TITLE OF INVENTION: INSPECTION APPARATUS FOR ELECTRONIC COMPONENT PROCESSING EQUIPMENT

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Korean Patent Application Nos. 10-2022-0087794 filed on July 15, 2022 and 10-2022-0091255 filed on July 22, 2022, which are hereby incorporated by reference herein in their entirety.

BACKGROUND

1. Technical Field

The present invention relates to technology for inspecting the seating states of individual electronic components loaded onto a loading element in electronic component processing equipment that processes electronic components while individually managing them.

2. Description of the Related Art

Produced electronic components are shipped after going through various types of processes such as a test process and/or a sorting process. In this procedure, electronic component processing equipment for processing electronic components is used.

Electronic component processing equipment may be manufactured in various forms according to the operational function thereof. A loading element onto which electronic components can be loaded is used for the operation of supplying or collecting electronic components to or from the electronic component processing equipment and the operation of moving electronic components. A loading element may be manufactured in various forms depending on the type of electronic components, the type of operation for which the loading element is used, and/or the like.

When a loading element is used, electronic components can be moved from one loading element to another loading element, or a processing operation required for electronic components can be performed on the electronic components in a state of being loaded onto the loading element. In some cases, it may be necessary to take out a loading element loaded with processed electronic components and supply it to other processing equipment. Accordingly, it is necessary for electronic components to be accurately seated on a loading element in order to appropriately move the electronic components, appropriately process the electronic components, or prevent defective processing in other processing equipment in advance. In contrast, when electronic components are loaded onto a loading element in a defective seating state, defective work naturally occurs. Therefore, in order to check

the loading error of electronic components, the present applicant has proposed Korean Patent Application Publication Nos. 10-2016-0018211 and 10-2017-0093624 (hereinafter referred to as "prior art 1").

In prior art 1, electronic components can be inspected for loading errors by radiating laser, photographing the laser with a camera, and then analyzing the pattern of the photographed laser. According to this prior art, it is essential that the direction in which laser is radiated and the direction in which the laser is photographed with the camera are spread at a predetermined angle. The reason for this is that when the direction in which laser is radiated and the direction in which the laser is photographed with the camera are parallel to each other, it is difficult to observe a change in the pattern of laser. Furthermore, the accuracy of an image can be guaranteed only when laser is radiated onto a part to be observed and the camera observes the part, onto which the laser is radiated, from the exact center of a camera lens. Accordingly, a laser radiator and the camera need to be mounted such that the predetermined angle is formed between the direction in which laser is radiated and the direction in which the laser is photographed with the camera. Due to this, the laser radiator and the camera are provided to be spaced apart from each other by a considerable distance.

However, when the laser radiator and the camera are

spaced apart from each other by a considerable distance as in prior art 1, the space for placing the corresponding components needs to be increased, and thus it becomes difficult to perform design to exclude interference from structures such as other devices. Accordingly, depending on the equipment, there may be cases where there is no sufficient space for placing a laser radiator and a camera. Furthermore, this problem makes it difficult to additionally install a laser radiator and a camera in equipment being operated at a site after individual components have already been produced in an optimally designed state. In order to overcome this difficulty, the present applicant has proposed a structure in which a checking camera and a laser radiator are disposed adjacent to each other and coupled to a picker module, as in Korean Patent Application Publication No. 10-2020-0011352 and Korean Patent Application No. 10-2020-0031529 (hereinafter referred to as "prior art 2").

Prior art 2 has brought the freedom to minimize an increase in the size of processing equipment to be produced or to add an inspection apparatus without changing the structure of existing processing equipment. In addition, the inspection apparatus is designed as a movable structure in which it is coupled to the picker module. Accordingly, it is also possible to minimize the construction cost because all loading elements that one picker module is responsible for can be

checked for loading defects.

