

【DESCRIPTION】**【Invention Title】**

ADAPTOR FOR ELECTRONIC COMPONENT TESTING HANDLER

【Technical Field】

5 The present invention relates to an adaptor for an electronic component testing handler.

【Background Art】

Electronic components (e.g., semiconductor devices, wafers, solid-state drives (SSDs), etc.) produced are tested
10 by means of a tester and sorted into good products and defective products, so that only the good products are shipped.

The electronic components are tested in a state of being electrically connected to the tester, and in this case,
15 equipment for connecting the electronic components to the tester so that the electronic components can be tested is called an electronic component testing handler (hereinafter, referred simply to as 'handler').

The handler is designed and manufactured according to
20 the development of new electronic components, and furthermore, various studies for the stabilization of the handler are made.

Recently, an SSD as a large-sized electronic component on which various electronic devices are mounted has been widely prevailed.

25 When a small number of SSDs are produced because of low demand for the SSDs, the SSDs are electrically connected to the tester and released from the connected state by means of manual works, but as the demand for the SSDs drastically increases, it is hard to perform the testing manually.

30 However, the thicknesses, structures, and weights of the SSDs are different from those of the conventional electronic components, so that it is impossible to apply the

conventional handler to the SSDs to be tested. Accordingly, handlers adequate for testing large-sized electronic components such as SSDs are developed and disclosed in Korean Patent Application Laid-open Nos. 10-2019-0050483 and 10-2019-0061291.

The SSDs may have various sizes according to the types of electronic devices mounted thereon or the dedicated purposes thereof, and accordingly, handlers for testing the electronic components with such various sizes are required. However, the handlers are high-priced and big in size, and accordingly, there is a need to develop a technology in which the electronic components with various sizes can be tested through a single handler in consideration of a production cost and an installation place of the handler.

So as to test the electronic components with different sizes, further, the parts corresponding to the size of the corresponding electronic component have to be replaced, and even if there is no need to perform the replacement of the parts, downtime is required to supply a new electronic component. Accordingly, the workability of the handler and the tester becomes deteriorated, and labor losses increase, so that there is a need for a handler having no separate downtime even upon one-cycle operation or continuous operations.

In the case of semiconductor devices as products with mass production in small variety, a test tray on which hundreds of semiconductor devices are loaded is provided, and the semiconductor devices are grasped by a plurality of pickers and thus inserted into inserts of the test tray. In such a system, precise positions of the semiconductor devices are taken by the inserts, and the semiconductor devices are held in position in a process of being connected to the

tester, so that even if the precision in position becomes deteriorated, it does not matter.

However, the electronic component such as the SSD with various electronic devices inclusive of semiconductor devices mounted thereon is small-quantity produced in large variety corresponding to the diversity of application apparatuses, and further, the electronic component has to be subjected to various types of tests. In this case, all of the testers do not have the test sockets existing in the same positions as one another, and accordingly, a high-priced test tray and a handler corresponding to the test tray have to be manufactured and prepared according to the types of electronic components or the types of the testers. It is found through past studies that the connection of the electronic component to the test socket in a state where the electronic component is directly grasped by grippers, without any consideration for the above-mentioned requirements, causes serious problems.

For example, various types of the electronic components have various lengths and widths, and even in the case of the same types of electronic components, it is hard to make the electronic components having the same size as one another because of machining errors generated according to manufacturing characteristics. If the electronic component is grasped by the grippers, without any consideration for the above-mentioned situation, it may be lost due to the grasping failure by the grippers or damaged due to too strong pressurizing force of the grippers. Of course, even if the grippers are controlled to grasp the electronic component well, the electronic component may be twisted or turned when grasped according to portions grasped thereof or the grasping strength of the grippers, so that it is checked that it is

hard to allow the electronic component grasped by the grippers to come into precise contact with the test socket. To solve such problems, precise control of a driver is needed, and a driving shaft has to be substantially long so as to correspond to all types of electronic components. Further, there is a need to use a high-priced motor that is capable of controlling torques by situation to prevent the electronic component from being damaged, twisted, or undemandedly turned. However, this causes the equipment to become bulky and requires high production cost, thereby having no effectiveness. So as to achieve precise contacts of the electronic components, further, auto-teaching has to be performed to set accurate grasping positions of the electronic components by the grippers, which undesirably needs enormous costs and high technologies.

Generally, SSDs have the same widths as one another in the machining error range, irrespective of their types, but they have different lengths by type according to the number of electronic devices mounted thereon or the sizes of the electronic devices.

A compatible handler equipped with an adaptor is disclosed in Korean Patent Application No. 10-2020-0073725 (hereinafter, referred to as 'prior application') as filed by the same applicant as the invention. The adaptor serves as a carrier for supplying an electronic component to a tester to allow the handler to treat various types of electronic components with different sizes, thereby improving the compatibility of the handler.

The most important requirements for an adaptor are the following.

Firstly, the adaptor has to appropriately grasp both ends of all types of SSDs with widths in error ranges caused by manufacturing tolerances.

Secondly, the adaptor has to grasp all types of SSDs being in general length ranges the electronic components can have (in the range from the SSD with the shortest length to the SSD with the longest length).

