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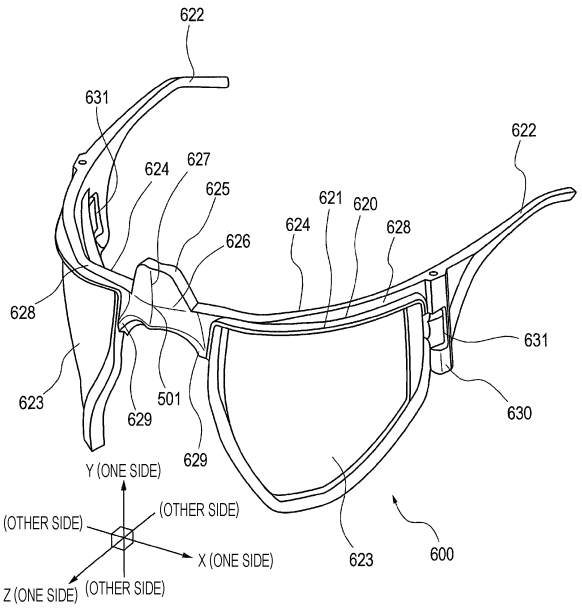
(54) THIN FILM AFFIXING DEVICE AND THIN FILM FORMATION METHOD

(57) A structure where a thin film can be efficiently applied to an applied face is realized. A thin film application device used to apply a thin film on an applied face of an application object includes a frame mountable to the application object, and a thin film holding member, that has a tentative application portion to which the thin film can be tentatively applied to a side face facing the applied face in use, and that is supported by the frame so that the tentative application portion can be pressed against the applied face, and that is detachably mountable to the frame.

FIG. 2



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Description

Technical Field

[0001] The present invention relates to a thin film application device and a thin film forming method, and in particular relates to a thin film application device used at a time of applying a thin film such as a beauty sheet or the like to an applied face (skin, in the case of a beauty sheet), and a thin film forming method suitable to use with such a thin film application device.

Background Art

[0002] Heretofore, there has been technology to make discoloration regions on the skin, such as blemishes on the cheeks, less conspicuous (e.g., see PTL 1). In the technology described in PTL 1, first, the discoloration region on the skin is identified from an image taken of the skin. A beauty sheet (thin film) that can be applied to the skin and has a non-discoloration region color printed thereupon is generated at the same size as the discoloration region or a larger size than the discoloration region. Applying a beauty sheet fabricated in this way enables the discoloration region of the skin to be made inconspicuous.

Citation List

Patent Literature

[0003]

PTL 1: Japanese Unexamined Patent Application Publication No. 2015-43836
PTL 2: Japanese Unexamined Patent Application Publication No. 2014-140978
PTL 3: Japanese Unexamined Patent Application Publication No. 3-157313
PTL 4: Japanese Unexamined Patent Application Publication No. 9-302294
PTL 5: Japanese Unexamined Patent Application Publication No. 2012-203425

Summary of Invention

[0004] The user holds the thin film described in PTL 1 with the hand and applies to the skin, so there is a possibility that the image portion on the thin film may be applied in a state deviated from the applied face that is the target of application. In such a case, the user will peel the thin film off of the applied face and reapply, which is troublesome and work efficiency is poor.

[0005] Accordingly, an aspect of the present invention provides a thin film applying device which can apply a thin film to an applied face in an efficient manner. Also provided is a thin film forming method suitable for use with such a thin film applying device.

[0006] A thin film application device according to an aspect of the present disclosure is a thin film application device used to apply a thin film on an applied face of an application object, and includes a frame mountable to the application object, and a thin film holding member, that has a tentative application portion to which the thin film can be tentatively applied to a side face facing the applied face in use, and that is supported by the frame so that the tentative application portion can be pressed against the applied face, and that is detachably mountable to the frame.

[0007] According to the present disclosure, a thin film can be efficiently applied to an applied face.

Brief Description of Drawings

[0008]

Fig. 1 is schematic diagrams for describing a thin film forming method performed using a thin film application device according to a first embodiment of the present disclosure, and a thin film application method.
Fig. 2 is a perspective view illustrating the thin film application device according to the first embodiment of the present disclosure obliquely from the front side.
Fig. 3 is a perspective view illustrating the thin film application device according to the first embodiment of the present disclosure obliquely from the rear side.
Fig. 4(a) is a perspective view of a holding member for tentatively holding a thin film at the time of using the thin film application device according to the first embodiment of the present disclosure, and (b) is a perspective view illustrating

the way in which a supporting member is peeled away from thin film held by a thin film holding face.

Fig. 5 is a schematic diagram illustrating an example of a makeup support system that performs forming of a thin film used with the thin film application device according to the first embodiment of the present disclosure.

Fig. 6 is a flowchart of a thin film forming method performed using the thin film application device according to the first embodiment.

Fig. 7 is a flowchart of a thin film forming method performed using the thin film application device according to the first embodiment.

Fig. 8(a) is a cross-sectional view illustrating one example of thin film, and (b) is a cross-sectional view illustrating another example of thin film.

Fig. 9 is schematic cross-sectional views for describing methods of cutting the thin film.

Fig. 10(a) is a schematic diagram for describing a state at the time of thin film being peeled away from the supporting member, and (b) is a schematic diagram for describing the state at the time of the thin film being peeled away from a soft member.

Fig. 11 is a perspective view illustrating a modification of the thin film application device according to the first embodiment.

Fig. 12 is schematic diagrams for describing a thin film forming method performed using a thin film application device according to a second embodiment.

Fig. 13(a) is a perspective view illustrating a modification of the thin film application device according to the second embodiment obliquely from the front side, (b) is a perspective view of the modification from the rear side, and (c) is a schematic diagram illustrating a user mounting the thin film application device.

Fig. 14 is a flowchart of a thin film forming method performed using the thin film application device according to the second embodiment.

Fig. 15 is schematic diagrams for describing a thin film forming method performed using a thin film application device according to a third embodiment.

Fig. 16 is a flowchart of the thin film forming method performed using the thin film application device according to the third embodiment.

Fig. 17 is schematic diagrams for describing a thin film forming method performed using a thin film application device according to a fourth embodiment.

Fig. 18 is a flowchart of the thin film forming method performed using the thin film application device according to the fourth embodiment. Description of Embodiments

[1. First Embodiment]

[0009] The structure of a thin film application device 600 according to the present embodiment will be described with reference to Figs. 1 through 4.

[0010] The thin film application device 600 is, for example, for applying a thin film 702 to an applied face (discoloration region 511) of a user 400, in a state of being mounted to an application object (user 400), as illustrated in Fig. 1 (hereinafter referred to as mounted state). Note that the applied face is not restricted to a discoloration region 511, and various regions are applicable, such as wrinkle regions of wrinkles and so forth formed on the face of the user, scar regions of scars or the like, and so forth, for example.

[0011] Now, the orientation of the members will be described in the following description based on an orthogonal coordinates system (X, Y, Z) illustrated in Figs. 1 through 3, to facilitate description. Specifically, in the orthogonal coordinates system (X, Y, Z), the X axis direction is the left-right direction and width direction of the user 400, the Y axis direction is the up-down direction of the user 400, and the Z axis direction is the front-back direction of the user 400. In other words, in the orthogonal coordinates system (X, Y, Z), the X axis direction is the left-right direction and width direction of a facial image 500 illustrated in Fig. 1, the Y axis direction is the up-down direction of the facial image 500, and the Z axis direction is the front-back direction of the facial image 500 (in other words, the depth direction). Note that the up-down direction of the user 400 and the facial image 500 does not necessarily match the vertical direction (in other words, the direction in which gravity acts).

[1.1 Overall Configuration of Thin Film Application Device]

[0012] The thin film application device 600 is formed generally in the shape of eyeglasses, and has a frame 620 and a pair of thin film holding members 640, as illustrated in Figs. 1 through 4. Note that Figs. 2 and 3 omit the pair of thin film holding members 640 from illustration.

[0013] The frame 620 functions to mount the thin film application device 600 to the user 400 like wearing eyeglasses.

[0014] The pair of thin film holding members 640 is pivotably supported as to the frame 620, and has a function where thin film is tentatively applied to a tentative loading portion provided to the rear face thereof. The tentative loading portion

of the pair of thin film holding members 640 services as a pressing portion that, in a mounted state, presses the thin film against an applied face that is the skin (normally the skin of the user him/herself). Note that the pair of thin film holding members 640 may be supported on the frame 620 so as to be capable of displacement, such as sliding or the like, for example.

[1.2 Overall Configuration of Thin Film Application Device]

[0015] Next, the configurations of each of the frame 620 and the pair of thin film holding members 640 will be described with reference to Figs. 1 through 4.

[0016] The frame 620 is configured of silicon (Si), synthetic resin, metal, or the like, for example, and has a frame main unit 621, a pair of retaining portions 622, and a pair of supporting portions 623. Note that the frame main unit 621, the pair of retaining portions 622, and the pair of supporting portions 623 may be configured of the same material, or may be configured of different materials.

[0017] From the middle in the width direction, the frame main unit 621 curves backwards overall the further toward the outer side in the width direction, and has a pair of frame elements 624 that are separated in the width direction, and a consecutive portion 625. In other words, the frame main unit 621 is curved so as to follow the face 401 of the user 400 in the mounted state. This consecutive portion 625 makes the pair of frame elements 624 to be consecutive with each other in the width direction.

[0018] The front face of the consecutive portion 625 has a width-direction reference line 626 in the form of a line formed extending in the width direction, and a vertical-direction reference line 627 in the form of a line formed extending in the vertical direction in the same way. An intersection between the width-direction reference line 626 and the vertical-direction reference line 627 serves as a device base point 501 that is a reference point instructing portion. The device base point 501 may be configured by a recess, a protrusion, a through hole, a decal, paint, or the like. The position of the device base point 501 is not restricted to the aforementioned position.

[0019] The pair of frame elements 624 has a middle frame 628 extending in the width direction, an inner-side frame 629 extending downwards from the inner side of the middle frame 628 in the width direction, and an outer-side frame 630 extending downwards from the outer side edge in the same way.

[0020] The pair of retaining portions 622 are portions for mounting the thin film application device 600 on the user 400. In other words, the pair of retaining portions 622 are equivalent to the temples of eyeglasses, with the rear end portions thereof being retained at the ears of the user 400. Specifically, the retaining portions 622 are provided integrally with the frame elements 624, extending toward the rear side from both ends of the frame main unit 621 in the width direction. The rear end portions of these the retaining portions 622 are inclined downwards the further toward the rear side. Accordingly, stability of the retained state of the retaining portions 622 and the ears 402 of the user 400 can be realized in a mounted state.

[0021] The pair of supporting portions 623 are generally pentagon-shaped platelike members in front-back view. The outer edge portions of these supporting portions 623 are pivotably supported at the outer-side frames 630 of the frame elements 624 via hinge mechanisms 631. That is to say, the pair of supporting portions 623 is capable of pivoting between a closed state illustrated in Figs. 1 (e), 2, and 3, and an open state illustrated in Fig. 1 (a). In the closed state of the thin film application device 600, the width-direction inner edge portions of the pair of supporting portions 623 engage the inner-side frames 629 of the frame elements 624. This engaging preferably occurs at an engaging force of an extend to where the supporting portions 623 do not readily pivot.

[0022] Also, generally pentagon-shaped holding recess portions 632 in front-back view are formed on the rear face of the supporting portions 623. These holding recess portions 632 having a function of holding the thin film holding members 640 in a state regulated to a predetermined relation (i.e., in a uniquely determined state). The holding recess portions 632 preferably have shapes that are not rotationally symmetrical in front-back view (i.e., a shape that only matches itself after being rotated 360 degrees). Note that the shapes and number of the holding recess portions 632 are not restricted to the arrangement in the present embodiment. For example, one or more holding recess portions 632a that are rotated by a predetermined angle from the holding recess portions 632 and have a different depth may be provided, as illustrated in Fig. 11. The user 400 can select the holding recess portion to use in accordance with the shape of his/her own face 401, the position of the discoloration region 511, or the like. Note that the structure illustrated in Fig. 11 is to describe a modification of the holding recess portions, and other structures are the same as a thin film application device 600b described in Fig. 13 which will be described later, so detailed description will be omitted.

[0023] Also, frame-side fixing portions 633 configured of magnets or the like are provided on the rear face of the holding recess portions 632.

[0024] Note that the structure of the rear face of the frame 620 differs between the structure illustrated in Figs. 2 and 3 and the structure illustrated in Fig. 1(c). Specifically, in the case of the structure illustrated in Fig. 1(c), a pair of elastic members 662 and 662a made of sponge or the like is provided at a portion situated to the upper side of the pair of supporting portions 623 and the rear face of the consecutive portion 625, on the rear face of the frame 620. Accordingly,

the thin mounted state of the film application device 600 according to the present embodiment can be adjusted within the range of elastic deformation of the elastic members 662 and 662a as to individual differences of the shape of the face 401 of the user 400.

