed on the inner surface of a corresponding one of the side seats 511 and spaced apart from each other along the X-direction, two belts 5104 each of which is looped around a corresponding two of
20 the rotating wheels 5103 and connected to a respective one of the slide plates 5101, two drive members 5105 each of which is used to drive movement of a respective one of the clamping members 5102, and two drive members 5106 configured as pneumatic cylinders and each of
25 which is used to drive opening and closing of a respective one of the clamping members 5102. Each clamping member 5102 includes two spaced-apart pivot

axles 51022 connected to one of the slide plates 5101,
and two clamping claws 51021 connected pivotally and
respectively to the pivot axles 51022. Each clamping
claw 51021 has an upper end formed with a clamping
5 portion 51023, and a lower end connected to and driven
by the drive member 5106. In operation, the two clamping
claws 51021 are pivotable about the pivot axles 51022
so as to move the two clamping portions 51023 toward
or away from each other. Each drive member 5105 drives
10 an adjacent one of the rotating wheels 5103 to rotate
so as to slidably move the clamping member 5102
reciprocally on the slide rail 5112.

The first storage mechanism 51 further includes two
spaced-apart lifting units 516 disposed between the
15 side seats 511 and between a sliding path of the clamping
members 5102. The lifting units 516 are respectively
located below the tray supporting region 513 and the
tray collecting region 514. Each lifting unit 516
includes a base seat 5161 having two engaging grooves
20 5162 parallel and spaced apart from each other for
engagement with bottom portions of the side seats 511
and for positioning the same thereto. Each lifting unit
516 further includes a support frame 517 mounted on the
base seat 516 between the two engaging grooves 5162,
25 a platform 518 mounted on the support frame 517, and
a drive member 519 for driving upward and downward
movement of the platform 518.

During conveying, a plurality of the carrier trays
10 loaded with the first electronic components 1 are
first stacked in the area defined by the posts 5133 of
the tray supporting region 513, and are disposed above
5 the stop keys 5135. The platform 518 disposed below the
tray supporting region 513 is then driven by the drive
member 519 to move upward and abut against a bottommost
one of the stacked carrier trays 10 after passing
through the rectangular space 5132, so that the whole
10 stack of the carrier trays 10 is moved upward and away
from the stop keys 5135. When the stop keys 5135 are
driven by the drive members 5134 to retract inwardly,
the platform 518 along with the whole stack of the
carrier trays 10 is moved downward by a distance
15 substantially equal to a height of a carrier tray 10,
after which the stop keys 5135 are again driven to
protrude for engaging the carrier tray 10 second to the
bottommost one of the stack, so that the bottommost
carrier tray 10 can be solely moved down by the platform
20 518 to rest on the slide rails 5111 of the side seats
511 and be clamped by the two clamping claws 51021 of
one of the clamping members 5102. Thereafter, the one
of the clamping members 5102 is driven to slide along
the slide rails 5112 for conveying the bottommost
25 carrier tray 10 to the pick-up area (P_1), where the first
electronic components 1 of the carrier tray 10 can be
picked up by the first transfer unit 522.

After all the first electronic components 1 of the bottommost carrier tray 10 are picked up and transferred, the empty carrier tray 10 is conveyed by the clamping member 5102 to the tray collecting region 514. At this time, the platform 518 of the lifting unit 516 which is disposed below the tray collecting region 514 is driven to move upward along with the empty carrier tray 10 until it abuts against the stop keys 5144 after passing through the rectangular space 5142 of the frame 5141. After the carrier tray 10 passes through the stop keys 5144, the stop keys 5144 are restored to their original positions, and the platform 518 is driven to move downward so that the carrier tray 10 can be disposed on the stop keys 5144.

It should be noted herein that the two clamping members 5102 move alternately during conveyance. That is, when one of the clamping members 5102 conveys the carrier tray 10 from the tray supporting region 513 through the pick-up area (P_1) to the tray collecting region 514, the other one of the clamping members 5102 disposed below the conveying carrier tray 10 is moved along a reverse direction from the tray collecting region 514 through the pick-up area (P_1) to the tray supporting region 513 for the next conveying operation.

