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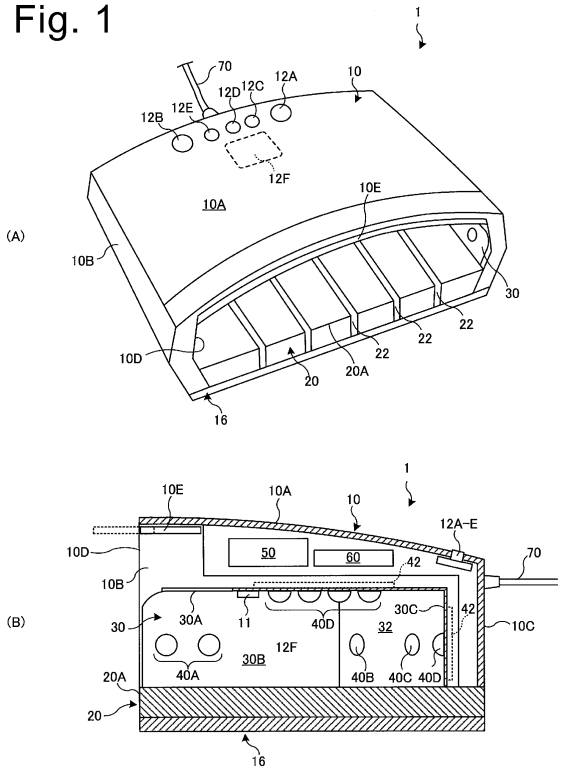
# (54) LIGHT RADIATION APPARATUS FOR NAIL RESIN

(57) A light irradiation apparatus for curing nail resin 1 includes: a pad-side cover member that faces a pad of a fingertip; a nail-side cover member disposed to cover at least a nail of the fingertip; and a light source configured to irradiate the nail with light. Furthermore, the pad-side cover member has a housing portion formed at least in the vicinity of the fingertip, the housing portion being configured to house part of a nail resin retaining member provided to the fingertip. This makes it possible to provide the light irradiation apparatus for a nail resin with high convenience for a user.

Fig. 1

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## Description

### Technical Field

**[0001]** The present invention relates to a light irradiation apparatus for curing a nail resin, which is configured to photo-cure a nail gel applied to a nail.

### Background Art

**[0002]** Conventionally, in shops such as nail salons, a nail gel is applied to finger and toe nails of customers, and the applied nail gel is cured on site by irradiation with light. In this process, a light irradiation apparatus for curing a nail resin (hereafter referred to as a light irradiation apparatus) is used (see, for example, Japanese Utility Model Registration No. 3042166).

**[0003]** As the nail gel, an ultraviolet curing resin is generally used. The ultraviolet curing resin is cured in a short time by irradiation with ultraviolet rays emitted from the light irradiation apparatus. The nail gel enables artificial nails to be extendingly provided on the distal-end side of actual finger and toe nails.

**[0004]** There are various types of the ultraviolet curing resin used as the nail gel. Examples of the nail gel mainly include a hard gel insoluble with a solvent and a soft gel soluble with a solvent. In recent years, such a soft gel soluble with a solvent is becoming popular. To cure the soft gel, ultraviolet rays with a wavelength of 405 nm is said to be desirable. In this connection, a technology has been proposed in which LEDs capable of emitting ultraviolet rays with a wavelength of 405 nm are mounted on a light irradiation apparatus to cure the soft gel in tens of seconds (see, for example, Japanese Utility Model Registration No. 3179777).

### Summary of Invention

### Technical Problem

**[0005]** Figs. 13(A) to 13(D) illustrate work processes of forming an artificial nail with a nail gel in nail salons. A manicurist winds an expansion seal 110 (see Fig. 13B) around a fingertip without an artificial nail (see Fig. 13(A)). The expansion seal 110 is wound in a cylindrical manner so as to further expand the distal-end side of the finger.

**[0006]** The expansion seal 110 provides an extension surface 111 for applying the nail gel. The expansion seal 110 has an opening 110A formed in a part corresponding to the nail. As a result, an actual nail can be exposed from the opening 110A, which causes the extension surface 111 to continue from the actual nail. If the nail gel is simultaneously applied to both the nail and the extended surface 111 and is cured, an artificial nail can be formed so as to continue from the actual nail. As described in the foregoing, the expansion seal 110 functions as a nail gel retaining member which temporarily retains the nail gel.

**[0007]** At the time of inserting a fingertip into the light irradiation apparatus, a seal end portion 112 of the expansion seal 110 remaining on a pad side of the finger becomes a hindrance. If the seal end portion 112 is caught by the light irradiation apparatus, the extension surface 111 may be deformed and the artificial nail is distorted thereby. Therefore, the manicurist cuts the seal end portion 112 with scissors in advance (see Fig. 13 (C)).

**[0008]** Then, the manicurist applies a gel nail to the extension surface 111 (see Fig. 13 (D)), puts the fingertip into the light irradiation apparatus, and irradiates the gel nail with ultraviolet rays to cure the gel nail on site. By repeating this step, the artificial nail of a desired size is formed.

**[0009]** However, bringing a cutting tool close to the customer's fingertip for cutting the seal end portion 112 is an action that the manicurist hopes to avoid as much as possible for safety reason. When the manicurist serves the customers face to face, the distal end of scissors is directed to the customer side at the time of cutting the seal end portion 112 with the scissors. Some customers may feel fear during the process of scissoring off the seal end portion 112.

**[0010]** Furthermore, cutting the seal end portion 112 reduces an adhesion area of the expansion seal 110, which causes a problem in which the expansion seal 110 easily separates from the finger during the process.

**[0011]** The present invention has been made in view of these actual circumstances, and it is therefore an object of the present invention to provide a light irradiation apparatus with high convenience even when the expansion seal is used. Solution to Problem

**[0012]** The object of the present invention is accomplished by the following means as a result of earnest research performed by the inventors of the present invention.

**[0013]** More specifically, to accomplish the above-stated object, a light irradiation apparatus for curing a nail resin, includes: a pad-side cover member that faces a pad of a fingertip; a nail-side cover member disposed to cover at least a nail of the fingertip; and a light source configured to irradiate the nail with light, wherein the pad-side cover member has a housing portion formed at least in a vicinity of the fingertip, the housing portion being configured to house part of a nail resin retaining member provided to the fingertip.

**[0014]** In relation to the above-stated object, the pad-side cover member of the light irradiation apparatus for curing a nail resin may face the pads of at least four fingertips, and the pad-side cover member may have the said portion configured to house at least part of the nail resin retaining member of the at least four fingertips.

**[0015]** In relation to the above-stated object, the housing portion of the light irradiation apparatus for curing a nail resin may include a region narrower than a fingerbreadth of the fingertip.

**[0016]** In relation to the above-stated object, the hous-

ing portion of the light irradiation apparatus for curing a nail resin may be in a shape of a slit extending in a longitudinal direction of the fingertip.

**[0017]** In relation to the above-stated object, a protrusion in contact with the pad of the fingertip is formed around the housing portion of the light irradiation apparatus for curing a nail resin.

**[0018]** In relation to the above-stated object, the light source of the light irradiation apparatus for curing a nail resin may include: a facing-side light source disposed to face the nail to irradiate a surface of the nail with light; and a fingertip-side light source disposed in a vicinity of an extension of the finger to emit light toward the fingertip.

**[0019]** In relation to the above object, the nail-side cover member of the light irradiation apparatus for curing a nail resin may have an inner wall that includes a light absorption surface formed to absorb the light.

## Advantageous Effects of Invention

**[0020]** According to the present invention, even in an operation step involving an expansion seal, the operation of cutting the expansion seal can be omitted, so that a nail resin can safely and reliably be cured.

## Brief Description of Drawings

**[0021]**

Figs. 1(A) and 1(B) are a perspective view and a vertical sectional view along a center line, respectively, each illustrating a light irradiation apparatus according to an embodiment of the present invention.

Fig. 2 is a bottom view of an upper casing, an inner cover, and an LED light source group of the light irradiation apparatus as viewed from the bottom side.

Fig. 3 is a plan view illustrating positional relationship between the LED light source group of the light irradiation apparatus and a hand.

Fig. 4 is a plan view illustrating a finger placement table of the light irradiation apparatus.

Figs. 5(A), 5(B), and 5(C) are a lateral partial sectional view, a plan view, and a partial sectional view as viewed from the fingertip side, respectively, each illustrating positional relationship between a housing portion of the finger placement table and a nail resin retaining member wound around a fingertip.

Fig. 6 is a plan view illustrating another configuration example of the finger placement table.

Figs. 7(A) and 7(B) are a lateral partial sectional view and a partial sectional view as viewed from the fingertip side, respectively, each illustrating another configuration example of the finger placement table.

Fig. 8 is a plan view illustrating another configuration example of the finger placement table.

Fig. 9 is a lateral partial sectional view illustrating another configuration example of the finger placement table.