However, most processing equipment is custom-made for customers, and thus the location of a mounting space may vary depending on the equipment. Accordingly, it is still difficult for the inspection apparatus according to prior art 2 to be appropriately applied to all types of processing equipment, especially all types of processing equipment already produced and in use. In other words, when the movement range of the picker module or the positions of other structures are taken into consideration, there are pieces of processing equipment having a structure in which the inspection apparatus cannot be coupled to the picker module.

Therefore, the present applicant has proposed the prior art disclosed in Korean Patent Application Publication No. 10-2021-0125181 (hereinafter referred to as "prior art 3").

In prior art 3, a reflector is applied such that an inspection apparatus can be mounted even in a considerably narrow space. The reflector reflects the linear laser, radiated by a laser radiator, to the surfaces of electronic components, and a checking camera photographs the laser radiated onto the surfaces of the electronic components.

In prior art 3, the laser radiator, the checking camera, and the reflector maintain a mutually coupled state through the intervention of a mounting member. In this case, the reflector is fixed to the mounting member by being attached by

an adhesive to a flat close contact surface inclined at a predetermined angle with respect to a vertical surface.

However, the reflector may not be attached at an accurate inclination due to the liquid state which an adhesive has for a while or poor manual work by a worker. This will be described in more detail with reference to the conceptual reference view of FIG. 1.

FIG. 1(a) shows a case where a reflector 120 is appropriately attached to a mounting member IE at a required inclination by an adhesive B.

Meanwhile, when the liquid adhesive B before solidification flows down after the reflector 120 has been attached to the flat close contact surface AF of the mounting member IE and thus a lower side becomes thick or when the adhesive B is applied to be thicker on one side by a worker's mistake, the inclination of the reflector 120 is out of a required inclination range, as shown in FIG. 1(b), which is an exaggerated drawing. That is, the reflector 120 is attached to the close contact surface AF with the inclination of the close contact surface AF and the inclination of the reflector 120 being different from each other. As a result, referring to FIG. 2, the linear laser LL reflected to the surfaces of electronic components ED seated on a loading element LE is not radiated onto the surfaces as shown in FIG. 2(a) but is tilted at a specific angle as shown in FIG. 2(b). Accordingly, in

this case, errors may occur in inspection.

For reference, FIG. 2(b) shows only an example, and the laser LL may be erroneously radiated in various forms, such as a form having a different line width or a curved form. In this case, there occurs a case where an appropriately seated electronic component is determined to be defectively seated, and thus the reliability of the inspection apparatus is significantly reduced.

In addition, if a defective seating situation occurs and processing equipment continues to operate without stopping, it causes damage to the equipment as well as electronic components. Accordingly, in general, processing equipment is set to be temporarily stopped when it is determined that a defective seating situation occurs. Therefore, even when there is no defective seating situation in reality, it is erroneously determined that there occurs a defective seating situation and thus the equipment is frequently stopped, which lowers the efficiency and processing capacity of the equipment.

SUMMARY

The present invention has been conceived from deliberations on ensuring that a reflector is always fixed to a mounting bracket at a required inclination.

According to a first aspect of the present invention, there is provided an inspection apparatus for electronic component processing equipment, the inspection apparatus including: a laser radiator provided to radiate long linear laser in one direction onto the top surfaces of electronic components loaded onto a loading element; a reflector configured to reflect the laser, radiated by the laser radiator, to the top surfaces of the electronic components; a checking camera configured to photograph the laser reflected to the top surfaces of the electronic components by the reflector; a mounting bracket provided to mount the reflector; and a controller configured to analyze the seating states of the electronic components by analyzing an image taken by the checking camera; wherein the mounting bracket has a close contact portion configured to bring the reflector into close contact with the flat close contact surface of the mounting bracket by pressing the reflector toward the flat close contact surface.

The close contact portion may have an elastic member configured to enable elastic compression and restoration to press the reflector toward the close contact surface.

The close contact portion may be configured such that the opposing surface thereof facing the close contact surface is provided as an elastically deformable surface configured to enable elastic deformation and restoration to press the

reflector toward the close contact surface.