[0025] The thin film holding members 640 have a supporting base 641 and a soft member 642, as illustrated in Fig. 4.

[0026] The supporting base 641 is configured of synthetic resin, silicon (Si), metal, or the like, and is a plate-shaped member that is curved toward the rear side the further toward the outer side in the width direction. The supporting base 641 has a general pentagon shape that is the same shape or generally the same shape as that of the holding recess portion 632, in front-back view. The supporting base 641 also has a supporting-base-side fixing portion 643, formed of a magnet or the like, at the front face thereof. The supporting-base-side fixing portion 643 of the supporting base 641 can be detachably fixed to the frame-side fixing portion 633 of the holding recess portion 632.

[0027] In this state, the supporting base 641 is disposed on the inner side of the holding recess portion 632 in a state with rattling substantially suppressed. In the case of the present embodiment, the holding recess portion 632 and the supporting base 641 have the same shape in front-back view, and neither has rotational symmetry, so in a state where the supporting base 641 is disposed on the inner side of the holding recess portion 632, the supporting base 641 and holding recess portion 632 are restricted to a predetermined relation.

[0028] Note that the supporting-base-side fixing portion 643 may be provided on the rear face of the supporting base 641, or embedded in the supporting base 641. In the case of the present embodiment, the structure where the positional relation between the supporting base 641 and holding recess portion 632 is restricted to a predetermined relation is realized by innovation of the form of the supporting base 641 and holding recess portion 632. Note however, that a structure where the positional relation between the supporting base 641 and holding recess portion 632 is restricted to a predetermined relation may be realized by innovation of the structure of the frame-side fixing portion 633 and supporting-base-side fixing portion 643.

[0029] The soft member 642 is a plate-shaped member such as a sponge, rubber sheet, or the like, for example, that is soft and absorbs water. An example of material for such a sponge is ethylene α-olefin copolymer, polyurethane, melamine resin, or the like. The soft member 642 has a general pentagon shape that is the same shape as the holding recess portion 632 and supporting base 641 in the front-back view. The front face of this soft member 642 is fixed to the rear face of the supporting base 641 by ab adhesive agent or the like. The rear face of the soft member 642 is a tentative application portion 644 where the thin film can be tentatively applied. This tentative application portion 644 is formed as a curved face that heads toward the rear side the further toward the outer side in the width direction.

[0030] The thin film application device 600 that has the configuration such as described above is mounted to the user 400 by the pair of retaining portions 622 being retained at the ears 402 of the user 400, and the rear face of the consecutive portion 625 of the frame main unit 621 being engaged with the upper end portion of the nose 403 of the user 400, as illustrated in Figs. 1 (a) and (e). Note that in the case of the present embodiment, the eyes 404 of the user 400 are not covered by the thin film application device 600 in the mounted state. In other words, in the mounted state, the eyes 404 of the user 400 are not overlaid with the thin film application device 600 with regard to the front-back direction.

[1.3 Thin Film Structure]

[0031] Next, the thin film structure used in the thin film application device 600 according to the first embodiment will be described.

[0032] A thin film structure 700 has a supporting member 701, and the thin film 702 on which an image portion 703 is formed on part of the front side.

[0033] The supporting member 701 is a sheet-shaped member of a predetermined shape, and is configured of paper or non-woven fabric, porous film, nanofiber sheets, or the like, that absorbs water and has hydrophilicity. A second supporting member (omitted from illustration) that is different from the supporting member 701 may be further provided. The second supporting member is configured of plastic or the like, and is provided in close contact with the reverse face of the supporting member 701 to the face where the thin film 702 is placed. The area of the side of the second supporting member where the supporting member 701 is in contact may be the same area as that of the face of the supporting member 701, but preferably is a larger area. Assistance mark images may also be formed on the second supporting member. Providing the second supporting member in this way can impart the thin film structure 700 with strength, and the user can handle the thin film structure 700 more readily. This supporting member 701 has a general pentagon shape that is of the same shape as the holding recess portion 632 of the frame 620 configuring the thin film application device 600, and the supporting base 641 of the thin film holding member 640, in plane view.

[0034] The thin film 702 is a sheet-shaped member that has permeability and biocompatibility. The materials of such a thin film 702 are not restricted in particular, and an optional thin film can be used. Examples of the material of the thin film include polyesters of which polyglycolic acid, polylactic acid, polycaprolactone, polyethylene succinate, polyethylene terephthalate, and copolymers thereof are representative, polyethers of which polyethylene glycol and polypropylene glycol are representative, polyamides of which nylon, polyglutamic acid, polyaspartic acid, and salts thereof are repre-

sentative, polysaccharides of which pullulan, cellulose, starch, chitin, chitosan, alginic acid, hyaluronic acid, corn starch, and salts thereof are representative, silicones of which acrylic silicone and trimethylsiloxysilicic acid are representative, acrylates of which alky acrylate, silicone acrylate, amide acrylate, and copolymers thereof are representative, polyvinyl alcohol, polyurethane, polycarbonate, polyanhydrides, polyethylene, and polypropylene. 10 to 10,000 nm (10 nm to 10 μm) can be used for the thickness of the thin film 702, and particularly 10 to 1,000 nm is preferable. In a case where the thin film has hydrophobic nature, 10 to 800 nm is particularly preferable. This thin film 702 has a general pentagon shape that is of the same shape as the supporting base 641 and soft member 642 of the thin film holding member 640, in plane view. Also, the outer edge of the thin film 702 is the same as the outer edge of the supporting member 701 as illustrated in Fig. 8(a), or slightly (e.g., 30 μm) smaller, as illustrated in Fig. 8(b). The thin film 702 is loaded to one side face of the supporting member 701 (the front side face in Fig. 1 (c)) so as to be capable of being peeled away. The difference between the outer edge of the thin film 702 and the outer edge of the supporting member 701 is substantially within the range of being the same shape, as described above. There are cases where optional slits are provided to the thin film 702 at the periphery or in plane, so as to be able to conform to the shape of the discoloration region 511 or the periphery of the discoloration region 511.

[0035] The image portion 703 is configured of a coloring matter such as cosmetics or the like, for example, and is formed by printing or the like, for example, on one side face (the front side face in Fig. 1 (c)) of the thin film 702. The image portion 703 may be printed not only of coloring matter, but for example, active components such as medical substances or the like that promote improvement of the discoloration region 511 (whitening components, vitamins, or moisturizing components), UV absorbents, UV reflective agents, and so forth. In a case where a wrinkle region such as wrinkles is detected from the facial image that has been taken, a moisturizing component may be printed on the image portion 703 and the image portion 703 applied to the wrinkle region. This image portion 703 is provided at a portion overlaying the discoloration region 511 in the front-back direction in a state where the thin film 702 is tentatively applied to a portion of the tentative application portion 644 of the thin film application device 600, and the user 400 has mounted the thin film application device 600 (hereinafter, simply referred to as "usage state"). Note that the image portion 703 does not necessarily have to be the same size and shape as the discoloration region 511. For example, the image portion 703 may be larger than the discoloration region 511 by a predetermined largeness.

[0036] The thin film 702 making up the thin film structure 700 is arranged such that the image portion 703 is applied to the discoloration region 511 by one side face of the thin film 702 being pressed against the discoloration region 511, for example.

[1.4 System Configuration]

[0037] Next, the overview of the makeup support system used for forming the above-described thin film will be described with reference to Fig. 5.

[0038] In Fig. 5, a makeup support system 100 has an image processing device 200 including an illumination unit 201, a camera 202, and a display unit 203 such as a liquid crystal display with a touch panel or the like, and a printing device 300, communicably connected to the image processing device 200. The image processing device 200 and printing device 300 are installed in, for example, factories, cosmetics shops, beauty shops, medical institutions, makeup rooms for grooming, event sites, private residences, and so forth. Note that the image processing device 200 may be a portable device that is readily carried.

[1.4.1 Image Processing Device]

[0039] An image acquiring unit (omitted from illustration) that the image processing device 200 has photographs the face 401 of the user 400 situated at the front of the display unit 203, using the camera 202 situated near the display unit 203, in a state of being illuminated by the illumination unit 201. The image processing device 200 then displays a facial image 500 (see Fig. 1) which is the photographed image that has been inverted in the horizontal direction on the display unit 203. That is to say, the image processing device 200 is configured to give the user 400 a sensation close to that of looking into a mirror. Note that Fig. 5 only illustrates a part of the facial image 500. The facial image 500 includes a mounting object image where the user 400 has mounted the thin film application device, and a non-mounting object image where the same is not mounted.

[0040] Note that in a case where the user 400 has a facial image as data or a printed article beforehand, photographing by the camera 202 may be omitted. In this case, an input device (omitted from illustration) for reading in the facial image that the user 400 has as data is preferably provided.

[0041] A mounting determining unit (omitted from illustration) that the image processing device 200 has analyzes the facial image 500, and determines whether or not the user 400 in the facial image 500 has mounted the above-described thin film application device 600 (see (a) and (d) in Fig. 1). In other words, the mounting determining unit that the image processing device 200 has determines whether the facial image 500 is a mounting object image where the user 400 is

in a state of having mounted the thin film application device, or a non-mounting object image where the user 400 is in a state of having not mounted the thin film application device.

[0042] In a case where the mounting determining unit determines that the user 400 has mounted the thin film application device 600, a device information obtaining unit (omitted from illustration) that the image processing device 200 has obtains the device base point 501 provided on the thin film application device 600 from the facial image 500. The method for obtaining the device base point 501 from the facial image 500 is almost the same as a method for obtaining feature points of faces from facial images, described in Japanese Unexamined Patent Application Publication No. 2014-183917 for example, so detailed description will be omitted.

[0043] The device information obtaining unit of the image processing device 200 sets a device coordinates system (e.g., a coordinates system where the horizontal direction of the user 400 is an X_1 axis and the vertical direction is a Y_1 axis) of which the device base point 501 is the origin, as illustrated in Fig. 1 (b). Note that the device coordinates system may be three dimensional, and is not limited to being two-dimensional. In a case of being three dimensional, a three-dimensional coordinates system is set based on multiple images taken from different angles, for example.

[0044] An object information obtaining unit (omitted from illustration) that the image processing device 200 has obtains the discoloration region 511 that is the applied face from the facial image 500, and obtains object coordinates that are the coordinates of the discoloration region 511 relating to the device coordinates system. The image processing device 200 can obtain the coordinates of all points making up the discoloration region 511, or a part of the coordinates. In a case where there are discoloration regions 511 at multiple locations that are separated from each other, the coordinates of each discoloration region 511 are obtained. The object information obtaining unit of the image processing device 200 also obtains information relating to the color of a peripheral region 512 of the discoloration region 511.

[0045] A print information obtaining unit (omitted from illustration) that the image processing device 200 has obtains, coordinates of a portion of an uncut structure 704 (see Fig. 1 (c)) where the image portion 703 is to be printed as image portion position information, based on the object coordinates set as described above. Note that the uncut structure 704 is a material of the thin film structure 700, and is a sheet-shaped member before being cut into the usage state form, and on which the image portion 703 is printed.

[0046] Specifically, the uncut structure 704 has a sheet-shaped uncut supporting member 705, and a sheet-shaped uncut thin film 706 that is loaded to one side face (the front side face in Fig. 1 (c)) of the uncut supporting member 705 in a state capable of being peeled away.

[0047] The method of obtaining the image portion position information specifically is to obtain coordinates of a portion corresponding to the coordinates of the discoloration region 511 in the uncut structure 704, in a state where the uncut structure 704 is assumed to have been placed in the device coordinates system, as image portion position information. At this time, the portion corresponding to the device base point 501 (i.e., the origin of the device coordinates system) is obtained as position information of a printing base point 707 (hereinafter referred to as printing base point position information).

[0048] The print information obtaining unit that the image processing device 200 has obtains coordinates of a portion making up the perimeter (outline) of the thin film structure 700 in the usage state, in a state where the uncut structure 704 is assumed to have been placed in the device coordinates system, as cutting position information.

[0049] An image data generating unit (omitted from illustration) that the image processing device 200 has generates print image data from the printing base point position information and image portion position information, and outputs to the printing device 300. In this case, the image data generating unit also outputs cutting position information to the printing device 300. Note that print image data may be generated and output to the printing device 300 based on cutting position information and image portion position information, instead of the printing base point position information.

[1.4.2 Printing Device]

[0050] The printing device 300 prints an image on the thin film 702 making up the uncut structure 704, based on the print image data obtained from the print information obtaining unit that that the image processing device 200 has. Specifically, in a case where the pint image data includes the printing base point position information and image portion position information, the printing device 300 prints the printing base point 707 illustrated in Fig. 1 (c) and the image portion 703 that is an overlaid image on the uncut structure 704.

[0051] On the other hand, in a case where the printing image data includes the cutting position information and image portion position information, the printing device 300 prints the image portion 703, and a portion corresponding to the perimeter of the thin film structure 700 indicated by a two-dot dashed line, illustrated in Fig. 1 (c) on the uncut structure 704. Materials such as ink that the printing device 300 uses for printing, and specific configurations of each portion are described in PTL 3 through 5 for example, so detailed description will be omitted here.