Fig. 10 is a perspective view illustrating the finger placement table pulled out to a near side.

Fig. 11 is a circuit configuration diagram of an LED light source group of the light irradiation apparatus.

Figs. 12(A) and 12(B) are a cross sectional view and a perspective view, respectively, each illustrating a pen-shaped type light irradiation apparatus according to another embodiment.

Fig. 13 is a process chart of forming an artificial nail by using an expansion seal in a nail salon.

## Description of Embodiments

**[0022]** Hereinafter, an embodiment of the present invention will be described with reference to the accompanying drawings.

**[0023]** Figs. 1(A) and 1(B) illustrate an overall configuration of a light irradiation apparatus for curing a nail resin (hereinafter a light irradiation apparatus) 1 according to an embodiment of the present invention. Fig. 1(A) is a perspective view and Fig. 1B is a cross-sectional view taken along a center line.

**[0024]** The light irradiation apparatus 1 includes an upper casing 10, a lower casing 16, a finger placement table (pad-side cover member) 20, an inner cover (nail-side cover member) 30, an LED light source group 40, a wiring substrate 42, a power unit 50, a control unit 60, and a power cable 70.

**[0025]** The upper casing 10 is formed in a dome shape so as to cover the entire upper part of a hand or a foot to be inserted therein. Specifically, the upper casing 42 has a ceiling portion 10A disposed on the upper side, right and left side portions 10B disposed on the side surfaces of the hand or the foot, and an innermost portion 10C disposed in the direction of a distal end of the hand or the foot. An insertion opening 10D opens to a user side. An operation area 12 is formed on the upper surface of the ceiling portion 10A. The operation area 12 is provided in the direction opposite to the user and is operated by a manicurist who faces the user. The operation area 12 includes a power button 12A, an auto set button 12B, a 5-second set button 12C, a 10-second set button 12D, a 20-second set button 12E, and a display screen 12F. The operation area 12 is connected to the control unit 60 to input and output a variety of information.

**[0026]** The power button 12A is configured to turn on and off a power source of the light irradiation apparatus 1. The auto set button 12B is configured to set an operational mode (manual and automatic modes). The 5-second, 10-second, and 20-second set buttons 12C, 12D, and 12E are configured to set irradiation time of the LED light source group 40. The display screen 12F displays various data, such as countdown and count-up of irradiation time, set modes, and errors.

**[0027]** An extension plate 10E is slidably disposed in the vicinity of the insertion opening 10D inside the ceiling portion 10A. The extension plate 10E is pulled out to the

user side, so that the ceiling portion 10A is expanded toward the user side. The extension plate 10E blocks the light from the internal LED light source 40 to reduce the amount of light that reaches the eyes of the user. Inside the ceiling portion 10A, a distance sensor 11 is disposed to measure a distance to an obstacle present below. Normally, the distance sensor 11 outputs a distance to the finger placement table 20. When a hand is inserted into the casing, a distance to the hand is output. On the basis of the changes in the output value, whether the hand is inserted or not is detected.

**[0028]** The lower casing 16, which is disposed on the floor side, is coupled to the upper casing 10. The lower casing 16 is detachable from the upper casing 10. For example, for irradiating the nails of a leg positioned on the floor with ultraviolet rays, the ultraviolet rays are emitted while the lower casing 16 and the finger placement table 20 are removed so that the leg is covered with only the upper casing 10 (illustration omitted).

**[0029]** Fig. 2 illustrates the placement of the LED light source group 40 as viewed from the bottom side. The LED light source group 40 is configured to include a plurality of LEDs. The LED light source group 40 is fixed to an inner cover 30 disposed along the inner wall of the upper casing 10. Therefore, the inner cover 30 also includes a ceiling portion 30A, side surface portions 30B, and an innermost portion 30C. The innermost portion 30C of the inner cover 30 has a pair of inclined surfaces 32 formed so that a central part of the innermost portion 30C has a deepest depth and both side parts have a shallower depth. The inner cover 30, which is disposed to cover at least the nail side of the toes or fingertips of the user, corresponds to the nail-side cover member of the present invention.

**[0030]** The inner wall of the inner cover 30 serves as a light absorption surface that absorbs ultraviolet rays. The light absorption surface is implemented by applying a black paint having ultraviolet absorption properties to the inner wall. As a consequence, the nails are irradiated mainly with direct light from the LED light source group 40, while irregular reflection of ultraviolet rays is prevented, so that stable light irradiation is achieved. Damages on the skins other than the nails, which are caused by irregular reflection of the ultraviolet rays inside the inner cover 30, are also suppressed.

**[0031]** The LED light source group 40 has first LEDs 40A that irradiate the nail of a thumb with ultraviolet rays, second LEDs 40B that irradiate the nail of a little finger with ultraviolet rays, third LEDs 40C that irradiate the nail of an index finger or an annular finger with ultraviolet rays, and fourth LED 40Ds that irradiate the nail of a middle finger with ultraviolet rays. One of the first LEDs 40A is disposed on the ceiling portion 30A above the thumb, and two of the first LEDs 40A are disposed on the side surface portions 30B along a depth direction of the side surface portions 30B. Two of the second LEDs 40B are disposed on the ceiling portion 30A above the little finger in the longitudinal direction of the finger, and one of the second LED 40B is disposed on the inclined surfaces 32 of the innermost portion 30C. Four of the third LEDs 40C are disposed on the ceiling portion 10A above the index finger or the annular finger in the longitudinal direction of the finger, and one of the third LED 40C is disposed on the inclined surfaces 32 of the innermost portion 10C. Four of the fourth LEDs 40D are disposed on the ceiling portion 10A above the middle finger in the longitudinal direction of the finger, and one of the fourth LED 40D is disposed on a deepest part of the innermost portion 10C. Except for the fourth LED 40D positioned at the center, the first to third LEDs 40A to 40C are disposed in line symmetry around a center line so as to correspond to both the right and left hands and legs.

**[0032]** Fig. 3 illustrates positional relationship between the placement of the LED light group 40 and an inserted hand. The fourth LEDs 40D corresponding to the middle finger will be described in detail as an example. The fourth LEDs 40D include: facing-side LEDs $40D_1$ to $40D_4$ disposed to face the nails to irradiate the surfaces of the nails with light; and a fingertip-side LED $40D_5$ disposed in the vicinity of the extension of the finger to emit light from an axial direction of the finger toward the fingertip. By combining two kinds of optical axes provided by the facing-side and fingertip-side LEDs, each nail is effectively irradiated with ultraviolet rays, so that the nail resin can be cured in a short time (for example, 10 seconds). Although the number of LEDs disposed for each nail is not particularly limited, it is preferable to dispose at least one LED (preferably a plurality of LEDs) at a position facing the surface of each nail and at least one LED at a position at other angles (at side surface and distal-end sides) so that two kinds of optical axes cross each other toward each nail.

**[0033]** With reference to Fig. 1(B) again, the wiring substrate 42 for the LED light source group 40, the power unit 50, and the control unit 60 are housed in a gap between the inner cover 30 and the upper casing 10. The LED light source group 40 is fixed to the wiring substrate 42. The power unit 50 converts electricity supplied via the power cable 70 to a predetermined direct-current voltage. The power unit 50 incorporates a battery, so that the current supplied from the power cable 70 can be stored. Therefore, when the power cable 70 is detached, the apparatus is still operable.

**[0034]** Fig. 4 illustrates the finger placement table 20. The palm of the user's hand comes into contact with the top of the finger placement table 20. That is, the finger placement table 20, which faces the pads of the fingertips, corresponds to the pad-side cover member of the present invention. The pad side of at least four fingertips, out of at least the fingers from the thumb to the little finger, is preferably placed on the finger placement table 20. In the present embodiment, the finger placement table 20 is sized to allow five fingertips, from the thumb to the little finger, to be collectively laid thereon.

**[0035]** The finger placement table 20 has the housing portion 22 configured to house seal end portions 112

(see Fig. 13) of the expansion seals (nail resin retaining member) 110 which are provided to each of the fingertips. Specifically, the housing portion 22 include a first opening 22A for the little finger or the thumb, a second opening 22B for the index finger or the annular finger, and a third opening 22C for the middle finger. The first and second openings 22A and 22B are disposed in pair in line symmetry with reference to the third opening 22C positioned at the center. As a result, total five openings are formed in the housing portion 22. It is naturally understood that the number of the openings are not particularly limited in the present invention. Preferably, at least four openings are formed.

**[0036]** As illustrated in Fig. 5, the housing portion 22 includes a region narrower than a fingerbreadth of the fingertip. In the present embodiment, the region may be in the shape of a thin slit as a whole. Therefore, the finger placement table 20 enables the seal end portions 112 to be inserted into the housing portion 22 while supporting the pad side of the fingers. As a result, interference between the seal end portions 112 and the finger placement table 20 can be avoided without the seal end portions 112 being cut in advance.