The mounting bracket may have an insertion groove configured such that a part of the reflector can be inserted thereinto; wall surfaces defining the insertion groove may include: the close contact surface configured such that the reflector pressed by the close contact portion comes into close contact therewith; a first opposing surface configured to face the close contact surface; an alignment surface configured such that one side of the reflector comes into close contact therewith; a second opposing surface configured to face the alignment surface; and a support surface configured to support a bottom end of the reflector; and the close contact portion may include the first opposing surface.

The first opposing surface may be rotatably provided such that when the first opposing surface is rotated to face the close contact surface, the close contact portion is in a state of pressing the reflector; and the inspection apparatus may further include a fixer configured to fix the first opposing surface so that the close contact portion maintains the state of pressing the reflector.

At least a part of the insertion groove may be provided as an accommodation space in which an excess adhesive can be accommodated.

According to a second aspect of the present invention, there is provided an inspection apparatus for electronic

component processing equipment, the inspection apparatus including: a laser radiator provided to radiate long linear laser in one direction onto the top surfaces of electronic components loaded onto a loading element; a reflector configured to reflect the laser, radiated by the laser radiator, to the top surfaces of the electronic components; a checking camera configured to photograph the laser reflected to the top surfaces of the electronic components by the reflector; a mounting bracket provided to mount the reflector; and a controller configured to analyze seating states of the electronic components by analyzing an image taken by the checking camera; wherein the mounting bracket includes an alignment portion configured to align the reflector by bringing the reflector into close contact with the alignment surface of the mounting bracket.

The alignment portion may have an elastic member configured to enable elastic compression and restoration to press the reflector toward the alignment surface.

The alignment portion may be configured such that the opposing surface thereof facing the alignment surface is provided as an elastically deformable surface configured to enable elastic deformation and restoration to press the reflector toward the alignment surface.

The mounting bracket may have an insertion groove configured such that a part of the reflector can be inserted

thereinto; wall surfaces defining the insertion groove may include: a close contact surface configured such that the reflector comes into close contact therewith; a first opposing surface configured to face the close contact surface; the alignment surface configured such that one side of the reflector pressed by the alignment portion comes into close contact therewith; a second opposing surface configured to face the alignment surface; and a support surface configured to support a bottom end of the reflector; and the alignment portion may include the second opposing surface.

The second opposing surface may be provided to selectively move forward and backward toward and away from the alignment surface so that when the second opposing surface moves forward toward the alignment surface, the alignment portion is in a state of pressing the reflector; and the inspection apparatus may further include a fixer configured to fix the second opposing surface so that the alignment portion maintains the state of pressing the reflector.

At least a part of the insertion groove may be provided as an accommodation space in which an excess adhesive can be accommodated.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages of

the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIGS. 1 and 2 are reference views illustrating conventional problems;

FIG. 3 is a schematic side view of an inspection apparatus according to a first embodiment of the present invention;

FIG. 4 is a perspective view schematically showing the main part of FIG. 3;

FIG. 5 is a schematic sectional view taken along line II of FIG. 4;

FIG. 6 is a reference view in which a reflector is removed from FIG. 4;

FIG. 7 is a reference view in which elastic members are excluded from FIG. 4;

FIG. 8 shows another example of an elastic member applied to the inspection apparatus of FIG. 3;

FIG. 9 shows another example of a close contact portion applied to the inspection apparatus of FIG. 3;

FIG. 10 shows the main part of an inspection apparatus according to a second embodiment of the present invention;

FIGS. 11 to 13 are reference views illustrating the main part of the inspection apparatus of FIG. 10; and

FIG. 14 shows an inspection apparatus according to

another modification of the present invention.

DETAILED DESCRIPTION

Embodiments of the present invention will be described below with reference to the accompanying drawings. For brevity of description, descriptions of known, redundant and/or substantially identical configurations will be omitted or abridged as much as possible.