Thirdly, the adaptor has to have a given structure in which the SSD is accurately seated. In this case, the given structure represents the parts around the adaptor, but it represents the parts built in the adaptor. If the SSD is defectively seated on the adaptor, the defective seating causes the failure in appropriate electrical connection between the SSD and the tester in the future.

Lastly, the adaptor has to grasp the SSD so that the terminal portion of the SSD seated thereonto is kept flatten. However, wafers may be often bent in their manufacturing process, and accordingly, even the SSD on which electronic devices are mounted may be bent and thus produced. Therefore, there is a need to seat even the defective SSD with bending onto the adaptor to allow the terminal portion of the SSD to be kept flatten.

【Disclosure】

【Technical Problem】

Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the related art, and it is an object of the present invention to provide an adaptor for an electronic component testing handler that is capable of appropriately grasping various electronic components, irrespective of manufacturing tolerances or lengths in error ranges of the electronic components.

It is another object of the present invention to provide an adaptor for an electronic component testing handler that is capable of accurately seating an electronic component with bending thereonto so that the terminal portion of the electronic component can be kept flatten thereonto.

【Technical Solution】

To accomplish the above-mentioned objects, according to the present invention, an adaptor for an electronic component testing handler may include: a pair of grasping levers located to face each other and linearly moving in a direction along which a distance therebetween becomes short or long to thus grasp both ends of the rear end portion of an electronic component or release the grasping state; an installation frame for installing the pair of grasping levers thereon to allow the pair of grasping levers to linearly move; a distance control mechanism disposed on the installation frame to apply a control force to the pair of grasping levers so that the pair of grasping levers moves to the direction along which the distance therebetween becomes long; and operating members for applying pressurizing forces to the pair of grasping levers in the direction along which the distance between the pair of grasping levers becomes short so that if the control force applied to the pair of grasping levers from the distance control mechanism is removed, the pair of grasping levers moves to the direction along which the distance therebetween becomes short, wherein the grasping levers each have a guide groove formed long in forward and backward directions on the surface facing each other to grasp both ends of the electronic component and guide forward and backward movements of the electronic component and a through groove adapted to pass a base protrusion of a base member of a mounting stand therethrough.

The distance control mechanism may be disposed linearly movable in forward and backward directions thereof on the installation frame, while including a control part having both ends coming into contact with the grasping levers so
5 that if the distance control mechanism moves linearly backward by means of an external force, the control part applies the control force to the grasping levers in the direction along which the distance between the grasping levers becomes long, and if the distance control mechanism
10 moves linearly forward by means of the removal of the external force, the control part releases the control force applied to the grasping levers, and the grasping levers each have rolling rollers mounted on surfaces facing each other to reduce the friction with the control part, the rolling
15 rollers protruding in directions facing each other, the control part having tilt portions formed narrow in width in left and right directions toward the rear end portion thereof on both left and right sides thereof in forward and backward directions so that as the tilt portions move backward in a
20 state of coming into contact with the rolling rollers of the grasping levers, the control part applies the control force to the grasping levers.

The adaptor may further include a pressurizing member adapted to elastically pressurize the distance control
25 mechanism backward, pressurizing member whose one side being supported against the installation frame and the other side coming into contact with the distance control mechanism.

The installation frame may include guide bars long in left and right directions thereof to guide the movements of
30 the grasping levers, and the grasping levers each have through holes adapted to insertedly pass the guide bars therethrough, at least one of the guide bars having the

shapes of straight lines on the section cut away in forward and backward directions thereof.

The installation frame may have a plurality of position setting protrusions protruding from both left and right sides thereof and thus inserted into position setting grooves of a test hand for moving the adaptor.

The installation frame may have an accommodation groove formed on the rear end portion thereof to accommodate the rear end portion of the electrical component therein, and the width of the accommodation groove in left and right directions may be larger than the width of the rear end portion of the electronic component in left and right directions, so that rear end portion of the electronic component floats in the air.

Each guide groove may include a horizontal maintaining section in which the electronic component grasped is maintained horizontally on level and a width increasing section increasing in width toward the forward direction from the front end of the horizontal maintaining section.

Each guide groove may include an open section located in front of the width increasing section and having at least the same width as the front end of the width increasing section or a width more increased than the width increasing section, and the open section may be divided into a rear horizontal section and a front downward section, so that in the front downward section, the width of the guide groove extends downward.

The installation frame may have a plurality of position fixing grooves formed on both left and right sides thereof to insert position fixing pins of the mounting stand for mounting the adaptor thereinto.

The installation frame may include: a pair of installation levers disposed on the rear portion of the installation frame to install the pair of grasping levers thereon; and a connection member adapted to connect the rear
5 ends of the installation levers to prevent a distance between the pair of installation levers from being open while being used, the connection member having an exposure window adapted to expose a contact terminal of the electronic component to the outside.

10 【Advantageous Effects】

According to the present invention, the adaptor for the electronic component testing handler has the following advantages.

Firstly, even if there is a manufacturing tolerance in
15 the manufacturing process of the electronic component, the adaptor can seat the electronic component thereonto, while appropriately grasping the electronic component thereby.

Secondly, the electronic components with various lengths can be appropriately seated onto the adaptor of the present
20 invention, thereby improving the compatibility of the electronic component testing handler.

