

DESCRIPTION

LEAD INSPECTION APPARATUS OF IC PACKAGE

5

TECHNICAL FIELD

The present invention relates to a lead inspection apparatus of an IC package which inspects flatness of leads, dispersion of lead pitches, short circuit caused by bending of tip portions of leads, and positional deviation between
10 lead terminals at tip portions by illuminating the lead terminals and photographing the image of the illuminated lead terminals.

BACKGROUND ART

15 Recently, IC packages of a type in which tip portions of leads are bent into a J shape, such as SOJ and PLCC, are becoming the mainstream type of IC packages.

Inspection items for such IC packages include:

- (1) Flatness of leads (Fig. 14(a))
- 20 (2) Pitch dispersion of grounding portions of leads (Fig. 14(a))
- (3) Short circuit caused by bending of tip portions of leads (Fig. 14(b))
- (4) Positional deviation of tip portions of lead
25 terminals (Fig. 14(c))
- (5) Character chipping, blurs and positional deviation of marks inscribed in top surface of a package

These items have been conventionally inspected by such an inspection apparatus as shown in Fig. 15.

In accordance with the conventional art in Fig. 15, light is irradiated from a light source placed at a side of an IC package on the first stage A, an image of lead terminals lined at the left side of the IC package is photographed by a camera F which is disposed at the opposite side of the light source, and based on this photographic data, flatness, pitch dispersion and short circuit caused by bending of leads with respect to the lead terminals lined at the left side are inspected.

Then, the IC package is transferred to the second stage B, and an image of lead terminals at the right side are photographed on this stage B using another camera G, then an inspection similar to above is executed.

Then, the IC package is transferred to the third stage C, and an image of the top face of the IC package is photographed on this stage C using another camera H disposed above, and character chipping, blurs and positional deviation of the marks inscribed in the top face of the package are inspected based on the image data.

Finally, the IC package is transferred to the fourth stage D, and image data on the rear face of the IC package is acquired by photographing the image of the upside down IC package on this stage D using a camera I disposed above the IC package. And based on this image data, positional deviation among the terminals at the tip portions of the lead terminals is inspected.

In the above described conventional art, when the items (1) to (3) are inspected in the stages A and B, images of the lead terminals are photographed in the status where the IC package is placed on the stage. Therefore, the image of the stage and the image of the lowest points of the lead terminals overlap with each other, which makes it difficult to judge flatness of leads.

Another problem of the conventional art is that when an image of the lead terminals, for example, at the left side is obtained, light from the light source is irradiated to the lead terminals at the left side by way of the lead terminals at the right side and enters the camera F. Therefore, the image of the lead terminals at the right side overlaps with the image of the lead terminals at the left side, which makes it difficult to judge flatness and pitch dispersion of the lead terminals.

Also, in accordance with this conventional art, because three stages are required for inspecting the inspection items (1) to, it takes a long time to shift these stages, it requires a large inspection space and a number of components such as cameras and illumination devices.

In addition to the above problems, in the final stage D of the conventional art, the image data of the rear face of the IC package is acquired by using the light source fixed to a specified position. Therefore, molding scratches and burrs on the surface of the leads may cause irregular reflection. As a result, it is difficult to acquire clear image data, which sometimes makes measurement impossible.

More specifically, since the lead terminals are bent by a press, scratches are likely to be generated by a die at different positions depending on the die. Therefore, for lead terminals which are bent by using a die, a clear image
5 may be obtained while for lead terminals which are bent by using another die, a measurable image may not be obtained. In some cases, measurement becomes impossible depending on the lot (in die unit) because irregular reflection is too large.

10 In view of the conventional art described above, it is an object of the present invention to provide a lead inspection apparatus of an IC package which can measure flatness of lead terminals at high precision.

It is another object of the invention to provide a lead
15 inspection apparatus of an IC package which can inspect lead terminals efficiently while saving space, saving cost and using less number of components.

It is still another object of the invention to provide a lead inspection apparatus of an IC package which can acquire
20 clear image data even if irregular reflection is generated by die scratches at the tip portions of the lead terminals.