<First Embodiment of Inspection Apparatus>

FIG. 3 is a schematic side view of an inspection apparatus 100 for electronic component processing equipment (hereinafter referred to as the "inspection apparatus") according to a first embodiment of the present invention, FIG. 4 is a perspective view schematically showing the main part A of FIG. 3, FIG. 5 is a schematic sectional view taken along line I-I of FIG. 4, and FIG. 6 is a reference view in which a reflector 120 is removed from FIG. 4.

The inspection apparatus 100 according to the first embodiment of the present invention includes a laser radiator 110, the reflector 120, a checking camera 130, a mounting bracket 140, and a controller 170.

The laser radiator 110 is provided to radiate a long linear laser LL in the left-right direction on the top surfaces of electronic components ED loaded onto a loading

element LE. The laser LL has a length that passes through the top surfaces of all electronic components ED in one column of the loading element LE.

The reflector 120 is located below the laser radiator 110 and the checking camera 130, and reflects the laser LL, radiated by the laser radiator 110, to the electronic components ED below the checking camera 130 so that the checking camera 130 can photograph all the electronic components ED in one column onto which the laser LL is radiated. It is most appropriate for the reflector 120 to reflect the laser LL so that a photographing center line PC and the laser LL meet each other on the top surfaces of the electronic components ED.

The checking camera 130 is provided to check the seating states of the electronic components ED loaded onto the loading element LE by photographing the laser LL radiated by the laser radiator 110. In the present embodiment, the checking camera 130 is provided on one side of the laser radiator 110, and is installed such that the photographing center line PC is directed vertically downward. The angle of view of the checking camera 130 is set such that all the electronic components D in one column of the loading element LE can be photographed.

The mounting bracket 140 is provided to install the laser radiator 110, the reflector 120, and the checking camera 130.

Accordingly, the laser radiator 110, the reflector 120, and the checking camera 130 are combined together through the mounting bracket 140 while being spaced apart from each other at predetermined intervals.

The mounting bracket 140 has a structure in which the main part A of the lower end thereof has an insertion groove IG into which at least a part of the lower part of the reflector 120 can be inserted.

The mounting bracket 140 has a close contact portion 141 and an alignment portion 142.

The close contact portion 141 brings the reflector 120 into close contact with the flat close contact surface AF of the mounting bracket 140 by pressing the reflector 120 onto the close contact surface AF. To this end, in the present embodiment, a separate first elastic member 141a is provided to elastically press the reflector 120 toward the close contact surface AF.

The alignment portion 142 brings the reflector 120 into close contact with the alignment surface LF by pressing one side (the left side in the drawing) of the reflector 120 into close contact with the alignment surface LF of the mounting bracket 140. To this end, in the present embodiment, a separate second elastic member 142a is provided to elastically press the reflector 120 toward the alignment surface LF.

The first elastic member 141a and second elastic member

141b described above may be made of rubber or silicon, which is a material that is soft and can be elastically compressed and restored.

Referring to FIG. 7 in which both the elastic members 141a and 142a are excluded from FIG. 5, wall surfaces defining the insertion groove IG include the close contact surface AF, a first opposing surface OF1, the alignment surface LF, a second opposing surface OF2, and a support surface SF, and also include a guide surface GF (see FIG. 6) over the close contact surface AF.

The close contact surface AF is a flat surface with which the surface of the reflector 120 opposite to the reflective surface of the reflector 120 comes into close contact. The close contact surface AF has an inclination at which the reflector 120 can accurately reflect the laser LL to the top surfaces of the electronic components ED.

The first opposing surface OF1 is a surface which faces the close contact surface AF.

The alignment surface LF is a surface with which one side of the reflector 120 comes into close contact.

The second opposing surface OF2 is a surface which faces the alignment surface LF.

The support surface SF is a surface which supports the bottom end of the reflector 120.

The guide surface GF is intended to guide the reflector

120 through appropriate insertion when the reflector 120 is inserted into the insertion groove IG, and is located over the close contact surface AF.

