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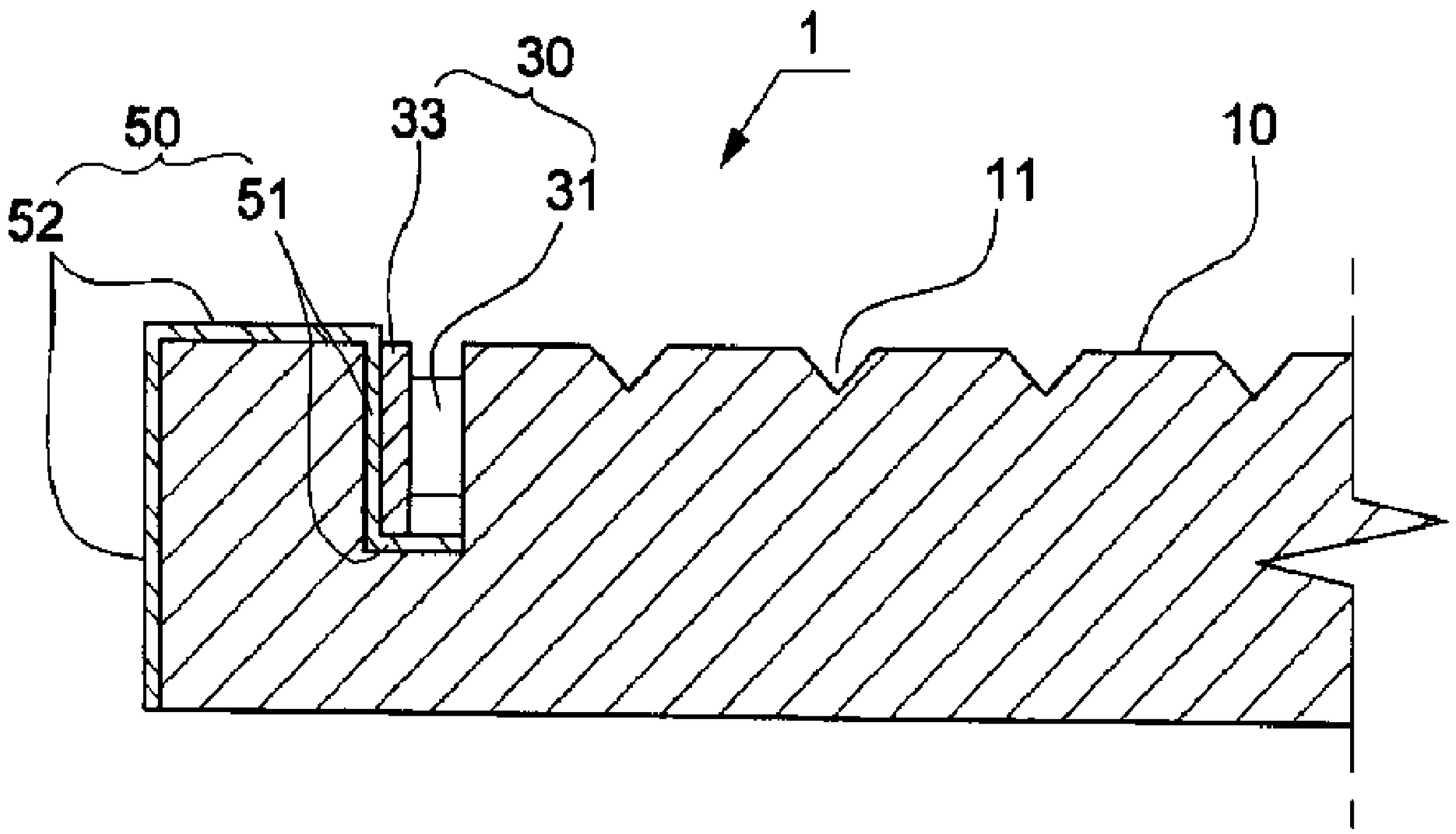
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(54) Titre : UNITE DE RETROECLAIRAGE CAPABLE D'ADOPTER FACILEMENT UNE FORME INCURVEE ET TRIDIMENSIONNELLE
(54) Title: BACKLIGHT UNIT CAPABLE OF EASILY FORMING CURVED AND THREE-DIMENSIONAL SHAPE



(57) Abrégé/Abstract:
Disclosed herein is a backlight unit (1), capable of easily forming a curved or three- dimensional shape. The backlight unit (1) according to the present invention comprises a light guide panel (10) which includes a light guide plate having on one surface of both surfaces thereof a plurality of notches (11), an uneven dot pattern, a printed dot patter or a sanded surface, of a light diffusion plate; a luminous means which includes a lamp (31) mounted on a PCB (33) to emit light to the light guide panel (10); a groove (13) formed along an edge of the light guide panel (10) so that the luminous means is installed in the light guide panel; and a thin heat radiating plate (50) fices on a back surface of the PCB (33) along the groove.

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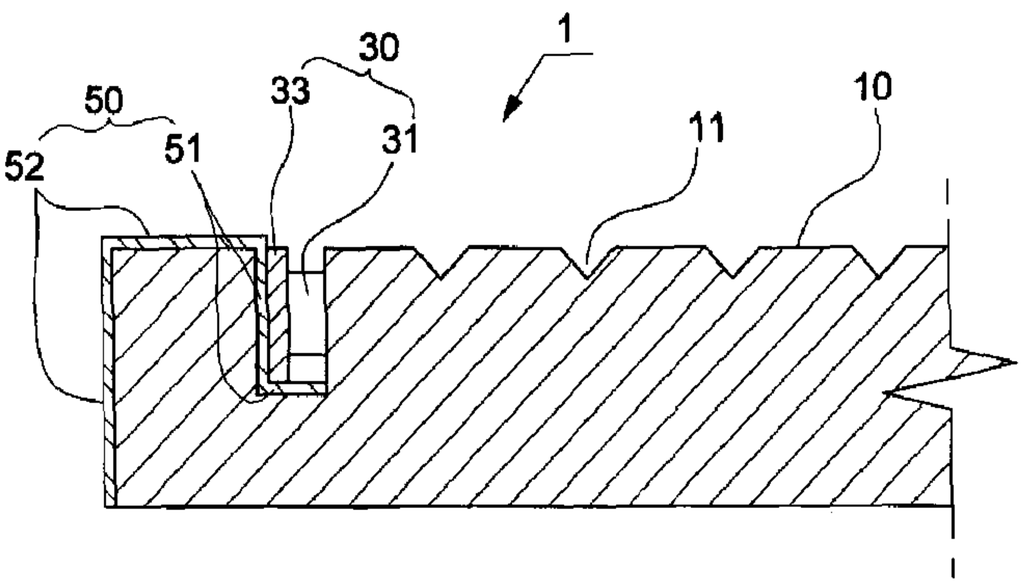
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(54) Title: BACKLIGHT UNIT CAPABLE OF EASILY FORMING CURVED AND THREE-DIMENSIONAL SHAPE



(57) Abstract: Disclosed herein is a backlight unit (1), capable of easily forming a curved or three- dimensional shape. The backlight unit (1) according to the present invention comprises a light guide panel (10) which includes a light guide plate having on one surface of both surfaces thereof a plurality of notches (11), an uneven dot pattern, a printed dot patter or a sanded surface, of a light diffusion plate; a luminous means which includes a lamp (31) mounted on a PCB (33) to emit light to the light guide panel (10); a groove (13) formed along an edge of the light guide panel (10) so that the luminous means is installed in the light guide panel; and a thin heat radiating plate (50) fices on a back surface of the PCB (33) along the groove.

WO 2007/049847 A1

BACKLIGHT UNIT CAPABLE OF EASILY FORMING CURVED AND THREE-DIMENSIONAL SHAPE

Technical Field

The present invention relates to a backlight unit capable of easily forming a curved or three-dimensional shape, and more particularly, to a backlight unit, in which a heat radiating plate comprises a thin plate so that a light guide panel has a curved shape, thus easily conforming to a PCB (Printed Circuit Board) even when it is installed to have a curved shape, and which has excellent waterproofing, to protect a luminous means and a circuit even when the backlight unit is installed under water, thus maximizing the lifespan of a lamp.

Further, the present invention relates to a backlight unit capable of easily forming a curved or three-dimensional shape, which is constructed so that the front of a light guide panel is neat and tidy, and all components including an electric wire are accommodated within the thickness of the light guide panel, thus being resistant to external interference or impact, being easy to handle, and minimizing the likelihood of damage thereto. Further, the present invention facilitates packaging or installing operation, and enables the manufacturing of various shapes of backlight units, using a flexible PCB.

Background Art

Generally, a backlight unit used for an LCD (Liquid Crystal Display), advertisement, illumination, floor illumination, a decoration, etc. includes a light guide panel comprising a light transmittable acrylic plate or a transmittable plate made of a mixture of acryl and a light diffusing substance. A lamp, which emits light, is mounted on one side of the light guide panel. A predetermined pattern of notches, an uneven dot pattern, a printed dot pattern, or a sanded surface is provided on a surface of the light guide panel so as to guide the optical path or light diffusion of the lamp.

FIG. **1** is a rear view showing the construction of a conventional backlight unit **100**, and FIG. **2** is a detailed sectional view taken along line A-A of FIG. **1**.

Referring to FIGS. **1** and **2**, the backlight unit is constructed as follows. That is, lamps **131** emitting light are provided on one side of a light guide panel **110** which is made of a light transmitting material. A plurality of V-shaped notches **112** is formed on the back surface of the light guide panel **110** in horizontal and vertical directions so as to uniformly diffuse light emitted from the side of the light guide panel **110** toward the front of the light guide panel **110** to which a display film **140** is attached. A reflection sheet **150** made of a PET material may be adhered to the back surface of the light guide panel **110** having the V-shaped notches.

Further, a heat radiating plate **180** is secured to a Printed Circuit Board (PCB) **133** having the lamps **131**, and a bracket **170** is additionally installed to support the lamps **131**, the heat radiating plate **180**, etc.

The backlight unit is mainly to be used in a light transmitting illumination means of an advertising structure to meet corporate demand. However, if the backlight unit is applied to interior decoration items for consumers, such as pictures or photographs, it could create considerable demand.

However, the conventional backlight unit **100** was problematic in that the PCB must adhere to the heat radiating plate **180**, and the bracket **170** must be separately fastened to the light guide panel using tape, a screw, etc., so that the backlight unit **100** was marketed and sold to consumers in the form of a finished product having a fixed specification, thus it was difficult to custom-make the backlight unit according to individual special requirements.

Further, it was impossible to manufacture shapes other than a rectangular shape.

In other words, the prior art had several problems, in terms of the operation of cutting the light guide panel and the bracket **170**, the installation of the luminous means, and the assembly of the bracket, so that it was difficult to manufacture the backlight unit at a desired site. Thus, the usefulness of the backlight unit was low, so that the applicable field of the backlight unit was limited.

Further, since the bracket had to be separately provided, the cost of materials and the working period were increased, and thus the cost of manufacturing the backlight unit was increased.

Since the bracket and the heat radiating plate were manufactured through aluminum extrusion, they had considerable thickness of about lmm at least, so the bracket and the heat radiating plate were not easily bent. Thus, when the light guide panel and the PCB were bent in a curved shape, it was impossible to manufacture the backlight unit at a desired site. Further, due to the thickness of the heat radiating plate, a step was formed, in which case when backlight units were loaded or carried in large quantities, fillers must be provided so as to compensate for the difference in thickness, thus inconveniencing a manufacturer. Even when a consumer assembles the backlight unit, the step caused by the thickness difference must be compensated.

Summary of the Invention

In accordance with one aspect of the invention there is provided a backlight unit. The apparatus includes a light guide panel which includes a light guide plate having on a front or back surface thereof a plurality of notches, an uneven dot pattern, a printed dot pattern or a sanded surface, or a light diffusion plate. The apparatus also includes at least one luminous means including light emitting diodes (LEDs) mounted on a front surface of printed circuit board (PCB). The apparatus further includes a groove having two sidewalls and formed along an extremity of the front or back surface of the light guide panel. The luminous means and a part of a thin heat radiating plate are fitted between the two sidewalls of the groove with the heat radiating plate and a back face of the printed circuit board being in direct contact with each other, and the light emitting diodes being in direct contact with one sidewall of the groove.

The groove may have one end extending to an edge surface of the light guide plate, through which an electric wire may be provided into the groove to supply electricity to the luminous means.

A separate light guide piece may be attached to the light guide plate and the groove may extend through the plate and into but not through the separate light guide piece.

The heat radiating plate may be made of an aluminum material, and the heat radiating plate may be bent at least once, so that the part of the heat radiating plate may be fitted into the groove and the remaining part of the heat radiating plate may be arranged on the outside of the light guide panel.

A white reflection film may be provided on a bottom surface of the groove, so that light from the light emitting diodes may be reflected from the reflection film and the luminous means and the electric wire may be screened from the outside.

When the groove is curved, the heat radiating plate may be provided with a plurality of V-shaped notches to facilitate fitting into the curved groove.

Two luminous means may be provided at both ends of the groove and the luminous means may be connected to each other by the electric wire running in the intervening section of the groove between the two luminous means.

The present invention may provide a backlight unit, which is easily custom-made at a desired site according to consumers' special requirements, thus easily and rapidly satisfying individuals' demands as well as companies' demands, thus extending the applicable range to a backlight unit for individual use, maximizing the accessibility to consumers, and creating vast demands.

The present invention may also provide a backlight unit, capable of easily forming a curved shape or a three-dimensional shape through vacuum forming.

In order to accomplish the above objects, the present invention provides a backlight unit comprising a light guide panel which includes a light guide plate having on one surface or both surfaces thereof a plurality of notches, an uneven dot pattern, a printed dot pattern or a sanded surface, or a light diffusion plate; a luminous means which includes a lamp mounted on a PCB to emit light to the light guide panel; a groove formed along an edge of the light guide panel so that the luminous means is installed in the light guide panel; and a thin heat radiating plate fixed on a back surface of the PCB along the groove.

The present invention provides a backlight unit, which does not require a bracket installing operation or a PCB adhering operation, thus reducing manufacturing costs of the backlight unit.

The present invention also provides a backlight unit, in which a heat radiating plate comprises a thin plate, so that it is convenient to deal with the case where a light guide panel or a PCB is installed in a curved shape, and it is not necessary to compensate for a surface step.

The present invention also provides a backlight unit, which is easily custom-made at a desired site according to consumers' special requirements, thus easily and rapidly satisfying individuals' demands as well as companies' demands, thus extending the applicable range to a backlight unit for individual use, therefore maximizing the accessibility to consumers, and creating vast demands.

The present invention also provides a backlight unit, in which an entrance of a groove receiving a luminous means is provided on only one place, and the groove is sealed with tape, thus affording excellent waterproofing, therefore protecting the luminous means and a circuit even if the backlight unit is installed under water. Thereby, the life-span of lamps is maximized.

The present invention also provides a backlight unit, in which components installed in a groove, for example, a PCB, are not exposed to the front surface of a light guide panel, thus providing a neat and tidy display screen, and in which all components including an electric wire are embedded within the thickness of the light guide panel, thus being resistant to external interference or impact, being easy to handle, minimizing damage, and allowing the packing or installing operation to be conveniently performed.