Referring to Fig. 9, in combination with Fig. 5, the first transfer mechanism 52 further includes a fixed seat 523 extending along the Y-direction and having one

end fixed to a top side of the side seat 511 which is proximate to the operator, a support seat 524 supporting the bottom of the other end of the fixed seat 523, a fine-tuning seat 525 disposed below the support seat 524 for fine tuning in the X- and Y-directions, a second rail seat 526 disposed above the fixed seat 523 and extending along the Y-direction, and a drive member 527 disposed on one end of the second rail seat 526. The first rail seat 521 is slidably connected to the fixed seat 523. The fixed seat 523 includes two spaced-apart auxiliary slide rails 5232 extending along the Z-direction and disposed on a first lateral side 5231 thereof which is a front side. The first rail seat 521 extends across the auxiliary slide rails 5232, and is slidable up and down along the same.

The first transfer unit 522 includes an upper slide plate 5221 slidably connected to the second rail seat 526, an upper slide rail 5222 fixed to the upper slide plate 5221 and extending along the Z-direction, a lower slide plate 5223 slidably connected to the first slide rail 5212, a lower slide rail 5224 fixed to the lower slide plate 5223 and extending along the Z-direction, an intermediate slide plate 5225 disposed across the first and second rail seats 521, 526 and slidably connected to the upper slide rail 5222 and the lower slide rail 5224. The drive member 527 drives the first transfer unit 522 to slide along the first and second

rail seats 521, 526 in a reciprocal manner. The first transfer unit 522 further includes a pick-up shaft 5226 connected to the intermediate slide plate 5225, a pick-up head 5227 disposed on a bottom end of the pick-up shaft 5226, and a drive member 5228. The pick-up head 5227 has a suction hole for sucking an electronic component. The pick-up head 5227 can have a shape corresponding to that of a surface of the electronic component to be sucked. The drive member 5228 drives rotation of the pick-up shaft 5226.

Referring to Fig. 10, in combination with Fig. 9, the first transfer mechanism 52 further includes a slide frame 528 provided on a back side of the base plate 5211 of the first rail seat 521, a third rail seat 529 extending along the Z-direction and disposed on a second lateral side 5233 of the fixed seat 523 which is a back side, a slide plate 530 slidably connected to the third rail seat 529, and a drive member 531 for driving the slide plate 530. The slide frame 528 includes a first side bar 5281 extending through a through hole 5234 in the fixed seat 523 and fixed to the base plate 5211, a second side bar 5282 fixed to the base plate 5211 after passing through an outer side of the fixed seat 523 and parallel to the first side bar 5281, and a third side bar 5283 connected between the first and second side bars 5281, 5282 and fixed to the slide plate 530. The drive member 531 drives the

slide frame 528 together with the first rail seat 521 to slide upward and downward along the third rail seat 529.

The second rail seat 526 has a first fixing member 5261 disposed on a back side thereof. The slide frame 528 further includes a second fixing member 5284 disposed on the third side bar 5283, a drive member 5285 disposed below the second fixing member 5284 and including a drive rod 5286 having one end connected to the first fixing member 5261, and two elastic members 5287 disposed on two opposite sides of the drive rod 5286 and connected to the first and second fixing members 5261, 5284. The drive member 5285 is a pneumatic cylinder. Each elastic member 5287 is a tension spring. The weights of the slide frame 528, the first rail seat 521 and the first transfer unit 522 are supported by the elastic members 5287 when in a floating state, so that energy may be saved when the drive member 531 drives the slide frame 528 to move along with the first rail seat 521 and the first transfer unit 522. Since the distance between the first and second fixing members 5261, 5284 defines the magnitude of an elastic restoring force of the elastic members 5287, the drive member 5285 can be a fine-tuning drive member for adjusting the retraction or extension of the drive rod 5286. Through this, the tightness of the elastic members 5287 can be finely tuned.

Referring to Figs. 11 to 13, in combination with Figs. 2 and 4, the feed mechanism 71 and the second transfer mechanism 72 of the second feed station 70 are adjacent to each other and are disposed in an intersecting manner.