Lastly, the grasping levers can tightly grasp the electronic component by means of the elastic members, and the electronic component can be supported by means of the guide
25 grooves and the stepped structures of the support projections even in the process of changing the posture thereof, so that the seated state of the electronic component can be appropriately kept, while the terminal portion of the electronic component is kept flatten, and accordingly, the
30 electronic component can be electrically connected to the tester accurately, thereby improving the reliability of the handler.

【Description of Drawings】

FIG. 1 is a perspective view showing an electrical connection structure between an electronic component and a tester.

5 FIG. 2 is a schematic plan view showing an electronic component testing handler to which an adaptor according to the present invention is applied.

FIG. 3 is a perspective view showing the handler of FIG. 2.

10 FIG. 4 is a perspective view showing the adaptor according to a first embodiment of the present invention.

FIG. 5 is an exploded perspective view showing the adaptor of FIG. 4.

15 FIG. 6 is a perspective view showing a grasping lever of the adaptor of FIG. 4.

FIG. 7 is a sectional view showing a guide groove formed in the grasping lever of FIG. 6.

FIG. 8 is a sectional view showing an operation of the guide groove of FIG. 7.

20 FIG. 9 is a perspective view showing a relation between the adaptor of FIG. 4 and a test hand.

FIG. 10 is a perspective view showing position setting protrusions of the adaptor of FIG. 4.

25 FIG. 11 is a perspective view showing an adaptor according to a second embodiment of the present invention.

FIG. 12 is an exploded perspective view showing the adaptor of FIG. 11.

FIG. 13 is a perspective view showing a grasping lever of the adaptor of FIG. 10.

30 FIG. 14 is a sectional view showing a guide groove formed in the grasping lever of FIG. 13.

FIG. 15 is a front view showing a guide bar of the adaptor of FIG. 14.

FIG. 16 is a perspective view showing a variation of the guide bar of FIG. 15.

5 **【Mode for Invention】**

The present invention is disclosed with reference to the attached drawings wherein for the brevity of the description, explanations on the repeated or same parts will be avoided or briefly given.

10 **<Explanation of electrical connection between an electronic component and a tester>**

A handler to which an adaptor according to the present invention is applied is more appropriately used in the case where a contact terminal portion of an electronic component
15 such as an SSD is inserted into a test slot of a tester.

For example, as shown in FIG. 1, a tester has a plurality of test slots S, and a contact terminal portion T of an electronic component ED is inserted into the corresponding test slot S, so that the electronic component
20 ED and the tester are electrically connected to each other.

<Brief explanation of a configuration of a handler>

FIG. 2 is a schematic plan view showing an adaptor for use in an electronic component testing handler HR (hereinafter, referred to simply as "adaptor") according to
25 the present invention, and FIG. 3 is a perspective view showing the handler HR of FIG. 2.

According to the present invention, the handler HR includes a connection part CP, a stacker part SP, and a transfer apparatus TA.

30 The connection part CP serves to withdraw electronic components ED to be tested from customer trays and thus supply them to the testers or to collect the electronic

components ED tested from the testers and thus load them onto the customer trays. The adaptor according to the present invention is used in the connection part CP.

5 The stacker part SP serves to store the customer trays brought into the handler HR to supply the customer trays on which the electronic components ED to be tested are loaded to the connection part CP or collect the customer trays on which the electronic components ED tested are loaded from the connection part CP and thus store them therein before they
10 are taken out of the handler HR. Further, the stacker part SP serves to supply the stored customer trays on which the electronic components ED to be tested are loaded to the transfer apparatus TA or collect the customer trays on which the electronic components ED tested are loaded from the
15 transfer apparatus TA.

The transfer apparatus TA serves to transfer the customer trays between the connection part CP and the stacker part SP. In specific, the customer trays on which the electronic components ED to be tested are loaded are
20 transferred from the stacker part SP to the connection part CP through the transfer apparatus TA, and the customer trays on which the tested electronic components ED are loaded are transferred from the connection part CP to the stacker part SP through the transfer apparatus TA.

25 **<Explanation of schematic flow of an electronic component relating to the adaptor>**

An explanation of the handler HR has been given in detail with reference to the prior application, and accordingly, the handler HR relating to the adaptor according
30 to the present invention will be described briefly below.

In a state where the adaptor is seated onto a mounting stand, a moving hand (not shown) withdraws the electronic

component ED from the customer tray CT and seats it onto the adaptor. In this case, an adaptor opener (not shown) opens the adaptor to allow the moving hand to seat the electronic component ED onto the adaptor.

5 The adaptor onto which the electronic component ED is seated moves from a setting position to a grasping position, together with the mounting stand, and then rotates to stand up. A test hand (not shown) grasps the adaptor standing up, moves it, and thus electrically connects the electronic
10 component ED to the tester. After that, if testing for the electronic component ED is completed, the tested electronic component ED is loaded onto the customer tray CT through the opposite operations to the operations mentioned above.

**<Explanation of an adaptor according to a first
15 embodiment of the present invention>**

FIG. 4 is a perspective view showing an adaptor 100 according to a first embodiment of the present invention, and FIG. 5 is an exploded perspective view showing the adaptor 100 of FIG. 4.