**[0037]** With reference to Fig. 4 again, in the present embodiment in particular, the housing portion 22 includes the shape of slits extending in the longitudinal direction of the fingers, with an end portion of the housing portion 22 reaching a user-side edge portion 20A of the finger placement table 20. Therefore, the user inserts the seal end portions 112 from the user-side edge portion 20A of the housing portion 22, and slides the fingertips toward the innermost side. Around the housing portion 22, protrusions 24 are formed to come into contact with the pads of the fingertips (more distal-end side than the first joint). At the moment when the pads of the fingertips come into contact with the protrusions 24, the user stops sliding his/her fingers. Thus, when the fingertips are stopped at optimum positions with use of the protrusions 24 while the seal end portions 112 are guided by the housing portion 22, the LED light source group 40 is optimally positioned for the nail of each fingertip. As a result, the nail gel can efficiently be cured.

**[0038]** Although the housing portion 22 that houses the seal end portions 112 includes the shape of slits in the above description, the present invention is not limited thereto. For example, as in the case of a finger placement table 20 illustrated in Fig. 6, the fingers themselves may be supported by a plurality of support columns 26. As illustrated in Fig. 7, a height H1 of each support column 26 is set larger than a projection length H2 of the seal end portion 112. As a consequence, all the regions other than the support columns 26 serve as the housing portion 22, so that interference between the seal end portions 112 and the finger placement table 20 can be prevented.

**[0039]** For example, as in the case of a finger placement table 20 illustrated in Fig. 8, a support base 28 may be provided to support the proximal-end side of fingers, while at least the entire tips of the first joints of the fingers are released. As a consequence, as illustrated in Fig. 9, all the regions on the inner side of the support base 28 serve as the housing portion 22, so that interference between the finger placement table 20 and the seal end portions 122 can further be suppressed. On the support base 28, protrusions 24 are formed to correspond to the respective fingers. The fingers are positioned when the protrusions 24 come into contact with regions between the first joint and the second joint of the fingers. In this case, although not illustrated, the support base 28 may have slits provided to guide the seal end portions 122 from the near side to the housing portion 22.

**[0040]** As illustrated in Fig. 10, it is preferable that the finger placement table 20 is slidably disposed. This applies to all the finger placement tables 20 separately described before. After the finger placement table 20 is pulled out to the near side and the hand is laid thereon, the finger placement table 20 and the hand may be inserted together into the casing.

**[0041]** Fig. 11 illustrates a circuit configuration of the LED light source group 40. In the present embodiment, the LEDs in each of the first LEDs 40A, the second LEDs D40B, the third LEDs 40C, and the fourth LEDs 40D are connected across each other in series. As a result, the LED elements belonging to the fourth LEDs 40D, for example, are connected in parallel. Accordingly, even when some trouble occurs in some lines, it becomes possible to avoid the situation where all the LEDs fail to irradiate the nail of the middle finger. That is, it is preferable to separately supply current to the plurality of LEDs of each nail via a plurality of lines.

**[0042]** A description will now be given of a lighting control mode of the LED light source group 40 by the control unit 60.

**[0043]**

(1) Timer mode: irradiation time is set by pressing the power button 12A, inserting the hand, and then pressing a combination of the 5-second set button 12C, the 10-second set button 12D, and the 20-second set button 12E. The LED light source group 40 is lit up at the same time that the timer mode is set. The display screen 12F displays "the number of remaining seconds" to be counted down. When the set time has passed, the LED light source group 40 is automatically turned off.

(2) Auto mode (basic): set by pressing the power button 12A and then pressing the auto set button 12B. When the hand is inserted after the auto mode is set, the distance sensor 11 inside the casing automatically detects the insertion of the hand, and the LED light source group 40 is automatically lit up. The display screen 12F displays "irradiation lapse time" to be counted up. When a desired time has passed, the hand is removed from the casing. The distance sensor 11 inside the casing automatically detects removal of the hand, so that the LED light source group 40 is automatically turned off. When the hand

is inserted again, the LED light source group 40 is automatically lit up, and the display screen 12F displays the irradiation lapse time to be counted up from 0 second again.

(3) Auto mode (with timer) : irradiation time is set by pressing the power button 12A, the auto set button 12B, and then further pressing a combination of the 5-second set button 12C, the 10-second set button 12D, and the 20-second set button 12E. The LED light source group 40 is lit up only while the distance sensor 11 detects the insertion of the hand, and the display screen 12F displays "the number of remaining seconds" to be counted down from the set time. When the hand is removed in the middle of countdown, "the number of remaining seconds" is temporarily stopped. When the hand is inserted again, countdown of the number of remaining seconds is resumed. When the number of remaining seconds becomes zero, the LED light source group 40 is automatically turned off. When the auto set button 12B is pressed in the middle of (1) timer mode described above, the mode shifts to the auto mode (with timer) with the time set in (1) timer mode being in effect.

**[0044]** As described in the foregoing, in the light irradiation apparatus 1 of the present embodiment, the housing portion 22 is formed at least in the vicinity of the fingertips on the finger placement table 20 that supports the pad side of the fingers. As a result, the seal end portions 112 of the expansion seals 110 can be housed, so that the fingers can be inserted without the seal end portions 112 being cut with scissors. As a result, in the light irradiation apparatus 1, the posture of the expansion seals 110 attached to the fingertips is stabilized, and poor adhesion of the expansion seals 110 caused by cutting of the seal end portions 112 is suppressed, so that beautiful artificial nails can be formed. Since at least four fingertips can collectively be placed on the finger placement table 20 and the housing portion 22 can also house the seal end portions 112 of at least four fingertips, the nail gel can efficiently be cured.

**[0045]** Furthermore, the housing portion 22 includes the region narrower than the fingerbreadth of the fingertip. In other words, while the seal end portions 112 can be inserted into or passed through the narrow region of the housing portion 22, the function of supporting the fingertips on both the sides of these narrow regions can be secured. When the slit shape as described in the present embodiment is employed in particular, it becomes possible to guide the seal end portions 112 while supporting the pads of the fingertips. Furthermore, since the protrusions 24 in contact with the pads of the fingertips are formed around the housing portion 22, the user can ascertain the stop position of his/her fingertips by touching. As a result, the fingertips can be placed at optimum positions with respect to the LED light source group 40.

**[0046]** The LED light source group 40 includes the facing-side light source disposed to face the nail and the fingertip-side light sources disposed in the vicinity of the extension of the fingers. As a result, optical axes from the LEDs cross each other in the vicinity of the nails, so that the nails can intensively and multilaterally be irradiated with ultraviolet rays coming from a plurality of directions. Since the light absorption surface made of a light-absorbing material is formed on the inner wall of the inner cover 30, irregular reflection of ultraviolet rays can be prevented and damages on the skin of the hand or the leg by the ultraviolet rays can be suppressed.

**[0047]** In the present embodiment, the configuration of collectively irradiating five fingertips with ultraviolet rays has been illustrated. However, the present invention is not limited to this configuration. For example, like a light irradiation apparatus 200 as illustrated in Fig. 12, a pen-shaped type apparatus that separately irradiates one fingertip with ultraviolet rays may be provided. The light irradiation apparatus 200 includes a body portion 201 configured to house a battery and a control unit (illustration omitted), and a cylindrical insert portion 202 to which one finger is inserted at a time. One surface of the inner peripheral wall of the insert portion 202 serves as a nail-side cover member 202A that covers the nail of the user, and the other surface corresponds to the pad-side cover member 202B that covers the pad of the finger. The pad-side cover member 202B has a slit (housing portion) 222 formed for inserting the seal end portion 112. Since the seal end portion 112 projects to the outside from the slit 222, the position of the fingertip can be estimated on the basis of the position of the seal end portion 112. As long as the seal end portion 112 is inserted in the housing portion 222, the nail directly faces an LED light source group 240. This makes it possible to simplify positioning of the fingertip itself.

**[0048]** When the LED light source group 240 is turned on with a manual switch 230, the nail is irradiated with ultraviolet rays from the LED light source group 240, and simple and easy curing of a nail resin can be achieved. Since the LED light source group 240 is covered with the insert portion 202, it becomes possible to suppress leakage of the ultraviolet rays.

**[0049]** The light irradiation apparatus of the present invention is not limited to the embodiments described above, and various modifications are possible without departing from the scope of the present invention.

Industrial Applicability

**[0050]** The light irradiation apparatus of the present invention can be applied to various cases in which the artificial nails formed with a photo-setting resin are cured.

## Claims

1. A light irradiation apparatus for curing a nail resin, comprising:

a pad-side cover member that faces a pad of a fingertip;
a nail-side cover member disposed to cover at least a nail of the fingertip; and
a light source configured to irradiate the nail with light, wherein
the pad-side cover member has a housing portion formed at least in a vicinity of the fingertip, the housing portion being configured to house part of a nail resin retaining member provided to the fingertip.