5 The feed mechanism 71 includes a mounting frame 711 mounted on the machine table top (T), and a reel support 712 movably mounted on a side of the mounting frame 711 that is opposite to the transport device 40. The mounting frame 711 includes two parallel slide rails 10 7111 extending in the Y-direction and spaced apart from each other in the Z-direction, a slide member 7112 connected to the reel support 712, and a drive member 7113 disposed between the slide rails 7111. The reel support 712 has two sliders 7121 provided on one side 15 thereof and disposed slidably and respectively on the slide rails 7111. The drive member 7113 drives the sliders 7121 to reciprocally slide along the slide rails 7111. The feed mechanism 71 further includes an air ejecting mechanism 713 disposed on a side of the 20 mounting frame 711 that is proximate to the transport device 40 and facing the fixture 42 for blowing air onto the first electronic component 1 to remove dust from the surface of the first electronic component 1, so that the second electronic component 2 can be adhered firmly 25 to the surface of the first electronic component 1.

The feed mechanism 71 further includes a winding unit 714 mounted on an upper portion of the reel support

712. The winding unit 714 includes a reel mounting shaft 7141 that rotates when driven, a first winding shaft 7142, a second winding shaft 7143, a belt 7144 looped around the first and second winding shafts 7142, 7143, and a drive member 7145 for driving the first and second winding shafts 7142, 7143 to rotate in the same direction. The reel mounting shaft 7141 has one end protruding out of the other side of the reel support 712 opposite to the sliders 7121 and the transport device 40 for mounting of the reel 3 thereon. The reel 3 is wound with the carrier tape assembly 20 that encapsulates the second electronic components 2, as shown in Fig. 2. The first winding shaft 7142 has one end protruding out of the side of the reel support 712 and located above the reel mounting shaft 7141 for mounting of an empty reel 4 thereon. The empty reel 4 is used to wind the cover tape 202 peeled off from the carrier tape assembly 20 shown in Fig. 2. The second winding shaft 7143 has one end protruding out of the side of the reel support 712 spaced apart from the reel mounting shaft 7141 and the first winding shaft 7142 for mounting of an empty reel 5 thereon. The empty reel 5 is used to wind the carrier tape 201 that is peeled off with the cover tape 202 and that has no second electronic components 2.

Referring to Fig. 14, in combination with Fig. 13, the feed mechanism 71 further includes a feed guide unit

715 mounted on the side of the reel support 712 opposite to the transport device 40 and disposed below the winding unit 714. The feed guide unit 715 includes a guide seat 7151 having a side fixed to the reel support 712. The guide seat 7151 has a conveying path 71511 extending along the Y-direction for guiding the carrier tape 201 carrying the second electronic components 2 to move therealong, a holding groove 71512 disposed below the conveying path 71511, and a plurality of air holes 71513 communicating with the conveying path 71511 and arranged in two rows at two opposite sides of the holding groove 71512. The air holes 71513 are spacedly disposed along the Y-direction for sucking a bottom surface of the passing carrier tape 201, so that when the carrier tape 201 with the second electronic components 2 on a top surface thereof is conveyed, an adhesion force is maintained on the bottom surface of the carrier tape 201 to abut against a top surface of the conveying path 71511. Through the presence of the holding groove 71512, when the bottom surface of the carrier tape 201 is adhered with, for example, the second electronic component 2 or other foreign object for an unknown reason, the second electronic component 2 or the foreign object may be stuck and fall into the holding groove 71512 during the conveyance.

The feed guide unit 715 further includes four insert pins 7152 protruding from a top surface of guide seat

7151 and spacedly disposed on outer sides of the two rows of air holes 71513, and a cover 7153 disposed on top of the conveying path 71511. The cover 7153 has four insert holes 71531 corresponding to the insert pins 7152. The cover 7153 is disposed on the top surface of the guide seat 7151 through engagement of the insert pins 7152 and the insert holes 71531. The cover 7153 further has a groove 71531 extending inwardly from a bottom surface thereof and corresponding in position to the conveying path 71511 to permit passage of the second electronic component 2 on the carrier tape 201 therethrough.