DISCLOSURE OF THE INVENTION

In the present invention, a lead inspection apparatus of
25 an IC package for inspecting abnormalities of lead terminals of an IC package by photographing images formed by illuminating the lead terminals of the IC package, comprises a lighting device disposed at a center of a bottom surface of

the IC package, having a width corresponding to a center area of the bottom surface of the IC package where the lead terminals of the IC package do not exist, and having a height longer than stand-off of the lead terminals such that light is irradiated only to a part of the lead terminals closer to center side of the IC package from tip portions of the lead terminals; and photographing means for photographing images of the lead terminals formed by the light from the lighting device.

10 In accordance with this invention, light is irradiated from the center area of the bottom surface of the IC package to the lead terminals in lateral directions, and images of the lead terminals are photographed by the illumination light. At this time, height of the light source is set to be longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to the center side of the IC package from the tip portions of the lead terminals, to prevent light from irradiating outside the tip portions (lowest portions) of the lead terminals.

Also, in the present invention, a lead inspection apparatus of an IC package for inspecting abnormalities of lead terminals of an IC package by photographing images formed by illuminating the lead terminals of the IC package, comprises a translucent IC package support disposed at a bottom surface of the IC package, having a width corresponding to a center area of a bottom surface of the IC package where the lead terminals of the IC package do not

exist, and having a height longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to the center side of the IC package from tip portions of the lead terminals; a light source for emitting light to a side surface of the IC package support; and photographing means for photographing images of the lead terminals formed by light from the light source guided by the IC package support.

In accordance with the invention, light that is emitted from the side surface of the IC package support is irradiated from the area around the bottom surface of the IC package to the lead terminals in lateral directions. Then images of the lead terminals formed by this irradiated light are photographed. At this time, height of the exposed portion, where light from the IC package support passes through, from the bottom surface of the IC package is set to be longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to the center side of the IC package from the tip portions of the lead terminals, to prevent light irradiating outside the tip portions (lowest portions) of the lead terminals.

Also, in the present invention, a lead inspection apparatus of an IC package for inspecting abnormalities of lead terminals of an IC package and inspecting the IC package from a top surface thereof by photographing images formed by illuminating the lead terminals of the IC package and the top surface of the IC package, comprises a first lighting device

disposed at a center of a bottom surface of the IC package, having a width corresponding to a center area of the bottom surface of the IC package where the lead terminals of the IC package do not exist, and having a height longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to a center side of the IC package from the tip portions of the lead terminals; a second lighting device disposed above the IC package, for illuminating the top surface of the IC package; two mirror means disposed at both sides of the IC package, respectively; a single photographing means disposed above the IC package, for photographing images of the lead terminals formed by light of the first lighting device guided by the mirror means, and for photographing the top surface of the IC package illuminated by the second lighting device; and control means for switching alternately on a time basis between illumination for the lead terminals by the first lighting device and illumination for the top surface of the IC package by the second lighting device, whereby inspection of the lead terminals and inspection of the IC package from the top surface thereof are performed at a single stage.

In accordance with the present invention, inspection of the lead terminals and inspection of marks on the top surface of the IC package are executed on the same stage, and a single camera is shared in these inspections at this time.

Also, in the present invention, in a lead inspection apparatus of an IC package for inspecting abnormalities of an IC package by placing the IC package on a stage with its rear

surface up, illuminating the rear surface of the IC package by a lighting device disposed above the IC package, and photographing the illuminated rear surface of the IC package, the lead inspection apparatus of an IC package comprises a
5 plurality of lighting devices each operating under different illumination conditions for the IC package and disposed above the IC package; and control means for switching illumination of the plurality of lighting devices for the IC package sequentially on a time basis.