20 The adaptor 100 according to the first embodiment of the present invention includes a pair of grasping levers 111 and 112, an installation frame 120, a distance control mechanism 130, elastic members 141 to 144, and pressurizing members 161 and 162.

25 The pair of grasping levers 111 and 112 is located to face each other and guided by means of guide bars 125 and 126 of the installation frame 120 so that the grasping levers 111 and 112 linearly move in left and right directions along which a distance therebetween becomes short or long. If the
30 distance between the pair of grasping levers 111 and 112 becomes short, the pair of grasping levers 111 and 112 grasps both ends of the rear end portion of the electronic component

ED. Contrarily, if the distance between the pair of grasping levers 111 and 112 becomes long, the pair of grasping levers 111 and 112 is in an open state where the grasping state for the electronic component ED is released. Accordingly, if it is desired to allow the electronic component ED to be seated or withdrawn onto or from the adaptor 100 by means of the moving hand, the pair of grasping levers 111 and 112 has to be in the open state where the grasping state for the electronic component ED is released.

As obviously shown in FIG. 6, the grasping levers 111 and 112 each have two rolling rollers R arranged in forward and backward direction thereof. The rolling rollers R are disposed more protrudingly from the grasping surfaces of the grasping levers 111 and 112 in directions facing each other.

Further, as shown in FIG. 6, the grasping levers 111 and 112 each have a guide groove GG formed long in forward and backward directions on the surfaces facing each other above the rolling rollers R. The guide grooves GG serve to guide the movement of the electronic component ED in a process of moving the electronic component ED in forward and backward directions (for example, a process of moving the electronic component ED so as to electrically connect the electronic component ED to be tested to the tester or a process of withdrawing the tested electronic component from the tester so as to move it to the adaptor). Furthermore, in the case where the grasping levers 111 and 112 grasp both ends of the rear end portion of the electronic component ED, both ends of the electronic component ED are inserted into the guide grooves GG and thus locked thereonto in upward and downward directions, thereby enabling the guide grooves GG to grasp the electronic component ED.

As shown in FIG. 7, each guide groove GG has a horizontal maintaining section HM, a width increasing section WG, a through hole section TS, and an open section OS sequentially in a direction from the rear side to the front side thereof.

The horizontal maintaining section HM is narrow in width so that it has almost the same thickness as the electronic component ED, and accordingly, it allows a portion where a contact terminal T is located on the rear end portion of the electronic component ED to be kept flatten, while appropriately grasping both ends of the electronic component ED.

The width increasing section WG increases in width toward the forward direction from the front end of the horizontal maintaining section HM. Even if an area of the electronic component ED excepting a portion suckedly grasped by the moving hand is sagged by means of gravity or bending occurring on the wafer itself in a process of seating the electronic component ED onto the adaptor, accordingly, both ends of the electronic component ED are appropriately grasped by the pair of grasping levers 111 and 112.

The through hole section TS is constant in width toward forward and backward directions from the front end of the width increasing section WG, and it corresponds to a width of a through groove TG in forward and backward directions that passes a rear side base protrusion sp of a base member SE of a mounting stand. In this case, the base member SE is ascendable and descendable. If the base member SE is ascended, tops of the base protrusions sp pass through the through grooves TG to support the electronic component ED being in a seated process, and if the base member SE is descended, the state of supporting the electronic component ED is released.

Of course, the base protrusions sp desirably each have a base projection J formed symmetrically in forward and backward directions and in left and right directions to support the electronic component ED. In the case where the base member SE
5 is mounted on the mounting stand, a situation in which the electronic component ED is defectively seated can be prevented from happening through the base protrusions sp fixed in position even if the adaptor 100 is slightly twistedly located.

10 The open section OS has at least the same width as the front end of the width increasing section WG or a width more increased than the width increasing section WG.

The guide groove GG is open in forward and backward directions.

15 The guide groove GG as shown in FIG. 7 removes the problems occurring when the adaptor 100 grasps the electronic component ED even in the case where the electronic component ED is bent downward, as shown in FIG. 8, while allowing a flatness of the contact terminal T portion of the rear end
20 portion of the electronic component ED to be kept, so that the contact terminal T is inserted accurately into the test slot S.

The installation frame 120 is provided to supportingly install the pair of grasping levers 111 and 112, the distance
25 control mechanism 130, the elastic members 141 to 144, and the pressurizing members 161 and 162.

The installation frame 120 has position setting protrusions 121 protruding from both left and right sides of the front end portion thereof toward left and right
30 directions.

The position setting protrusions 121 are inserted into position setting grooves SG formed on the grasping surfaces

of a test hand 400 as shown in FIG. 9. In specific, when the test hand 400 grasps the installation frame 120, that is, the adaptor 100, the position setting protrusions 121 are inserted into the position setting grooves SG. Even though an external force is applied to the adaptor 100 in forward and backward directions in the state where the test hand 400 grasps the adaptor 100, the installation frame 120 is fixed in position, which causes the adaptor 100 to be fixed in position. In this case, one or more position setting protrusions 121 are provided. Of course, the position setting grooves may be formed on the installation frame 120, whereas the position setting protrusions 121 may be formed on the test hand 400.