Continuously referring to FIG. 8, the above-described first elastic member 141a may be made of rubber or silicone in an integrated form, as shown in FIG. 8(a). Alternatively, it may be contemplated that the first elastic member 141a constituting part of the close contact portion 141 includes a pressing plate 141a-1 and springs 141c configured to elastically support the pressing plate 141a-1 on the first opposing surface OF1, as shown in FIG. 8(b).

Alternatively, depending on implementation, it may be contemplated that a wall including the first opposing surface OF1 is provided in an elastically deformable and restorable shape and forms the close contact portion 141, as shown in FIG. 9. In this case, it may be contemplated that the wall including the first opposing surface OF1 is thinner than a wall including the close contact surface AF1 so that elastic deformation can appropriately be made. In this case, it may be contemplated that the alignment surface LF and the alignment portion 142 are omitted.

Alternatively, the alignment portion 142 may also have the same structure as the close contact portion 141 shown in FIGS. 8 and 9.

The controller 170 controls the operation of the checking

camera 130. Furthermore, the controller 170 has an analysis means and also functions as an analyzer that determines whether the electronic components ED are loaded appropriately by analyzing the pattern of the laser LL based on an image acquired through the checking camera 130 or analyzing it through another analysis technique.

According to the above embodiment, a worker who mounts the reflector 120 inserts the reflector 120 into the insertion groove IG in an interference fit manner so that the surface opposite to the reflective surface is directed toward the close contact surface AF. In this case, as shown in the conceptual sectional view of FIG. 5, the reflector 120 inserted into the insertion groove IG is strongly brought into close contact with the close contact surface AF by a contactor 150 and is pressed onto the alignment surface LF by an aligner 160 so that the position thereof is also aligned.

<Second Embodiment of Inspection Apparatus>

FIG. 10 shows the main part of an inspection apparatus 100 according to a second embodiment of the present invention.

The basic configuration of the inspection apparatus 100 according to the second embodiment is the same as that of the first embodiment.

However, as shown in the conceptual reference view of FIG. 11, the present embodiment is different from the first embodiment in that a close contact portion 141 including a

first opposing surface OF1 is rotatably provided. That is, when the first opposing surface OF1 is rotated to face a close contact surface AF, the close contact portion 141 is in a state of pressing the reflector 120 toward the close contact surface AF.

In addition, the present embodiment is different from the first embodiment in that a second opposing surface OF2 is provided to selectively move forward and backward toward and away from an alignment surface LF. That is, the second opposing surface OF2 and a second elastic member 142a attached to the second opposing surface OF2 are provided to selectively move forward and backward toward and away from the alignment surface LF. Accordingly, when the second opposing surface OF2 move forward toward the alignment surface LF, the second elastic member 142a fixed to the second opposing surface OF2 is in a state of pressing the reflector 120 toward the alignment surface LF. To this end, it may be contemplated that, as shown in the reference drawing of FIG. 12, rail grooves RG are formed in a wall including the second opposing surface OF2 and rail protrusions (not shown) are formed on the close contact surface AF and the first opposing surface OF1 so that the rail grooves RG and rail protrusions are engaged with each other, and thus, the second opposing surface OF2 can move forward and backward in the left and right directions.

However, in the second embodiment, a fixer 180 configured

to fix the first and second opposing surfaces OF1 and OF2 needs to be additionally provided such that the close contact portion 141 and the alignment portion 142 are maintained in a state of pressing the reflector 120.

There may be various examples of the fixer 180.

For example, as in FIGS. 10 and 13, it may be contemplated that the fixer 180 has a ring shape that binds wall surfaces including the contact surface AF, the alignment surface LF, the first opposing surface OF1, and the second opposing surface OF2.

It may be contemplated that the fixer 180 has a square frame shape or is formed of a material such as an elastic band.