10 In accordance with the present invention, the plurality of lighting devices are disposed such that illumination conditions of the lighting devices for the IC package (e.g. illuminating direction, distance from the IC package, illuminance) are different, and clear photographic images
15 with less influence by the shape of the leads and scratches can be obtained by switching the driving of these plurality of lighting devices.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Fig. 1 is a front view conceptually depicting the first embodiment of the present invention;

Fig. 2 is a plan view of the embodiment in Fig. 1;

Fig. 3 is a diagram depicting an image photographed by the embodiment in Fig. 1;

25 Fig. 4 is an enlarged view of an area near the lead terminals of the IC package of the embodiment in Fig. 1;

Fig. 5 is a diagram for explaining restrictions for $L_s + \alpha$;

Fig. 6 is a diagram depicting the second embodiment of the present invention;

Figs. 7(a) through 7(d) are diagrams depicting various modifications of the embodiment in Fig. 6;

5 Figs. 8(a) and 8(b) are diagrams depicting the third embodiment of the present invention;

Figs. 9(a) through 9(d) are diagrams depicting various modifications of the embodiment in Figs. 8(a) and 8(b);

10 Fig. 10 is a diagram depicting the fourth embodiment of the present invention;

Fig. 11 is a diagram depicting the fifth embodiment of the present invention;

Fig. 12 is a diagram depicting a modification of the fifth embodiment in Fig. 11;

15 Fig. 13 is a diagram depicting another modification of the fifth embodiment in Fig. 11;

Figs. 14(a) through 14(d) are diagrams depicting various inspection items of lead terminals of an IC package; and

Fig. 15 is a diagram depicting a conventional art.

20

BEST MODE FOR CARRYING OUT THE INVENTION

Embodiments of the invention are now described referring to the accompanying drawings.

25 Fig. 1 shows the concept of the first embodiment of the present invention, and the embodiment has a configuration for inspecting flatness of lead terminals, and for inspecting pitch and short circuit of the leads.

In Fig. 1, an IC package (such as SOJ, PLCC) 2 which has J-shaped lead terminals 1 is placed on a translucent support 3 having light scattering properties, which is made from such material as white acrylic, as shown in the plan view in Fig.

5 2. In this embodiment, a light source 4 is disposed under the IC package 2, and emits light from below the IC package by way of a light diffusion plate 5 and the support 3. A light shielding mask 6 which is provided at the side of the support 3 is disposed such that the light from the light
10 source 4 does not directly enter cameras 7 and 8. The cameras 7 and 8 for photographing images of the lead terminals 1 are disposed at the left and right of the IC package 2, and an image of the lead terminals at the left side and an image the lead terminals at the right side are
15 photographed by each camera 7 and 8, respectively.

Specifically, according to the configuration of Fig. 1, light is guided from below the IC package 2, comes out from the upper portion of the support 3, and reaches the cameras 7 and 8 through the lead terminals 1, and this light is
20 photographed by the cameras 7 and 8, as in the photographed image shown in Fig. 3. In Fig. 3, the hatched portion corresponds to shadow, the portion indicated by number 9 corresponds to the body of the IC package 2, the portion indicated by number 10 corresponds to the lead terminals, and
25 the portion indicated by number 11 corresponds to the light shielding mask 6.

As Fig. 4 shows, the distance from the bottom face of the IC package 2 to the tip portions (lowest portions) of the

leads is called "stand-off" L_s . By setting the distance ($L_s + \alpha$), which is the addition of the distance α from the tip portions (lowest portions) of the leads to the top surface of the light shielding mask 6 and the stand-off L_s , to the
5 height such that the light does not irradiate the tip portions (lowest portions) of the leads and the portions of the leads outside the tip portions of the lead terminals, in other words, to the height longer than stand-off such that light is irradiated only to a part of the lead terminals
10 closer to the center side of the IC package from the tip portions of the lead terminals, the image of the tip portions (lowest portions) of the leads can be photographed clearly.

If α is set to be too long as shown in Fig. 5, the light illuminates the tip portions (lowest portions) of the leads
15 as well as the portion of the leads outside the tip portion of the leads, which makes it impossible to photograph the tip portion (tip portions) of the leads as a clear image, to determine the stand-off L_s accurately, and to inspect flatness accurately.

20 Concerning the length L_a in the x direction (see Fig. 2) of the support 3 for guiding light from the light source 4, it is necessary to maintain the length L_a to such length that the light does not irradiate the tip portion of the lead terminals of the IC package 2 (do not set the length too
25 long).