[0052] In a case where only the printing base point 707 and image portion 703 are printed on the uncut structure 704, the printing device 300 obtains a portion corresponding to the perimeter of the thin film structure 700 based on the cutting position information received from the image processing device 200 (the portion indicated by the two-dot dashed line in

Fig. 1(c)), and cuts the uncut structure 704 along this portion.

[0053] On the other hand, in a case where the image portion 703 and a portion corresponding to the perimeter of the thin film structure 700 are printed on the uncut structure 704, the printing device 300 cuts the uncut structure 704 along this portion.

[0054] A method for cutting the uncut structure 704 by the printing device 300 will be briefly described below. The printing device 300 cuts the thin film structure 700 along the periphery while irradiating the portion corresponding to the periphery of the thin film structure 700 in the uncut structure 704 with a laser 708, as illustrated in Fig. 9(b). At this time, the material making up the thin film 702 is less tolerant to heat than the material making up the supporting member 701, so the cut face of the thin film 702 shrinks more in a direction away from the laser 708 than the cut face of the supporting member 701, due to the heat of the laser 708. As a result, the perimeter of the thin film 702 is situated slightly toward the middle side of the thin film 702 from the perimeter of the supporting member 701. Note that a thin film structure 700 having the same features can be obtained in a case of employing a configuration where the uncut structure 704 is cut by a heated cutter 709 as illustrated in Fig. 9(c) for example, instead of the laser 708. According to this cutting method, just the supporting member 701 can be engaged by the fingers when peeling the supporting member 701 away from the thin film structure 700, so the supporting member 701 can be peeled away from the thin film structure 700 more easily.

[0055] While Fig. 9 illustrates the uncut supporting member 705 being cut as well, an arrangement can be made where only the uncut thin film 706 is cut while leaving the uncut supporting member 705 uncut, by adjusting the laser output. A thin film structure obtained by cutting in this way will have a structure where multiple thin films 702 are loaded on one side of the uncut supporting member 705. In a case of such a structure, pressing the tentative application portion 644 against the thin film 702 so that the cut portion of the thin film 702 matches the perimeter of the tentative application portion 644 of the thin film holding member 640 enables just the thin film of a necessary shape to be peeled away (lifted) from the uncut supporting member 705 following the cut.

[1.5 Thin Film Forming Method]

[0056] An example of a thin film forming method performed using the film application device 600 according to the first embodiment will be described with reference to Figs. 1 and 6. Note that the thin film forming method according to the present example is performed using the above-described image processing device 200.

[1.5.1 First Step]

[0057] First, in step S1, the user 400 mounts the thin film application device 600 in an opened state as illustrated in Fig. 1(a), and obtains the facial image 500 that is a mounting object image by photographing the face 401 using the camera 202 (see Fig. 5) of the image processing device 200. In the case of the thin film forming according to the present example, the film application device 600 is in the opened state, so the discoloration region 511 is in the facial image 500. Note that in a case where the user 400 has a facial image 500 as data or a printed article beforehand, the facial image 500 is input from an input device that the image processing device 200 has. The facial image 500 is also displayed on the display unit 203 as necessary. Note that a state where the user 400 has mounted the thin film application device 600 in an opened state and the pair of supporting portions 623 of the film application device 600 do not cover the discoloration region 511 that is the applied face (e.g., not overlaid in the front-back direction), illustrated in Fig. 1(a), corresponds to a second position of the pair of supporting portions 623.

[1.5.2 Second Step]

[0058] Next, in step S2, the device information obtaining unit that the image processing device 200 has analyzes the facial image 500, and obtains the device base point 501 provided on the thin film application device 600 mounted by the user 400 in the facial image 500. A device coordinates system with the device base point 501 as the origin is set as illustrated in Fig. 1(b).

[1.5.3 Third Step]

[0059] Next, in step S3, the object information obtaining unit that the image processing device 200 has obtains the discoloration region 511 from the facial image 500, and also obtains object coordinates that are the coordinates of the discoloration region 511 relating to the device coordinates system.

[1.5.4 Fourth Step]

[0060] Next, in step S4, the print information obtaining unit that the image processing device 200 has obtains image

portion position information that is the coordinates corresponding to the portion of the image portion 703 in the uncut structure 704 (see Fig. 1(c)), based on the object coordinates. Specifically, coordinates corresponding to the coordinates of the discoloration region 511 in the uncut structure 704, in a state where the uncut structure 704 (uncut supporting member 705 or uncut thin film 706) is assumed to be placed in the device coordinates system, are obtained as image portion position information, as illustrated in Fig. 1(c).

[1.5.5 Fifth Step]

[0061] Next, in step S5, the print information obtaining unit that the image processing device 200 has obtains a portion corresponding to the device base point 501 (i.e., origin) in the device coordinates system as print base point position information. Print image data including the image portion position information and the print base point position information is generated.

[1.5.6 Sixth Step]

[0062] Next, in step S6, the print information obtaining unit that the image processing device 200 has obtains coordinates of the portion corresponding to the perimeter of the thin film structure 700, in a state where the uncut structure 704 is assumed to be placed in the device coordinates system, and obtains these coordinates as cutting position information.

[1.5.7 Seventh Step]

[0063] Next, in step S7, the printing device 300 prints the image portion 703 and printing base point 707 on the uncut thin film 706 making up the uncut thin film 700, based on the print image data.

[1.5.8 Eighth Step]

[0064] Finally, in step S8, the printing device 300 cuts the uncut structure 704 into a predetermined shape (in the case of the present example, a general pentagon shape). In the case of the thin film forming method according to the present example, only the printing base point 707 and image portion 703 are printed on the uncut structure 704. Accordingly, the printing device 300 obtains the portion of the uncut structure 704 that corresponds to the perimeter of the thin film structure 700 (the portion indicated by two-dot dashed lines in Fig. 1(c)) based on cutting position information received from the image processing device 200, and cuts along this position. The cutting method of the uncut structure 704 by the printing device 300 is as described above. Note that a sheet-shaped member already cut in the shape of the perimeter of the thin film structure 700 can be provided before the printing in step S7. In this case, step S8 can be omitted.

[1.6 Thin Film Application Method]

[0065] An example of a thin film application method performed using the thin film application device 600 according to the first embodiment will be described with reference to Figs. 1 and 7. Note that in the following description, a case will be described where there is a discoloration region 511 on only one cheek (the left cheek in Fig. 1(a)) of the user 400. However, the basic thin film application method is the same in a case where there are discoloration regions 511 on both cheeks.

[0066] First, in step S11, the user 400 removes one thin film holding member 640 from the thin film application device 600.

[0067] Next, in step S12, the thin film structure 700 is placed in a recess 661 of a holding member 660 illustrated in Fig. 4(a) in a state where the thin film 702 is on the top. The shape of the recess 661 in plane view (i.e., the shape as viewing from above in Fig. 4) is substantially the same as the shape of the thin film structure 700 in plane view. Note that substantially the same includes difference where the thin film structure 700 can be placed within the recess 661 without rattling. The shape of the recess 661 of the holding member 660 in plane view does not have rotational symmetry, either.

[0068] Next, in step S13, the soft member 642 of the thin film holding member 640 is wetted using a mister or the like.

[0069] Next, in step S14, the tentative application portion 644 of the soft member 642 is pressed against the front face of the thin film 702 that has been placed in the recess 661 of the holding member 660. Thus, the thin film structure 700 is tentatively applied to the tentative application portion 644 of the soft member 642 across the thin film 702. In this state, the supporting member 701 is loaded on the thin film 702.

[0070] Note that in the case of the thin film applying method according to the present example, the shape of the soft member 642 in the front-back direction is substantially the same as the shape of the recess 661 of the holding member 660 in plane view. Accordingly, the positional relation between the soft member 642 and the thin film structure 700 is

restricted to a predetermined relation in a state where the thin film structure 700 is tentatively applied to the soft member 642. Note that the thin film 702 of the thin film structure 700 can be tentatively applied to the tentative application portion 644 of the soft member 642 by hand, as long as the positional relation between he soft member 642 and the thin film structure 700 can be restricted to a predetermined relation.

[0071] Next, in step S15, one thin film holding member 640 is inserted to the inner side of the holding recess portion 632 of one supporting portion 623, in a state where the thin film application device 600 is closed, and the supporting-base-side fixing portion 643 of one thin film holding member 640 is detachably fixed to the frame-side fixing portion 633 of one supporting portion 623, as illustrated in Fig. 1(d). In this state, the positional relation between the one thin film holding member 640 and the frame 620 (one supporting portion 623) is restricted to a predetermined relation. Accordingly, the positional relation between the thin film structure 700 and thin film application device 600 is also restricted to a predetermined relation. Note that the above-described work may be performed in a state where the thin film application device 600 is opened, and then the thin film application device 600 is placed in a closed state after having fixed the one thin film holding member 640 to the frame 620.

[0072] Next, in step S16, the user 400 peels the supporting member 701 away from the thin film structure 700, as illustrated in Fig. 4(b). At this time, a water layer 663 has been formed on the supporting member 701 between the supporting member 701 and the thin film 702 as illustrated in Fig. 10(a), so the supporting member 701 can be easily peeled away from the thin film structure 700 (thin film 702).

[0073] Next, in step S17, the user 400 mounts the thin film application device 600 in a closed state, as illustrated in Fig. 1(e). In this state, the image portion 703 of the thin film 702 that has been tentatively applied to the tentative application portion 644 of the thin film application device 600 overlays the discoloration region 511 in the front-back direction. In other words, in the case of the thin film 702 that has been fabricated by the thin film forming method such as described above, the coordinates of the image portion 703 of the thin film 702 tentatively applied to the tentative application portion 644 are equal to the coordinates of the discoloration region 511 in the device coordinates system. Accordingly, the thin film 702 is pressed against the discoloration region 511 in the state illustrated in Fig. 1(e). Note that the front face of one (the left side in Fig. 1(e)) supporting portion 623 may be pressed toward the discoloration region 511 as necessary. Note that the state where the user 400 has mounted the thin film application device 600 in a closed state and the pair of supporting portions 623 of the thin film application device 600 cover (i.e., overlaid in the front-back direction) the discoloration region 511 that is the applied face, as illustrated in Fig. 1(e), corresponds to the first position of the pair of supporting portions 623.

[0074] Finally, in step S18, the user 400 removes the thin film application device 600, whereupon the thin film 702 is peeled away from the tentative application portion 644 of the thin film application device 600, and the image portion 703 of the thin film 702 is applied to the discoloration region 511, as illustrated in Fig. 1(f). Note that in the case of the thin film application method according to the present example, portions of the thin film 702 other than the image portion 703 are applied to the periphery of the discoloration region 511, but are inconspicuous due to be uncolored and transparent. There is the water layer 663 formed between the thin film 702 and tentative application portion 644 as illustrated in Fig. 10(b), so the thin film 702 readily peels away from the tentative application portion 644 when removing the thin film application device 600.

[1.7 Operations and Advantages]

[0075] According to the thin film application device 600 of the present embodiment having the configuration described above, the thin film 702 can be efficiently applied to the discoloration region 511. That is to say, when the user 400 mounts the thin film application device 600 in a state where the thin film 702 formed by the above-described forming method is tentatively applied to the tentative application portion 644 of the thin film application device 600, the image portion 703 of the thin film 702 overlays the discoloration region 511 in the front-back direction. Accordingly, the image portion 703 of the thin film 702 can be accurately applied to the discoloration region 511 that is the application target. As a result, the task of peeling and reapplying the thin film 702 can be reduced, and the work efficiency of applying the thin film 702 can be improved.

[0076] Also, in the case of the thin film application device 600 according to the present embodiment, the task of pressing the thin film 702 against the discoloration region 511 can be performed without using the hands. Accordingly, the possibility of the thin film 702 being deformed or damaged at the time of application work can be reduced. Also, according to the thin film application device 600 of the present embodiment, photography of the user 400 when carrying out the forming method using the thin film application device 600 only needs to be performed once, so the work efficiency of forming the thin film 702 can be improved.

[1.8 Notes]

[0077] Although the thin film application device 600 according to the above-described first embodiment has the tentative

application portion 644 formed to the rear face of the soft member 642, a hydrophilic member that has hydrophilicity at a face that faces the discoloration region 511 at least in the usage state can be employed instead of the soft member. In this case, the rear face of the hydrophilic member serves as the tentative application portion.

[2. Second Embodiment]

[0078] A thin film application device 600a according to a second embodiment will be described with reference to Fig. 12.

[0079] The structure of the thin film application device 600a according to the present embodiment differs from the thin film application device 600 according to the above-described first embodiment with regard to the structure of a pair of supporting portions 623a. Other structures are the same as the thin film application device 600 according to the first embodiment, so description will be made below primarily regrading points of difference.