Referring to Figs. 15 and 16, in combination with Fig. 14, the feed guide unit 715 further includes a receiving seat 7154 disposed on an outer end of the guide seat 7151, and a drive member 7155 to drive the receiving seat 7154 to move to and fro along the Y-direction. The receiving seat 7154 includes a feed guide portion 71541 extending downwardly and inclinedly from an end thereof that corresponds in position to the outer end of the guide seat 7151, and a releasing portion 71542 having a plurality of spaced-apart slots formed in a top surface thereof. A slit (S) is formed between the outer end of the guide seat 7151 and the inner end of the receiving seat 7154 for passage of the carrier tape 201 that is separated from the second electronic component 2. The feed guide unit 715 further includes a fixing

member 7156 disposed below the slit (S), and a sensing element 7157 and an air blowing element 7158 disposed on the fixing member 7156 and facing the slit (S). The fixing member 7156 and the receiving seat 7154 are simultaneously driven by the drive member 7155 to move to and fro along the Y-direction.

When the carrier tape 201 is conveyed to the top surface of the conveying path 71511, it turns at the outer end of the guide seat 7151 and passes through the slit (S) to detach from the continuously moving second electronic component 2. When the sensing element 7157 senses the second electronic component 2, it activates the air blowing element 7158 to blow air onto the second electronic component 2 so as to assist the same in separating from the carrier tape 201, so that the second electronic component 2 can move across the slit (S) and be guided by the feed guide portion 71541 toward the top surface of the releasing portion 71542. Through the presence of the slots in the top surface of the releasing portion 71542, an area of contact between the top surface of the releasing portion 71542 and the second electronic component 2 is reduced. It should be noted herein that when a portion of the second electronic component 2 is separated from the carrier tape 201 and moves to the slit (S), a second transfer unit 725 of the second transfer mechanism 72 is disposed on a pick-up area (P₂) above the slit (S) for sucking the

second electronic component 2, a detailed description of which will be described later.

With reference to Figs. 2, 13 and 14, the feed mechanism 71 further includes a clamping unit 717
5 mounted on the side of the reel support 712 opposite to the transport device 40 and adjacent to the feed guide unit 715. The clamping unit 717 includes a fixed first clamping seat 7171, a movable second clamping seat 7172, a fixed third clamping seat 7173 and a fixed fourth
10 clamping seat 7174, each of which has two clamps that can be driven to open and close.

The first and third clamping seats 7171, 7173 correspond to each other along the Z-direction for clamping and positioning the carrier tape 201. The
15 first clamping seat 7171 is located on a transfer path of the carrier tape 201 between the guide seat 7151 and the reel 3. The clamping unit 717 further includes a sensing element 7175 disposed at an entry side of the first clamping seat 7171, and a first guide wheel 7176
20 located on the transfer path of the carrier tape 201 between the first clamping seat 7171 and the reel 3. The third clamping seat 7173 is located on the transfer path of the carrier tape 201 between the guide seat 7151 and the empty reel 5. The clamping unit 717 further
25 includes a second guide wheel 7177 located on the transfer path of the carrier tape 201 between the third clamping seat 7173 and the guide seat 7151.

The fourth clamping seat 7174 is used for clamping and positioning the cover tape 202, and is located on a transfer path of the cover tape 202 between the reel 3 and the empty reel 4. The clamping unit 717 further includes a sensing element 7178 disposed at an entry side of the first clamping seat 7171, and two third guide wheels 7179, one of which is disposed between the fourth clamping seat 7174 and the reel 3, and the other one of which is disposed between the fourth clamping seat 7174 and the empty reel 4.

The second clamping seat 7172 is used for clamping and positioning the carrier tape 201, and is located on the transfer path of the carrier tape 201 between the empty reel 5 and the guide seat 7151. The second clamping seat 7172 is disposed in a hollow section 7122 of the reel support 712, and is connected to a right side of the slide member 7112. When a drive member 718 drives the slide member 7112, the second clamping seat 7172 can move together with the slide member 7112 reciprocally along the Y-direction, and conducts the clamping, pulling and releasing of the carrier tape 201 in sequence. The clamping unit 717 further includes a fourth guide wheel 719 disposed between the second clamping seat 7172 and the empty reel 5.