Fig. 6 shows the second embodiment of the present invention, where light that comes out of the upper portion of the support 3 is reflected by a prism mirror 12, and the

reflected light is photographed by a camera 13 disposed above the IC package 2, and a single camera 13 simultaneously photographs images of the lead terminals at the left and right sides. In this embodiment, the top surface of a light shielding mask 6 is processed such that light reflection does not occur, making the portion black, for example.

In the embodiment in Fig. 6, a relatively high support 3 is used and the distance ($L_s + \alpha$) is adjusted by a light shielding component 14 attached to the top of the light shielding mask 6.

Creating such a light shielding component 14 include: integrating into the light shielding mask 6 as shown in Fig. 7(a), creating a step component 14 separately from the light shielding mask 6 and attaching it later as shown in Fig. 7(b), coating light shielding coating material at the lower portion of the support 3 as shown in Fig. 7(c), and altering the properties of the lower portion of the support 3 to have light shielding properties as shown in Fig. 7(d).

Figs. 8(a) and 8(b) show the third embodiment of the present invention, which is also configured to inspect flatness of lead terminals and to inspect pitch and short circuit of leads, like the first and second embodiments.

Fig. 8(a) is a plan view and Fig. 8(b) is a side view when viewing from the arrow M direction.

In the embodiment shown in Figs. 8(a) and 8(b), the light source 4 is disposed not below the IC package but on the side of the IC package, and light is irradiated on the area under the IC package from the side through the semi-

transparent support 3 that has light scattering properties.

A light shielding body 17 where the support 3 is inserted is disposed between the light source 4 and the IC package 2, and the light shielding body 17 guides light from the side to the area under the IC package 2 only through the support 3. The light guided to the area under the IC package 2 enters the cameras 15 and 16 disposed at the left and right of the support 3. Thus, the image of the lead terminals 1 is

photographed. A light shielding mask 18 is disposed at the lower part of the support 3 as shown in Fig. 9(a), for adjusting the height ($L_s + \alpha$) such that light does not irradiate the tip portions (lowest portions) of the leads and portion of the leads outside the tip portions of the lead terminals, in other words, to a height such that light is irradiated only to the lead terminals closer to the center side of the IC package from the tip portions of the lead terminals. In the case of Fig. 9(a), the support 3 is buried in the light shielding mask 18.

Other examples of the light shielding mask 18 are a concave shaped light shielding component covering the support 3 as shown in Fig. 9(b), a light shielding coating material coating the lower portion of the support 3 as shown in Fig. 9(c), and altering the lower portion of the support component 3 to have light shielding properties as shown in Fig. 9(d).

In the embodiment shown in Figs. 8(a) and 8(b) and Figs. 9(a) through 9(d), a single camera may be disposed above the IC package, just like the embodiment in Fig. 6, and light is guided by the two mirrors disposed at the positions where the

cameras 15 and 16 are disposed in Fig. 8(a), so as to form images at the left and right lead terminals.

Fig. 10 shows the fourth embodiment of the present invention, where a light source 20 to illuminate the top surface of the IC package 2 is added to the configuration of the embodiment in Fig. 6, and marks on the top surface of the IC package 2 can be inspected on the same stage as the inspection of flatness of the lead terminals and inspection of pitch and short circuit of the leads.

In this embodiment, when the flatness of the lead terminals and the pitch and short circuit of the lead terminals are to be inspected, the light source 4 is turned on and the light source 20 is turned off, and images of the lead terminals are photographed by the camera 13. When the mark is to be inspected, the light source 20 is turned on and the light source 4 is turned off, and the mark on the top surface of the IC package 2 is photographed by the camera 13.

For the light sources 4 and 20, an LED, stroboscope, semiconductor laser and other light sources which can implement switching of light on and off at a high speed are used.