If the position setting protrusions 121 protrude from both left and right sides of the front end portion of the installation frame 120 in a state of being spaced apart from each other in forward and backward directions, the front end portion of the adaptor 100 grasped by the test hand 400 rotates and thus moves down by means of gravity, thereby preventing defective grasping for the electronic component ED from occurring. As shown in FIG. 10, one of the two position setting protrusions 121 is cylindrical so that it has a relatively short protruding length, and the other is conical so that it has a relatively long protruding length. In a process where the test hand 400 grasps the adaptor 100, the conical position setting protrusions 121 serve to correct the position and posture of the adaptor 100, and the cylindrical position setting protrusions 121 serve to accurately maintain the set position of the adaptor 100, thereby preventing the defects in manufacturing tolerances of the position setting protrusions 121 from occurring.

Further, the installation frame 120 has the guide bars 125 and 126 long in left and right directions thereof to guide the linear movements of the grasping levers 111 and 112 in the left and right directions thereof. Of course, the
5 grasping levers 111 and 112 have through holes TH adapted to insertedly pass the guide bars 125 and 126 therethrough.

In addition, the installation frame 120 has an accommodation groove AG formed on the front end portion thereof to accommodate the front end portion of the
10 electronic component ED therein. In this case, the width of the accommodation groove AG in left and right directions is larger than that of the front end portion of the electronic component ED in left and right directions, so that both sides of the front end portion of the electronic component ED float
15 in the air, without being mechanically pressurized against or fitted to the adaptor 100. In the same manner as the guide grooves GG, the accommodation groove AG is open in forward and backward directions thereof. This means that a seating space of the adaptor 100 in which the electronic component ED
20 is seated is open in forward and backward directions thereof. In specific, the seating space in which the guide grooves GG and the accommodation groove AG are included is open in the forward and backward directions thereof. Accordingly, the electronic components ED having various lengths may be seated
25 onto the seating space over the guide grooves GG and the accommodation groove AG, without any limit in their length.

Further, the installation frame 120 has two position fixing grooves FG formed on both left and right sides of the rear end portion thereof to insert position fixing pins of
30 the mounting stand thereinto. Two or more position fixing grooves FG may be formed on both left and right sides of the rear end portion of the installation frame 120. Accordingly,

the position fixing grooves FG and the position fixing pins serve to correct and fix the position of the adaptor 100 grasped by the mounting stand. Accordingly, when the mounting stand moves or rotates, the adaptor 100 is prevented from escaping from the mounting stand by means of the position fixing grooves FG and the position fixing pins. Even though an external force in forward and backward directions is applied to the adaptor 100 coupled to the mounting stand, further, the position fixing grooves FG and the position fixing pins serve to allow the installation frame 120 to be maintained in position.

Further, the installation frame 120 includes a connection member 128 disposed on the rear end portion thereof as well as a pair of installation levers 123 and 124 coupled to the pair of grasping levers 111 and 112.

The connection member 128 serves to connect the rear ends of the installation levers 123 and 124 to prevent a distance between the installation levers 123 and 124 from being open due to the pressurizing forces continuously applied from the elastic members 141 to 144 while the installation levers 123 and 124 are being used. The connection member 128 has an exposure window W adapted to expose the contact terminal T of the electronic component ED to the outside.

The distance control mechanism 130 is disposed on the installation frame 120 and applies a control force to the pair of grasping levers 111 and 112 to move the pair of grasping levers 111 and 112 to a direction along which a distance between the pair of grasping levers 111 and 112 becomes long. To do this, the distance control mechanism 130 is disposed movable in forward and backward directions on the

installation frame 120 and includes a control part 131, a push plate 132, and transfer bars 133.

5 The control part 131 has two tilt portions TP formed narrow in width toward the rear end portion thereof on both left and right sides thereof in forward and backward directions. As the tilt portions TP move backward in a state of coming into contact with the rolling rollers R of the grasping levers 111 and 112, the control part 131 applies the control force to the grasping levers 111 and 112 in the
10 direction along which a distance between the grasping levers 111 and 112 becomes long. Contrarily, as the distance control mechanism 130 moves forward, the control force applied to the grasping levers 111 and 112 from the control part 131 is naturally released.

15 The push plate 132 receives an external force of the adaptor opener (not shown) in a forward direction applied to the distance control mechanism 130. In specific, the adaptor opener applies a force in a backward direction through the push plate 132 to supply a driving force moving the distance
20 control mechanism 130 backward, and through the driving force of the adaptor opener, the distance control mechanism 130 moves backward.

The transfer bars 133 whose front ends are fixedly coupled to the push plate 132 and rear ends are fixedly
25 coupled to the control part 131 serve to transfer the external force of the adaptor opener with which the push plate 132 pushes backward to the control part 131.

The elastic members 141 to 144 are disposed to allow one side to come into contact with the installation frame 120 and
30 the other side to come into contact with the grasping levers 111 and 112. Accordingly, the elastic members 141 to 144 apply elastic forces to the grasping levers 111 and 112 in

the direction along which a distance between the grasping levers 111 and 112 becomes short. If the control force applied to the grasping levers 111 and 112 through the distance control mechanism 130 is removed, as a result, the grasping levers 111 and 112 move in the direction along which a distance therebetween becomes short by means of the elastic forces of the elastic members 141 to 144, thereby grasping the electronic component ED. Accordingly, the elastic members 141 to 144 serve as operating members for generating pressurizing forces capable of grasping the electronic component ED and keeping the generated pressurizing forces, and furthermore, they serve to close the adaptor 100. Of course, motors, cylinders, or the like may be considered as the operating members, but so as to handle all widths of electronic components having machining errors in a given range, without any separate setting, it is most desirable that the elastic members such as springs have to be provided as the operating members.