[0080] The thin film application device 600a has the one pair of supporting portions 623a formed integrally with the frame main unit 621. Accordingly, the one pair of supporting portions 623a do not pivot as to the frame main unit 621. Accordingly, the discoloration region 511 cannot be viewed form the front side in a state where the user 400 has mounted the thin film application device 600a, as illustrated in Fig. 12(b). Other structures are the same as with the thin film application device 600 according to the above-described first embodiment.

[2.1 System Configuration]

[0081] Next, an overview of the makeup support system, used in a thin film forming method that will be described later, will be described with reference to Figs. 5 and 12. Note that description of configurations of the image forming device that the makeup support system has, that would be redundant with content already described, will be omitted as possible.

[0082] In the case of the present example, in a case where an object information obtaining unit (omitted from illustration) that the image processing device 200 has analyzes facial images (e.g., facial images 500a and 500b in Figs. 5 and 12) and determines that the user 400 in the facial images does not have the thin film application device 600a mounted, obtains an object base point 406, which is a feature point, from the facial image 500a that is a mounting object image. The object information obtaining unit then sets an object coordinates system where the object base point 406 is the origin (e.g., a coordinates system where the horizontal direction of the face 401 of the user 400 is the X_2 axis and the vertical direction is the Y_2 axis), as indicated by the dashed lines in Fig. 12(c). Feature points are, for example, the intersection between a line α_1 that follows the ridge of the nose and a line α_2 that connects the eyes, between the eyebrows, the eyes, the mouth, or the like. A method for obtaining feature points from facial images is described in Japanese Unexamined Patent Application Publication No. 2014-183917 for example, so detailed description will be omitted.

[0083] Also, the object information obtaining unit that the image processing device 200 has obtains the discoloration region 511 from the facial image 500a and obtains object coordinates that are coordinates of the discoloration region 511 relating to the object coordinates system.

[0084] A base point determining unit (omitted from illustration) that the image processing device 200 has determines whether the device base point 501 that is a reference point indicating portion overlays the object base point 406 in the front-back direction in the facial image 500b illustrated in Fig. 12(b).

[0085] In a case where, as a result of the base point determining unit performing determining, the device base point 501 and object base point 406 are judged to not be overlaid in the front-back direction, a position information correcting unit (omitted from illustration) that the image processing device 200 has converts object coordinates that are coordinates of the discoloration region 511 relating to the object coordinates system into coordinates of the discoloration region 511 relating to the device coordinates system, and obtains these as corrected object coordinates.

[0086] On the other hand, in a case where, as a result of the base point determining unit performing determining, the device base point 501 and object base point 406 are judged to be overlaid in the front-back direction, the position information correcting unit that the image processing device 200 has maintains the object coordinates that are the coordinates of the discoloration region 511 relating to the object coordinates system as they are.

[2.2 Thin Film Forming Method]

[0087] An example of a thin film forming method using the thin film application device 600a according to the second embodiment will be described with reference to Figs. 12 and 14. Note that description of the thin film application method will be omitted, since it is the same as the thin film application method described with reference to Fig. 1. The thin film forming method described below is carried out using the above-described image processing device 200.

[0088] The thin film forming method according to the present example is a method suitable for a cause of using the thin film application device 600a where the pair of supporting portions 623a cannot pivot as to the frame main unit 621,

and the discoloration region 511 cannot be visually recognized from the front side in a mounted state.

[2.3.1 First Step]

[0089] Specifically, first, in step S21, the user 400 photographs the face 401 using the camera 202 of the image processing device 200 (see Fig. 5) in a state of not mounting the thin film application device 600a, as illustrated in Fig. 12(a), thereby obtaining the facial image 500a. The discoloration region 511 is in the facial image 500a in this state. Note that with the forming method according to the present example as well, in a case where the user 400 has a facial image 500a as data or a printed article beforehand, the facial image 500a is input from an input device that the image processing device 200 has. The facial image 500 is also displayed on the display unit 203 as necessary.

[2.3.2 Second Step]

[0090] Next, in step S22, an object base point 406 that is a feature point is obtained from the facial image 500a, by the object information obtaining unit that the image processing device 200 has. An object coordinates system (e.g., a coordinates system where the horizontal direction of the face 401 of the user 400 is an X_2 axis and the vertical direction is the Y_2 axis) with the object base point 406 as the origin is set, such as illustrated by dashed lines in Fig. 12(c).

[2.3.3 Third Step]

[0091] Next, in step S23, the object information obtaining unit that the image processing device 200 has obtains the discoloration region 511 from the facial image 500a, and coordinates of the discoloration region 511 relating to the object coordinates system are obtained as object coordinates.

[2.3.4 Fourth Step]

[0092] Next, in step S24, the user 400 mounts the thin film application device 600a as illustrated in Fig. 12(b), and photographs the face 401 by the camera 202 of the image processing device 200 to obtain the facial image (mounting object image) 500b. Note that in a case where the user 400 has a facial image 500b as data or a printed article beforehand, the facial image 500b is input from an input device that the image processing device 200 has. The facial image 500b is also displayed on the display unit 203 as necessary.

[2.3.5 Fifth Step]

[0093] Next, in step S25, the facial image 500b is analyzed by the device information obtaining unit that the image processing device 200 has, and the device reference point 501 provided to the thin film application device 600a is obtained.

[2.3.6 Sixth Step]

[0094] Next, in step S26, the base point determining unit that the image processing device 200 has determines whether or not the device reference point 501 and the object base point 406 are overlaid in the front-back direction in the facial image 500b illustrated in Fig. 12(b). At this time, the correlation between the facial image 500a and the facial image 500b is adjusted beforehand. Specifically, the object coordinates system set to the facial image 500a is set to the facial image 500b, for example. Position information of the object base point 406 in the facial image 500b is obtained. Note that the device reference point 501 and the object base point 406 are not overlaid in the facial image 500b.

[2.3.7 Seventh Step]

[0095] Next, in a case where the base point determining unit that the image processing device 200 has determined that the device reference point 501 and object base point 406 are not overlaid in the front-back direction in the facial image 500b, in step S27 a device coordinates system (e.g., a coordinates system where the horizontal direction of the face 401 of the user 400 is the X_1 axis and the vertical direction is the Y_1 axis) of which the device base point 501 is the origin is set, as indicated by solid lines in Fig. 12(c).

[2.3.8 Eighth Step]

[0096] Next, in step S28, object coordinates that are coordinates of the discoloration region 511 relating to the object coordinates system are converted into coordinates of the discoloration region 511 relating to the device coordinates

system, and the coordinates after coordinate conversion are obtained as corrected object coordinates. Specifically, (X_{2a}, Y_{2a}) that are coordinates of the discoloration region 511 with regard to the object coordinates system (X_2, Y_2) are converted into (X_{1a}, Y_{1a}) that are coordinates of the device coordinates system (X_1, Y_1), as illustrated in Fig. 12(c), for example. Such coordinate conversion is performed regarding all points making up the discoloration region 511.

[2.3.9 Ninth Step]

[0097] Next, in step S29, the print information obtaining unit that the image processing device 200 has obtains image portion position information that is the coordinates of the portion corresponding to the image portion 703 in the uncut structure 704 (see Fig. 1(c)) as correction object coordinates. Specifically, coordinates corresponding to the corrected object coordinates in the uncut structure 704 are taken as image portion position information in a state where the uncut structure 704 is assumed to be placed in the device coordinates system.

[0098] Note that in a case where the base point determining unit that the image processing device 200 has determines that the device reference point 501 and object base point 406 are overlaid in the back-front direction in the facial image 500b, in step S30 the print information obtaining unit that the image processing device 200 has obtains image portion position information that is the coordinates of a portion corresponding to the image portion 703 in the uncut structure 704 (see Fig. 1(c)), based on the object coordinates obtained in step S23. The subsequent steps are the same as the thin film forming method described with reference to Fig. 6. Also, detailed description of the thin film application method will be omitted, since it is the same as the thin film application method described with reference to Fig. 7.

[2.4 Operations and Advantages]

[0099] In a case of the thin film application device according to the second embodiment described above, the pair of supporting portions 623a do not pivot as to the frame main unit 621, so there is no need to provide a pivoting mechanism, and the structure of the thin film application device 600a can be simplified. As a result, the manufacturing costs of the thin film application device 600a can be reduced.

[0100] Also, according to the thin film forming method using the thin film application device 600a according to the present embodiment, a thin film can be formed that is suitable for use with the thin film application device 600a according to the present embodiment where the discoloration region 511 cannot be visually recognized form the front side in a state where the user 400 has the thin film application device 600a mounted.

[2.5 Notes]

[0101] Separate from the thin film application device 600a described above, a thin film application device 600b such as illustrated in Fig. 13, for example, can be used with the thin film forming method described above. The thin film application device 600b will be briefly described below.

[0102] The thin film application device 600b has the pair of supporting portions 623a formed integrally with the frame main unit 621, in the same way as the thin film application device 600a according to the second embodiment described above. Accordingly, the pair of supporting portions 623a do not pivot as to the frame main unit 621. Thus, the discoloration region 511 cannot be visually recognized form the front side in a state where the user 400 has the thin film application device 600b mounted, as illustrated in Fig. 13(c), with the thin film application device 600b as well.

[0103] Also, a forehead covering portion 634 is provided to the frame main unit 621 of the thin film application device 600b, at a portion that overlays the lower edge of the forehead 405 of the user 400 in the front-back direction when mounted. A pair of through holes 635 that pass through the frame main unit 621 in the front-back direction is formed at portions relating to the vertical direction of the forehead covering portion 634 and the pair of supporting portions 623a. These through holes 635 are overlaid on the eyes 404 of the user 400 in the front-back direction, in a mounted state. Accordingly, the user 400 can see through in the front-back direction, in a mounted state.

[0104] At portions of the rear face of the frame main unit 621 where the nose 403 of the user 400 and the lower edge portion of the forehead 405 are overlaid in the front-back direction, elastic members 637a and 637b such as sponge or the like are fixed by adhesive agent or the like. Accordingly, in the mounted state, the thin film application device 600b can be adjusted within the range of elastic deformation of the elastic members 637a and 637b as to individual differences of the shape of the face 401 of the user 400.

[0105] The mounted state of the thin film application device 600b that has the configuration such as described above can be stabilized, since the area of the portion facing the user 400 in the front-back direction is larger in the mounted state.

[3. Third Embodiment]

[0106] A thin film application device 600c according to a third embodiment will be described with reference to Fig. 15.

[0107] The structure of the thin film application device 600c according to the present embodiment differs from the thin film application device 600 according to the above-described first embodiment with regard to the structure of a frame consecutive portion 625a making up a frame 620b. Other structures are the same as those of the thin film application device 600 according to the first embodiment, so description will be made below primarily regrading points of difference.

[0108] In the case of the thin film application device 600c, a base point through hole 636 that passes through the consecutive portion 625a in the front-back direction is formed at the middle in the width direction and toward the upper edge of the consecutive portion 625a making up the frame 620b. This base point through hole 636 is formed having a circular shape as viewed in the front-back direction. Note that the shape of the base point through hole 636 is not restricted to the case of the present embodiment. The base point through hole 636 may be, for example, a rectangle, polygon, or the like, in the front-back direction, for example. The base point through hole 636 serves as the device base point that is the base point indicating portion in the case of the present embodiment. Other structures are the same as those of the thin film application device 600 according to the first embodiment described above.

[3.1 System Configuration]

[0109] Next, a configuration of the makeup support system, used in a thin film forming method that will be described later, will be described with reference to Figs. 5 and 15. Note that description of configurations of the image processing device that the makeup support system has, that would be redundant with content already described, will be omitted as possible.

[0110] In the case of the present example, in a case where an object information obtaining unit (omitted from illustration) that the image processing device 200 has analyzes a facial images 500c and determines that the user 400 in the facial image 500c does not have the thin film application device 600c mounted, an object base point 406b is obtained from the facial image 500c that is a mounting object image. The object information obtaining unit then sets an object coordinates system where the object base point 406b is the origin (e.g., a coordinates system where the horizontal direction of the face of the user 400 is the X_1 axis and the vertical direction is the Y_1 axis), as indicated by the solid lines in Fig. 12(c). The object base point 406b is configured of a decal applied to the face of the user 400, paint, or the like. The method of obtaining the object base point 406a from the facial image 500c is almost the same as the method for obtaining feature points from facial images that is described in Japanese Unexamined Patent Application Publication No. 2014-183917 for example, so detailed description will be omitted.

[0111] Also, the object information obtaining unit that the image processing device 200 has obtains the discoloration region 511 from the facial image 500c and obtains object coordinates that are coordinates of the discoloration region 511 relating to the object coordinates system.

[3.2 Thin Film Forming Method]

[0112] An example of a thin film forming method using the thin film application device 600c according to the third embodiment will be described with reference to Figs. 15 and 16. Note that description of the thin film application method will be omitted, since it is the same as the thin film application method described with reference to Fig. 1. The thin film forming method described below is carried out using the above-described image processing device 200.