It may be so configured that the light sources 4 and 20 are on all the time and shutters are disposed in front of the light sources, which are alternately switched to opening or closing. Alternatively, a single light source may be shared for the light source 4 and 20 such that light of the single light source is guided to the bottom surface and the top surface of the IC package using an independent optical

system. Further, one of the light source 4 and 20 may be turned on all the time and on or off of this light source is performed by opening or closing of a shutter disposed in front of this light source while the other light source 20 or
5 4 may be turned on or off by switching on or off.

In the embodiment in Fig. 10, inspection to be performed based on the image data of the camera 13 disposed above the IC package is not limited to inspection of the mark on the top surface of the IC package, but may include inspection as
10 to whether the width of the IC lead terminals is within standard width, and inspection of lead width when viewed from the top.

Fig. 11 shows the fifth embodiment of the present invention, where the IC package 2 is placed on the stage 25 in an upside down status, and the positional deviation
15 between the lead terminals at the tip portions thereof as shown in Fig. 14(c), is inspected by photographing the bottom surface of the IC package using the camera 26.

In this embodiment, the light sources 30 for
20 illuminating the bottom surface of the IC package (LEDs in this case) are divided into three groups 30-a through 30-c. Each group has different illuminating conditions such as the height of the light sources, installation angle (direction of illumination) and illuminance, and is driven for lighting,
25 with switching the groups sequentially.

Specifically, the light sources of the group 30-a are first turned on and the light sources of the other groups 30-b and 30-c are turned off, then the light sources of group

30-b are turned on and the light sources of the other groups 30-a and 30-c are turned off, then the light sources of the group 30-c are turned on and the light sources of the other groups 30-a and 30-b are turned off, and this switching is
5 repeatedly executed.

Thus in the embodiment of Fig. 11, clear images with less influence by the shape of the leads and presence of scratches can be obtained by changing the illumination conditions in various ways using multiple groups of light
10 sources.

For the light sources 30, LEDs, stroboscope, semiconductor lasers and other light sources which can implement the switching of lighting on and off at a high speed are used.

15 Fig. 12 shows a modification of the embodiment in Fig. 11, where the light sources 35 which are constantly turned on are used, and the illumination switching control similar to the embodiment in Fig. 11 is performed by shielding/passing the lights from the light sources using open/close driving of
20 a shutter 36 which is disposed for each light source.

Fig. 13 is also a modification of the light sources 30 of the embodiment in Fig. 11, where one light source 40 (fluorescent light, for example) is disposed each at the left and right, and the illumination switching control similar to
25 the embodiment in Fig. 11 is performed by shielding/passing the lights from the light sources using open/close driving of a shutter 41 which is disposed at different locations and angles depending on the group.

In the embodiment in Fig. 11, a part of the light sources 30-a through 30-c may be kept on at all times, where illumination from this part of the light sources is turned on or off by opening or closing a shutter disposed in the front of the light sources, and illumination from the other light sources is turned on or off by turning the light source on or off.

In the above embodiments, the present invention is applied to an IC package with J-shaped leads, such as SOJ and PLCC, but the invention may be applied to quad flat packages (QFP).

In each of the above embodiments, the emission color of a part or all of the illumination may be red, green or another color.

INDUSTRIAL APPLICABILITY

In accordance with the present invention, as described above, illumination is irradiated to the lead terminals from the center part of the bottom surface of the IC package in the side directions, and the image of the lead terminals formed by the light is photographed, where the height of the light source is higher than stand-off of the lead terminals of the IC package such that light irradiates only portions of the lead terminals closer to the center of the IC package from the tip portions of the lead terminals, therefore light does not irradiate outside the tip portions of the lead terminals, which allows obtaining a clear image of lead

terminals, and improves the measurement accuracy of stand-off and flatness dramatically.

Also in the present invention, inspection of the lead terminals and inspection of marks on the top surface of the
5 IC package can be executed on a same stage, which makes inspection of lead terminals efficient, and decreases space, cost and the number of required components.

Also in the present invention, leads are inspected by
irradiating the rear face of the IC package by multiple
10 lighting devices with different illumination conditions, therefore a clear image data can be obtained even if irregular reflection due to die scratches and burrs exist at the tip portions of the lead terminals, which improves the measurement accuracy.