Referring to Figs. 17 and 18, in combination with Fig. 2, the second transfer mechanism 72 has a structure substantially identical to that of the first transfer

mechanism 52 (see Fig. 5). Particularly, the second transfer mechanism 72 includes a fixed seat 721 extending along the X-direction, a support seat 722, a fine-tuning seat 723 disposed below the support seat 722, a drive member 726, first and second rail seats 728, 729, and the second transfer unit 725. The fixed seat 721 has one end hanging above the fixture 42 which is proximate to the transport device 40, and the other end supported by the support seat 722. The drive member 725 can drive the fine-tuning seat 723 to move the fixed seat 721 and the support seat 722 to displace along the Y-direction.

The second transfer mechanism 72 further includes a rail seat 724 and a storage bin 727. The rail seat 724 includes two spaced-apart slide rails 7241 extending along the Y-direction and disposed below the fine-tuning seat 723. The storage bin 726 is disposed on the fine-tuning seat 723 for receiving defective second electronic components 2. The fixed seat 721 includes two spaced-apart auxiliary slide rails 7212 extending along the Z-direction and disposed on a first lateral side 7211 thereof which is a left side.

The first rail seat 728 extends across the auxiliary slide rails 7212 along the X-direction and is slidable up and down along the auxiliary slide rails 7212. The second rail seat 729 extends along the X-direction and is disposed above the fixed seat 721. The first rail

seat 727 has a structure substantially identical to that of the first rail seat 521, while the second rail seat 728 has a structure substantially identical to that of the second rail seat 526.

5 The intermediate slide plate 7255 of the second transfer unit 725 is disposed across the first and second rail seats 728, 729, and is slidably connected to upper and lower slide rails 7254 (only the lower slide rail 7254 is visible in Fig. 17) of the second transfer
10 unit 725. Through this, the second transfer unit 725 can be driven by a drive member 7291 disposed on the second rail seat 729 to reciprocally slide on the first and second rail seats 728, 729 along the X-direction. The second transfer unit 725 further includes two
15 mounting seats 7256 extending along the Z-direction and disposed on the second rail seat 729 at two opposite sides of the intermediate slide plate 7255, and two light source modules 7257 respectively disposed on bottom ends of the mounting seats 7256.

20 The second feed station 70 further includes an upper inspection mechanism 73 and a lower inspection mechanism 74. The upper inspection mechanism 73 is disposed above the second transfer mechanism 72, and includes two parallel support rods 731 disposed on a
25 side of the second transfer mechanism 72 opposite to the transport device 40, a support plate 732 mounted on top of the support rods 731, two fine-tuning

components 733 mounted on the support plate 732 for performing the fine-tuning along the X- and Y-directions, and two spaced-apart upper inspection elements 734 disposed on the fine-tuning components 733
5 for conducting inspection in a top-to-bottom direction. The upper inspection elements 734 are respectively disposed above the light source modules 7257.

The lower inspection mechanism 74 is disposed below a moving path of the second transfer unit 725 between the fixture 42 and the pick-up area (P_2), and includes
10 a lower inspection element 741 for conducting inspection in a bottom-to-top direction. Particularly, the lower inspection element 741 is used for inspecting a bottom side of the second electronic component 2
15 picked up by the second transfer unit 725.

The second transfer unit 725 is linearly movable among the component receiving area 4251 (see Fig. 6), the pick-up area (P_2) and the storage bin 727. The upper inspection elements 734 move along with the second
20 transfer unit 725 to the component receiving area 4251 and the light source modules 7257. When the second transfer unit 725 is at the component receiving area 4251, the light source module 7257 proximate to the pick-up area (P_2) is activated, so that the upper
25 inspection element 734 can inspect and determine whether the second electronic component 2 at the pick-up area (P_2) is defective or not and whether the

orientation is correct or not. If defective, it is delivered to the storage bin 727. When the second transfer unit 725 is moved to the storage bin 727, the light source module 7257 proximate to the pick-up area (P₂) is activated, so that the upper inspection element 734 can inspect and determine whether the second electronic component 2 at the pick-up area (P₂) is defective or not. When the second transfer unit 725 moves from the component receiving area 4251 to the pick-up area (P₂), the light source module 7257 proximate to the fixture 42 is activated, so that the upper inspection element 734 can inspect and determine whether the orientation of the second electronic component 2 at the component receiving area 4251 is correct or not.