The present invention also provides a backlight unit, in which a light guide panel becomes slim, thus increasing flexibility and achieving lightness, therefore being easy to bend and install to be suitable for a curved structure, and being easy to handle.

Finally, the present invention allows various three-dimensional backlight units to be manufactured using a flexible PCB, thus remarkably extending the applicable range of the backlight unit.

Brief Description of the Drawings

The above 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:

FIG. **1** is a rear view showing the construction of a general light guide panel;

FIG. **2** is a detailed sectional view taken along line A-A of FIG. **1**;

FIG. **3** is an exploded perspective view showing a backlight unit, according to the first embodiment of the present invention;

FIG. **4** is a perspective view showing the assembled state of the backlight unit of FIG. **3**;

FIG. **5** is a detailed sectional view showing important parts of the backlight unit shown in FIG. **4**;

FIGS. **6** to **12** are views corresponding to FIG. **5**, showing the modifications of the first embodiment;

FIG. **13** is a view showing the construction of the backlight unit, according to the first embodiment of the present invention;

FIG. **14** is a view illustrating the process of manufacturing the backlight unit, according to the first embodiment of the present invention;

FIG. **15** is a view illustrating the process of manufacturing a curved-type backlight unit, according to the first embodiment of the present invention;

FIG. **16** is a view showing the backlight unit in use, according to the first embodiment of the present invention;

FIG. **17** is an exploded perspective view of the backlight unit, according to the first embodiment of the present invention, with some components omitted;

FIG. **18** is a perspective view showing the backlight unit of FIG. **10** in an assembled state;

FIG. **19** is a detailed sectional view of the backlight unit FIG. **18**, with some components omitted;

FIG. **20** is a rear view showing a light guide panel of a backlight unit, according to the second embodiment of the present invention;

FIG. **21** is a rear view showing a light guide panel of a backlight unit, according to the third embodiment of the present invention;

FIG. **22** is a rear view showing a light guide panel of a backlight unit, according to the fourth embodiment of the present invention;

FIG. **23** is a rear view showing a backlight unit, according to the fifth embodiment of the present invention;

FIG. **24** is a partial exploded perspective view of a backlight unit, according to the sixth embodiment of the present invention;

FIG. **25** is a view showing the construction of a backlight unit, according to the seventh embodiment of the present invention;

FIG. **26** is a partial cutaway perspective view showing the construction of a backlight unit, according to the eighth embodiment of the present invention;

FIG. **27** is a sectional view of a backlight unit, according to the ninth embodiment of the present invention, with some components omitted; and

FIG. **28** is a sectional view of a backlight unit, according to the tenth embodiment of the present invention, with some components omitted.

Description

Hereinafter, a backlight unit capable of easily forming a curved or three-dimensional shape, according to the preferred embodiment of the present invention, will be described in detail with reference to the accompanying drawings.

FIG. **3** is an exploded perspective view showing a backlight unit, according to the first embodiment of the present invention, FIG. **4** is a perspective view showing the backlight unit of FIG. **3** in an assembled state, and FIG. **5** is a detailed sectional view showing important parts of the backlight unit shown in FIG. **4**.

That is, a light guide panel **10** of the invention comprises a light guide plate having on one surface or both surfaces thereof a plurality of V-shaped notches **11**, an

uneven dot pattern, a printed dot pattern or a sanded surface, or a light diffusion plate.

Guide slots **31**a may be formed on a PCB **33** at a predetermined interval (see FIG. **14**). The PCB **33** has the shape of a strip which is thin and long, and is cut to a desired size to be connected to an electric wire.

As shown in FIGS. **6** to **12**, a thin heat radiating plate **50** includes at least one groove fitting part **51** and one exposed part **52**. The groove fitting part **51**, which is fitted into a groove **13** of the light guide panel **10** and includes a PCB contact part, is formed on one or more surfaces of the thin heat radiating plate **50**. The exposed part **52**, which is exposed to the outer surface of the light guide panel **10**, is formed on one surface of the thin heat radiating plate **50**, or two or three surfaces of the thin heat radiating plate **50** which is bent and extends to a predetermined position.

The thin heat radiating plate **50** may be variously formed, as long as each of the groove fitting part **51** which is in contact with the PCB **33** and is installed in the groove **13** and the exposed part **52** which extends from the groove fitting part **51** to be exposed to the outside is provided on at least one surface of the thin heat radiating plate **50**. Preferably, each of the groove fitting part **51** and the exposed part **52** is formed on two or more surfaces so as to maximize the heat absorbing area and the heat emitting area.

In this case, it is preferable that the thin heat radiating plate **50** comprises a thin aluminum plate.

When the thin heat radiating plate **50**, that is, the thin aluminum plate, is formed to have a thickness from **0.2**mm to **0.4**mm, the thin heat radiating plate **50** is easily bent, and a step protruding from the surface of the light guide panel is very small, so that it is not necessary to compensate for the step.

Further, as shown in FIG. **13**, a step **15**a may be formed at a portion extending from the groove **13** to an end of the light guide panel **10** on the outer surface thereof. The step **15**a has a thickness corresponding to that of the thin heat radiating plate **50**. That is, while the groove **13** is formed, part of the light guide panel **10** is cut by the thickness of the thin heat radiating plate **50**. Thereby, the entire surface of the light guide panel **10** is formed to be flat.

Further, a luminous means **30** and the thin heat radiating plate **50** may not be provided on one side of the light guide panel, but may be provided on two opposite sides, three sides, or on all surfaces.

The manufacture and operating state of the backlight unit **1** according to this invention, constructed as described above, will be described below.

FIG. **14** is a view illustrating the process of manufacturing the backlight unit **1**, according to the present invention. First, as shown in FIG. **15**, a raw light guide panel **10** comprising a light guide plate having the V-shaped notches **11** or dots, or a light diffusion plate is cut to a desired size, according to the ordered specification, at step SIl. The groove **13** is formed at a position adjacent to an end of the light guide panel **10**, so that the luminous means is installed in the groove **13**, at step S**12**.

At this time, the size of the groove **13** is determined so that LED (Light Emitting Diode) lamps **31** mounted on the PCB **33** and the thin heat radiating plate **50** are tightly fitted into the groove **13** and are not undesirably moved.

Next, the PCB **33** on which the LED lamps **31** are continuously mounted at a predetermined interval is cut to a length corresponding to the groove **13** at step S**21**, and is connected to an electric wire **35** at step S**22**. The electric wire **35** is provided with a contact jack **35**a.

Further, the thin heat radiating plate **50**, which is formed to be long in a lengthwise direction and is made of aluminum, is cut to a length corresponding to that of the PCB **33** at step S**31**.

Then, when the luminous means **30** and the thin heat radiating plate **50** are forcibly fitted into the groove **13** of the light guide panel **10**, undesirable movement of the luminous means **30** and the thin heat radiating plate **50** is prevented by the elasticity of the light guide panel **10**, the luminous means **30**, and the thin heat radiating plate **50**, so that the components are firmly assembled with each other. Thus, the manufacturing operation is easily completed.

As such, according to the invention, the bracket installing operation and the PCB adhering operation are not required. For example, a groove forming machine, a saw, scissors, and other simple tools are prepared at a manufacturing site, such as a

retail location, and the backlight unit can be easily manufactured at such a location to be suitable for the ordered specification.

Therefore, the present invention is capable of easily satisfying the varying requirements of individuals as well as companies requiring many products having the same specification, through custom-made manufacture performed at any location.

Further, the thin heat radiating plate **50** is formed to be thin. Thus, as shown in FIG. **15**, even when the PCB **33** is installed in a curved form, V-shaped notches **53** are cut in the thin heat radiating plate **50**, thus allowing the thin heat radiating plate **50** to be freely bent. In this way, a contact surface of the thin heat radiating plate **50** contacting the PCB may be formed.

Thus, it is easy to comply with a circular or a fan-shaped backlight unit at a desired location. The step relative to the surface of the light guide panel **10** is very small, so that the step compensating operation using the filler, which is performed in the prior art when a large number of backlight units is loaded or a backlight unit is inserted into a frame, is not required. Thereby, it is convenient to install the backlight unit in the frame.

When the backlight unit **1** of the invention is inserted into a frame **3**, with a picture or a display film **25** being placed on the front surface of the backlight unit, as shown in FIG. **16**, light of the LED lamps, transmitted through the light guide panel at predetermined intervals, illuminates a picture or a photograph from behind. Thereby, the backlight unit **1** of the invention can be utilized as a decorative item for producing a distinctive atmosphere.

Meanwhile, an entrance **13**a is formed on only one end of the groove **13** of the light guide panel **10** to communicate with the exterior, and a closure end **13**b is provided on the other end of the groove **13**, so that the entrance **13**a is placed on one place. Preferably, a coupling groove **13**e is formed between PCB mounting parts **13**c which are provided on opposite sides, so that the electric wire **35** is inserted into the coupling groove **13**e.

Preferably, a white film **21** for screening and reflecting is provided on a surface of the groove **13**, which faces the front of the light guide panel **10**.

The colors of the PCB **33** and the electric wire **35** installed in the groove **13**, and the shadow of the LED lamps **31** are displayed on the front surface **10**a of the

light guide panel and a display film **25**. However, the white film **21** is installed on the bottom of the groove **13**, thus reflecting the light of the lamps **31** and making the PCB **33** and the electric wire **35** diffuse when viewed from the outside.

Preferably, the thin heat radiating plate **50** is installed to extend from the PCB **33** to the back surface **10**b of the light guide panel **10**.

Preferably, in order to efficiently prevent moisture from entering the groove **13**, the entrance **13**a is provided on an end of a bent part **13**d which is bent from the PCB mounting part **13**c.

As shown in FIG. **20**, the bent part **13**d may be bent from the PCB mounting part **13**c only once to have the shape of an "L". However, when the bent part **13**d is bent twice in the Z shape shown in FIG. **21**, the electric wire **35** is prevented from being removed by an external force.

Further, the groove **13** is formed on the back surface of the light guide panel **10**, and the luminous means **30** is installed in the groove **13**. Afterwards, the thin heat radiating plate **50** and a reflection sheet **12** are sequentially assembled. Next, the thin heat radiating plate **50** is coupled to the reflection sheet **12** via a reflection tape **61**, or is coupled to the light guide panel **10**. Further, a sealing packing **63** is provided on the entrance **13**a.

When the light guide panel **10** has a rectangular shape, as shown in FIG. **22**, the groove **13** is preferably formed in a "U" shape along the circumference of the light guide panel **10**. The PCBs **33** equipped with the LED lamps **31** are mounted on the corresponding PCB mounting parts **13**c, and the electric wire **35** is inserted into the coupling groove **13**e which couples the PCB mounting parts **13**c to each other. It is preferable that the coupling groove **13**e be narrower and shallower than each PCB mounting part **13**c.

Further, as shown in FIG. **23**, in which the thin heat radiating plate and the reflection tape are omitted, when the light guide panel has a circular shape or other shapes and the PCBs and the LED lamps are mounted on both sides, the coupling groove **13**e couples the PCB mounting parts **13**c to each other. Thereby, the coupling groove **13**e and the PCB mounting parts **13**c are formed along the circumference of the light guide panel **10**.

Further, when the light guide panel **10** is formed to have a three-dimensional shape (see, FIGS. **24** and **25**), the PCB **33** installed in the groove **13** comprises a flexible PCB **33'** which is easily bent. The flexible PCB has excellent bendability and assemblability, so that it is suitable for a three-dimensional arrangement.

Preferably, the thin heat radiating plate **50** used together with the flexible PCB **33'** has a plurality of notches **53** to correspond to the shape of the groove **13**.

The notches **53** may be alternately formed on the side of the thin heat radiating plate **50** contacting the flexible PCB **33'** and the opposite side. The thin heat radiating plate **50** having the notches **53** formed in this way may be mounted on the light guide panel **10** regardless whether it is bent in any shape.

The reflection tape **61**, provided along the circumference of the light guide panel **10**, uses a white adhesive tape, called a 'side tape', which is generally used to prevent the loss of light.

A reflection sheet **23** is attached to the back surface of the light guide panel **10**.

The outer portion of the light guide panel **10** is generally machined on the plane using a carving tool. The groove **13** in which the luminous means **30** is installed is simultaneously machined to be in the same plane (see, FIGS. **15** and **16**).

The PCB **33**, on which the LED lamps **31** are mounted at predetermined intervals, is fitted into the groove **13** of the light guide panel formed as such, and the thin heat radiating plate **50** is installed. The sealing packing **63** threaded in the electric wire **35** is provided on the entrance **13**a of the groove **13**. Subsequently, the circumference of the exposed part of the thin heat radiating plate **50**, the edge of the light guide panel **10**, and the groove **13** including the coupling groove **13**e which is open yet are covered with the reflection tape **61**, thus simultaneously performing a waterproof sealing operation and securing the thin heat radiating plate **50**. Thereby, the manufacture of the backlight unit is completed.

According to the invention manufactured in this way, the entrance **13**a serving as the exterior passage of the groove **13** is formed at only one place, and the waterproof sealing operation and the operation of securing the luminous means **30** and the thin heat radiating plate **50** are performed using the reflection tape **61**. Thus, the present invention provides excellent waterproofing and affords ease of manufacture.

In other words, the groove **13** in which the PCB is installed is sealed with tape at the back surface **10**b of the light guide panel, and the sealing packing **63** is provided at or silicone is input to the entrance **13**a, which is the only passage communicating with the exterior, thus completely preventing water from entering.

Thereby, even if the backlight unit is installed under water, it does not cause any problem because it is waterproof. Therefore, the life-span of the luminous means is maximized and the applicable range of the backlight unit is increased.

Further, even when the luminous means **30** is installed on opposite sides of the light guide panel **10**, the electric wire **35** is not exposed to the outside but is installed in the coupling groove **13**e to be sealed therein. That is, all components are housed and embedded within the thickness of the light guide panel **10**, so that components other than the plate do not protrude to the outside and do not sag. Thereby, the backlight unit is resistant to external interference and impact, and is easy to handle. Further, the possibility of damage to the backlight unit is minimized, and it is convenient to install and load the backlight unit.

Since the frame or the heat radiating plate are not exposed outside the edge of the light guide panel **10** and the white film **21** is installed in the groove **13**, the light of the LED lamps **31** installed in the groove **13** is reflected on a display screen, and the PCB **33**, the LED lamps **31**, and the electric wire **35** are not reflected on the front surface **10**a of the light guide panel. Thus, a neat display screen is achieved.

An important advantage of the present invention is that one can freely manufacture the backlight unit having the curved shape or the three-dimensional shape, using the flexible PCB **33'**, without the frame used in the prior art. The light guide panel may be manufactured to have any shape using a thermal deformation forming process. For example, as shown in FIG. **25**, the light guide panel may be manufactured to be suitable for the cover of a cockpit of a helicopter, a lower end of which varies in height and curvature. Thus, the flexible PCB **33'** which is freely bent and the thin heat radiating plate **50** having the notches **53** are installed in the curved groove **13**, so that it is possible to manufacture various three-dimensional backlight units.