The elastic members 141 to 144 determine the distance between the grasping levers 111 and 112 according to compressed degrees thereof. This means that the elastic members 141 to 144 serve as variable members for varying a grasping width (an isolation width between the grasping levers 111 and 112 for grasping the electronic component ED) between the grasping levers 111 and 112. In specific, the grasping levers 111 and 112 can grasp the electronic components ED with various widths in accordance with the compressed degrees of the elastic members 141 to 144.

The pressurizing members 161 and 162 apply elastic forces to the distance control mechanism 130 in the forward direction to gently return the distance control mechanism 130 in position in the forward direction when the external force

generated from the adaptor opener is removed. The pressurizing members 161 and 162 serve to pressurize the distance control mechanism 130 forward, thereby strengthening the grasping forces of the elastic members 141 to 144 applying the elastic forces to the grasping levers 111 and 112 in the direction along which a distance between the grasping levers 111 and 112 becomes short.

Continuously, the operation of the adaptor 100 will be explained below.

As an initial ED or an ED to be tested is placed, the adaptor 100 corresponding to the size of the electronic component ED to be tested is seated onto the mounting stand by a worker. After that, if it is desired that the electronic component ED withdrawn from the customer tray is seated onto the adaptor 100 by means of the moving hand, the adaptor opener pushes the distance control mechanism 130 backward. In this case, the installation frame 120 is fixed to the mounting stand by means of position fixing grooves FG, so that only the distance control mechanism 130 moves backward by means of the pressurizing force of the adaptor opener. In this process, the tilt portions TP of the control part 131 move backward in the state of coming into contact with the rolling rollers R of the grasping levers 111 and 112 and thus apply forces to the grasping levers 111 and 112 in left and right directions, so that a distance between the grasping levers 111 and 112 becomes long to allow the adaptor 100 to become open. Next, the base member SE of the mounting stand is ascended to allow the base protrusions sp to support the electronic component ED. As a result, the rear end portion of the electronic component ED is supported against the four base projections J of the base member SE.

If the adaptor 100 has been open, the moving hand, which suckedly grasps the top of the electronic component ED, is descended to a height at which the rear end portion of the electronic component ED is placed on the base projections J.

5 The descending process is a process of converting a bent state of the rear end portion of the electronic component ED into a flatten state. In specific, the descending of the electronic component ED through the moving hand allows both left and right ends of the rear end portion of the electronic component ED to become flatten and thus inserted
10 appropriately into the guide grooves GG of the grasping members 111 and 112. Accordingly, even though the electronic component ED is somewhat bent, it can be appropriately grasped by the grasping levers 111 and 112 through the guide grooves GG. In this case, the rear end portion of the electronic component ED is supported against the base
15 projections J on total four positions, that is, in every direction, it can be flatten by means of the pressurizing force applied downward by the moving hand, and to do this, the points suckedly grasped by the moving hand have to be placed among four support points (desirably, a point where two diagonal lines connecting two support points in a diagonal direction cross each other). Accordingly, it is desirable that at least four or more base protrusions sp
20 protrude from the base member SE.

Next, the external force applied to the distance control mechanism 130 is removed in the state where the rear end portion of the electronic component ED is supported against the base projections J. As a result, the distance between the grasping levers 111 and 112 becomes short by means of the
30 elastic forces of the elastic members 141 to 144, and the distance control mechanism 130 is pushed forward. In this

process, both left and right ends of the electronic component ED are inserted into the guide grooves GG of the grasping levers 111 and 112, thereby completing the grasping of the electronic component ED by the adaptor 100. In this case, the rear end portion (more particularly, a portion where the contact terminal is located) of the electronic component ED is kept flatten by means of the shapes of the guide grooves GG. Further, even if there is a large tolerance in the width of the electronic component ED, the width of the accommodation groove AG is sufficiently large, so that the rear end portion of the electronic component ED is prevented from being fitted to the walls constituting the accommodation groove AG.

If the electronic component ED is grasped by the grasping levers 111 and 112, the moving hand releases the grasping state for the electronic component ED and moves to another position.

Further, the adaptor 100 seated onto the mounting stand stands vertically. In this case, the lower end portion of the electronic component ED standing vertically is supported against the guide grooves GG and the wall surfaces constituting the support projections J, while being fitted to the guide grooves GG by means of the pressurizing forces of the grasping levers 111 and 112 and the bending restoring forces generated, in some cases, from the grasping levers 111 and 112, so that the seated state of the electronic component ED is appropriately kept. The adaptor 100 standing vertically is grasped by the test hand 400, and in this process, the position setting protrusions 121 are inserted into the position setting grooves SG. Accordingly, the adaptor 100 is grasped by the test hand 400 so that it can be placed on an accurate setting position. Further, the installation frame

120 is fixedly maintained in position even under the external force applied to the adaptor 100 in the future, which eventually allows the adaptor 100 to be fixedly maintained in position.