[3.2.1 First Step]

[0113] In the thin film forming method according to the present example, first, in step S31, the user 400 sets the object base point 406b, configured of a decal or the like, on an object base point setting portion 407 that is a portion of the face 401 of the user 400 overlaid by the base point through hole 636 in the front-back direction in a state where the thin film application device 600c is mounted, as illustrated in Fig. 15(a). Specifically, in a state where the thin film application device 600c is mounted, the object base point 406b is inserted inside the base point through hole 636 of the thin film application device 600c from the front of the thin film application device 600c, and applied to the object base point setting portion 407. Note that the object base point 406b may be set by applying paint or the like, for example, to the object base point setting portion 407, instead of a decal.

[3.2.2 Second Step]

[0114] Next, in step S32, the user 400 photographs the face 401 by the camera 202 of the image processing device 200 (see Fig. 5) to obtain the facial image 500c. In this state, the discoloration region 511 is in the facial image 500c. Note that in the case of the present embodiment as well, if the user 400 has a facial image 500c as data or a printed article beforehand, the facial image 500c is input from an input device that the image processing device 200 has. The facial image 500c is also displayed on the display unit 203 as necessary.

[3.2.3 Third Step]

[0115] Next, in step S33, the object base point 406b is obtained from the facial image 500c by the object information obtaining unit that the image processing device 200 has. An object coordinates system is then set where the object base point 406b is the origin (e.g., a coordinates system where the horizontal direction of the face 401 of the user 400 is the X_1 axis and the vertical direction is the Y_1 axis), as indicated by the solid lines in Fig. 15(c).

[3.2.4 Fourth Step]

[0116] Next, in step S34, the object information obtaining unit that the image processing device 200 has obtains the discoloration region 511 from the facial image 500c, and also obtains object coordinates that are the coordinates of the discoloration region 511 relating to the object coordinates system.

[3.2.5 Fifth Step]

[0117] Next, in step S35, the print information obtaining unit that the image processing device 200 has obtains image portion position information that is the coordinates of a portion corresponding to the image portion 703 in the uncut structure 704 (see Fig. 1(c)), based on the object coordinates. Specifically, coordinates corresponding to the coordinates of the discoloration region 511 in the uncut structure 704, in a state assuming the uncut structure 704 to be placed in the object coordinates system, are taken as image portion position information. The subsequent steps are the same as the thin film forming method described with reference to Fig. 6. Also, detailed description of the thin film application method will be omitted, since it is the same as the thin film forming method described with reference to Fig. 7.

[3.3 Operations and Advantages]

[0118] In the case of the thin film application device according to the third embodiment that has the configuration such as described above, providing the base point through hole 636 to serve as the device base point in the thin film application device 600c enables the object base point 406b to be set on the face 401 of the user 400, overlaid by the device base point in the front-back direction, in a state of the user 400 mounted with the thin film application device 600c. Accordingly, the number of times of photography of the face 401 can be made to be once in the thin film forming method performed using the thin film application device 600c, and there is no need to perform coordinate conversion as with the thin film forming method described with reference to Fig. 14.

[4. Fourth Embodiment]

[0119] A thin film application device 600d according to a fourth embodiment will be described with reference to Fig. 17.

[0120] The thin film application device 600d according to the present embodiment differs from the thin film application device 600a according to the above-described second embodiment with regard to the structure of a frame consecutive portion 625b. Specifically, the thin film application device 600d has the width-direction reference line 626 and vertical-direction reference line 627 formed on the front face of the consecutive portion 625b, in the same way as with the thin film application device 600 according to the first embodiment described above. Other structures are the same as those of the thin film application device 600a according to the second embodiment. Note that the configuration of the image processing device is almost the same as the configuration of the image processing device 200 described above, so detailed description will be omitted.

[4.1 Thin Film Forming Method]

[0121] An example of a thin film forming method for forming the thin film used by thin film application device 600d according to the fourth embodiment will be described with reference to Figs. 17 and 18. The thin film forming method according to the present example is carried out using the above-described image processing device 200.

[4.1.1 First Step]

[0122] In the thin film forming method according to the present example, first, in step S41, the user 400 sets an object base point 406c, configured of a decal or the like, on an object base point setting portion 407a that is any portion of the face 401 of the user 400 (below the left eye in Fig. 17(a) in the case of the present example), as illustrated in Fig. 17(a). Note that the object base point 406c may be set by applying cosmetics, paint such as a coloring material, or the like, for example, to the object base point setting portion 407a, instead of a decal.

[4.1.2 Second Step]

[0123] Next, in step S42, the user 400 photographs the face 401 by the camera 202 of the image processing device 200 (see Fig. 5) to obtain the facial image 500d, without mounting the thin film application device 600d. In this state, the discoloration region 511 is in the facial image 500d. Note that in the case of the present embodiment as well, if the user 400 has a facial image 500d as data or a printed article beforehand, the facial image 500d is input from an input device that the image processing device 200 has. The facial image 500d is also displayed on the display unit 203 as necessary.

[4.1.3 Third Step]

[0124] Next, in step S43, the object base point 406c is obtained from the facial image 500d by the object information obtaining unit that the image processing device 200 has. An object coordinates system is then set where the object base point 406c is the origin (e.g., a coordinates system where the horizontal direction of the face 401 of the user 400 is the X_2 axis and the vertical direction is the Y_2 axis), as indicated by the dashed lines in Fig. 17(b).

[4.1.4 Fourth Step]

[0125] Next, in step S44, the object information obtaining unit that the image processing device 200 has obtains the discoloration region 511 from the facial image 500d, and also obtains object coordinates that are the coordinates of the discoloration region 511 relating to the object coordinates system.

[4.1.5 Fifth Step]

[0126] Next, in step S45, in a state where the thin film application device 600a is mounted, a portion of the facial image 500d that is overlaid by the intersection between the width-direction reference line 626 and vertical-direction reference line 627 of the thin film application device 600a (in the case of the present example, the intersection between the line α_1 that follows the ridge of the nose and the line α_2 that connects the eyes) is taken as a device reference point 501b that is a base point indicating portion, and a device coordinates system (e.g., a coordinates system where the horizontal direction of the face 401 of the user 400 is the X_1 axis and the vertical direction is the Y_1 axis) of which the origin is the device reference point 501b is set, as indicated by solid lines in Fig. 17(b).

[4.1.6 Sixth Step]

[0127] Next, in step S46, object coordinates that are coordinates of the discoloration region 511 relating to the object coordinates system are converted into coordinates of the discoloration region 511 relating to the device coordinates system, and the coordinates after coordinate conversion are obtained as corrected object coordinates. Specifically, (X_{2a}, Y_{2a}) that are coordinates of the discoloration region 511 with regard to the object coordinates system (X_2, Y_2) are converted into (X_{1a}, Y_{1a}) that are coordinates of the device coordinates system (X_1, Y_1), as illustrated in Fig. 17(b), for example. Such coordinate conversion is performed regarding all points making up the discoloration region 511.

[4.1.7 Seventh Step]

[0128] Next, in step S47, the print information obtaining unit that the image processing device 200 has obtains image portion position information that is the coordinates of the portion corresponding to the image portion 703 in the uncut structure 704 (see Fig. 1(c)). Specifically, coordinates corresponding to the coordinates of the discoloration region 511 in the uncut structure 704 are taken as image portion position information in a state where the uncut structure 704 is assumed to be placed in the device coordinates system. Subsequent steps are the same as in the thin film forming method described with reference to Fig. 6.

[0129] When applying the thin film 702 (see Fig. 1) to the discoloration region 511, the thin film application device 600a is mounted in a state where the intersection of the width-direction reference line 626 and the vertical-direction reference line 627 of the thin film application device 600a overlays the intersection between the line α_1 that follows the ridge of the nose of the user 400 and the line α_2 that connects the eyes, in the front-back direction. Other aspects of the thin film application method are almost the same as the thin film forming method described with reference to Fig. 7, so detailed description will be omitted.

[4.2 Operations and Advantages]

[0130] In the case of the thin film application device according to the present embodiment having the above-described

configuration as well, the number of times of photography of the face 401 of the user 400 can be made to be once in the thin film forming method performed described above, so work time can be reduced and work efficiency can be improved. The above-described thin film forming method is effective, for example, in a case where the distance between the device reference point 501b and the discoloration region 511 is long, and the coordinates of the discoloration region 511 based on the device reference point 501b are not readily directly obtained.

[5. Notes Regarding Present Disclosure]

[0131] Description has been made regarding a thin film application device used to hide blemishes on the skin of a user in the above-described embodiments. However, the thin film application device and thin film forming method according to the present disclosure can be carried out in usages such as applying fake tattoos, body paint, and so forth, to the skin of a user. In this case, a face to apply the fake tattoo or body paint is obtained as a virtual face by simulation in the image processing device 200, and the thin film forming method according to the present disclosure is applied with this virtual face as an applied face.

[0132] Further, making the thin film application device according to the present disclosure based on data obtained by 3D scanning of the face of the user beforehand enables a thin film application device of a shape suitable for individual users. On the other hand, aggregating data of a great number of users (e.g., facial shape) and designing a standard-shape thin film application device that meets the needs of a great number of users would enable mass-production, and reduction in manufacturing costs can be reduced.

Industrial Applicability

[0133] The thin film application device and thin film forming method according to the present disclosure are particularly useful with regard to beauty.

Reference Signs List

[0134]

100	makeup support system
200	image processing device
201	illumination unit
202	camera
203	display unit
300	printing device
400	user
401	face
402	ears
403	nose
404	eyes
405	forehead
406, 406a, 406b, 406c	object base point
407, 407a	object base point setting portion
500, 500a, 500b, 500c, 500d	facial image
501, 501	b device reference point
511	discoloration region
512	peripheral region
600, 600a, 600b, 600c, 600d	thin film application device
620, 620b	frame
621	frame main unit
622	retaining portion
623, 623a	supporting portion
624	frame element
625, 625a, 625b	consecutive portion
626	width-direction reference line
627	vertical-direction reference line
628	middle frame
629	inner-side frame

630	outer-side frame
631	hinge mechanism
632, 632a	holding recess portion
633	frame-side fixing portion
634	forehead covering portion
635	through hole
636	base point through hole
637a, 637b	elastic member
640	thin film holding member
641	supporting base
642	soft member
643	supporting-base-side fixing portion
644	tentative application portion
660	holding member
661	recess
662, 662a	elastic member
663	water layer
700	thin film structure
701	supporting member
702	thin film
703	image portion
704	uncut structure
705	uncut supporting member
706	uncut thin film
707	printing reference point
708	laser
709	cutter

Claims

1. A thin film application device used to apply a thin film on an applied face of an application object, the thin film application device comprising:

a frame mountable to the application object; and
a thin film holding member, that has a tentative application portion to which the thin film can be tentatively applied to a side face facing the applied face in use, and that is supported by the frame so that the tentative application portion can be pressed against the applied face, and that is detachably mountable to the frame.

2. The thin film application device according to Claim 1,
wherein the thin film holding member includes

a supporting base detachably mountable to the frame, and
a soft member fixed to the supporting base in a layered state,

wherein the tentative application portion is provided on a side face of the soft member that faces the applied face in use.

3. The thin film application device according to Claim 1,
wherein the frame has a supporting portion,
and wherein the supporting portion supports the thin film holding member with the side face of the thin film holding member facing the applied face when the frame is mounted to the application object.

4. The thin film application device according to Claim 3,
wherein the supporting portion is provided to be capable of displacement as to a frame main unit of the frame, and moves between a first position where the supporting portion covers the applied face when the frame is mounted on the application object, and a second position where the supporting portion does not cover the applied face when the frame is mounted on the application object.

5. The thin film application device according to Claim 1, wherein the frame has a retaining portion that is capable of being retained to the application object.

6. The thin film application device according to Claim 1, wherein the tentative application portion has the shape of a curved face.

7. The thin film application device according to Claim 1, wherein the frame has a reference point indication portion that indicates a reference point for position coordinates obtaining of the applied face when mounted to the application object.