Further, the thin heat radiating plate **50** can be installed throughout a wide range to cover the back surface **10**b of the light guide panel **10**, so that the heat

emitting operation of the luminous means **30** is efficiently carried out. The operation of securing the thin heat radiating plate **50** to the light guide panel **10** is implemented using the reflection tape **61**. Thus, it is easy to manufacture the backlight unit.

Meanwhile, as in the embodiments shown in FIGS. **26** to **28**, the light guide panel **10** includes a slim panel **10**c which is thinner than the depth of the groove **13**, and an adding piece **10**d which is partially provided to form the groove **13**.

In this case, the adding piece **10**d combines with the slim panel **10**c, thus providing the thickness for forming the groove **13**. The adding piece **10**d is made of a material which may adhere to the slim panel **10**c.

That is, the adding piece **10**d is added to complement the insufficient thickness of the slim panel **10**c, thus forming a groove **13** having sufficient depth for installation of the PCB **33**. Preferably, the adding piece **10**d having a narrow width is attached to the part for mounting the luminous means, which is provided in the slim panel **10**c.

Further, the adding piece **10**d adheres to the back of the groove forming part of the slim panel **10**c, and a reflection sheet **81** is provided on part of the outer surface of the adding piece **10**d to prevent the leakage of light.

According to another embodiment of the present invention, a compensation panel **70** is provided on the back of the slim panel **10**c and connected to the adding piece **10**d to form a flat surface.

The compensation panel **70** may be made of a porous shock absorbing material, such as Styrofoam, or MDF (Medium Density Fiberboard).

As shown in FIG. **13**, the slim panel **10**c may have a step **15**a which extends from the groove **13** to an end of the slim panel **10**c and has a depth corresponding to the thickness of the thin heat radiating plate **50**.

Further, the thin heat radiating plate **50** includes a part which is provided in the groove **13** while contacting the PCB **33**. The thin heat radiating plate **50** is bent from the PCB contact part and extends to surround the outer portions of the slim panel **10**c and the adding piece **10**d. That is, the thin heat radiating plate **50** is preferably formed throughout a larger area so as to maximize a heat absorbing area and a heat emitting area.

The groove **13** is preferably formed on the side of the slim panel **10**c. However, the groove **13** may be formed on the side of the adding piece **10**d.

As such, since the light guide panel comprises the relatively thin slim panel **10c**, the light guide panel is smoothly bent. Thus, even when the backlight unit is mounted on a curved surface, such as a cylindrical structure, it is easy to make it comply with the curve surface, so that it is very convenient and easy to install the backlight unit at a desired spot.

Hereinbefore, the preferred embodiments of the present invention have been described with reference to the accompanying drawings. It is to be understood that the words which have been used are words of description rather than limitation and that changes within the purview of the appended claims may be made without departing from the true scope and spirit of the invention. Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A backlight unit, comprising:

a light guide panel which includes a light guide plate having on a front or back surface thereof a plurality of notches, an uneven dot pattern, a printed dot pattern or a sanded surface, or a light diffusion plate;

at least one luminous means including light emitting diodes (LEDs) mounted on a front surface of a printed circuit board (PCB); and

a groove having two sidewalls and formed along an extremity of the front or back surface of the light guide panel, wherein the luminous means and a part of a thin heat radiating plate are fitted between the two sidewalls of the groove with the heat radiating plate and a back face of the printed circuit board being in direct contact with each other, and the light emitting diodes being in direct contact with one sidewall of the groove.

2. The backlight unit as set forth in claim **1**, wherein the groove has one end extending to an edge surface of the light guide plate, through which an electric wire is provided into the groove to supply electricity to the luminous means.

3. The backlight unit as set forth in claim **1**, wherein a separate light guide piece is attached to the light guide plate and the groove extends through the plate and into but not through the separate light guide piece.

4. The backlight unit as set forth in claim **1**, wherein the heat radiating plate is made of an aluminum material, and wherein the heat radiating plate is bent at

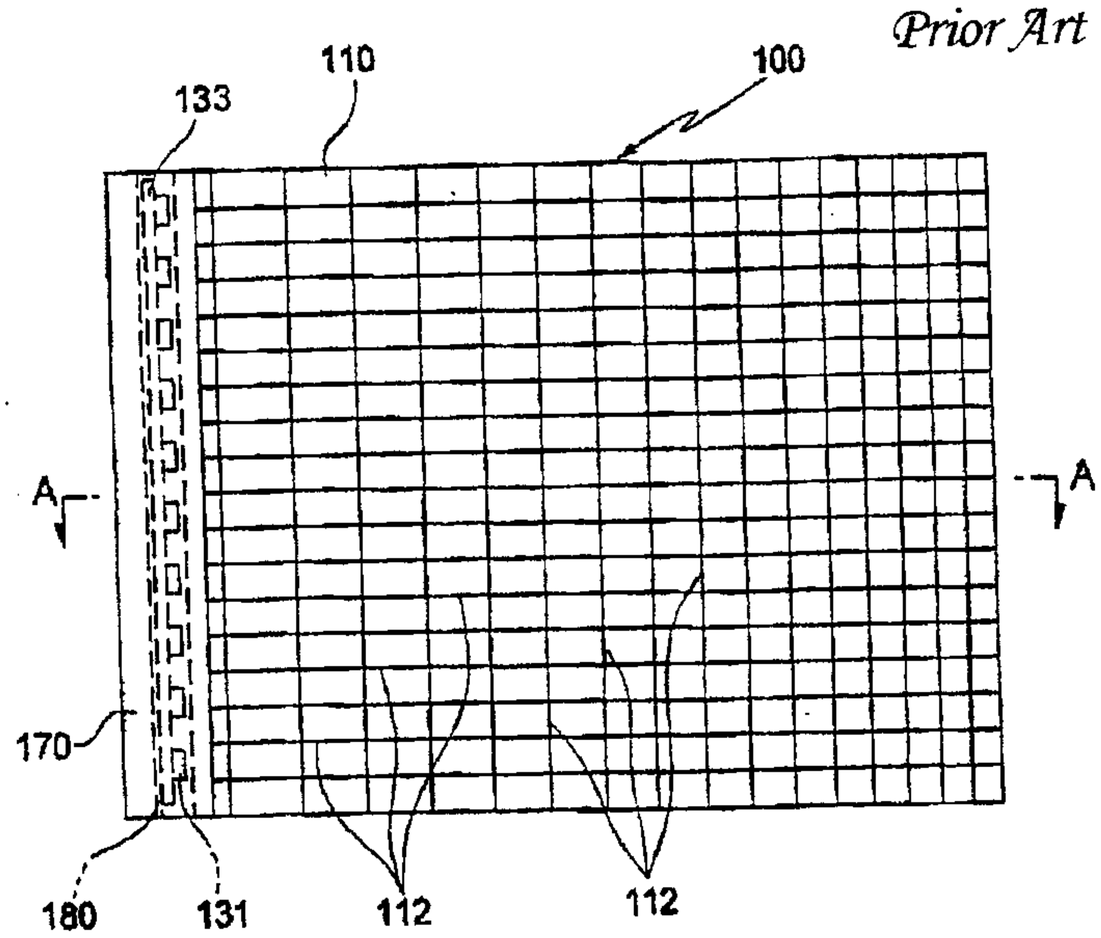
least once, so that the said part of the heat radiating plate is fitted into the groove and the remaining part of the heat radiating plate is arranged on the outside of the light guide panel.

5. The backlight unit as set forth in claim **1**, wherein a white reflection film is provided on a bottom surface of the groove, so that light from the light emitting diodes can be reflected from the reflection film and the luminous means and the electric wire can be screened from the outside.

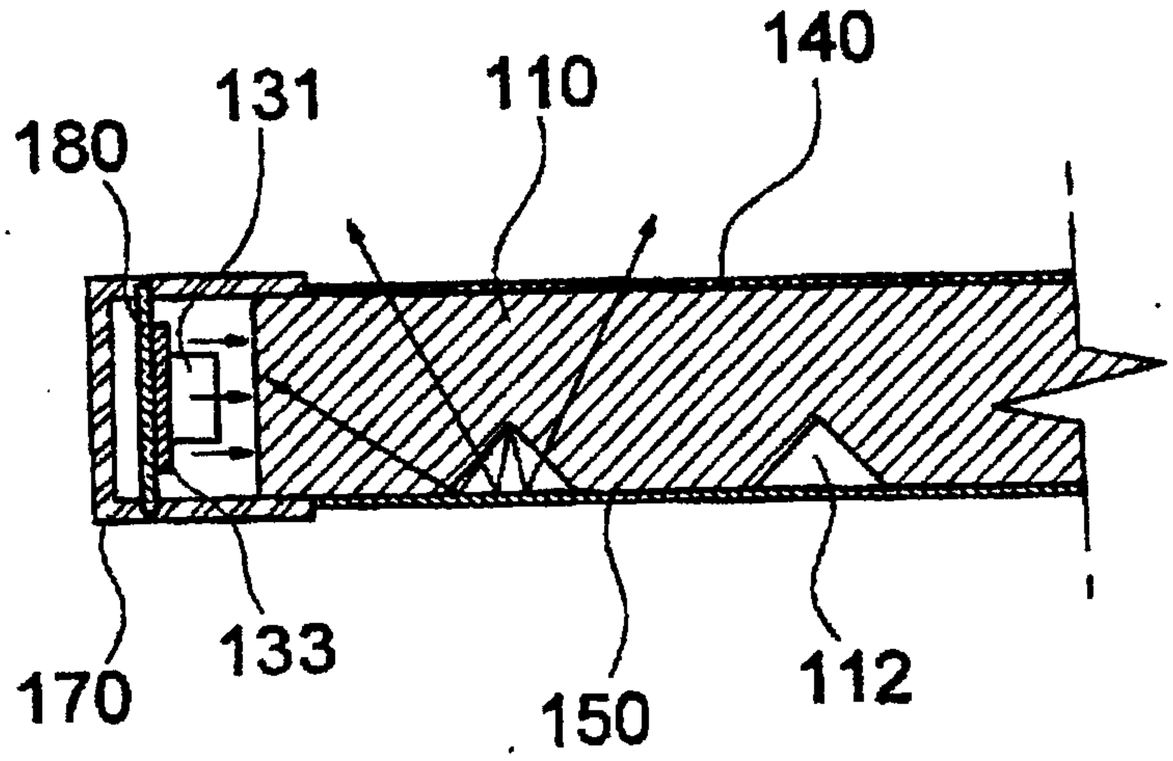
6. The backlight unit as set forth in claim **1**, wherein when the groove is curved, the heat radiating plate is provided with a plurality of V-shaped notches to facilitate fitting into the curved groove.

7. The backlight unit as set forth in claim **2**, wherein two luminous means are provided at both ends of the groove and the luminous means are connected to each other by the electric wire running in the intervening section of the groove between the two luminous means.

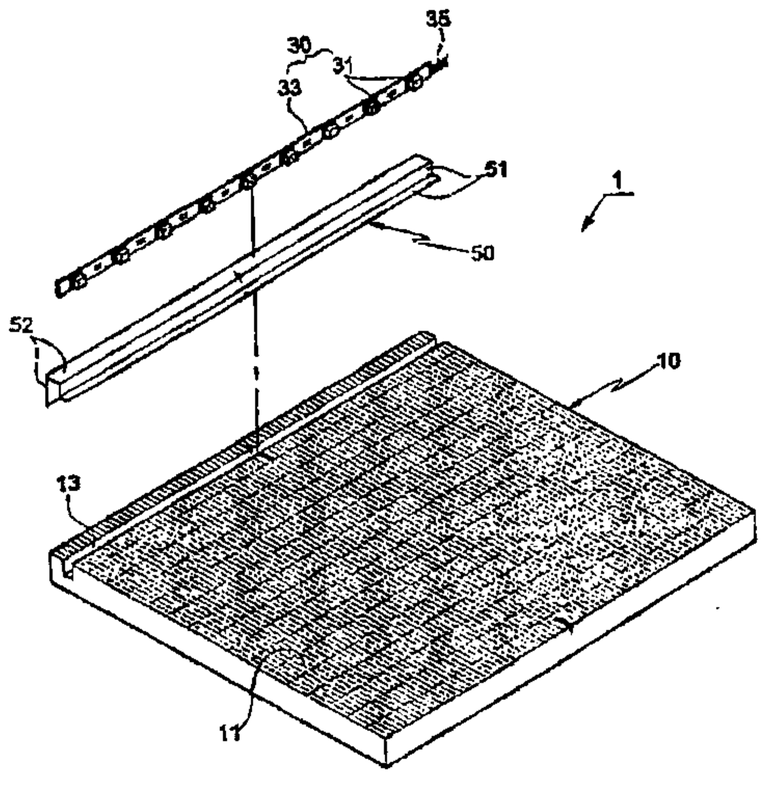
[Fig. 1]
Prior Art



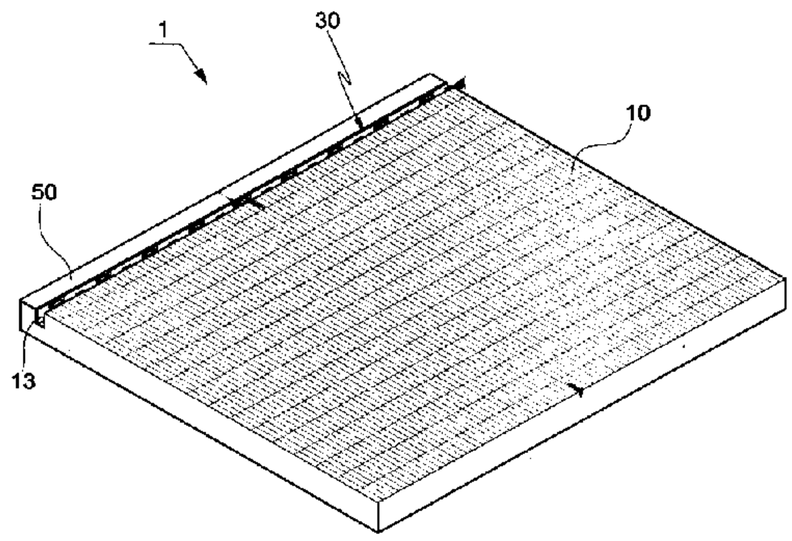
[Fig. 2]
Prior Art



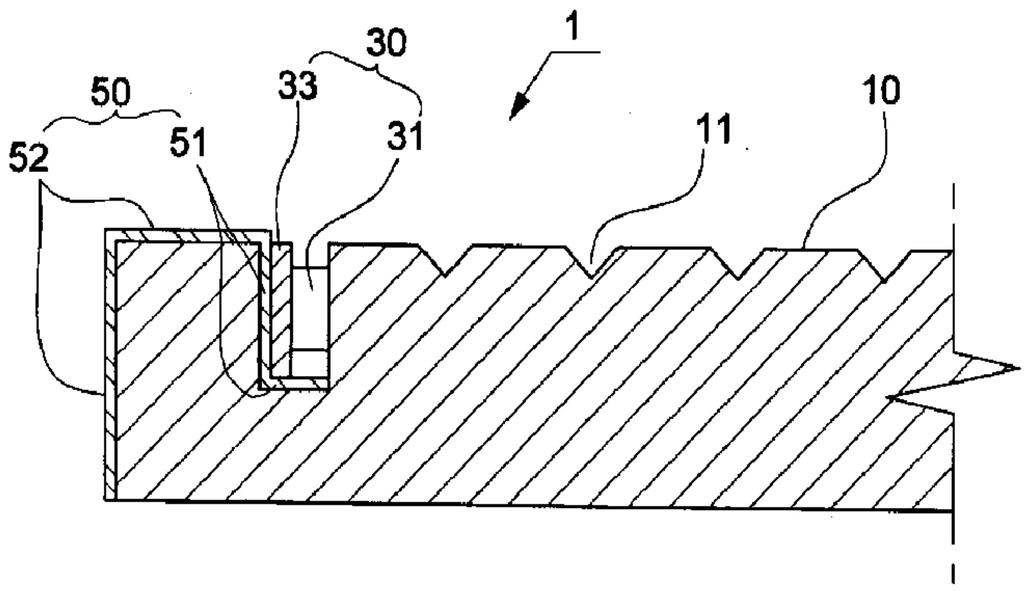
[Fig. 3]