**2.** The light irradiation apparatus for curing a nail resin according to claim 1, wherein
the pad-side cover member faces pads of at least four fingertips, and
the pad-side cover member has the housing portion configured to house at least part of the nail resin retaining member of the at least four fingertips.

**3.** The light irradiation apparatus for curing a nail resin according to claim 1 or 2, wherein the housing portion includes a region narrower than a fingerbreadth of the fingertip.

**4.** The light irradiation apparatus for curing a nail resin according to any one of claims 1 to 3, wherein the housing portion is in a shape of a slit extending in a longitudinal direction of the fingertip.

**5.** The light irradiation apparatus for curing a nail resin according to any one of claims 1 to 4, wherein a protrusion in contact with the pad of the fingertip is formed around the housing portion.

**6.** The light irradiation apparatus for curing a nail resin according to any one of claims 1 to 5, wherein the light source includes: a facing-side light source disposed to face the nail to irradiate a surface of the nail with light; and a fingertip-side light source disposed in a vicinity of an extension of the finger to emit light toward the fingertip.

**7.** The light irradiation apparatus for curing a nail resin according to any one of claims 1 to 6, wherein the nail-side cover member has an inner wall that includes a light absorption surface formed to absorb the light.

Fig. 1

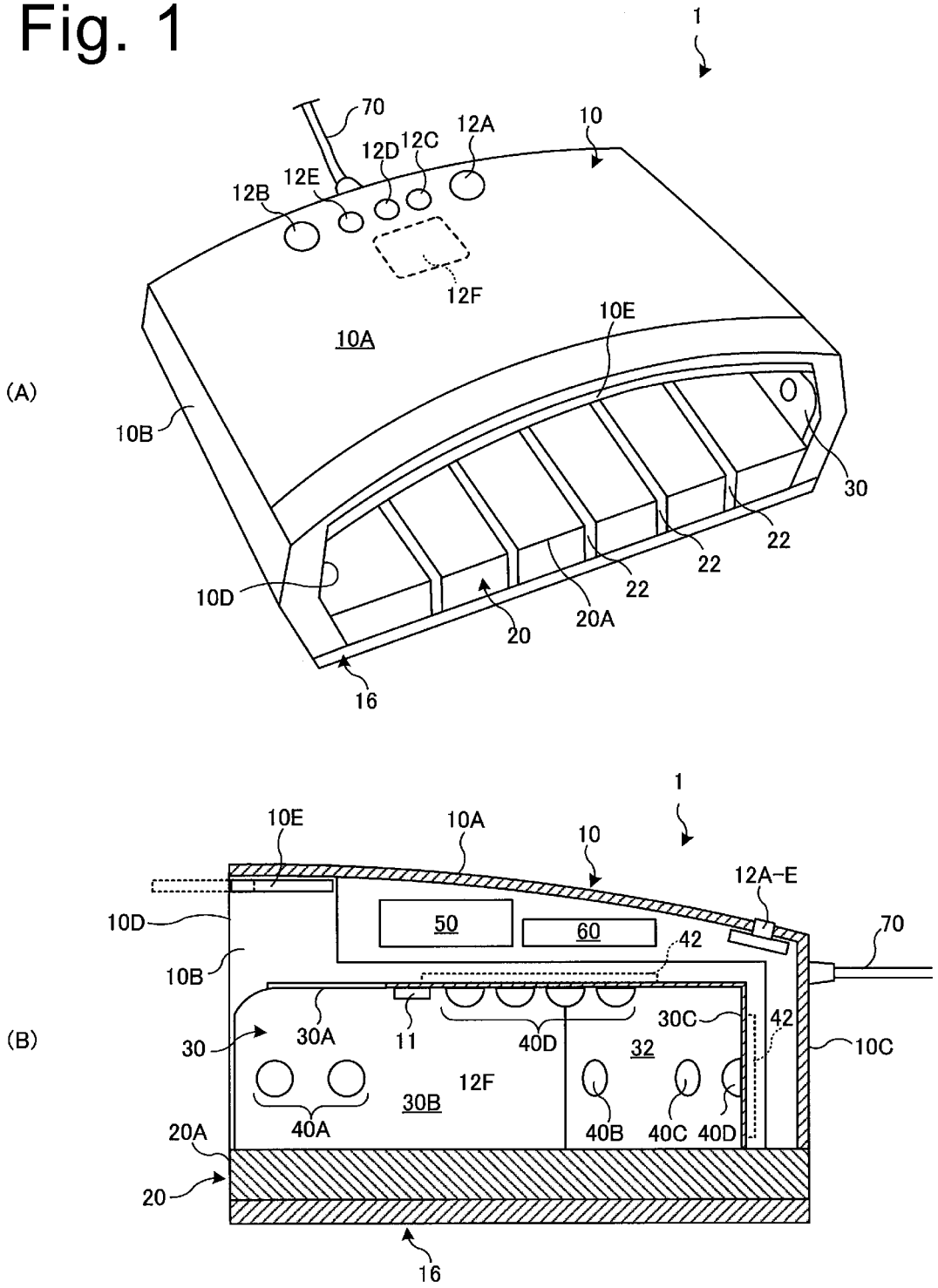
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Fig. 2

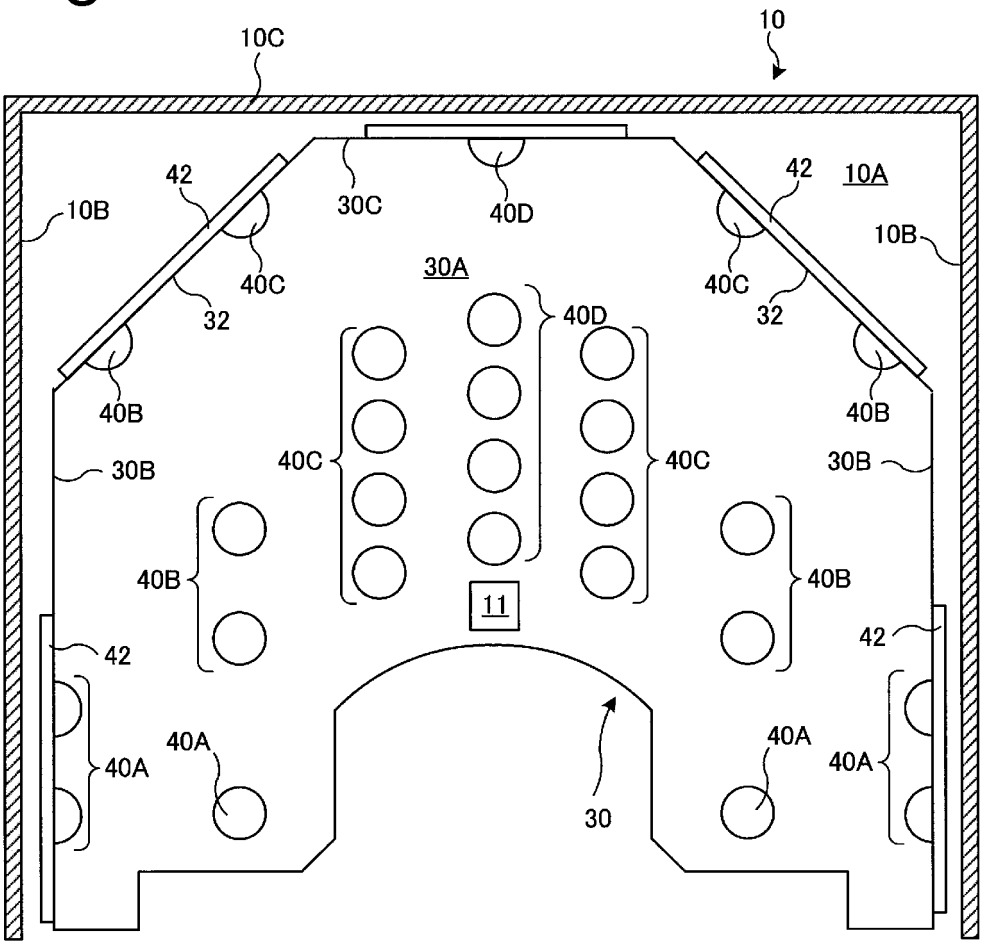
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Fig. 3