CLAIMS

1. A lead inspection apparatus of an IC package for inspecting abnormalities of lead terminals of an IC package by photographing images formed by illuminating the lead terminals of the IC package, comprising:

a lighting device disposed at a center of a bottom surface of the IC package, having a width corresponding to a center area of the bottom surface of the IC package where the lead terminals of the IC package do not exist, and having a height longer than stand-off of the lead terminals such that light is irradiated only to a part of the lead terminals closer to center side of the IC package from tip portions of the lead terminals; and

photographing means for photographing images of the lead terminals formed by the light from the lighting device.

2. The lead inspection apparatus of an IC package according to Claim 1, wherein the lighting device comprises:

a light source disposed below the IC package;

a translucent IC package support having a width corresponding to the center area of the bottom surface of the IC package, for guiding light from the light source to an area near the bottom surface of the IC package, and for supporting the IC package;

first light shielding means for shielding an area outside a bottom surface of the IC package support so that the light from the light source is guided to the area near the bottom



surface of the IC package only through the bottom surface of the IC package support; and

second light shielding means for shielding at least a face of the IC package support opposing to the lead terminals so that the height of an exposed portion of the IC package support from the bottom surface of the IC package is longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to the center side of the IC package from the tip portions of the lead terminals.

3. The lead inspection apparatus of an IC package according to Claim 2, wherein the first light shielding means and the second light shielding means are constructed in an integrated structure.

4. The lead inspection apparatus of an IC package according to any one of Claim 1 through Claim 3, wherein the photographing means comprises two cameras disposed on both sides of the IC package, respectively.

5. The lead inspection apparatus of an IC package according to any one of Claim 1 through Claim 3, wherein the photographing means comprises:

two mirror means disposed on both sides of the IC package, respectively; and



a single camera means disposed above the IC package for photographing images of the lead terminals guided by the two mirror means.

6. A lead inspection apparatus of an IC package for inspecting abnormalities of lead terminals of an IC package by photographing images formed by illuminating the lead terminals of the IC package, comprising:

a translucent IC package support disposed at a bottom surface of the IC package, having a width corresponding to a center area of a bottom surface of the IC package where the lead terminals of the IC package do not exist, and having a height longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to the center side of the IC package from tip portions of the lead terminals;

a light source for emitting light to a side surface of the IC package support; and

photographing means for photographing images of the lead terminals formed by light from the light source guided by the IC package support.

7. The lead inspection apparatus of an IC package according to Claim 6, further comprising first light shielding means for shielding an area other than the side surface of the IC package support so that the light from the light source is guided to an area near the bottom surface of the IC package only from the side surface of the IC package support.



8. The lead inspection apparatus of an IC package according to Claim 6 or Claim 7, wherein the IC package support further comprising second light shielding means for shielding at least a face of the IC package support opposing to the lead terminals so that height of an exposed portion of the IC package support from the bottom surface of the IC package is longer than stand-off of the lead terminals of the IC package such that the light is irradiated only to a part of the lead terminals closer to the center side of the IC package from the tip portions of the lead terminals.

9. The lead inspection apparatus of an IC package according to any one of Claim 6 through Claim 8, wherein the photographing means comprises:

two mirror means disposed on both sides of the IC package, respectively; and

a single camera means disposed above the IC package for photographing images of the lead terminals guided by the two mirror means.

10. The lead inspection apparatus of an IC package according to any one of Claim 6 through Claim 8, wherein the photographing means comprises two cameras disposed on both sides of the IC package, respectively.

11. A lead inspection apparatus of an IC package for inspecting abnormalities of lead terminals of an IC package and inspecting the IC package from a top surface thereof by



photographing images formed by illuminating the lead terminals of the IC package and the top surface of the IC package, comprising:

a first lighting device disposed at a center of a bottom surface of the IC package, having a width corresponding to a center area of the bottom surface of the IC package where the lead terminals of the IC package do not exist, and having a height longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to a center side of the IC package from the tip portions of the lead terminals;

a second lighting device disposed above the IC package, for illuminating the top surface of the IC package;

two mirror means disposed at both sides of the IC package, respectively;

a single photographing means disposed above the IC package, for photographing images of the lead terminals formed by light of the first lighting device guided by the mirror means, and for photographing the top surface of the IC package illuminated by the second lighting device; and

control means for switching alternately on a time basis between illumination for the lead terminals by the first lighting device and illumination for the top surface of the IC package by the second lighting device,

whereby inspection of the lead terminals and inspection of the IC package from the top surface thereof are performed at a single stage.