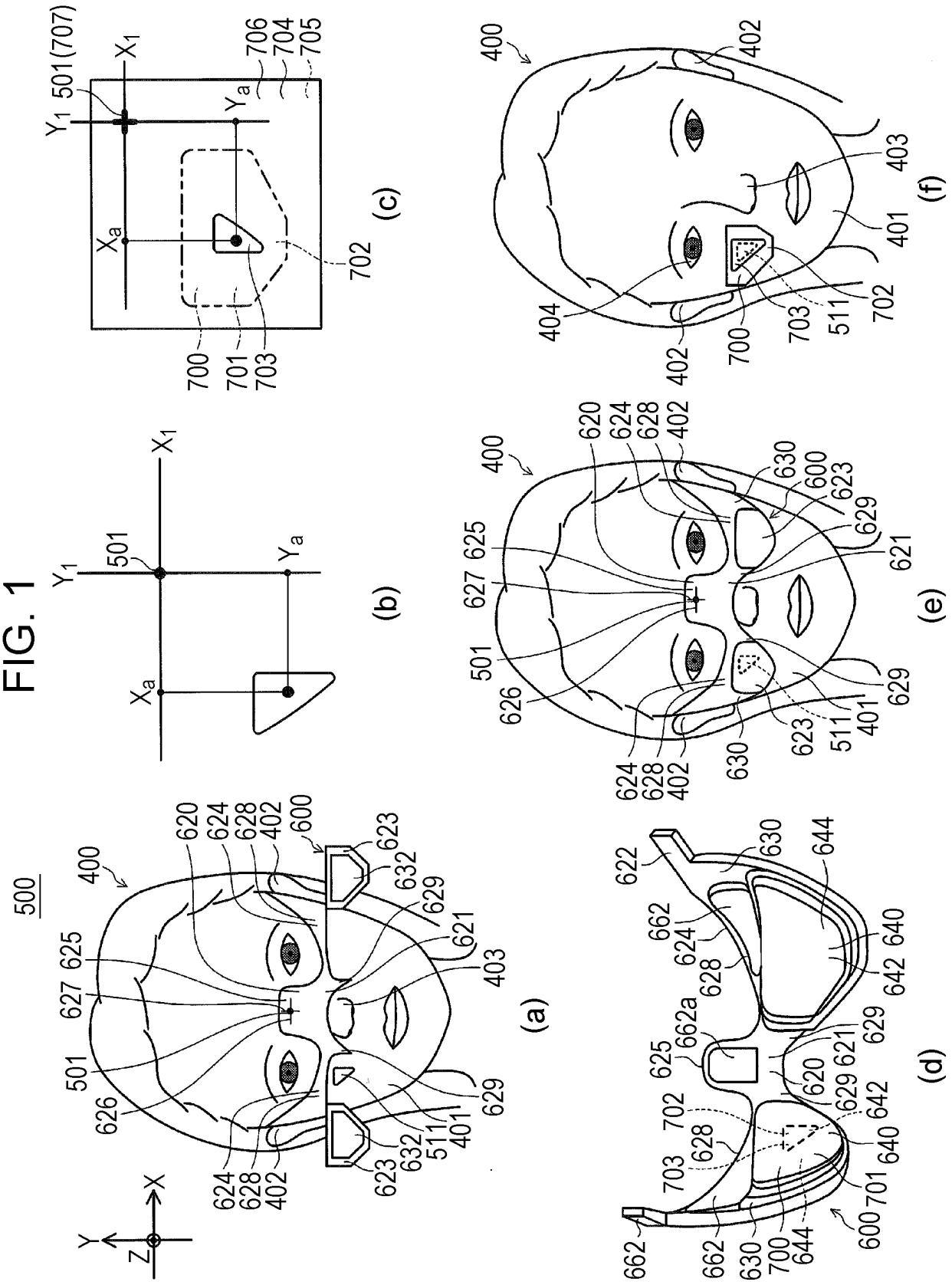
8. A thin film forming method of forming a thin film that, in a state of being tentatively applied to a tentative application portion of a thin film application device, is pressed against an applied face of an application object, thereby applying the thin film to the applied face, the method comprising:

a step of obtaining an object image that is an image where the application object is a subject, including at least the applied face;
a step of obtaining coordinates in the object image of coordinates of a position corresponding to the applied face, as to a reference point on the thin film application device, as object coordinates; and
a step of printing a overlaying image on a thin film material of the thin film, that is overlaid on the applied face, at a portion corresponding to the object coordinates as to the reference point.

9. The thin film forming method according to Claim 8, wherein, in the step of obtaining as object coordinates, the application object that has mounted the thin film application device in an opened state is in the object image, and wherein, in the step of obtaining as the object coordinates, the reference point is taken as the reference point supporting portion formed on the front side of the thin film application device.

10. The thin film forming method according to Claim 8, wherein, in the step of obtaining the object image, the application object that has not mounted the thin film application device is in the object image, and wherein, in the step of obtaining the object coordinates, an object base point of the application object is obtained from the object image, and coordinates of a position corresponding to the applied face as to the object base point are converted into coordinates where the base point on the thin film application device is an origin, which are taken as object coordinates.

FIG. 1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400
620
624
628
402
600
623
632
629
621
403
627
625
501
626
624
628
402
623
632
511
401
629
(a)
Y
X
Z
X1
501
Y1
Ya
Xa
(b)
501(707)
X1
Y1
Ya
Xa
706
704
705
702
700
701
703
(c)
622
630
644
662
624
628
662a
625
702
703
640
642
629
621
620
701
600
700
(d)
620
624
628
402
400
630
600
623
629
621
627
625
501
626
624
628
402
623
511
401
629
(e)
400
402
403
401
404
700
703
511
702
(f)

FIG. 2

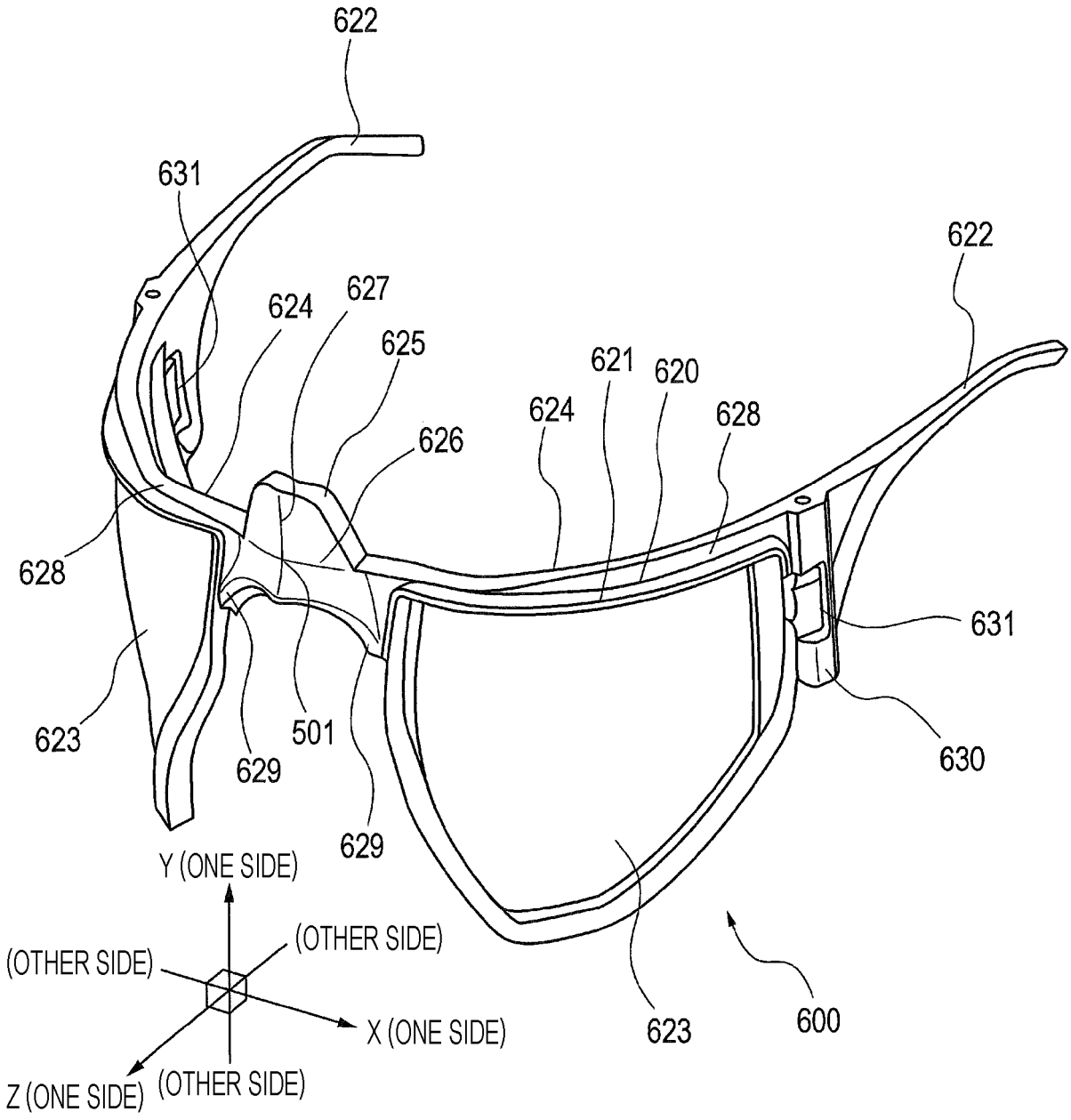
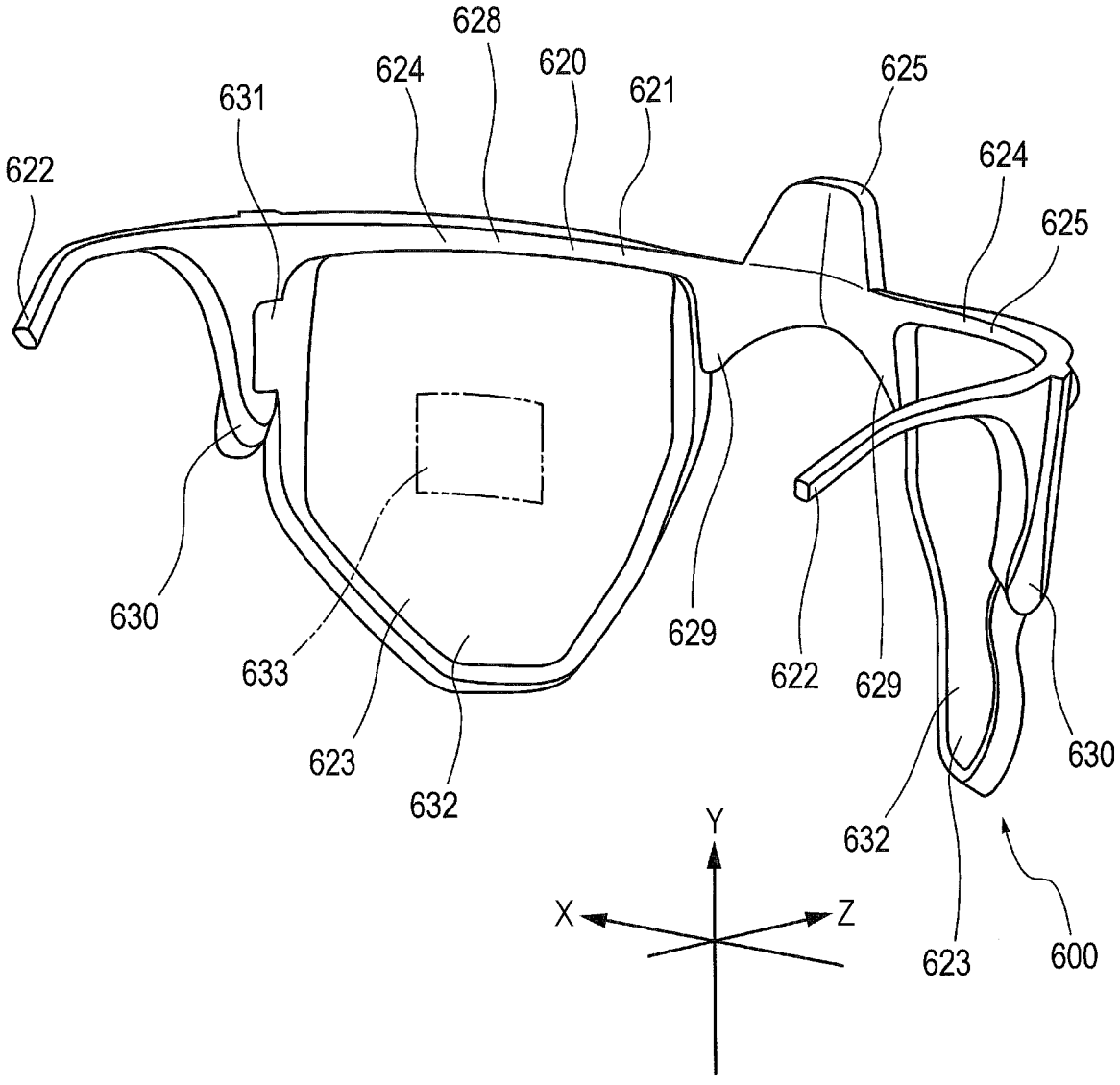

622
631
624
627
625
626
628
623
629
501
629
621
620
624
628
622
631
630
623
600
Y (ONE SIDE)
(OTHER SIDE)
(OTHER SIDE)
X (ONE SIDE)
Z (ONE SIDE)
(OTHER SIDE)

FIG. 3


628
624
620
631
621
625
622
624
625
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633
623
632
629
622
629
630
632
623
600
Y
X
Z