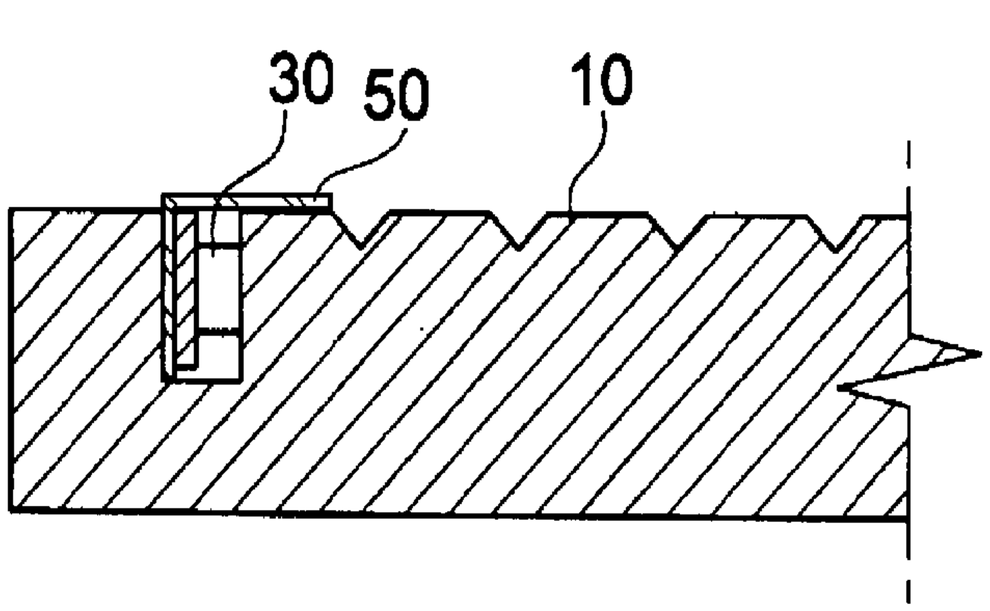
[Fig. 4]



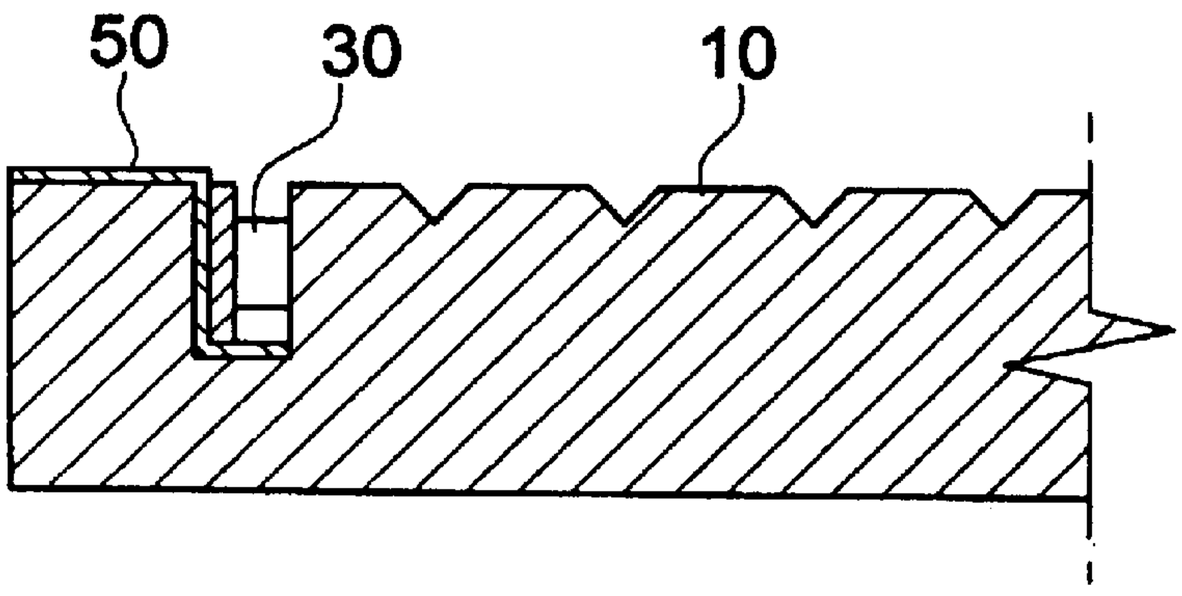
[Fig. 5]



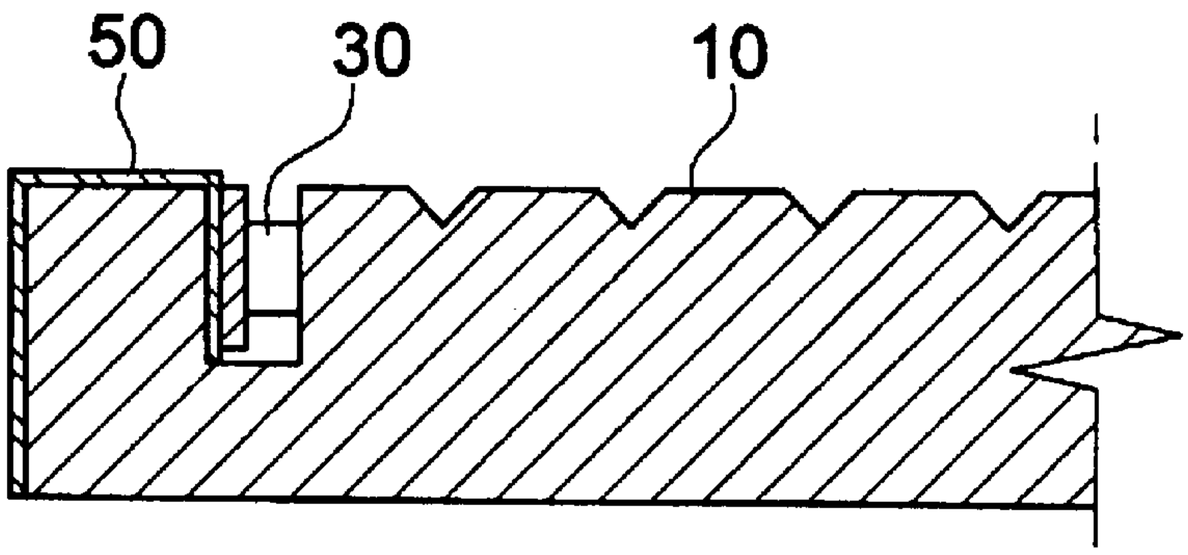
[Fig. 6]



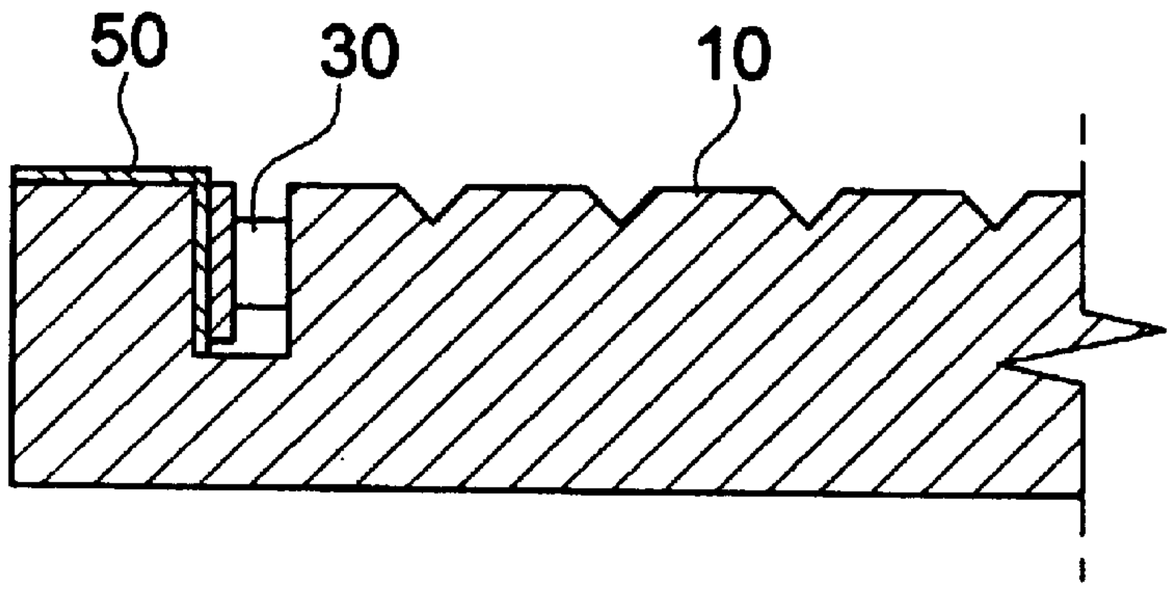
[Fig. 7]



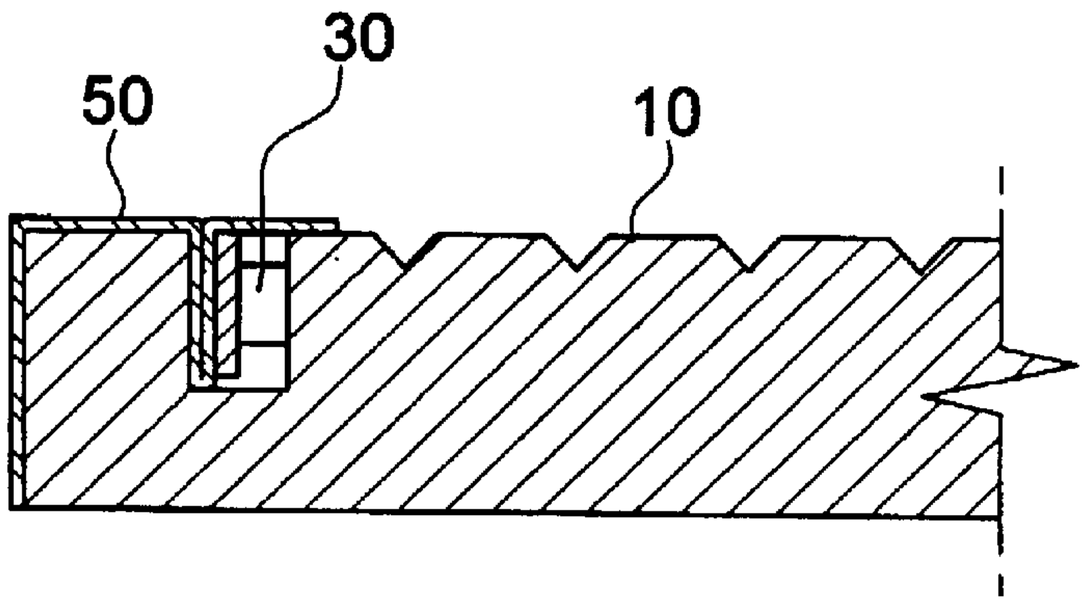
[Fig. 8]



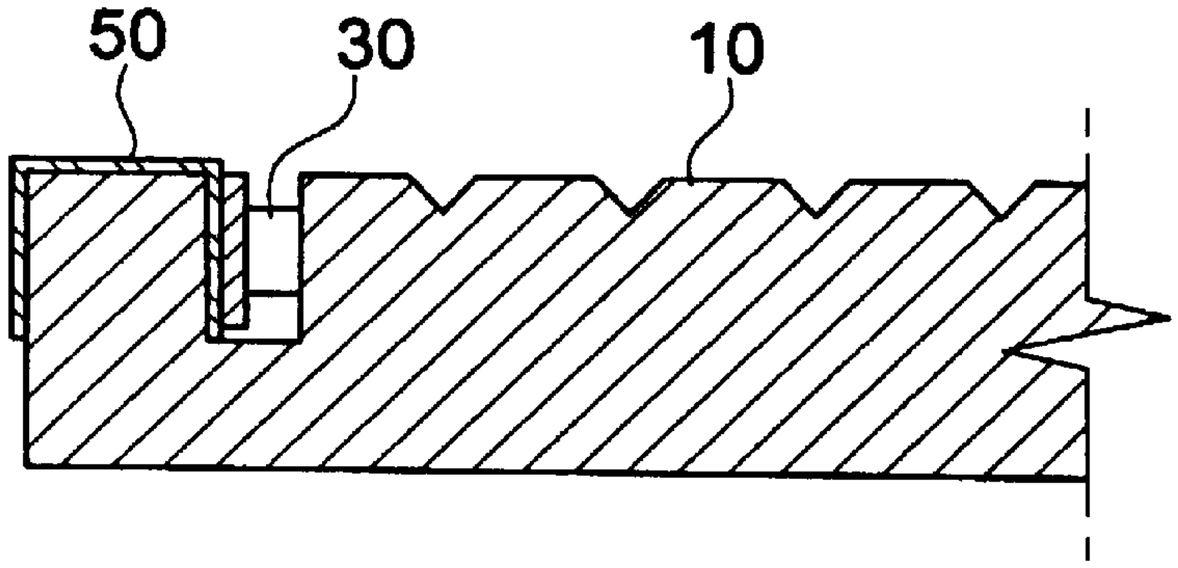
[Fig. 9]



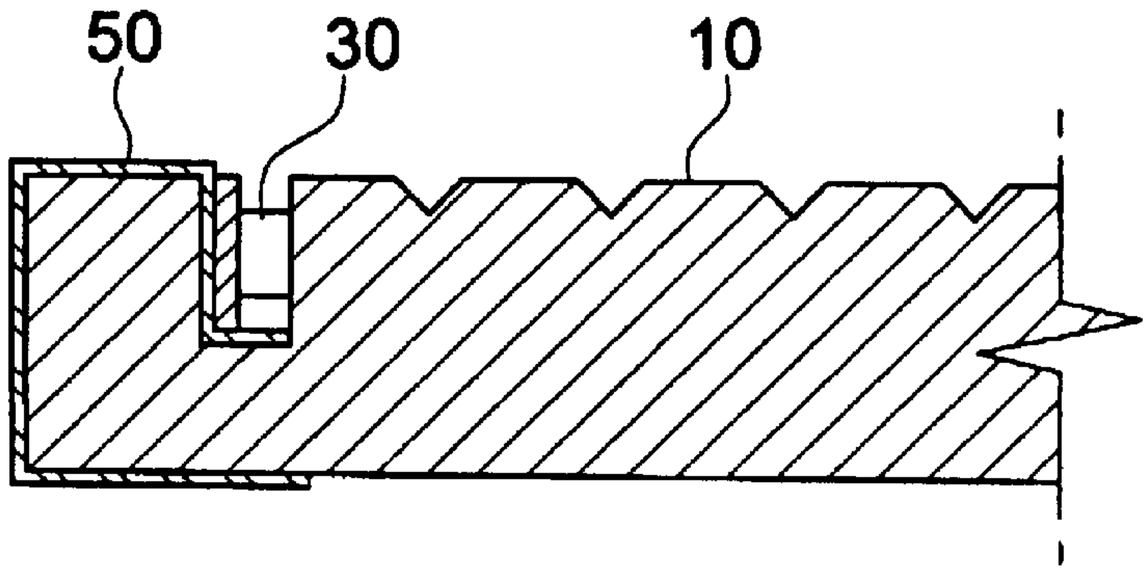
[Fig. 10]