5 After that, if the test hand 400 moves the adaptor 100 toward the tester to allow a position between the adaptor 100 and the test slot S to be accurately set, an opening element of the test hand 400 slightly pushes the distance control mechanism 130 to allow the distance between the grasping
10 levers 111 and 112 to become slightly long, and in this state, a connection element of the test hand 400 pushes the electronic component ED toward a test socket to allow the rear end portion of the electronic component ED where the contact terminal T exists to be inserted into the test slot S.

15 Further, if the testing is done, the adaptor 100 operates to a state of fixing the electronic component ED thereto, and next, the electronic component ED is withdrawn from the test slot S by means of the test hand 400. The electronic component ED withdrawn moves through the opposite
20 processes to the above-mentioned processes and is finally loaded onto the customer tray CT.

<Explanation of an adaptor according to a second embodiment of the present invention>

FIG. 11 is a perspective view showing an adaptor 200
25 according to a second embodiment of the present invention, and FIG. 12 is an exploded perspective view showing the adaptor 200 of FIG. 11.

The adaptor 200 according to the second embodiment of the present invention includes a pair of grasping levers 211
30 and 212, an installation frame 220, a distance control mechanism 230, elastic members 241 to 244, and pressurizing members 261 and 262.

The pair of grasping levers 211 and 212 is located to face each other and guided by means of guide bars 225 and 226 of the installation frame 220 so that the grasping levers 211 and 212 linearly move in left and right directions along which a distance therebetween becomes short or long to thus grasp the electronic component ED or be in an open state where the grasping state is released.

As shown in FIG. 13, the grasping levers 211 and 212 each have two operating grooves OG formed on the surfaces facing each other.

The operating grooves OG are formed on portions of the grasping levers 211 and 212 coming into contact with the distance control mechanism 230. The two operating grooves OG formed on each grasping lever are formed side by side in forward and backward directions. Each operating groove OG has a slant surface so that it becomes low in depth toward the rear side thereof.

Further, in the same manner as the first embodiment of the present invention, the grasping levers 211 and 212 each have a guide groove GG formed long in forward and backward directions on the surfaces facing each other above the operating grooves OG. As shown in FIG. 14, each guide groove GG has a horizontal maintaining section HM, a width increasing section WG, a through hole section TS, and an open section OS sequentially in a direction from the rear side to the front side thereof. However, the open section OS in the second embodiment of the present invention is divided into a rear horizontal section OS1 and a front downward section OS2, and in the front downward section OS2, the width of the guide groove GG extends downward so that even the electronic component ED having large bending can be appropriately accommodated.

The installation frame 220 is provided to supportingly install the pair of grasping levers 211 and 212, the distance control mechanism 230, the elastic members 241 to 244, and the pressurizing members 261 and 262. According to the second
5 embodiment of the present invention, of course, the installation frame 220 includes position setting protrusions 221, installation levers 223 and 224, guide bars 225 and 226, an accommodation groove AG, position fixing grooves FG, and a connection member 228 with an exposure window W.

10 According to the second embodiment of the present invention, however, at least one (the guide bar 226) of the guide bars 225 and 226 has both left and right end areas whose tops have the shapes of straight lines when viewed in left and right directions on the section cut away in forward
15 and backward directions thereof. Further, the areas with the shapes of the straight lines of the guide bar 226 are coupled to the installation levers 223 and 224, and through the shapes of the straight lines, the guide bar 226 is prevented from rotating.

20 Further, the guide bar 226 is flattenly incised on top and underside thereof in the middle area thereof to thus have top and underside with the shapes of straight lines when viewed on the section cut away in forward and backward directions thereof. As a result, the guide bar 226 becomes
25 enlarged in sectional area, while top of the guide bar 226 does not interfere with the electronic component ED and underside thereof with the distance control mechanism 230. Accordingly, the guide bar 226 is improved in stiffness so that it can be prevented from being bent or deformed in shape
30 while being used.

Of course, as shown in FIG. 16, the guide bar 226 may have a rectangular sectional shape over the entire area

thereof so that it can be prevented from rotating, while being kept appropriately in stiffness.

The distance control mechanism 230 is disposed on the installation frame 220 and applies a control force to the pair of grasping levers 211 and 212 to move the pair of grasping levers 211 and 212 to a direction along which a distance between the pair of grasping levers 211 and 212 becomes long. According to the second embodiment of the present invention, to do this, the distance control mechanism 230 includes a control part 231, a push plate 232, and transfer bars 233.

According to the second embodiment of the present invention, the control part 231 has two rolling rollers R located on both left and right sides thereof, which correspond to the operating grooves OG, and each rolling roller R forms protruding portions protruding outward from both left and right sides thereof. Accordingly, while portions of the rolling rollers R are inserted into the operating grooves OG, the rolling rollers R come into contact with the surfaces forming the operating grooves OG. In specific, both ends of the control part 231 of the distance control mechanism 230 come into contact with the grasping levers 211 and 212 through the rolling rollers R. As the distance control mechanism 230 moves backward, the rolling rollers R come into contact with the slant surfaces of the operating grooves OG that become low in depth, and accordingly, the distance control mechanism 230 naturally applies the control force to the grasping levers 211 and 212 in the direction along which the distance between the grasping levers 211 and 212 becomes long. Contrarily, as the distance control mechanism 230 moves forward, the rolling rollers R come into contact with the slant surfaces of the

operating grooves OG that become high in depth, and accordingly, the distance control mechanism 230 naturally releases the control force applied to the grasping levers 211 and 212.