The second feed station 70 further includes a positioning module 75 disposed on the machine table top (T) below the fixture 42 for supporting and positioning the fixture 42 when the second transfer unit 725 moves the second electronic component 2 to the fixture 42 located at the end of the cantilever 412.

Referring to Fig. 19, in combination with Figs. 2, 3 and 7, the positioning module 75 includes a positioning frame 751, a fine-tuning seat 752 located below the positioning frame 751 for fine tuning along the X- and Y-directions, a rail seat 753 extending along the Z-direction and disposed on a side of the

positioning module 75, a movable seat 754 movably disposed on the rail seat 753, a drive member 755 for driving the movable seat 754 to move up and down along the rail seat 753, a heating seat 756 disposed above the movable seat 754, a heating element 757 disposed in the heating seat 755 for providing heat source, and a suction seat 758 disposed above the heating seat 756 to be heated. The suction seat 758 has a negative pressure suction nozzle provided on a top surface thereof, and is similar to the negative pressure suction nozzle 8281 of the positioning module 82 shown in Fig. 21.

With the drive member 755 driving the movable seat 754 to move upward and with the suction nozzle of the suction seat 758 sucking a bottom surface of the platform 4221 of the fixture 42, the suction seat 758 and the platform 4221 provided with the component receiving area 4251 are driven to move along with the movable seat 754 and to ascend relative to the machine table top (T) and the end portion of the cantilever 412. The slide seat 4222 will also slide relative to the fixed seat 421 through the slide plate 4223 and compress the elastic member 4225 to store a restoring force until the platform 4221 reaches a predetermined position, in which the second electronic component 2 is placed on a surface of a predisposed first electronic component 1 in the fixture 42 by the second transfer unit 725.

The heating element 757 then provides heat source to the platform 4221 so as to appropriately melt the adhesive layer 22 on the bottom surface of the second electronic component 2, thereby adhering together the first and second electronic components 1, 2. After bonding, the suction nozzle of the suction seat 758 releases the negative pressure, the heating element 757 stops heating, and the drive member 755 drives the movable seat 754 to descend. The platform 4221 still has the bottom surface thereof abutting against the top surface of the suction seat 758 because of the restoring force released by the elastic member 4225, and is moved downward along with the suction seat 758 until the upper wall portion (4224b) of the groove-defining wall of the groove 4224 of the slide seat 4222 abuts against a top edge of the protrusion 4212. After the platform 4221 is stopped, the suction seat 758 continues to descend until a clearance is formed between the suction seat 758 and the platform 4221 and is positioned thereat.

Referring to Figs. 20 and 21, since the positioning module 82 of the press work station 80 is identical to the positioning module 75 (see Fig. 19) of the second feed station 70, a detailed description thereof is dispensed herewith for the sake of brevity. The press mechanism 81 includes a mounting frame 811, a fine-tuning seat 812 disposed below the mounting frame 811 for fine-tuning along the X- and Y-directions, a

5 rail seat 813 extending along the Z-direction and mounted on the mounting frame 811, a movable seat 814 movably disposed on the rail seat 813, a drive member 815 for driving the movable seat 814 to move up and down along the rail seat 813, a slide rail 816 extending along the Z-direction and disposed on a front side of the movable seat 814, a punch seat 817 movably disposed on the slide rail 816, a drive member 818 for driving the punch seat 817 to move up and down along the slide rail 10 816, and a press die 819 disposed below the punch seat 817 and corresponding in position to the negative pressure suction nozzle 8281 of the suction seat 828. When the corresponding fixture 42 of the transport device 40 is intermittently rotated to the press work station 80, the component receiving area 4251 (see Fig. 15 6) is located between the press die 819 and the suction nozzle 8281.