Meanwhile, the second embodiment has a structure in which the pressing movement of the close contact part 141 and the alignment part 142 is accompanied, and thus the use of a separate adhesive may be additionally contemplated. Accordingly, a worker performs assembly work by applying the adhesive onto the reflector 120, attaching the reflector 120 onto the close contact surface AF, and then pressing the reflector 120 using the close contact portion 141, the alignment portion 142, and the fixer 180. In this case, the adhesive B is spread to a uniform thickness between the reflector 120 and the close contact surface AF by the strong pressing force of the close contact portion 141, and thus the

reflector 120 may be adhered to the close contact surface AF while maintaining an appropriate inclination required for the reflector 120.

Meanwhile, in this case, there may be cases where an amount of adhesive B larger than a required amount is used, and thus it may be contemplated that an accommodation space (ES) configured such that excess adhesive B can be accommodated therein is provided.

Accordingly, as shown in FIG. 13, it may be contemplated that the width W1 of the first elastic member 141a is narrower than the width W2 of the reflector 120, so that the accommodation space ES is formed between the reflector 120 and the close contact portion 141. Furthermore, it may be more preferable that the accommodation space ES is formed on both sides of the close contact portion 141 so that the adhesive B is prevented from being concentrated on a side.

For reference, although the reference symbols shown in FIG. 13 denote only two accommodation spaces ES, the space between the alignment unit 142 and a side of the reflector 120 is also used as an accommodation space. Furthermore, as shown in FIG. 9, the gap between the close contact surface AF and the rear surface of the reflector 120 may also be used as an accommodation space. In some cases, when the degree of adhesion is important, there may also be employed a method of applying an adhesive between the first elastic member 141a and

the front surface of the reflector 120, as shown in FIG. 13. In this case, the accommodation space ES located on a corner portion in front of the reflector 120 may be utilized as a space in which excess adhesive is accommodated. That is, at least a portion of the insertion groove IG may remain empty and function as an accommodation space ES that accommodates excess adhesive.

According to the second embodiment, a worker who mounts the reflector 120 applies the adhesive B to the surface of the reflector 120 opposite to the reflective surface of the reflector 120 and then attaches the reflector B to the close contact surface AF. Thereafter, the worker rotates the first opposing surface OF1, moves the second opposing surface OF2 forward so that the adhesion part 141 and the alignment part 142 can press the reflector 120, and then fixes the first opposing surface OF1 and the second opposing surface OF2 by fixing the wall having the first opposing surface OF1 and the wall having the second opposing surface OF2 with the fixer 180. In this case, excess adhesive moves out and is accommodated in the accommodation space ES.

For reference, in the case of the second embodiment to which the elastic pressing structure of FIG. 9 is applied, an accommodation space is formed below the contact point at which the first opposing surface OF1 comes into contact with the reflector 120.

It is obvious that even in the case of the first embodiment, an adhesive used to attach the reflector 120 onto the contact surface AF may be used. In this case, an accommodation space is also required.

<Additional Items>

1. Although the mounting bracket 140 is described as a modification of the mounting member IE of prior art 3 in the description of the present invention, it may also be possible to provide a structure in which a mounting bracket having the characteristics of the present invention is coupled to a mounting member.

2. In the case of having only a single elastic member

Referring to FIG. 14, it may be contemplated that only a single elastic member EE configured to realize close contact and alignment at the same time is provided.

When the elastic member EE is attached onto a first opposing surface OF1, it has an alignment function as well as a close contact function as the first elastic member 141a. In contrast, when the elastic member EE is attached onto a second opposing surface OF2, it has a close contact function as well as an alignment function as the second elastic member 142a. It is obvious that the elastic member EE may be attached onto each of the first and second opposing surfaces OF1 and OF2.

That is, in some cases, the present invention may be realized even by constructing only a close contact portion and

bringing a reflector into close contact with the close contact portion.

Alternatively, it may be possible to achieve close contact and alignment at the same time using only an alignment portion without a separate close contact portion.