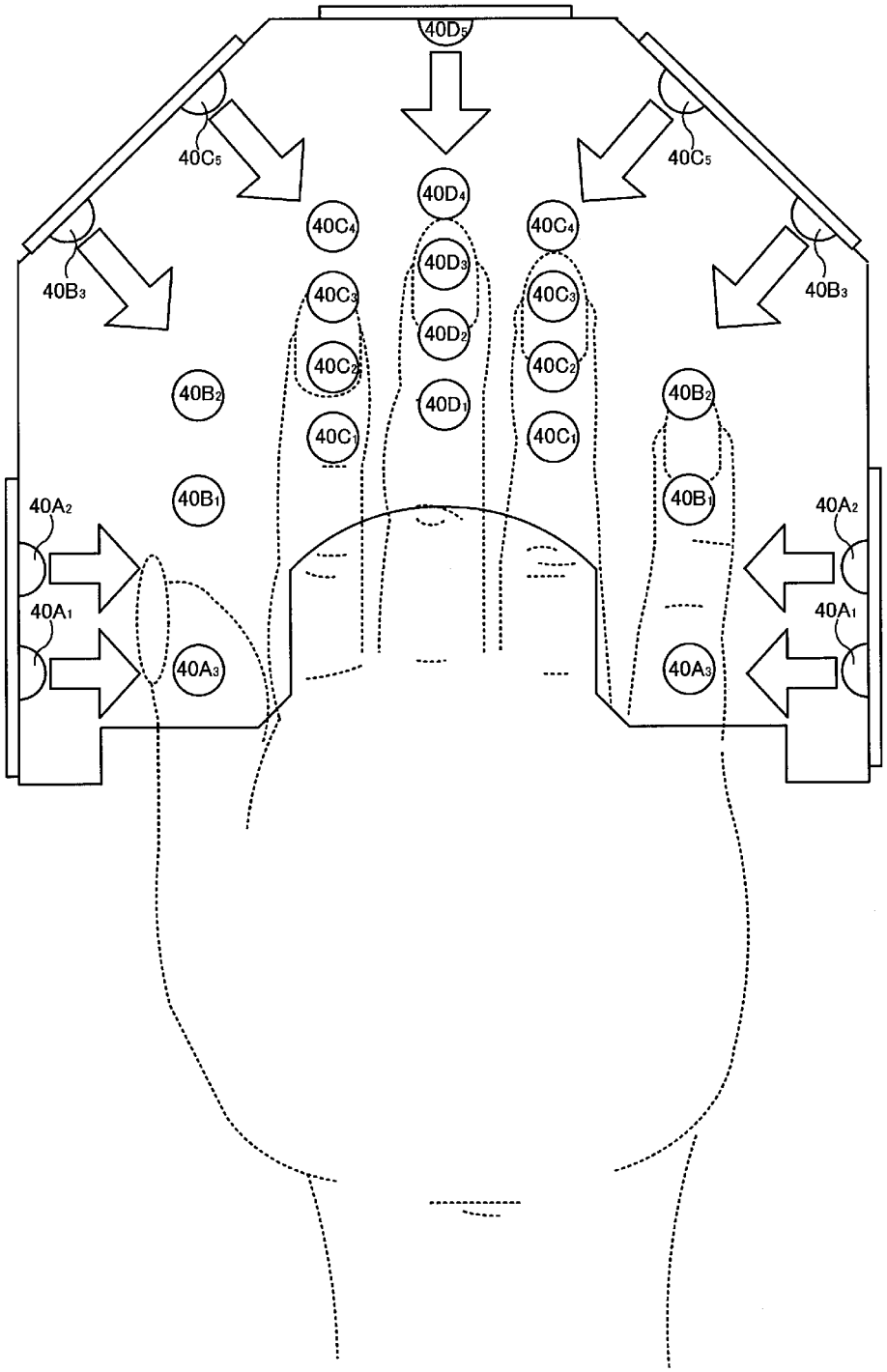
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Fig. 4

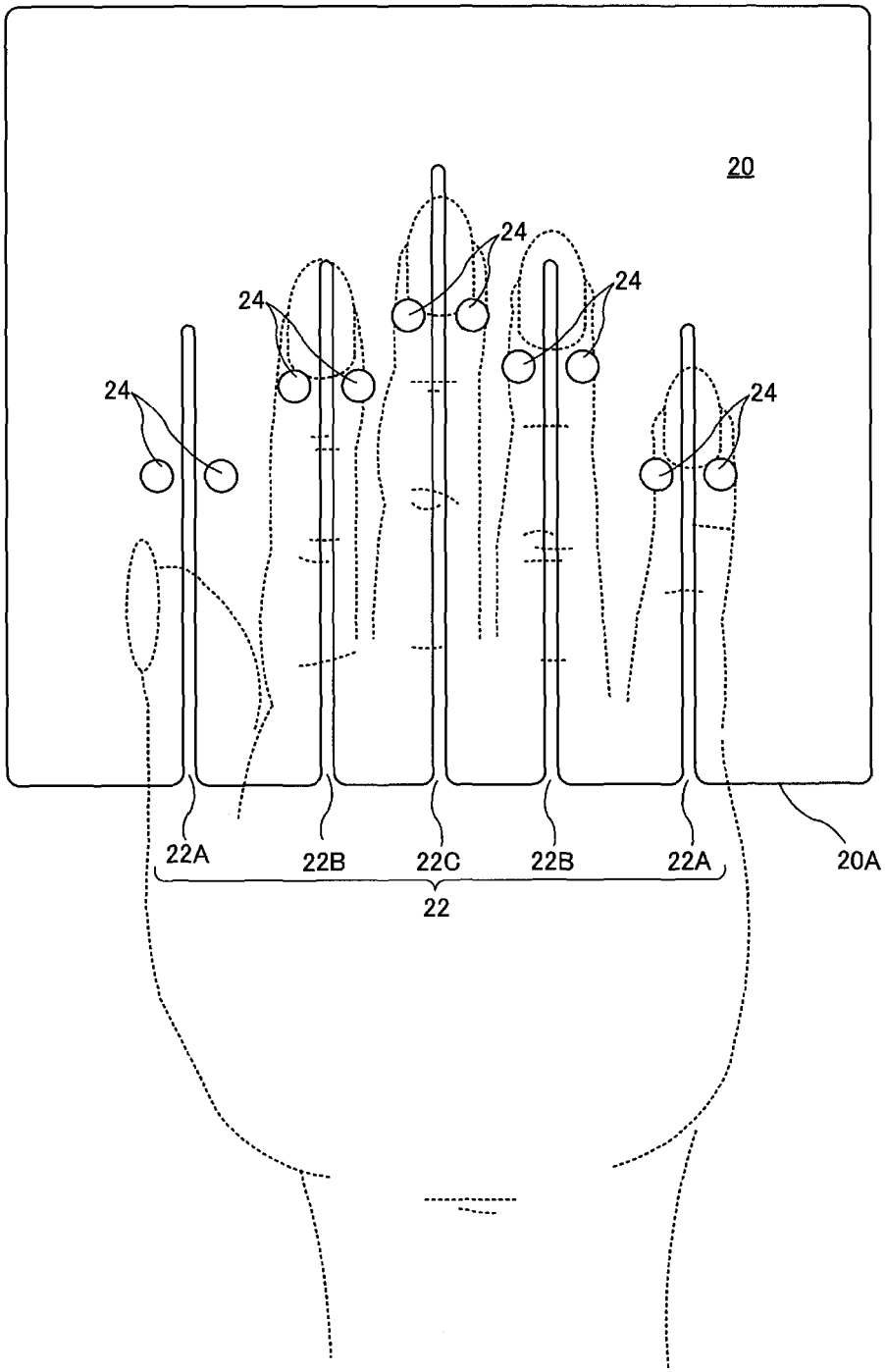
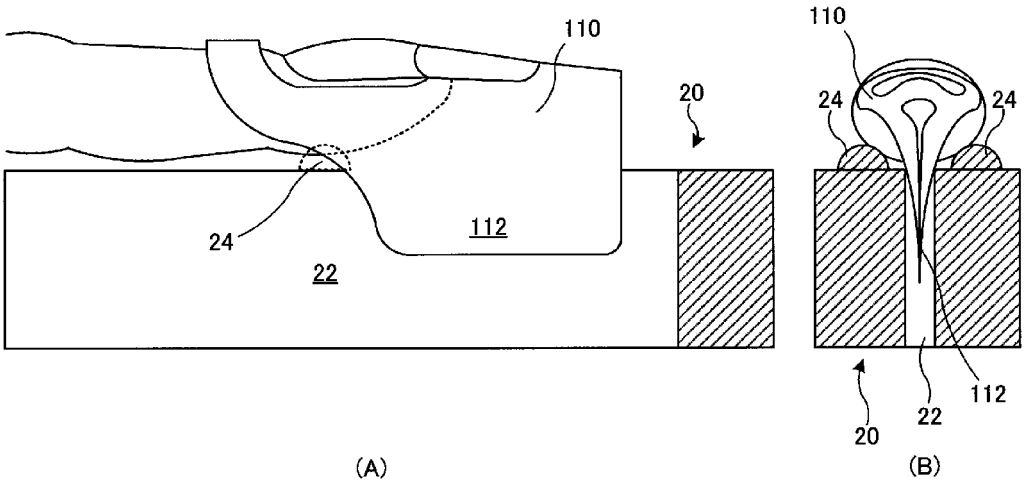