Referring to Fig. 22, the press die 819 has a press head 8191 that is located at a bottom end thereof, that is curved, and that is made of a flexible material. When 20 the press head 8191 moves down and presses the adhered first and second electronic components 1, 2 in the component receiving area 4251, it will press first a central portion of the second electronic component 2 and then gradually toward the two sides thereof so as 25 to squeeze out possible air bubbles generated by the adhesive layer 22 between the first and second

electronic components 1, 2.

With reference to Figs. 1, 2 and 4, after the pressing of the assembly of the first and second electronic components 1, 2 by the press work station 80 is completed, the assembly of the first and second electronic components 1, 2 is moved to the second inspection station 90 through the fixture 42. After being inspected by the second inspection units 91, the assembly of the first and second electronic components 1, 2 is moved to the receiving station 100. The third transfer mechanism 103 of the receiving station 100 has a third transfer unit 104 movable among the fixture 42, the second storage mechanism 101 and the third storage mechanism 102. Since the mechanism, operating and corresponding relations of the second storage mechanism 101, the third storage mechanism 102 and the third transfer mechanism 103 are generally identical to the first storage mechanism 51 and the first transfer mechanism 52 of the first feed station 50, a detailed description thereof is dispensed herewith for sake of brevity.

In sum, in the embodiment of this disclosure, a plurality of the first electronic components 1 disposed on the carrier tray 10 in a matrix arrangement are picked up one by one by the first transfer mechanism 52 and placed in the corresponding fixture 42, and a plurality of the second electronic components 2 arranged on the

carrier tape 201 in a single row are picked up one by one by the second transfer mechanism 72 and placed in the corresponding fixture 42, and through the intermittent rotation of the transport device 40, each
5 fixture 42 can pass through the feed, inspection, press work and receiving stations in sequence to complete the adhering process of the first and second electronic components 1, 2, so that the process efficiency of this disclosure can be greatly improved and can be applied
10 to the different picking and placing methods of the two components. Further, with the second electronic components 2 being packaged in the carrier tape assembly 20, they do not occupy space on the machine table top (T).

15 While the disclosure has been described in connection with what is considered the exemplary embodiment, it is understood that this disclosure is not limited to the disclosed embodiment but is intended to cover various arrangements included within the
20 spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

CLAIMS:

1. A method for adhering two electronic components comprising:

5 placing a plurality of first electronic components on a carrier tray in a matrix arrangement;

 releasably packaging a plurality of second electronic components in a carrier tape assembly having a carrier tape and a cover tape peelably adhered to the carrier tape;

10 picking up and transferring one of the first electronic components to a fixture by a first transfer mechanism; and

 picking up and transferring one of the second electronic components to the fixture by a second transfer mechanism so as to adhere the one of the second electronic components to the one of the first electronic components and form an assembly;

15 wherein a first feed station and a second feed station are located in order on an intermittent rotation flow path of a transport device, the first transfer mechanism picking up the one of the first electronic components from the first feed station to the fixture, the second transfer mechanism picking up the one of the second electronic components from the second feed station to the fixture, and wherein a step of transferring the assembly of the one of the first electronic

20

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components and the one of the second electronic components from the fixture to a new carrier tray is performed by a third transfer mechanism.

5 2. The method as claimed in Claim 1, wherein the carrier tape assembly is wound around a reel, and each of the second electronic components includes a film layer, and an adhesive layer formed below the film layer and adhered to the carrier tape.

10

3. The method as claimed in Claim 1, wherein the second electronic components are arranged equally spaced apart from each other along a length direction of the carrier tape.

15

4. The method as claimed in Claim 1, wherein a step of inspection is conducted on the one of the first electronic components by a first inspection unit in a top-to-bottom direction after the one of the first electronic components is placed on the fixture.

20

5. The method as claimed in Claim 1, wherein, when the one of the second electronic components is transferred to the fixture, the fixture is simultaneously supported upwardly.

25

6. The method as claimed in Claim 5, wherein a step of

pressing the assembly of the one of the first
electronic components and the one of the second
electronic components is performed after the one of
the second electronic components is assembled to the
5 one of the first electronic components, and the
fixture is simultaneously supported upwardly.