According to the present invention, the reflector comes into close contact with the flat mounting surface of the mounting bracket to have the same inclination as the mounting surface, so that the reflection direction of the laser reflected by the reflector becomes accurate, thereby improving the reliability of inspection.

Therefore, although the description of the specific forms of the present invention has been given based on the embodiments with reference to the accompanying drawings, the above-described embodiments have been described merely as examples of the present invention. It should be understood that the present invention is not limited only to the above embodiments and the scope of the present invention encompasses the following claims and their equivalents.

WHAT IS CLAIMED IS:

[Claim 1] An inspection apparatus for electronic component processing equipment, the inspection apparatus comprising:

a laser radiator provided to radiate laser;

a reflector configured to reflect the laser, radiated by the laser radiator, to top surfaces of electronic components loaded onto a loading element to make long linear laser radiated in one direction onto the top surfaces of the electronic components;

a checking camera configured to photograph the laser reflected to the top surfaces of the electronic components by the reflector;

a mounting bracket provided to mount the reflector; and

a controller configured to analyze seating states of the electronic components by analyzing an image taken by the checking camera;

wherein the mounting bracket comprises an alignment portion configured to align the reflector by bringing the reflector into close contact with an alignment surface of the mounting bracket,

wherein the alignment portion is configured such that a second opposing surface thereof facing the alignment surface is provided as an elastically deformable surface configured to enable elastic deformation and restoration to press the reflector toward the alignment surface,

wherein:

the mounting bracket has an insertion groove configured such that a part of the reflector can be inserted thereinto;

wall surfaces defining the insertion groove include:

a close contact surface configured such that the reflector comes into close contact therewith;

a first opposing surface configured to face the close contact surface;

the alignment surface configured such that one side of the reflector pressed by the alignment portion comes into close contact therewith;

the second opposing surface configured to face the alignment surface; and

a support surface configured to support a bottom end of the reflector; and

the alignment portion includes the second opposing surface, wherein:

the second opposing surface is provided to selectively move forward and backward toward and away from the alignment surface so that when the second opposing surface moves forward toward the alignment surface, the alignment portion is in a state of pressing the reflector; and

the inspection apparatus further comprises a fixer configured to fix the second opposing surface so that the alignment portion maintains the state of pressing the reflector.

[Claim 2] The inspection apparatus of claim 1, wherein the alignment portion has an elastic member configured to enable elastic compression and restoration to press the reflector toward the alignment surface.

[Claim 3] The inspection apparatus of claim 1, wherein the mounting bracket further comprises a close contact portion configured to bring the reflector into close contact with a flat close contact surface of the mounting bracket by pressing the reflector toward the flat close contact surface,

wherein the close contact portion has an elastic member

configured to enable elastic compression and restoration to press the reflector toward the close contact surface.

[Claim 4] The inspection apparatus of claim 1, wherein the mounting bracket further comprises a close contact portion configured to bring the reflector into close contact with a flat close contact surface of the mounting bracket by pressing the reflector toward the flat close contact surface,

wherein the close contact portion is configured such that the first opposing surface is provided as an elastically deformable surface configured to enable elastic deformation and restoration to press the reflector toward the close contact surface.

[Claim 5] The inspection apparatus of claim 4, wherein the reflector pressed by the close contact portion comes into close contact with the close contact surface, and

the close contact portion includes the first opposing surface.

[Claim 6] The inspection apparatus of claim 5, wherein:

the first opposing surface is rotatably provided such that when the first opposing surface is rotated to face the close contact surface, the close contact portion is in a state of pressing the reflector; and

the fixer is configured to fix the first opposing surface so that the close contact portion maintains the state of pressing the reflector.

[Claim 7] The inspection apparatus of any one of claim 1 or 4, wherein an adhesive is used between the reflector and the close contact surface to attach the reflector to the close contact surface, at least a part of the insertion groove is provided as an accommodation space which accommodates excess adhesive moving out between the reflector and the close contact surface.