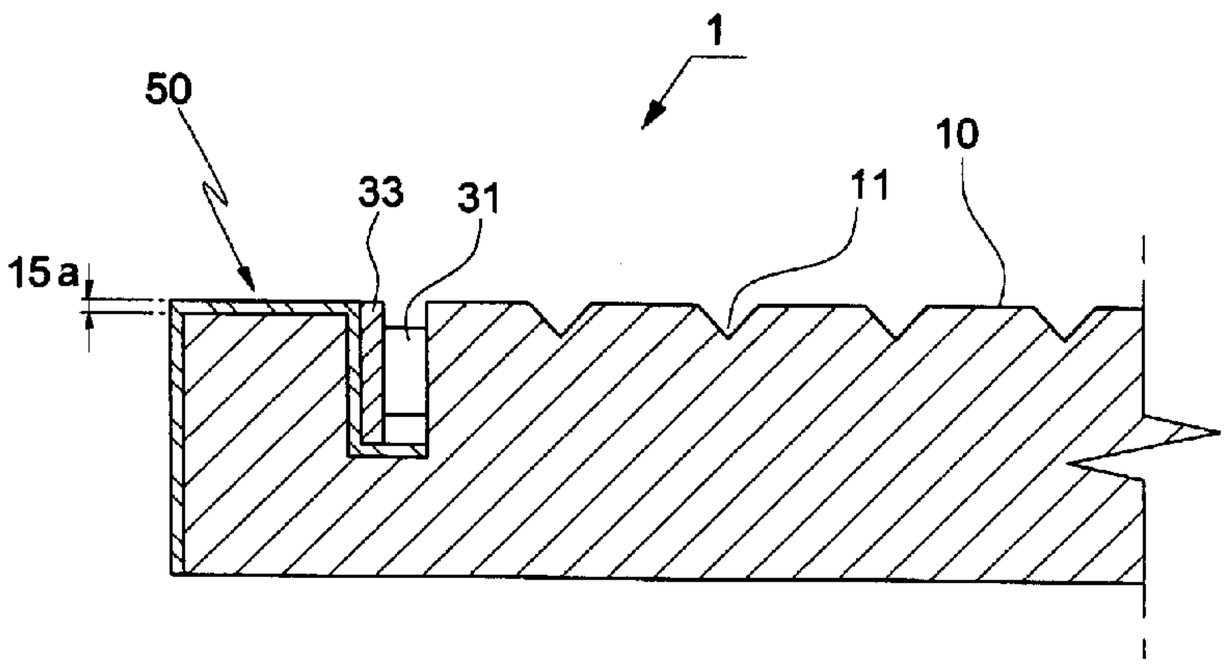
[Fig. 11]



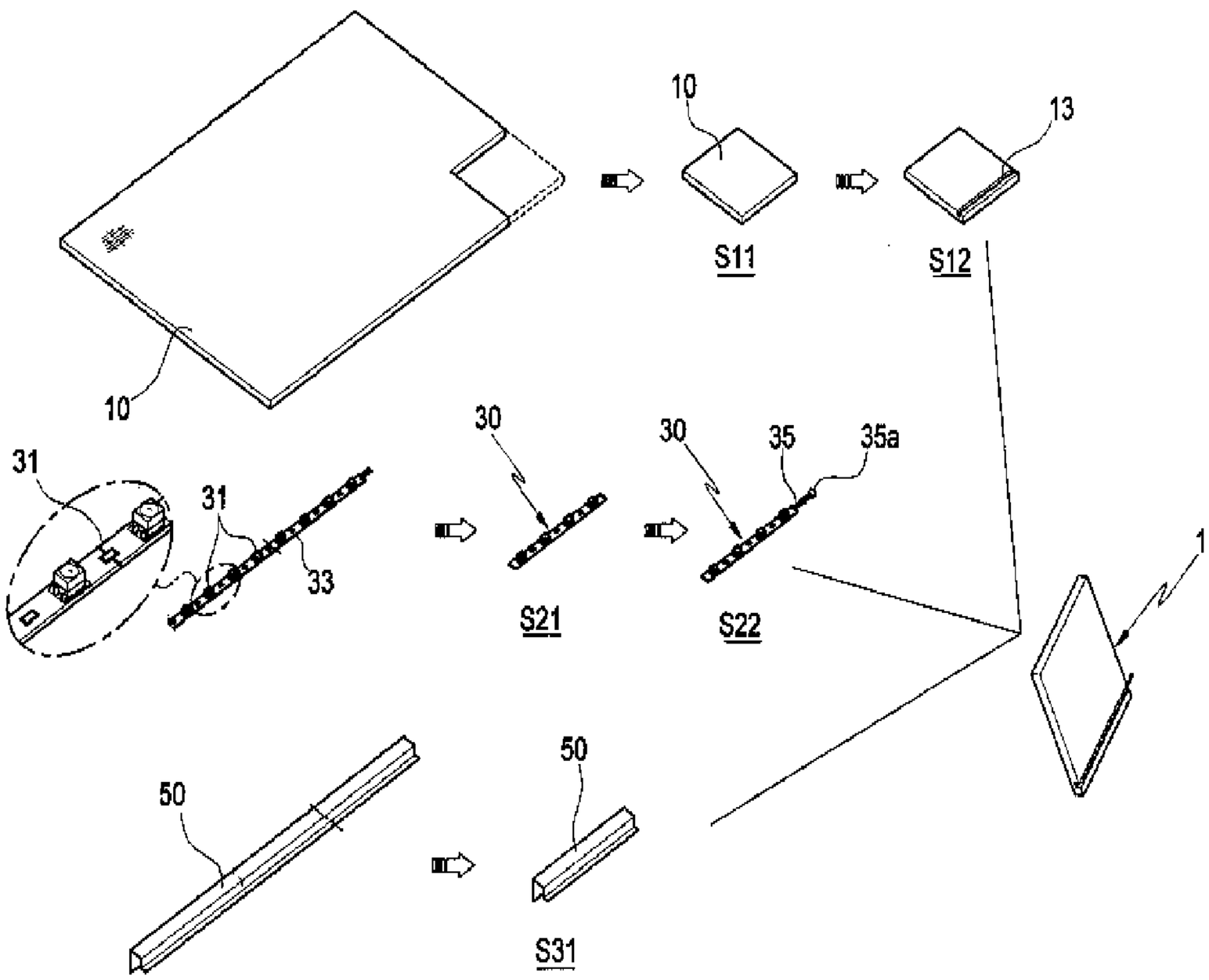
[Fig. 12]



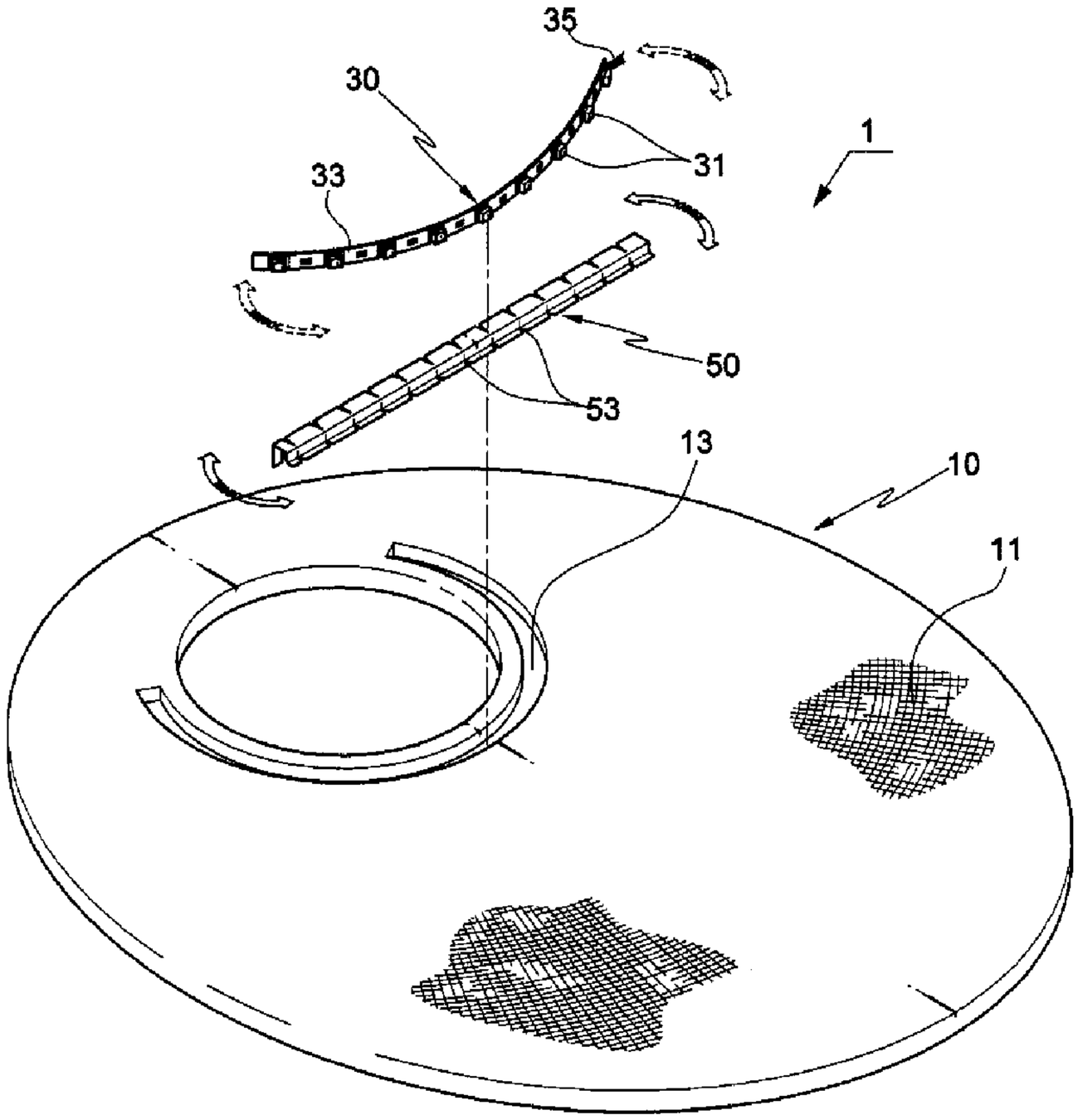
[Fig. 13]



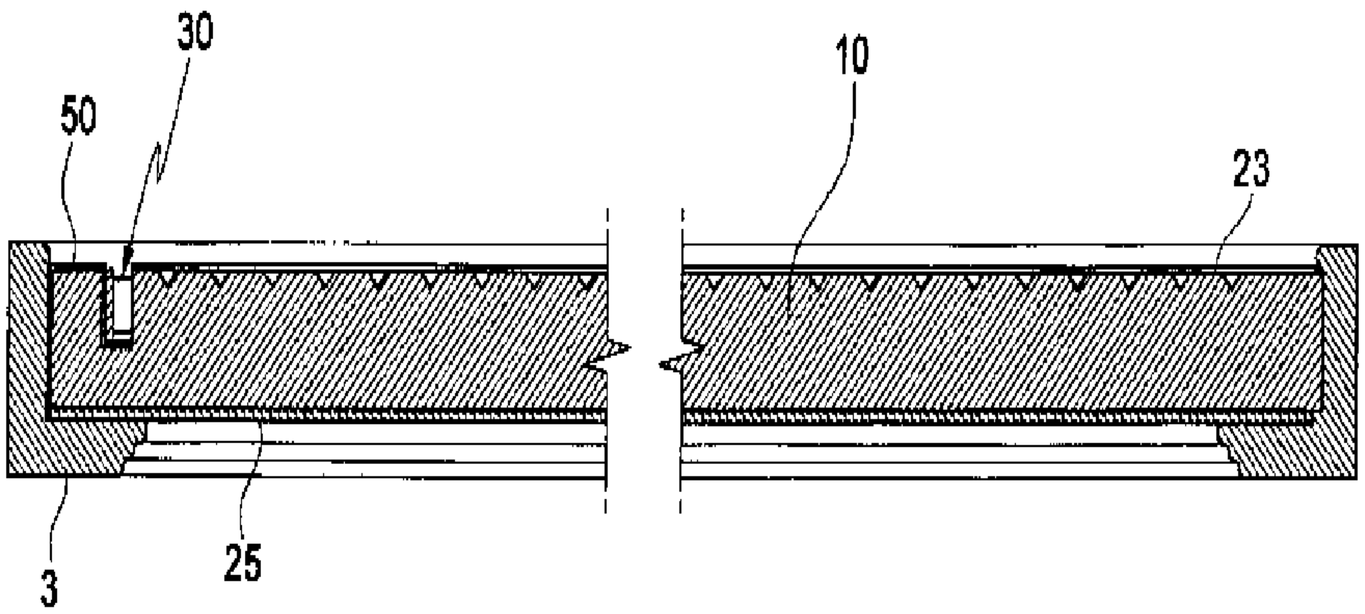
[Fig. 14]