Fig. 5



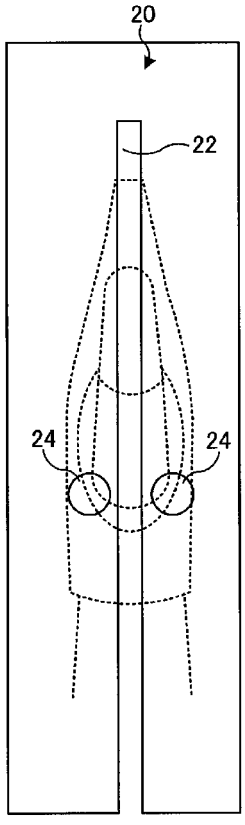



Fig. 6

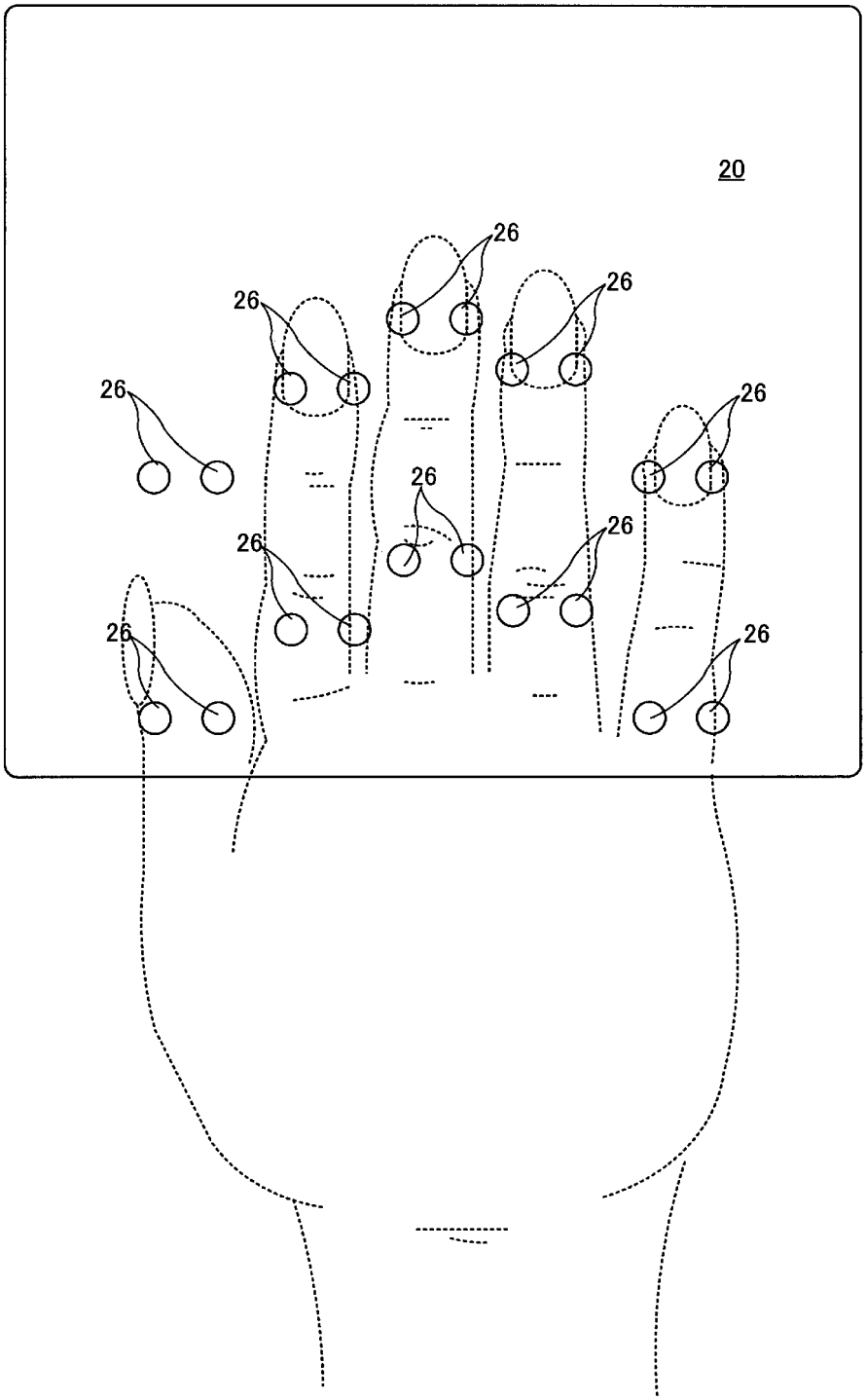
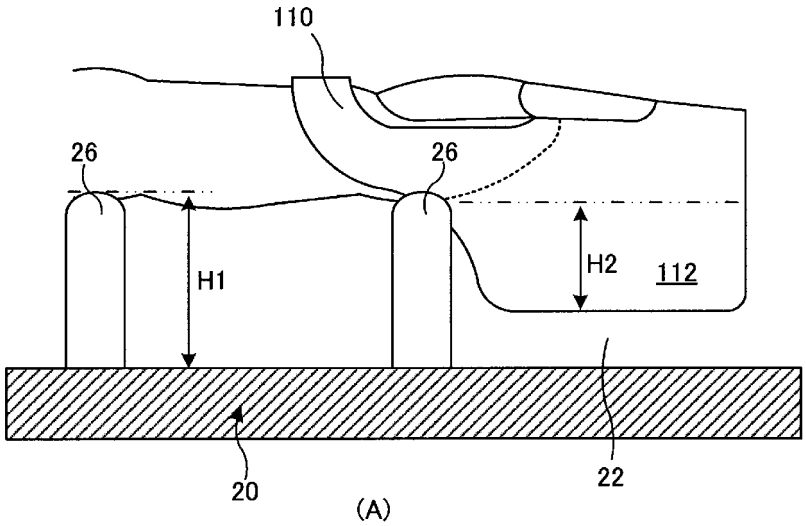


Fig. 7

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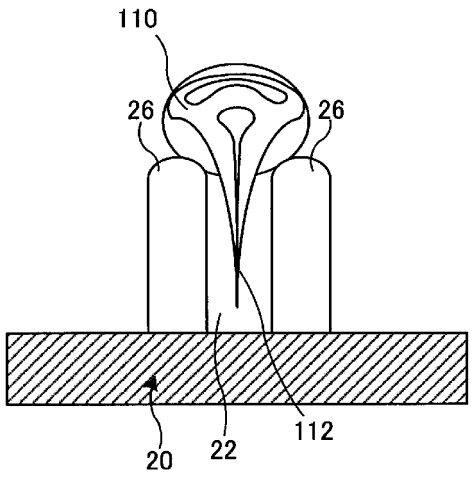



(B)