12. The lead inspection apparatus of an IC package according to Claim 11 wherein the control means alternately switching lighting time of the first lighting device and the second lighting device.

13. The lead inspection apparatus of an IC package according to Claim 11, wherein the control means comprises:

first and second shutter means disposed in front of the first lighting device and the second lighting device, respectively for shielding or passing light from the respective lighting devices; and

shutter open/close control means for alternately switching on a time basis illumination of the first lighting device for the lead terminals and illumination of the second lighting device for the top surface of the IC package by executing open/close control of these first and second shutter means.

14. The lead inspection apparatus of an IC package according to Claim 11 wherein the control means comprises:

shutter means disposed at one of the first and second lighting devices, for shielding or passing light from the lighting device where the shutter means is disposed; and

illumination control means for executing lighting control of the lighting device where the shutter means is not disposed and open/close control of the shutter means so that time when the lighting device where the shutter means is not disposed



turns on and time when the shutter opens are switched alternately on a time basis.

15. A lead inspection apparatus of an IC package for inspecting abnormalities of lead terminals of an IC package and inspecting the IC package from the top surface thereof by photographing images formed by illuminating lead terminals of the IC package and top surface of the IC package, comprising:

- a first lighting device disposed below the IC package;
- a translucent IC package support having a width corresponding to a center area of a bottom surface of the IC package, for guiding light of the first lighting device to an area near the bottom surface of the IC package, and for supporting the IC package;

first light shielding means for shielding an area outside the bottom surface of the IC package support so that light of the first lighting device is guided to an area near the bottom surface of the IC package only from the bottom surface of the IC package support;

second light shielding means for shielding at least a face of the IC package support opposing to the lead terminals so that a height of an exposed portion of the IC package support is longer than stand-off of the lead terminals of the IC package such that light is irradiated only to a part of the lead terminals closer to a center side of the IC package from tip portions of the leads;

two mirror means disposed at both sides of the IC package, respectively;



second lighting device disposed above the IC package, for illuminating the top surface of the IC package;

a single photographing means disposed above the IC package, for photographing images of the lead terminals guided by the mirror means, and photographing the top surface of the IC package illuminated by the second lighting device; and

illumination control means for switching illumination of the first and second lighting devices alternately on a time basis,

whereby inspection of the lead terminals and inspection of the IC package from the top surface thereof are performed at a single stage.

16. In a lead inspection apparatus of an IC package for inspecting abnormalities of an IC package by placing the IC package on a stage with its rear surface up, illuminating the rear surface of the IC package by a lighting device disposed above the IC package, and photographing the illuminated rear surface of the IC package, the lead inspection apparatus of an IC package comprising:

a plurality of lighting devices each operating under different illumination conditions for the IC package and disposed above the IC package; and

control means for switching illumination of the plurality of lighting devices for the IC package sequentially on a time basis.



17. The inspection apparatus of an IC package according to Claim 16, wherein the control means sequentially switches the lighting time of the plurality of lighting devices.

18. The inspection apparatus of an IC package according to Claim 16, wherein the control means comprises:

a plurality of shutter means disposed in front of the plurality of lighting devices, respectively, for shielding or passing light from each lighting device; and

shutter open/close control means for switching open or close of the plurality of shutter means sequentially.

19. The inspection apparatus of an IC package according to Claim 16, wherein the control means comprises:

one or a plurality of shutter means disposed on a part of the plurality of lighting devices, for shielding or passing light from the lighting devices; and

illumination control means for executing lighting control of the lighting devices where the shutter means is not disposed, and for executing open/close control of the shutter means so that time when the lighting devices where the shutter means is not disposed turn on and time when the shutters means are open are sequentially controlled.