7. The method as claimed in Claim 6, wherein a step of
inspection is conducted on the assembly by a second
10 inspection unit after the step of pressing.

8. The method as claimed in Claim 1, wherein the one
of the second electronic components is picked up from
a pick-up area and placed on a component receiving
15 area of the fixture, and wherein a step of inspection
is conducted by an upper inspection mechanism on the
pick-up area and the component receiving area.

9. The method as claimed in Claim 1, wherein a step of
20 inspection is conducted on the one of the second
electronic components by a lower inspection
mechanism in a bottom-to-top direction before the
one of the second electronic component is placed on
the fixture.

25

10. The method as claimed in Claim 1, wherein the fixture
is rotated intermittently to pass through one by one

a plurality of work stations for transporting the assembly of the one of the first electronic components and the one of the second electronic components.

5

11. An apparatus for adhering together a first electronic component and a second electronic component, a plurality of the first electronic components being placed on a carrier tray, a plurality of the second electronic components being releasably packaged in a carrier tape assembly, said apparatus comprising:

10

a transport device for providing an intermittent rotation flow path and including a fixture;

15

a first feed station and a second feed station located in order on an intermittent rotation flow path of said transport device;

said first feed station including

20

a storage mechanism for storage of the carrier tray; and

25

a first transfer mechanism provided with a first transfer unit which is movable between said fixture and the carrier tray for picking up and transferring one of the first electronic components from said first feed station to said fixture;

said second feed station including

5 a second transfer mechanism provided with a
second transfer unit which is movable between
said fixture and the carrier tape assembly for
picking up and transferring one of the second
electronic components from said second feed
station to said fixture so as to adhere the one
of the second electronic components to the one
of the first electronic components and form an
assembly; and

10 a third transfer mechanism for transferring the
assembly of the one of the first electronic
components and the one of the second electronic
components from said fixture to a new carrier tray;

15 wherein said fixture, said storage mechanism and
said first and second transfer mechanisms are all
mounted on a machine table.

12. The apparatus as claimed in Claim 11, wherein said
storage mechanism has a tray supporting region, a
20 tray collecting region spaced apart from said tray
supporting region, and a pick-up area between said
tray supporting region and said tray collecting
region, said first transfer unit being located
between said fixture and said pick-up area.

25

13. The apparatus as claimed in Claim 11, wherein the
carrier tape assembly includes a carrier tape and

a cover tape peelably adhered to the carrier tape, said apparatus further comprising a winding unit, said winding unit including a reel mounting shaft for mounting thereon a reel wound with the carrier tape assembly, a first winding shaft for mounting thereon an empty reel used for winding the cover tape peeled off from the carrier tape, and a second winding shaft for mounting thereon an empty reel used for winding the carrier tape that is peeled off with the cover tape and that is released with the second electronic components.

14. The apparatus as claimed in Claim 11, wherein said fixture includes a platform provided with a component receiving area, said apparatus further comprising a positioning module disposed below said fixture, said positioning module including a positioning frame, and a movable seat disposed on said positioning frame and driven to move upwardly and downwardly, said platform being driven by said movable seat to move upwardly and downwardly therealong.

15. The apparatus as claimed in Claim 11, further comprising a punch seat disposed above said fixture and being driven to move upwardly and downwardly.

16. The apparatus as claimed in Claim 11, wherein said
third transfer mechanism is provided with a third
transfer unit, said apparatus further comprising a
second storage mechanism for storing an assembly of
5 the first and second electronic components which is
determined to be good, and a third storage mechanism
for storing an assembly of the first and second
electronic components which is determined to be
defective, said third transfer unit being movable
10 among said fixture and said second and third storage
mechanisms.

17. The apparatus as claimed in Claim 11, further
comprising two light source modules that are movable
15 along with said second transfer unit.

18. The apparatus as claimed in Claim 11, wherein said
fixture includes a platform provided with a
component receiving area, said apparatus further
20 comprising a pick-up area for picking up the one of
the second electronic components, and a storage bin
for storing a defective second electronic component,
said second transfer unit being movable among said
component receiving area, said pick-up area, and
25 said storage bin.