Fig. 8

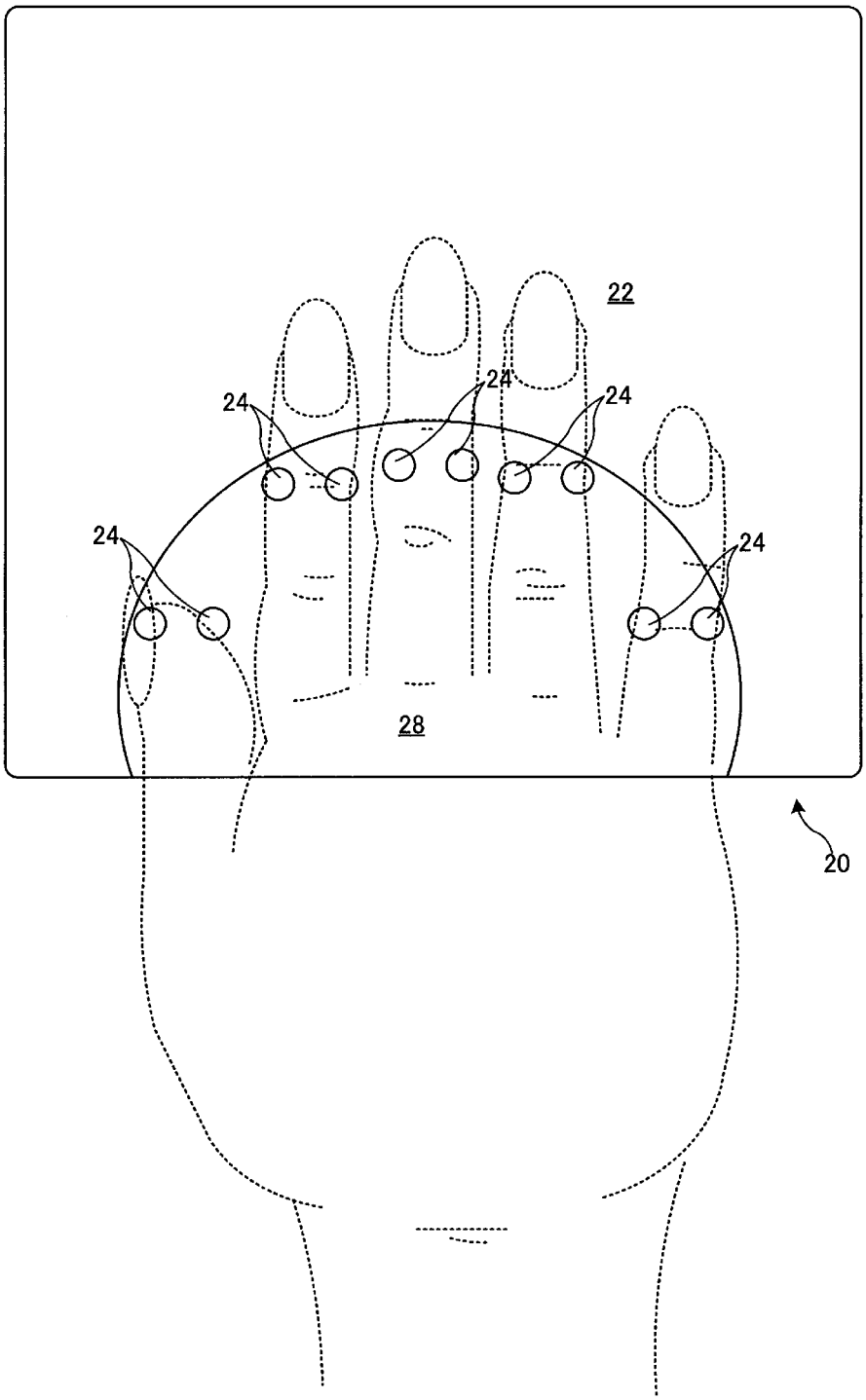


Fig. 9

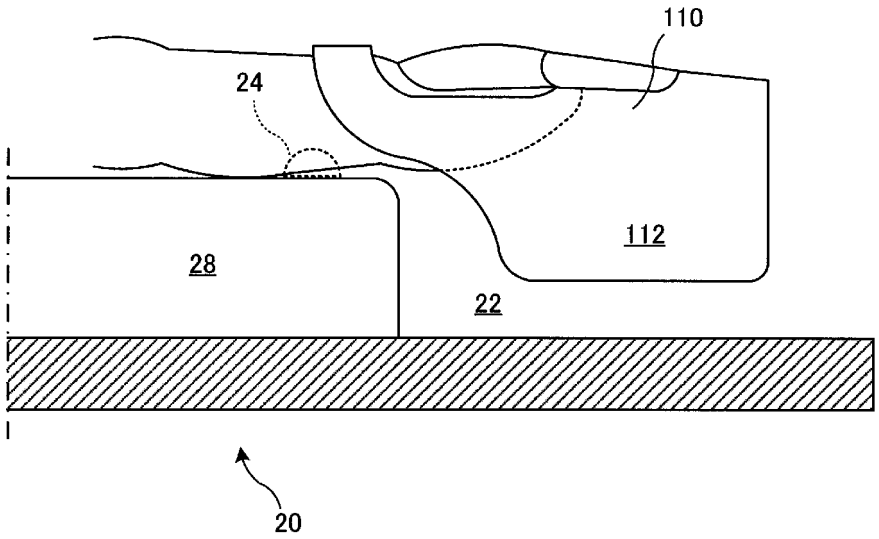


Fig. 10

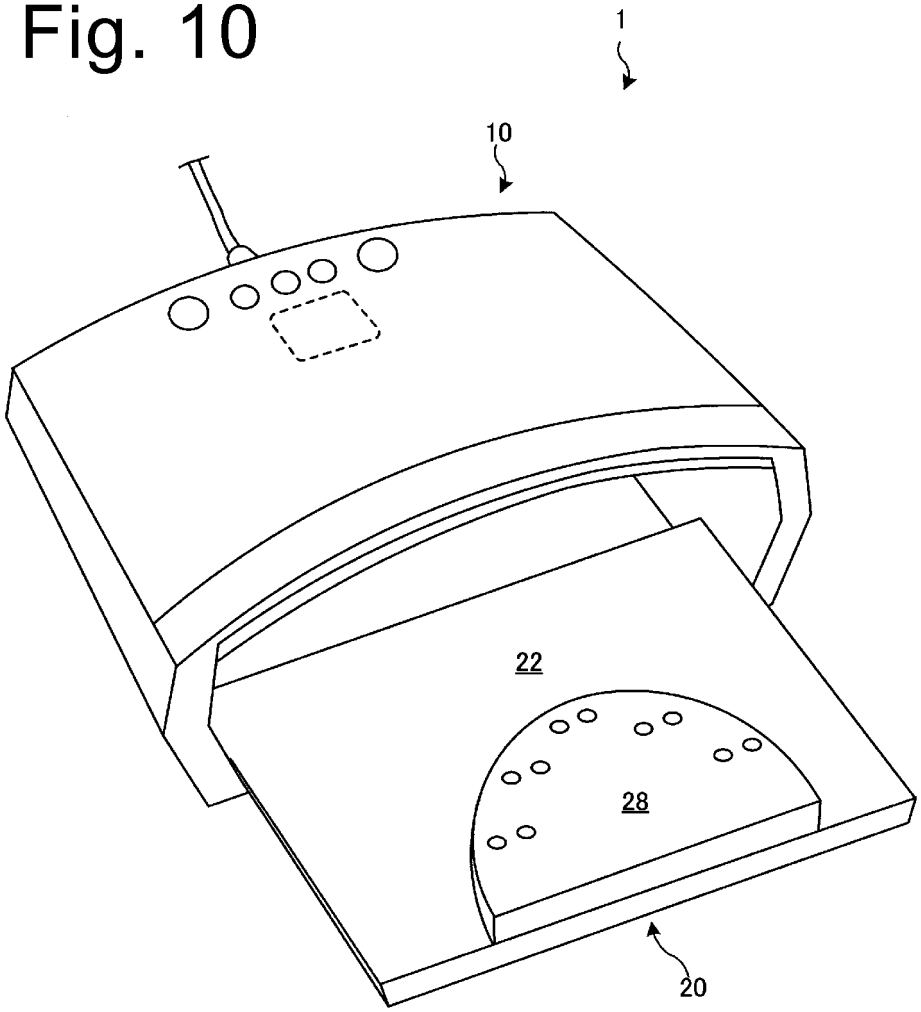


Fig. 11

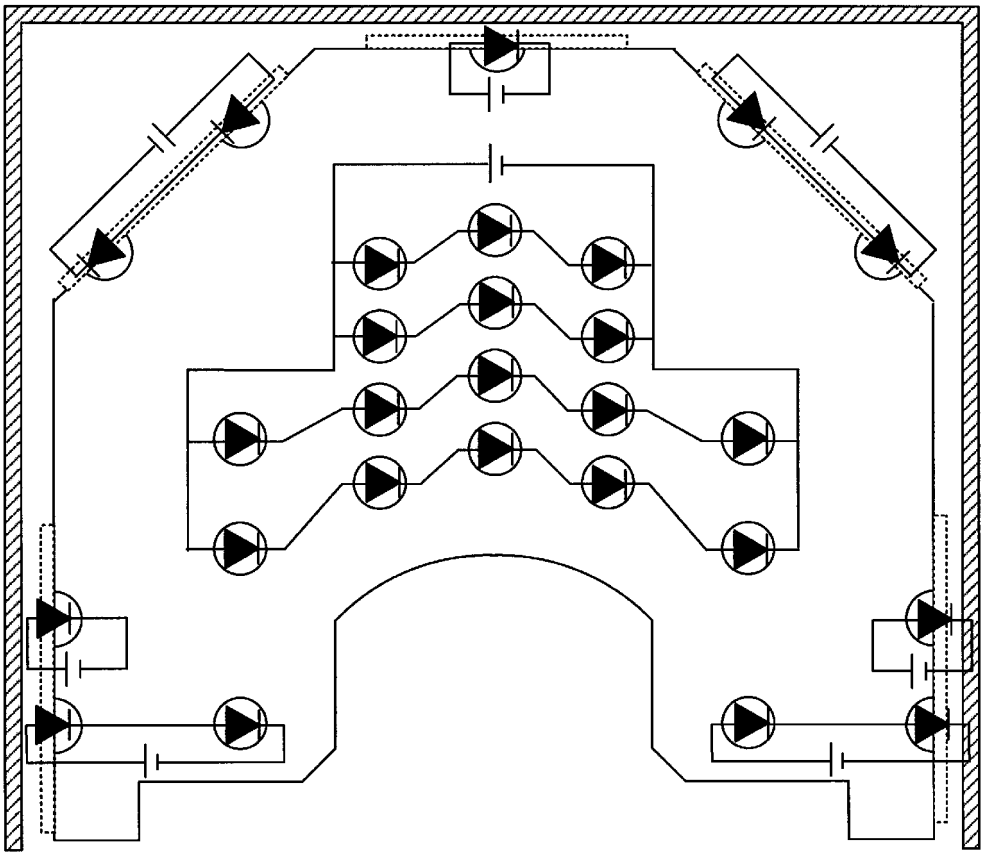
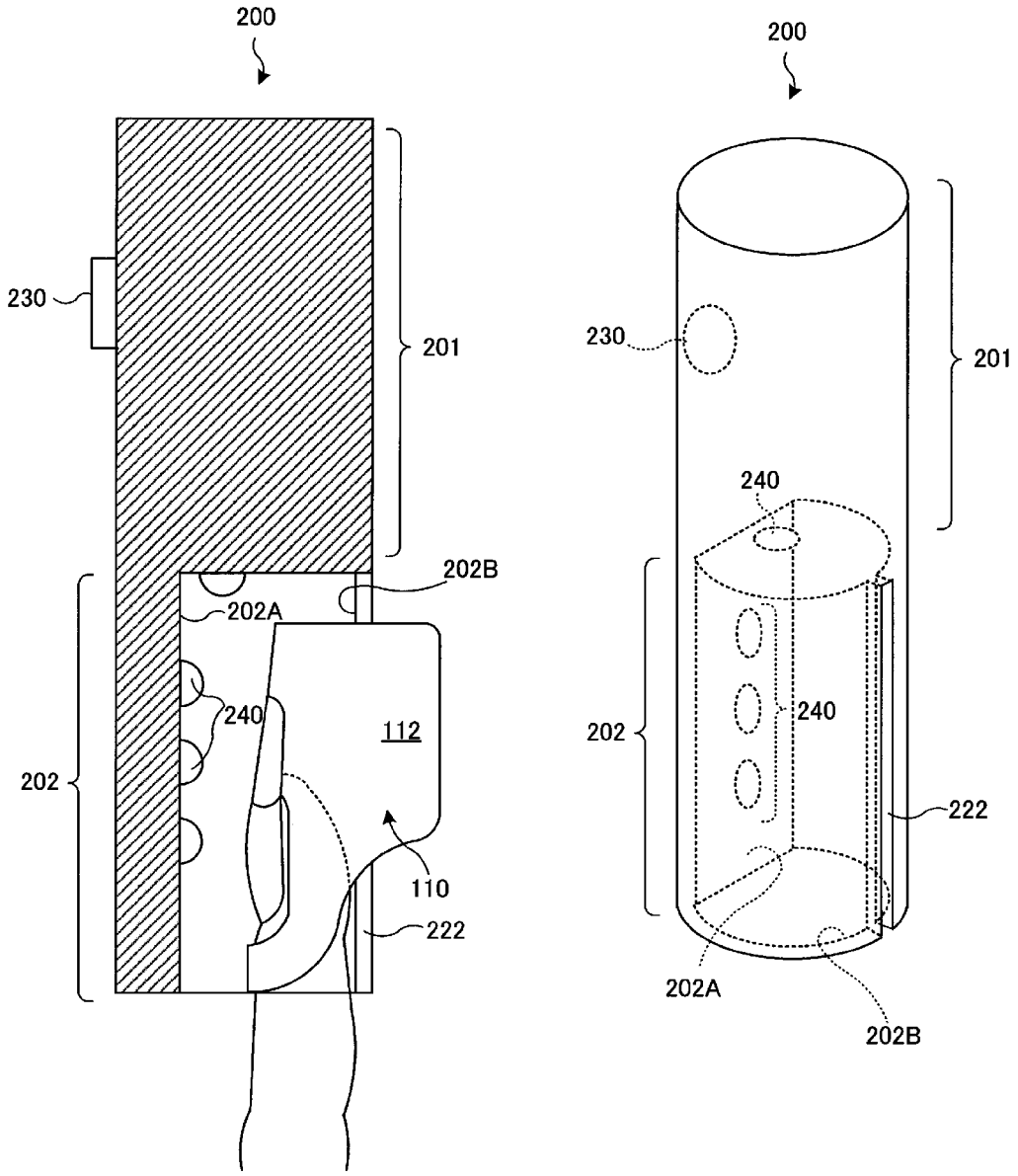


Fig. 12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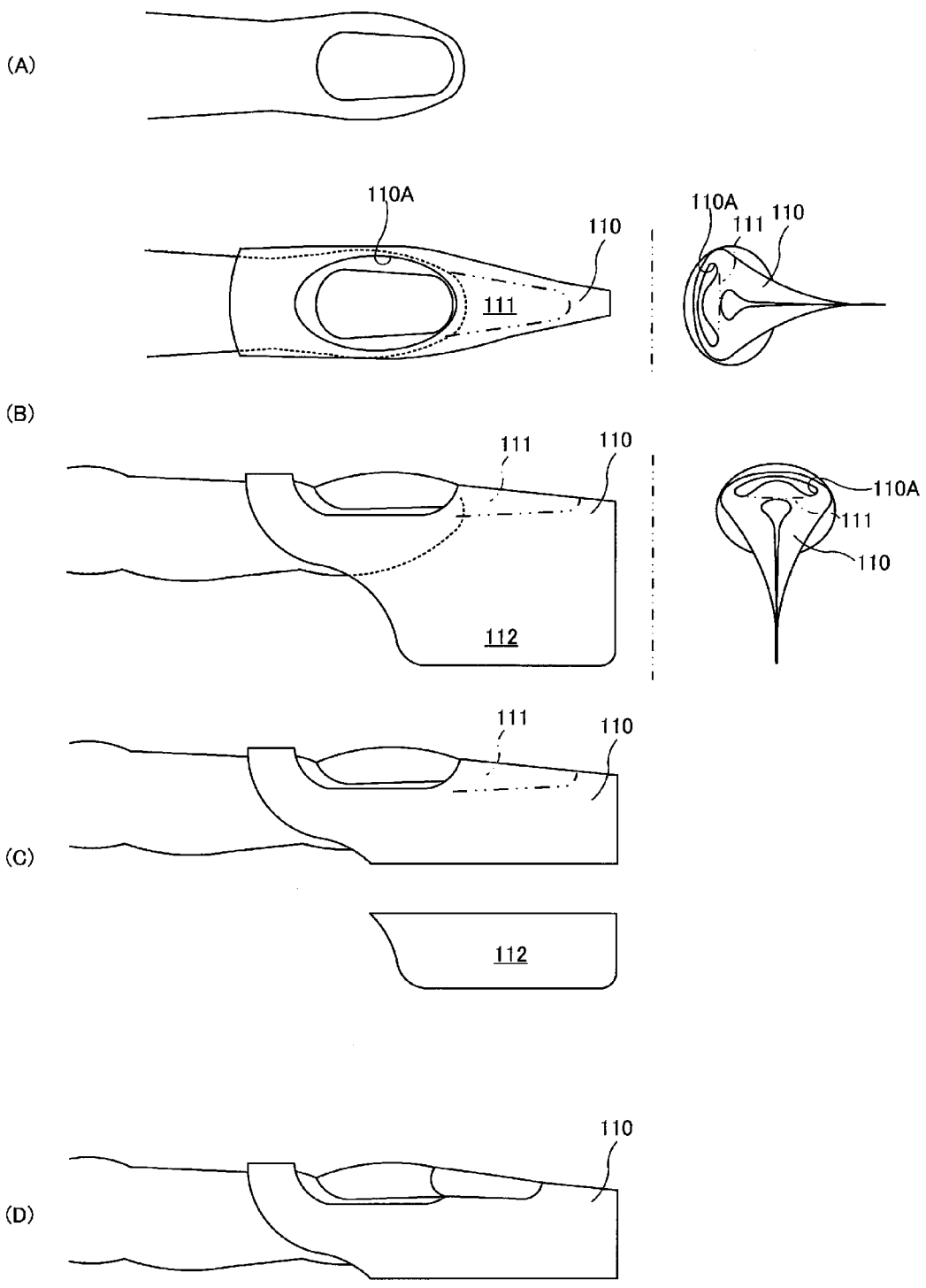
202B
(B)

Fig. 13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(D)
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**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2014/060684

A. CLASSIFICATION OF SUBJECT MATTER
*A45D29/18*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A45D29/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | JP 5036015 B1 (Koichi ARAI), 26 September 2012 (26.09.2012), entire text; all drawings (Family: none) | 1-7 |
| A | JP 3151698 U (Twinbird Corp.), 02 July 2009 (02.07.2009), entire text; all drawings (Family: none) | 1-7 |
| A | JP 2011-78638 A (Prof Precision Kabushiki Kaisha), 21 April 2011 (21.04.2011), entire text; all drawings (Family: none) | 1-7 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 15 July, 2014 (15.07.14) | 29 July, 2014 (29.07.14) |
| Name and mailing address of the ISA/ Japanese Patent Office<br>Facsimile No. | Authorized officer<br>Telephone No. |

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### Patent documents cited in the description


- JP 3042166 A **[0002]**
- JP 3179777 A **[0004]**