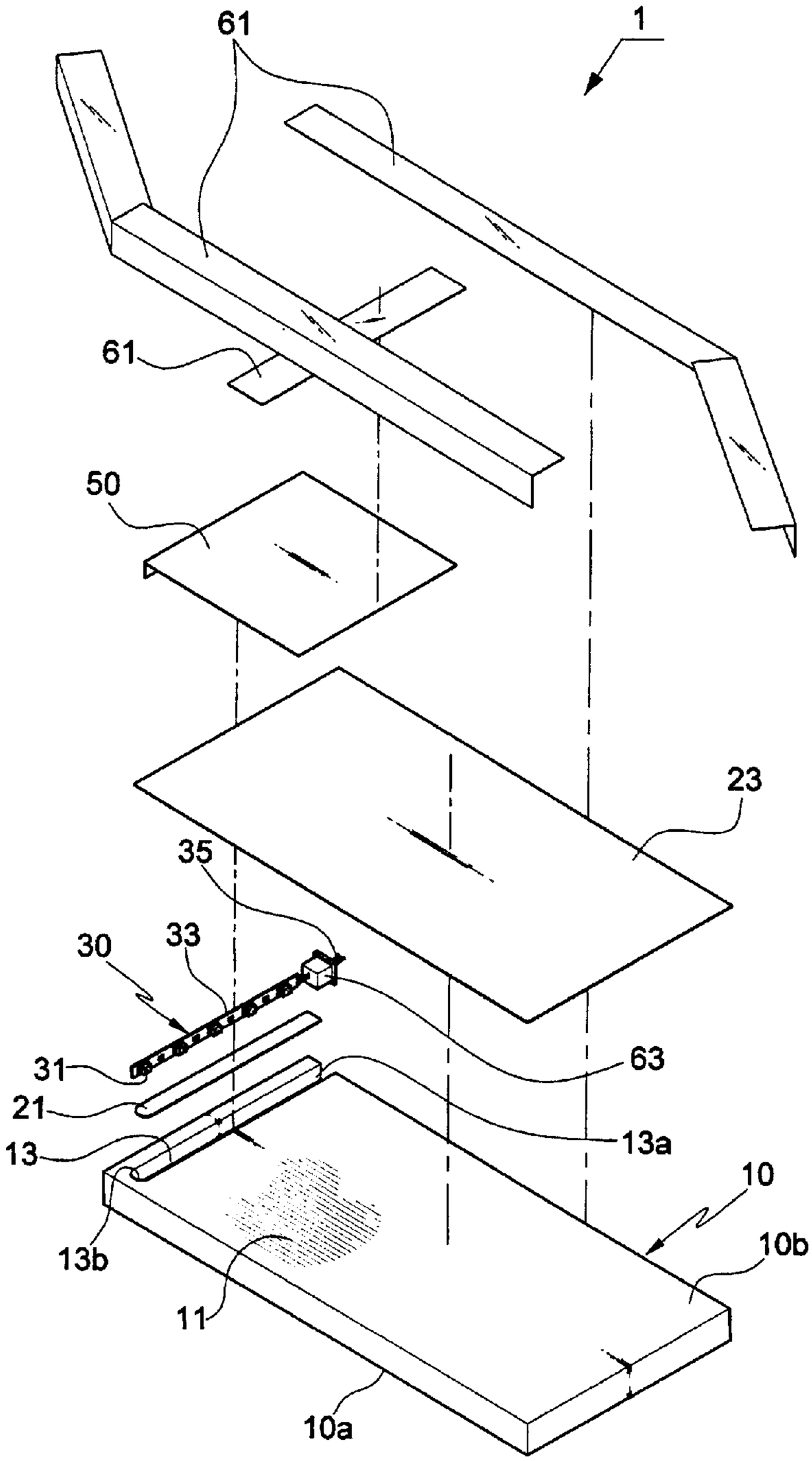
[Fig. 15]



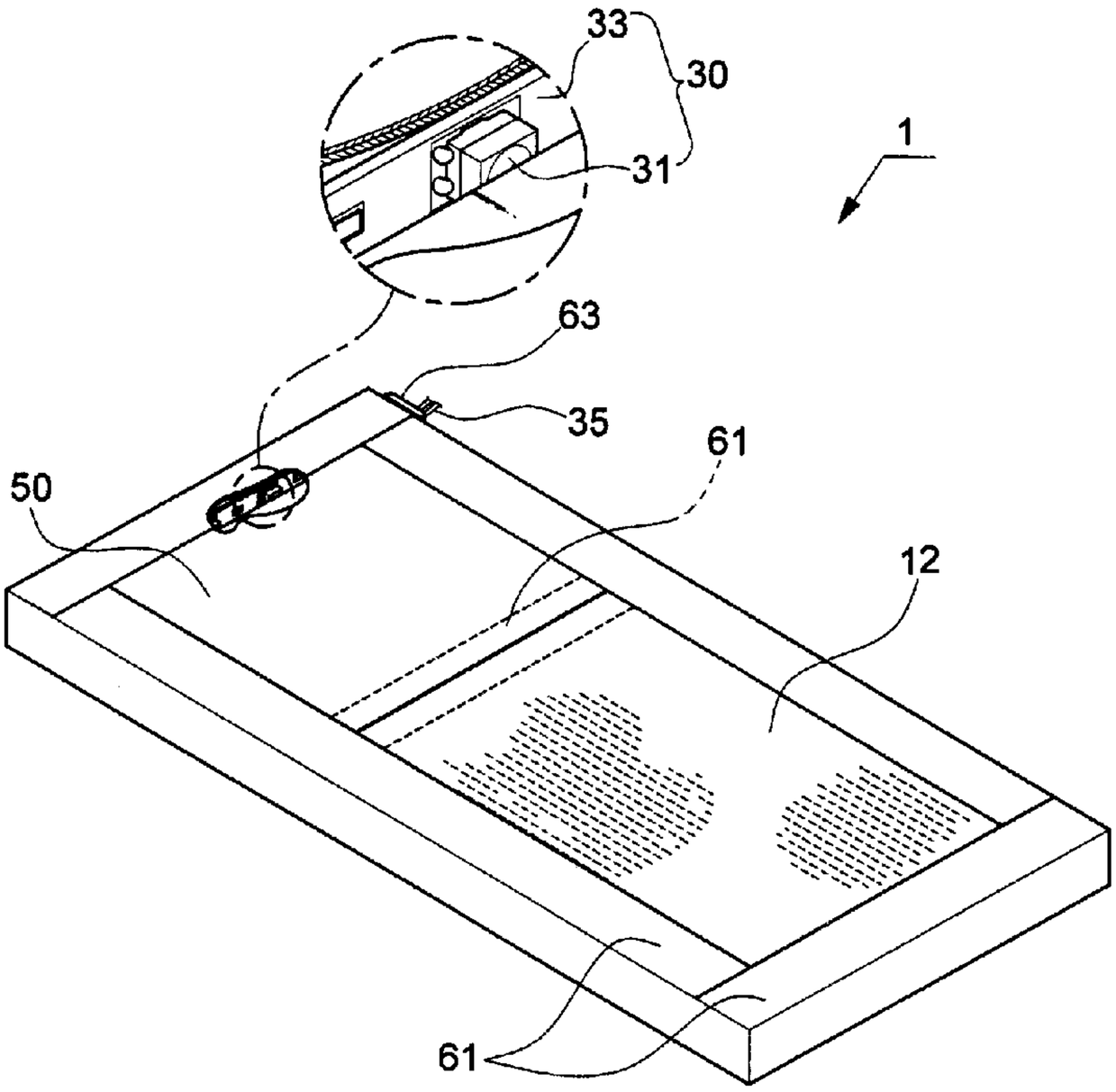
[Fig. 16]



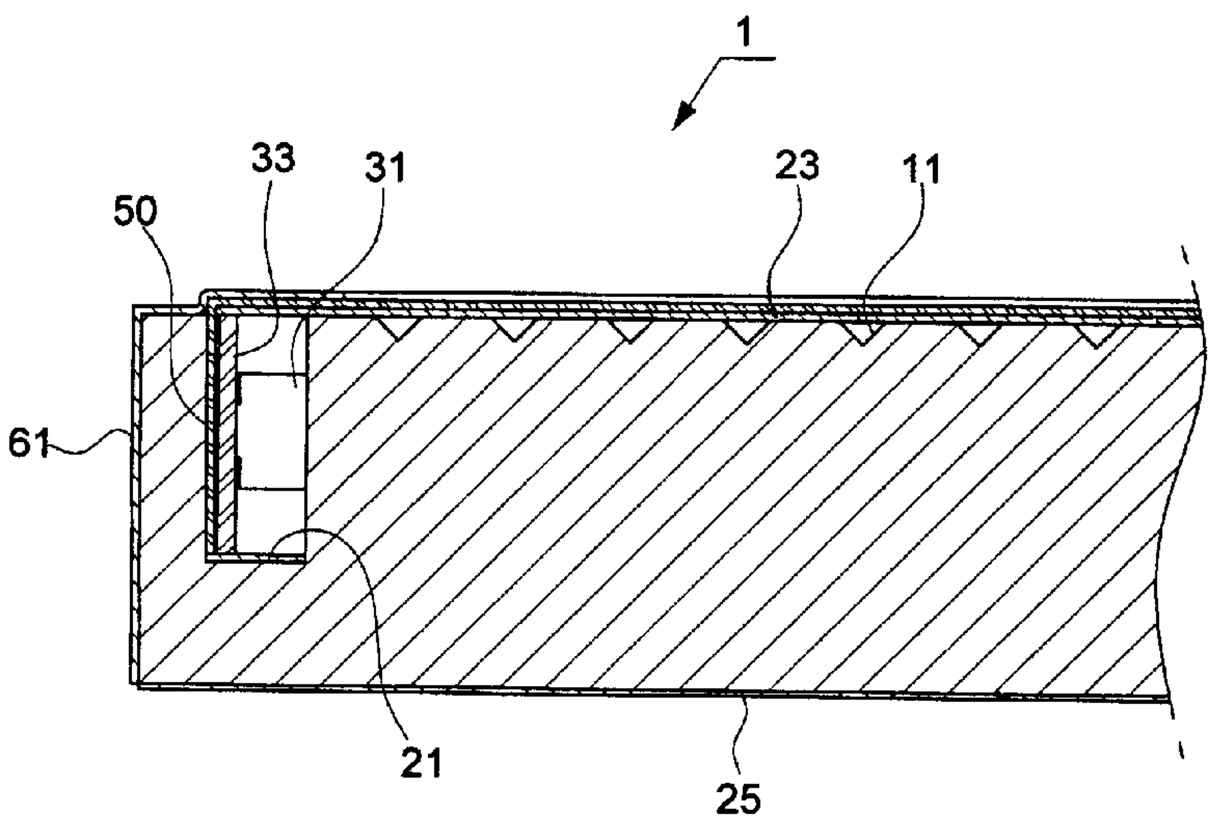
[Fig. 17]



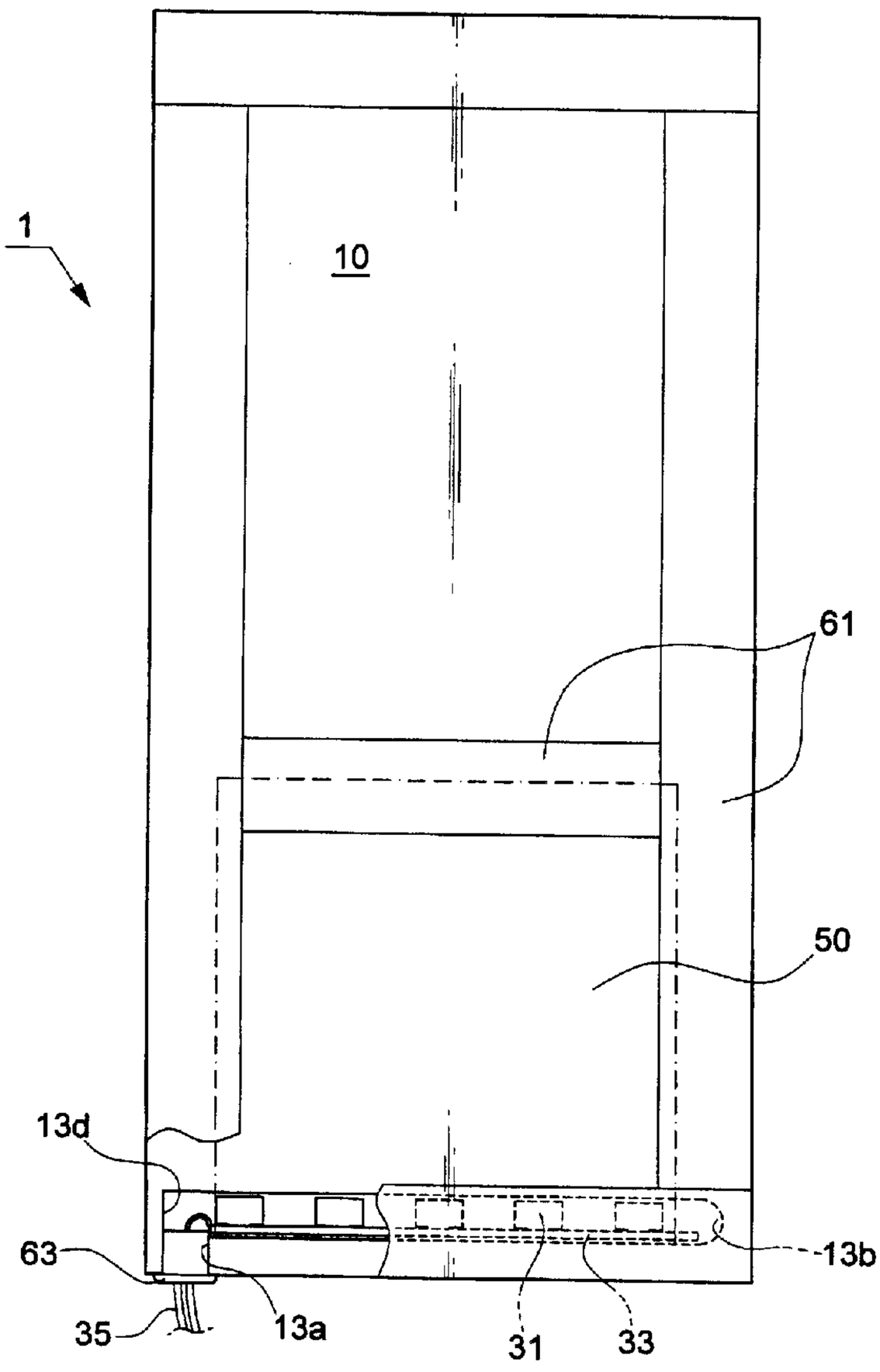
[Fig. 18]