5 The elastic members 241 to 244 and the pressurizing members 261 and 262 are the same as in the first embodiment of the present invention.

10 The operation of the adaptor 200 according to the second embodiment of the present invention is the same as of the adaptor 100 according to the first embodiment of the present invention, and therefore an explanation of the operation of the adaptor 200 will be avoided.

15 As mentioned above, the foregoing description of the embodiments of the invention has been presented for the purpose of illustration; it is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Persons skilled in the relevant art can appreciate that many modifications and variations are possible in light of the above teachings. It is therefore intended that the scope of
20 the invention be limited not by this detailed description, but rather by the claims appended hereto.

【CLAIMS】**【Claim 1】**

An adaptor for an electronic component testing handler,
comprising:

5 a pair of grasping levers located to face each other and
linearly moving in a direction along which a distance
therebetween becomes short or long to thus grasp both ends of
the rear end portion of an electronic component or release
the grasping state;

10 an installation frame for installing the pair of
grasping levers thereon to allow the pair of grasping levers
to linearly move;

 a distance control mechanism disposed on the
installation frame to apply a control force to the pair of
15 grasping levers so that the pair of grasping levers moves to
the direction along which the distance therebetween becomes
long; and

 operating members for applying pressurizing forces to
the pair of grasping levers in the direction along which the
20 distance between the pair of grasping levers becomes short so
that if the control force applied to the pair of grasping
levers from the distance control mechanism is removed, the
pair of grasping levers moves to the direction along which
the distance therebetween becomes short,

25 wherein the grasping levers each have a guide groove
formed long in forward and backward directions on the surface
facing each other to grasp both ends of the electronic
component and guide forward and backward movements of the
electronic component and a through groove adapted to pass a
30 base protrusion of a base member of a mounting stand
therethrough.

【Claim 2】

The adaptor according to claim 1, wherein the distance control mechanism is disposed linearly movable in forward and backward directions thereof on the installation frame and comprises a control part having both ends coming into contact
5 with the grasping levers so that if the distance control mechanism moves linearly backward by means of an external force, the control part applies the control force to the grasping levers in the direction along which the distance between the grasping levers becomes long, and if the distance
10 control mechanism moves linearly forward by means of the removal of the external force, the control part releases the control force applied to the grasping levers, and the grasping levers each have rolling rollers mounted on surfaces facing each other to reduce the friction with the control
15 part, the rolling rollers protruding in directions facing each other, the control part having tilt portions formed narrow in width in left and right direction toward the rear end portion thereof so that as the tilt portions move backward in a state of coming into contact with the rolling
20 rollers of the grasping levers, the control part applies the control force to the grasping levers.

【Claim 3】

The adaptor according to claim 1, further comprising a pressurizing member adapted to elastically pressurize the
25 distance control mechanism backward, pressurizing member whose one side being supported against the installation frame and the other side coming into contact with the distance control mechanism.

【Claim 4】

30 The adaptor according to claim 1, wherein the installation frame comprises guide bars long in left and right directions thereof to guide the movements of the

grasping levers, and the grasping levers each have through holes adapted to insertedly pass the guide bars therethrough, at least one of the guide bars having the shapes of straight lines on the section cut away in forward and backward
5 directions thereof.

【Claim 5】

The adaptor according to claim 1, wherein the installation frame has a plurality of position setting protrusions protruding from both left and right sides thereof
10 and thus inserted into position setting grooves of a test hand for moving the adaptor.

【Claim 6】

The adaptor according to claim 1, wherein the installation frame has an accommodation groove formed on the
15 rear end portion thereof to accommodate the rear end portion of the electrical component therein, and the width of the accommodation groove in left and right directions is larger than the width of the rear end portion of the electronic component in left and right directions, so that rear end
20 portion of the electronic component floats in the air.

【Claim 7】

The adaptor according to claim 1, wherein each guide groove comprises a horizontal maintaining section in which the electronic component grasped is maintained horizontally
25 on level and a width increasing section increasing in width toward the forward direction from the front end of the horizontal maintaining section.

【Claim 8】

The adaptor according to claim 7, wherein each guide
30 groove comprises an open section located in front of the width increasing section and having at least the same width as the front end of the width increasing section or a width

more increased than the width increasing section, and the open section is divided into a rear horizontal section and a front downward section, so that in the front downward section, the width of the guide groove extends downward.

5 **【Claim 9】**

 The adaptor according to claim 1, wherein the installation frame has a plurality of position fixing grooves formed on both left and right sides thereof to insert position fixing pins of the mounting stand for mounting the
10 adaptor thereinto.

【Claim 10】

 The adaptor according to claim 1, wherein the installation frame comprises:

 a pair of installation levers disposed on the rear
15 portion of the installation frame to install the pair of grasping levers thereon; and

 a connection member adapted to connect the rear ends of the installation levers to prevent a distance between the pair of installation levers from being open while being used,
20 the connection member having an exposure window adapted to expose a contact terminal of the electronic component to the outside.