FIG. 4

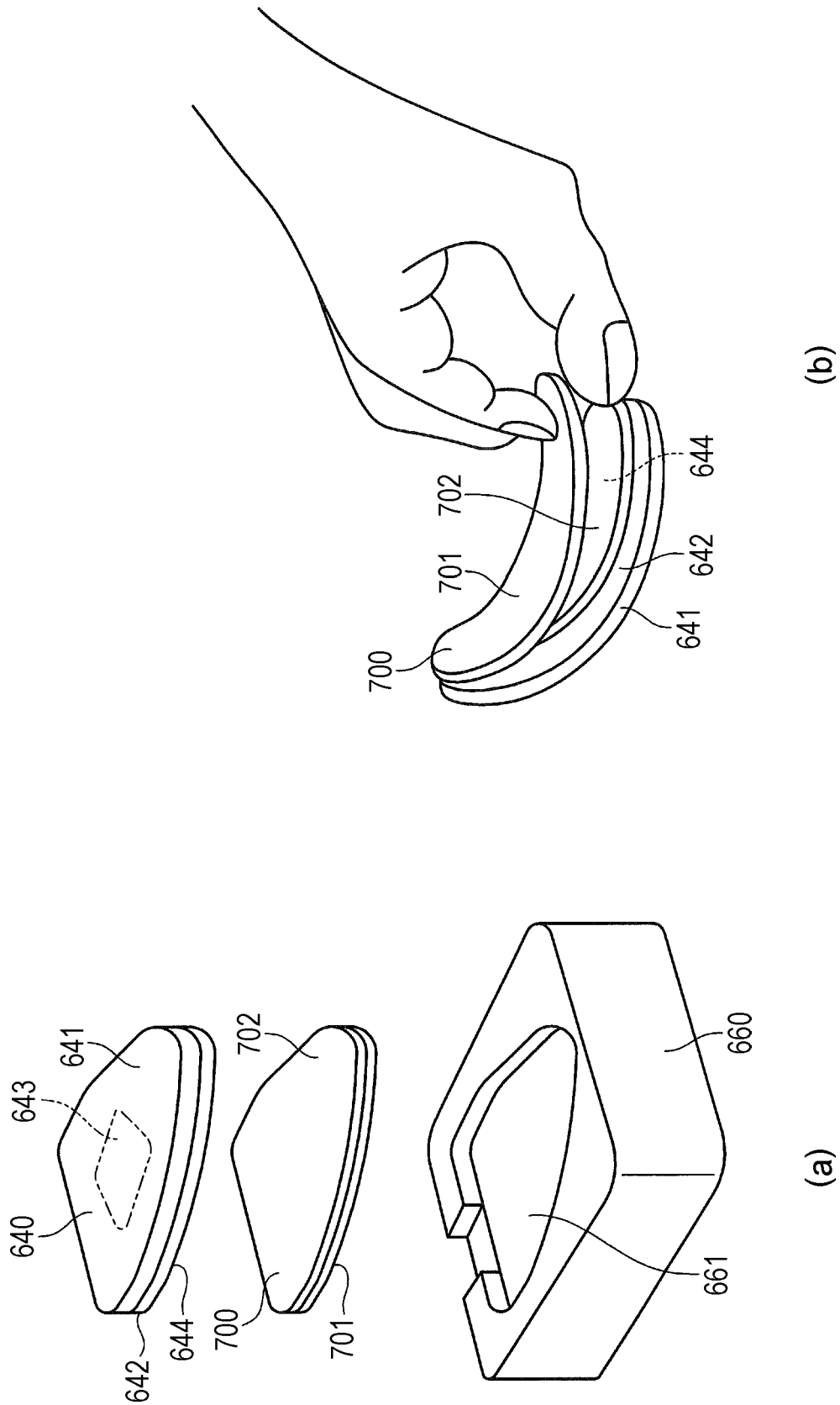
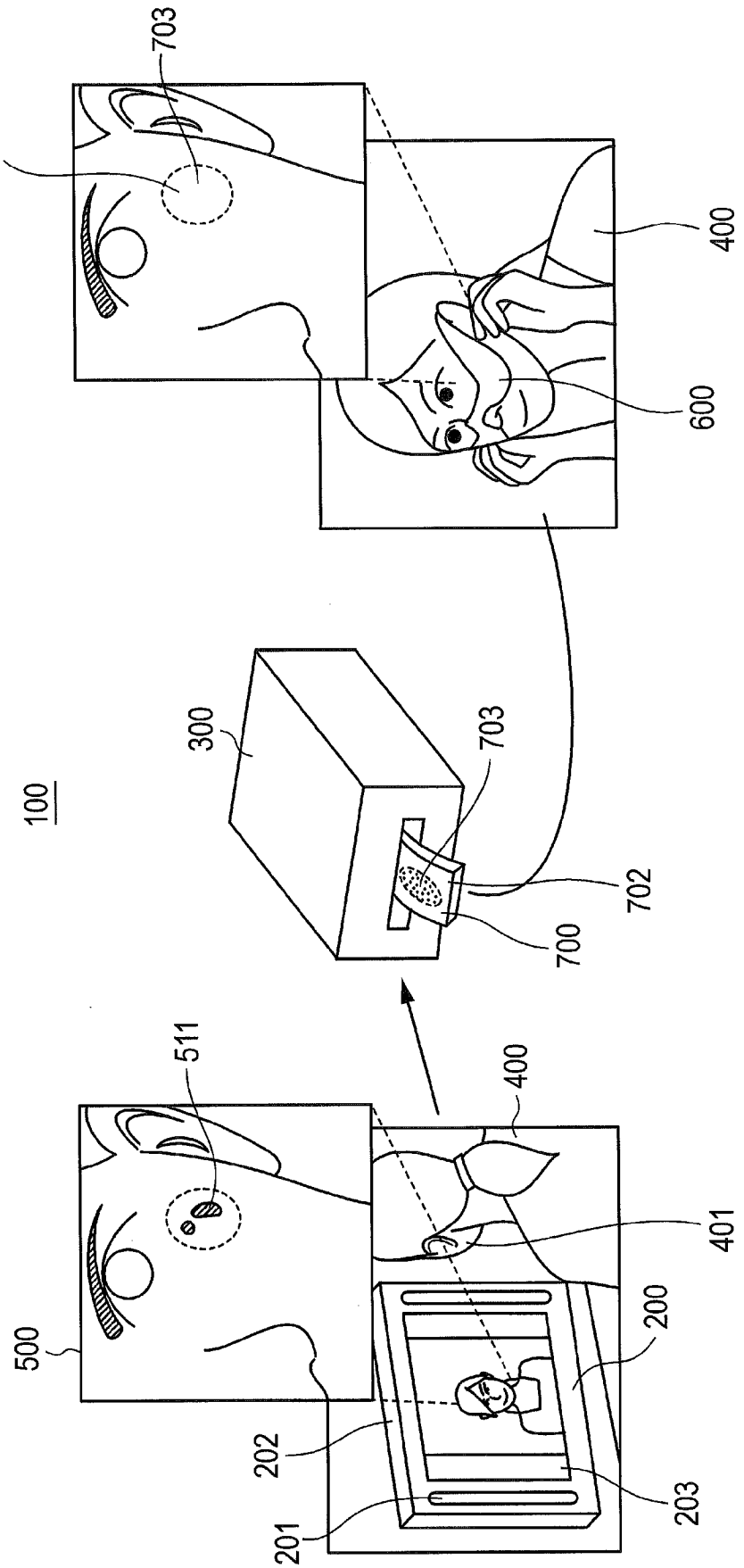

(a)
660
661
640
641
642
643
644
700
701
702
(b)
700
701
702
641
642
644

FIG. 5


703
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400
600
300
703
100
702
700
511
400
401
500
200
202
203
201

FIG. 6

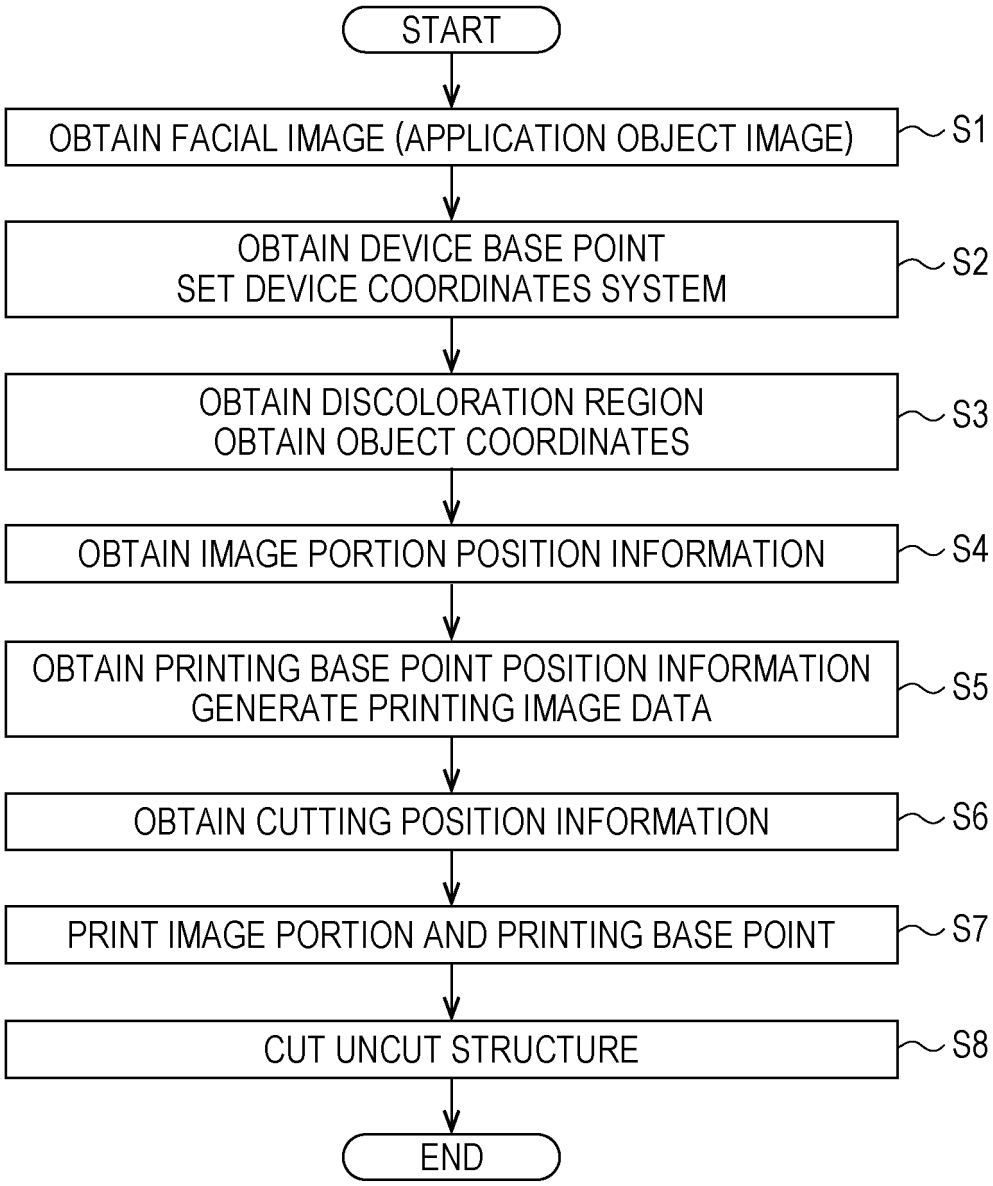

START
OBTAIN FACIAL IMAGE (APPLICATION OBJECT IMAGE)
S1
OBTAIN DEVICE BASE POINT
SET DEVICE COORDINATES SYSTEM
S2
OBTAIN DISCOLORATION REGION
OBTAIN OBJECT COORDINATES
S3
OBTAIN IMAGE PORTION POSITION INFORMATION
S4
OBTAIN PRINTING BASE POINT POSITION INFORMATION
GENERATE PRINTING IMAGE DATA
S5
OBTAIN CUTTING POSITION INFORMATION
S6
PRINT IMAGE PORTION AND PRINTING BASE POINT
S7
CUT UNCUT STRUCTURE
S8
END