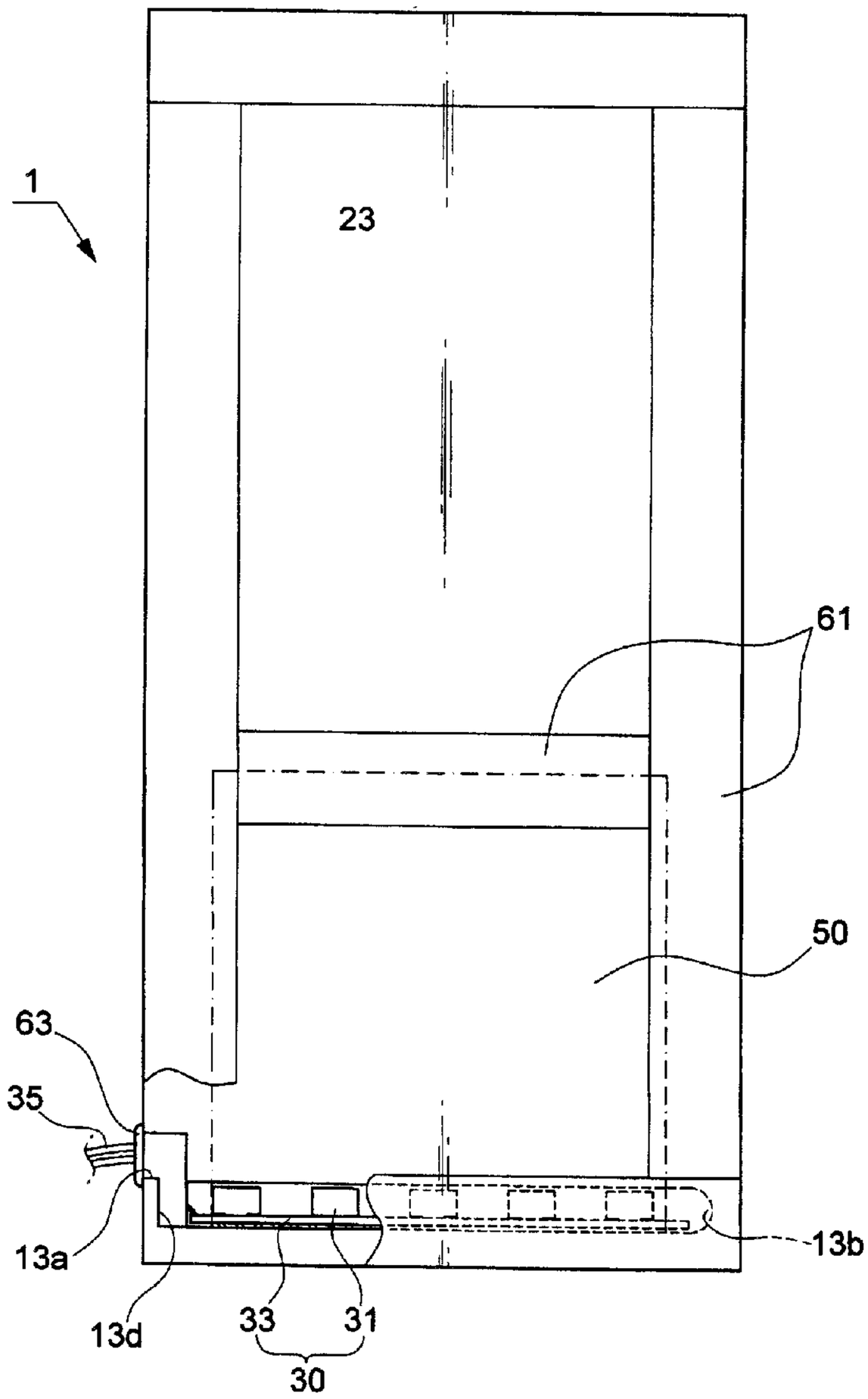
[Fig. 19]



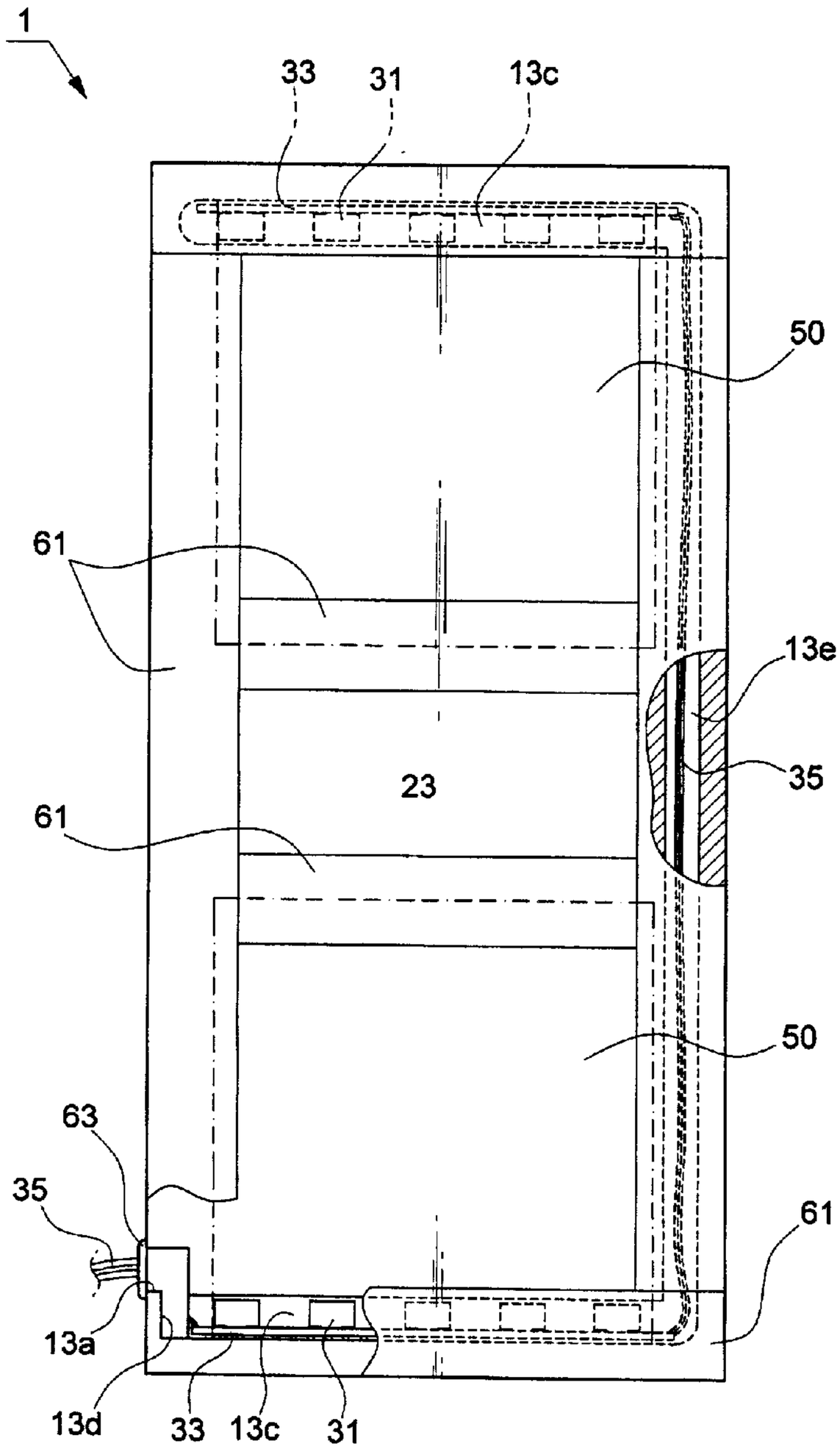
[Fig. 20]



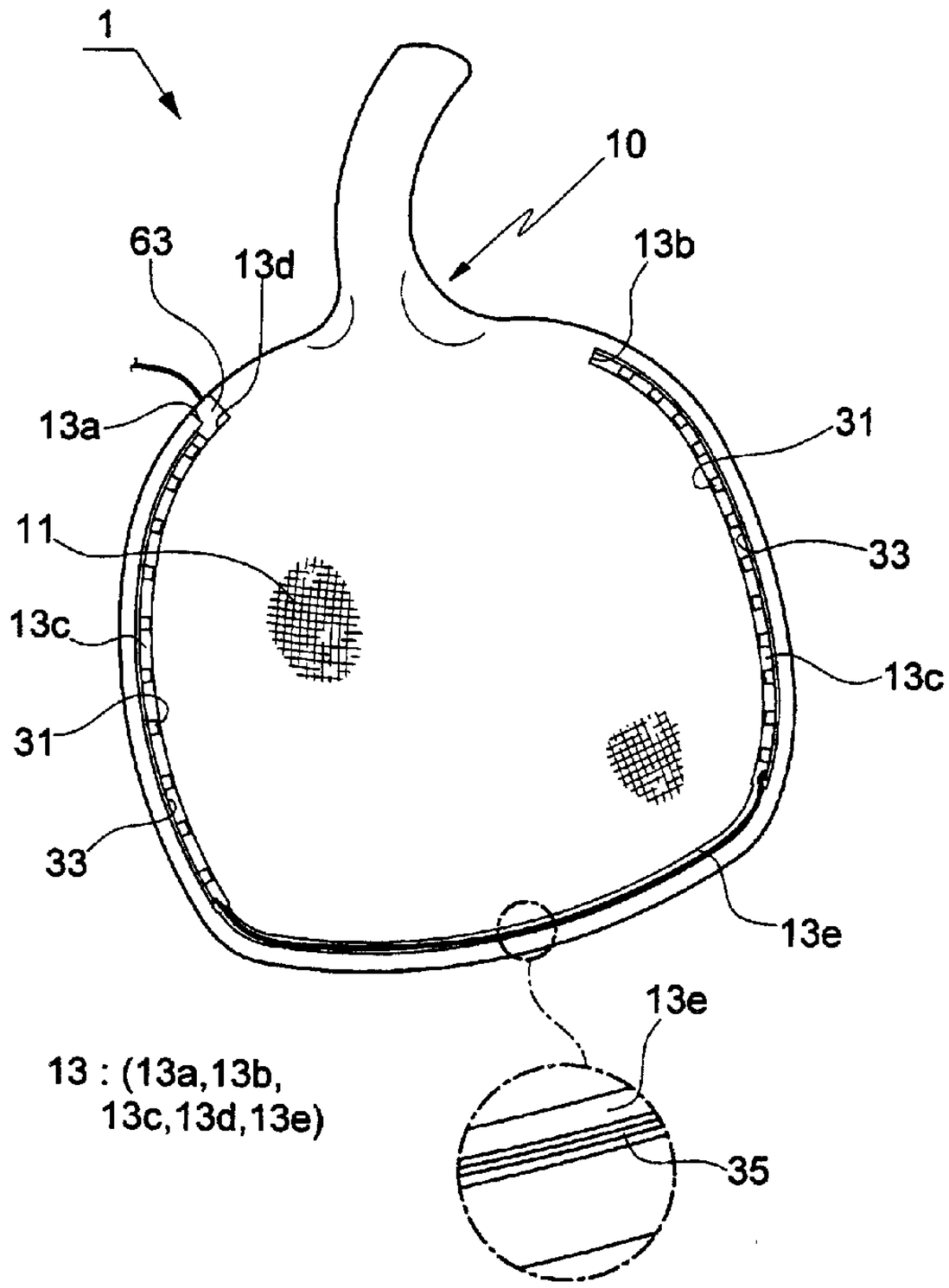
[Fig. 21]



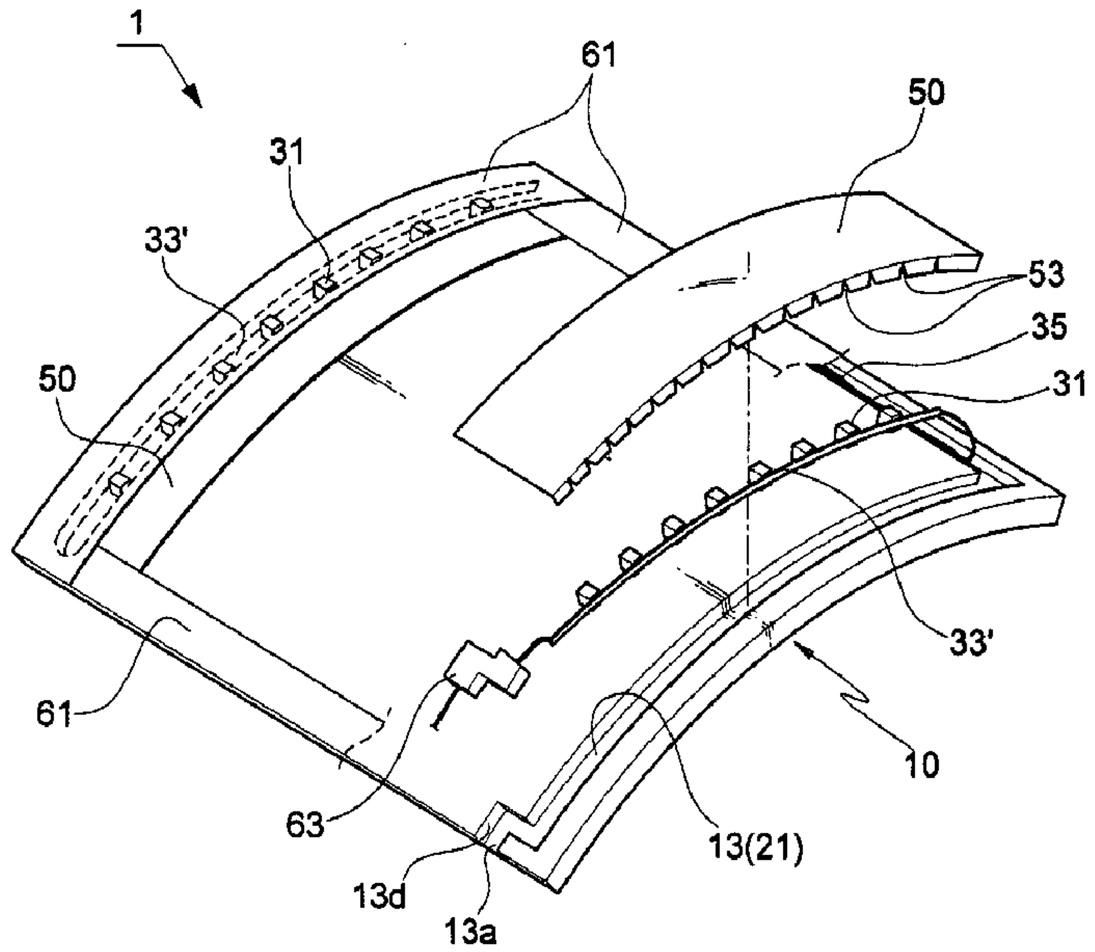
[Fig. 22]



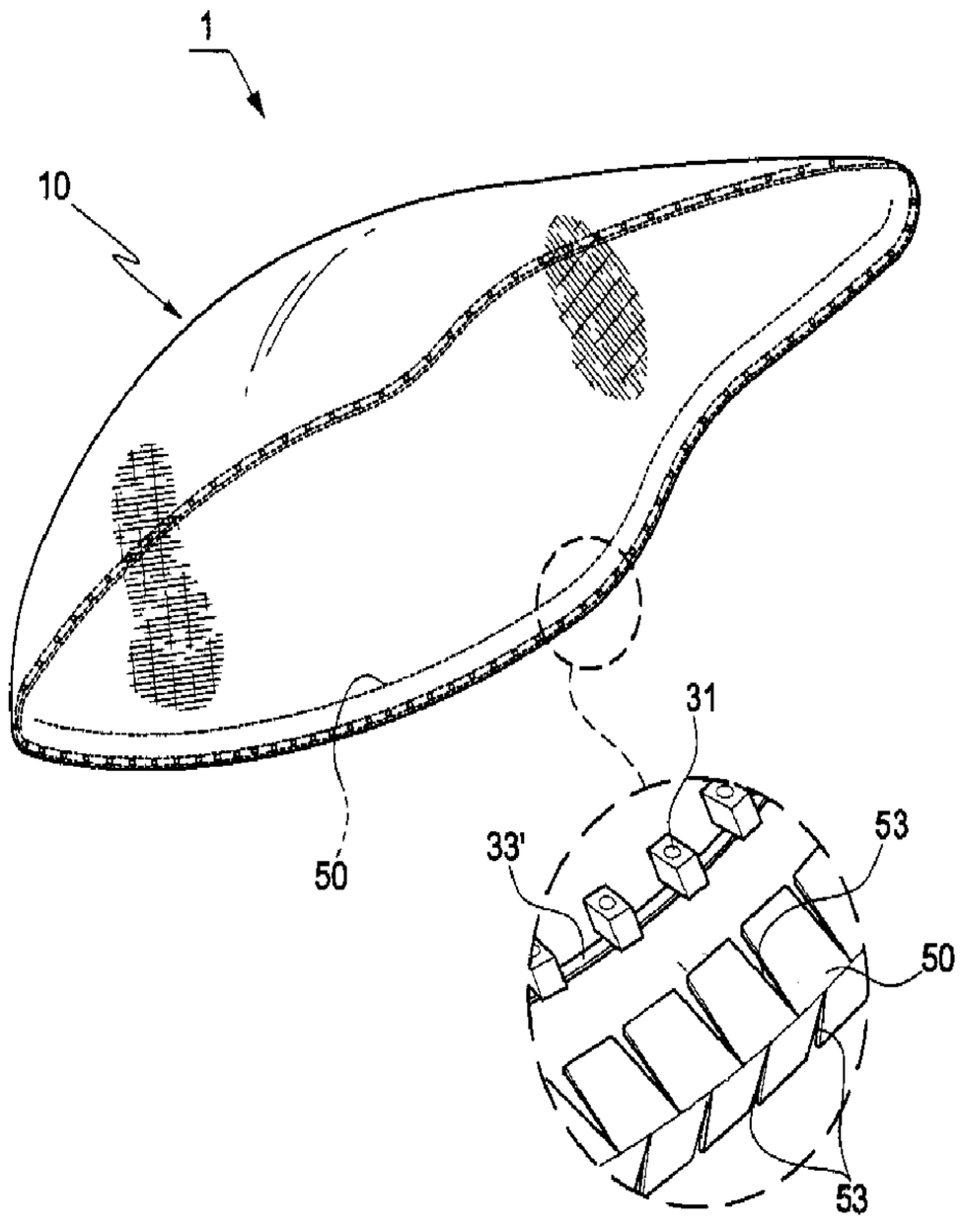
[Fig. 23]


1
10
63
13d
13b
13a
31
11
33
13c
13c
31
33
13e
13e
13 : (13a,13b,
13c,13d,13e)
35

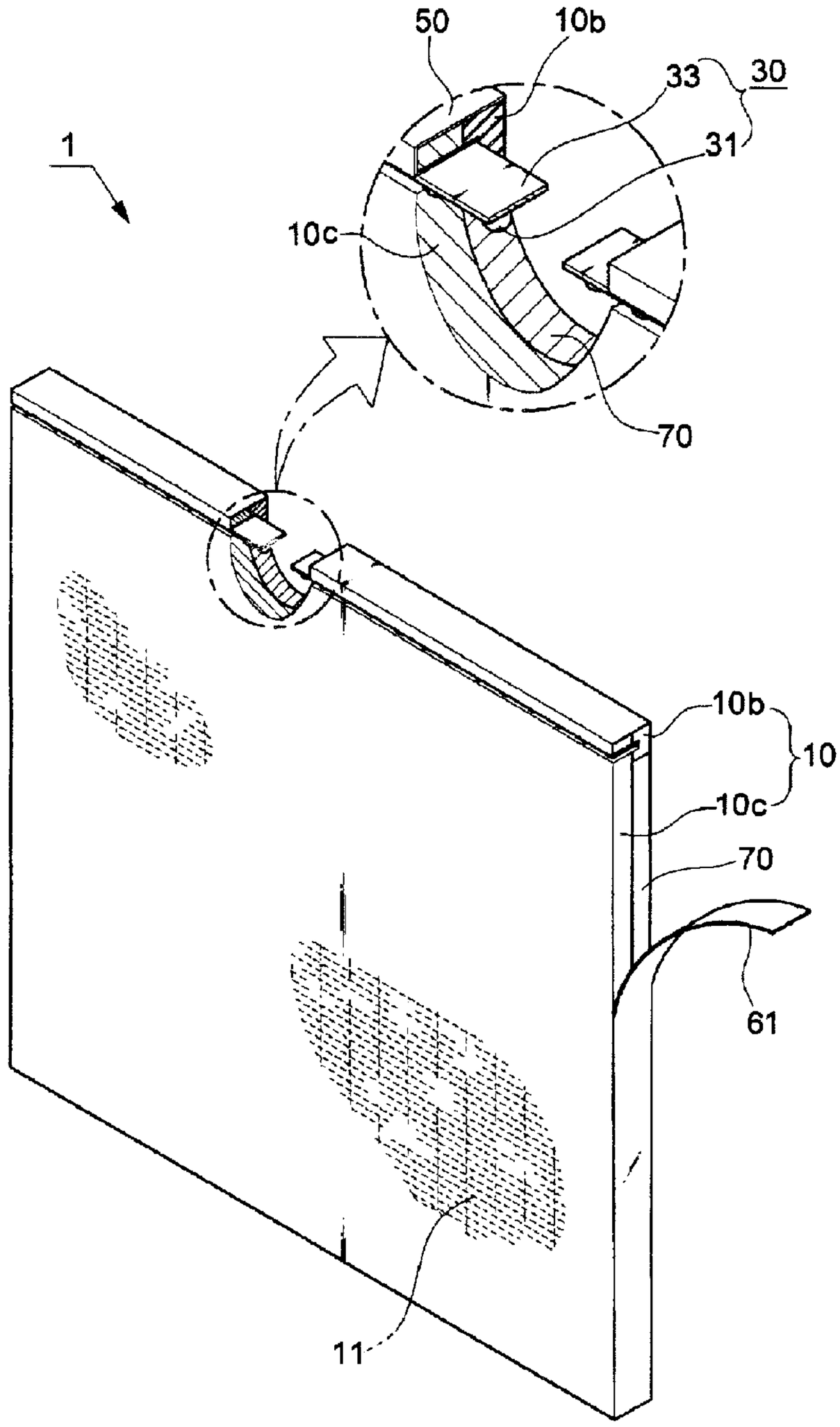
[Fig. 24]


1
61
50
31
33'
53
35
50
31
33'
61
10
63
13(21)
13d
13a

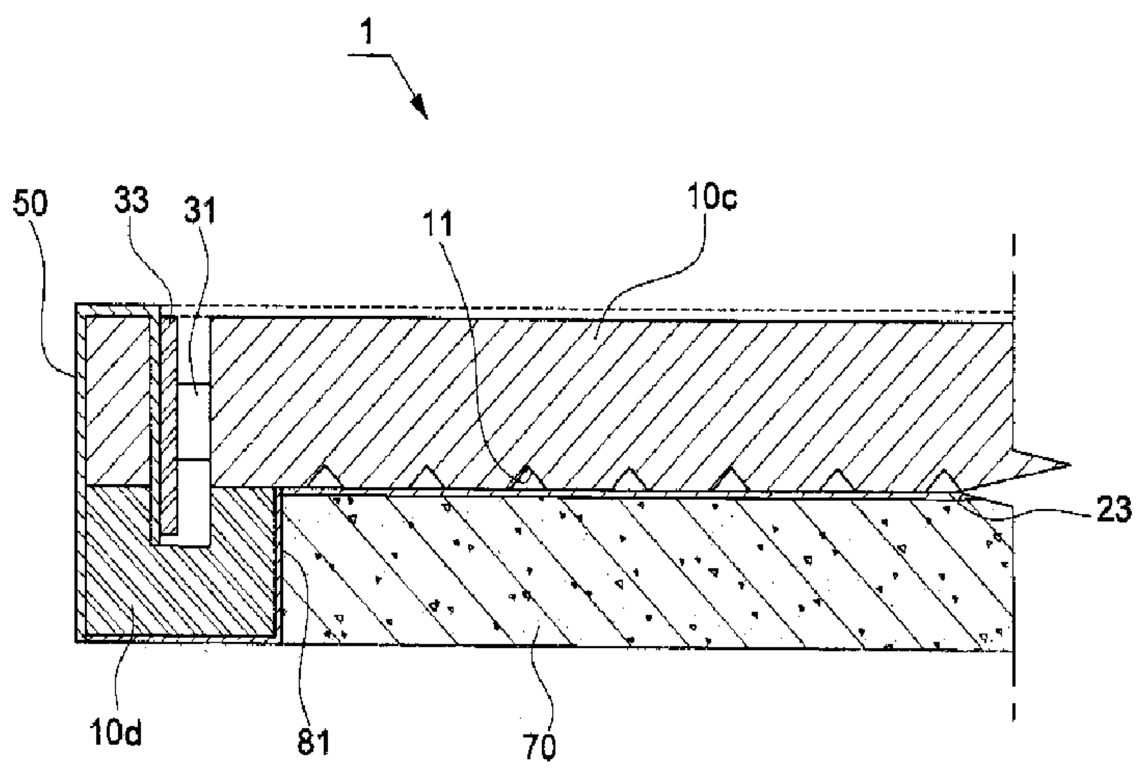
[Fig. 25]



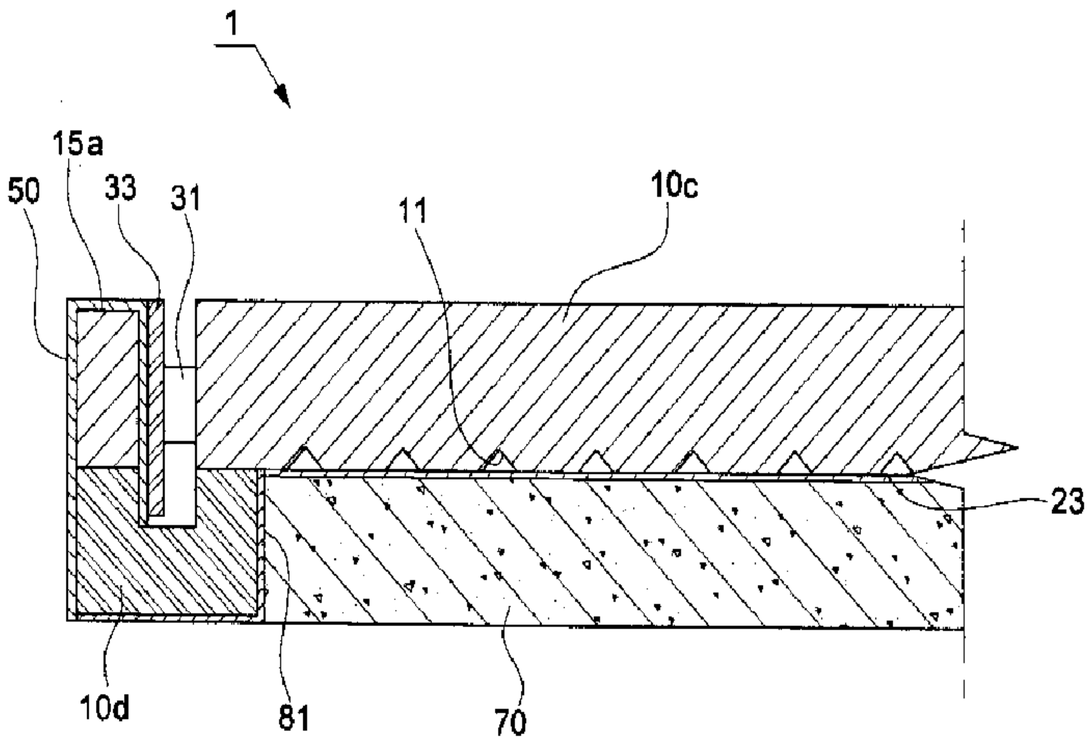
[Fig. 26]

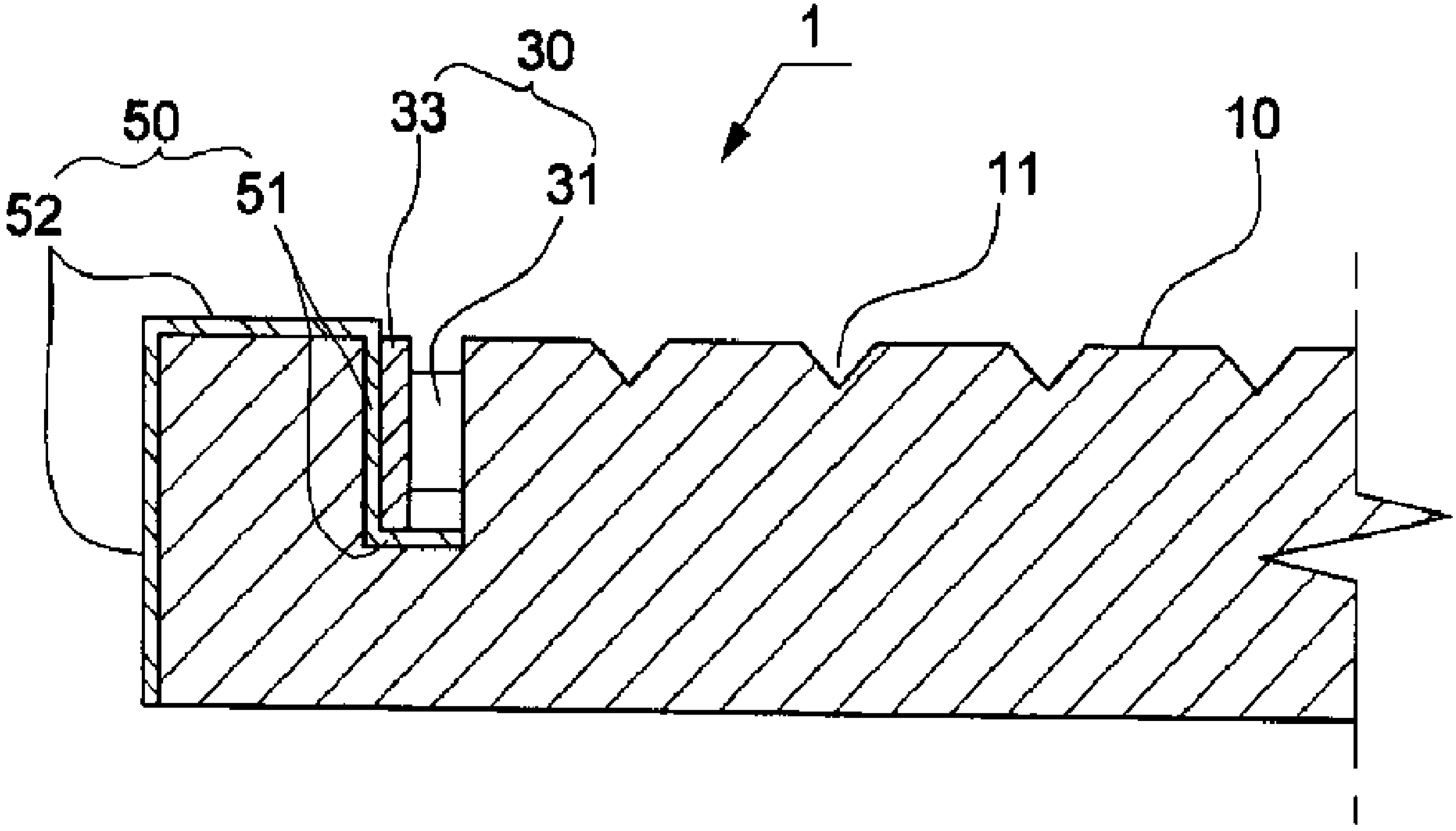

50
10b
33
30
31
1
10c
70
10b
10
10c
70
61
11

[Fig. 27]


1
50
33
31
11
10c
23
10d
81
70

[Fig. 28]




1
30
33
50
52
51
31
11
10