FIG. 7

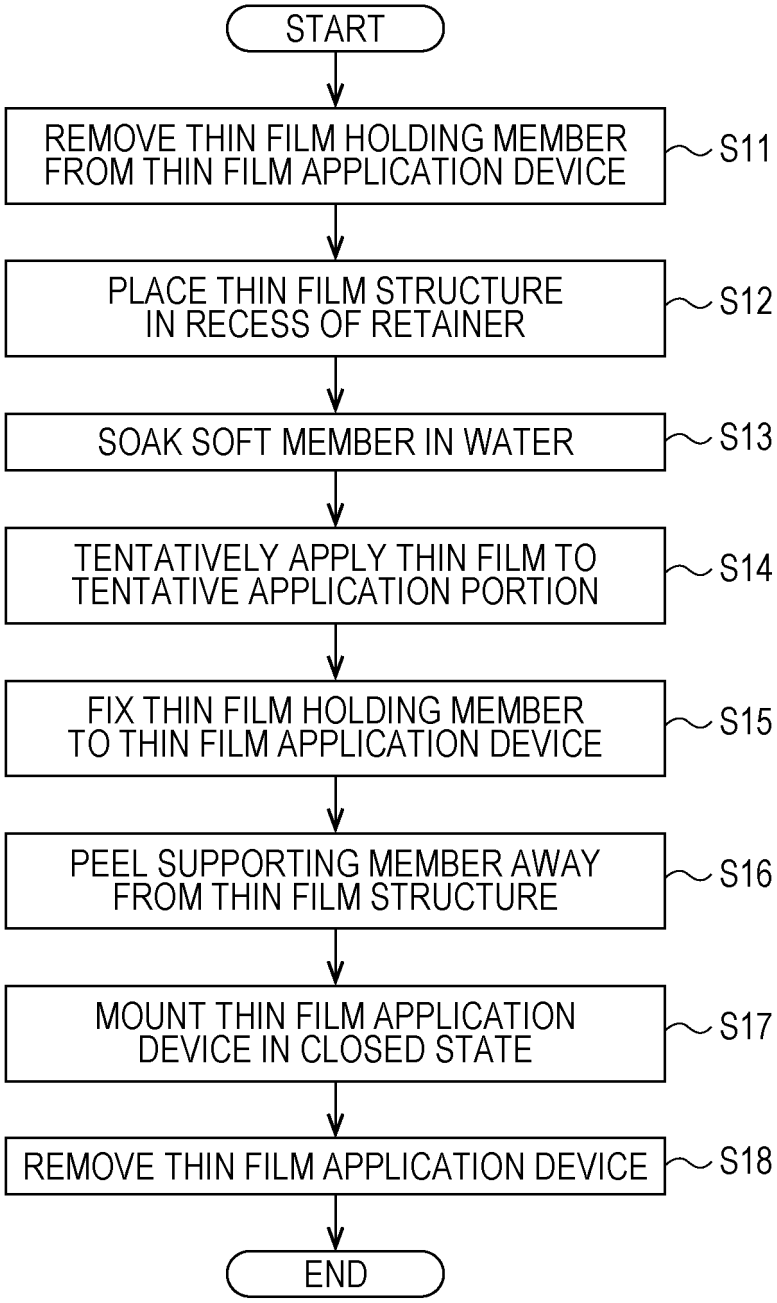

START
REMOVE THIN FILM HOLDING MEMBER FROM THIN FILM APPLICATION DEVICE
S11
PLACE THIN FILM STRUCTURE IN RECESS OF RETAINER
S12
SOAK SOFT MEMBER IN WATER
S13
TENTATIVELY APPLY THIN FILM TO TENTATIVE APPLICATION PORTION
S14
FIX THIN FILM HOLDING MEMBER TO THIN FILM APPLICATION DEVICE
S15
PEEL SUPPORTING MEMBER AWAY FROM THIN FILM STRUCTURE
S16
MOUNT THIN FILM APPLICATION DEVICE IN CLOSED STATE
S17
REMOVE THIN FILM APPLICATION DEVICE
S18
END

FIG. 8

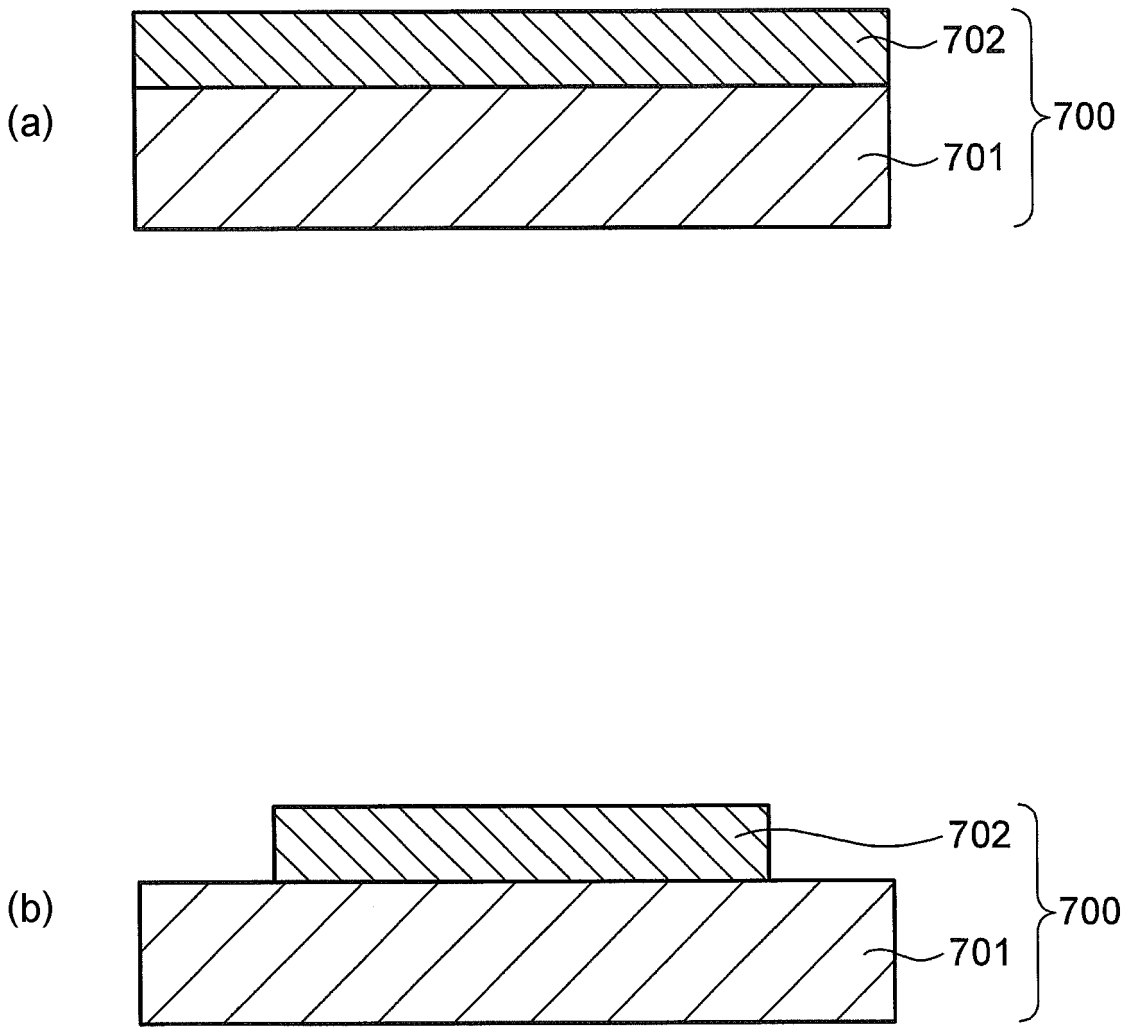


FIG. 9

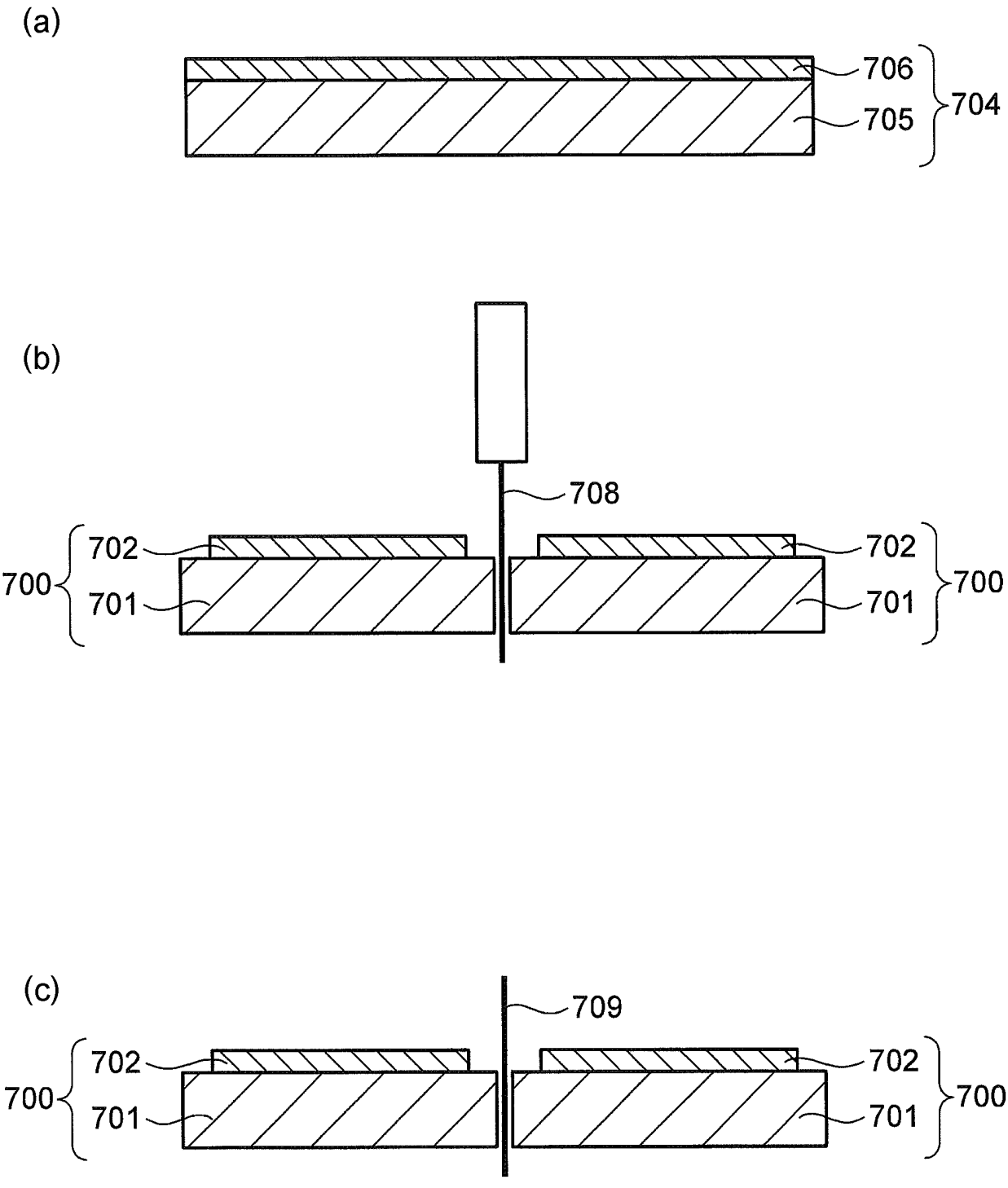
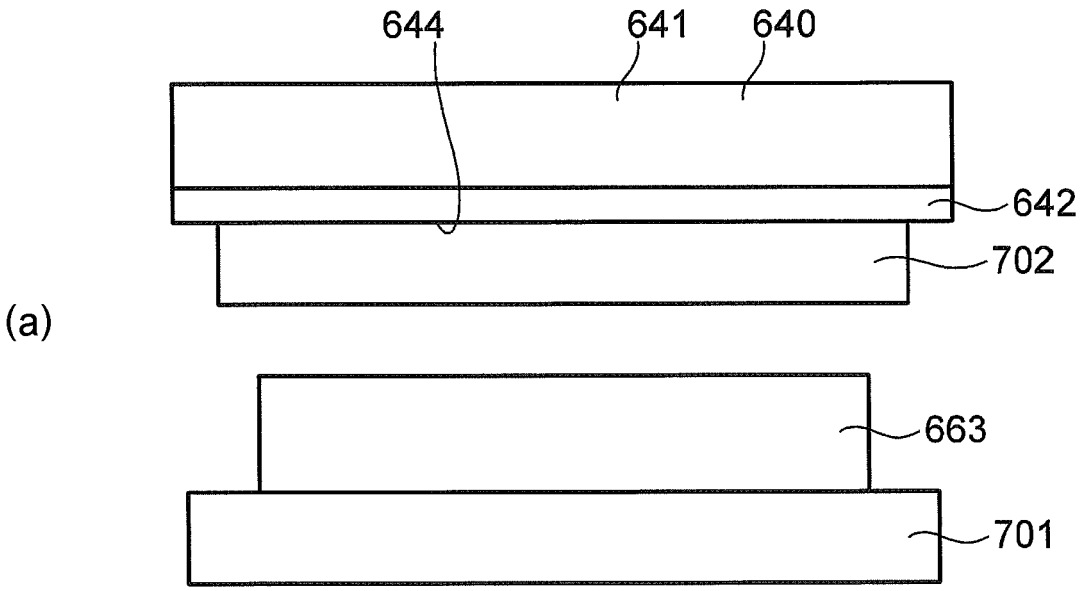

(a)
706
705
704
(b)
708
702
701
700
702
701
700
(c)
709
702
701
700
702
701
700

FIG. 10

(a)



(b)

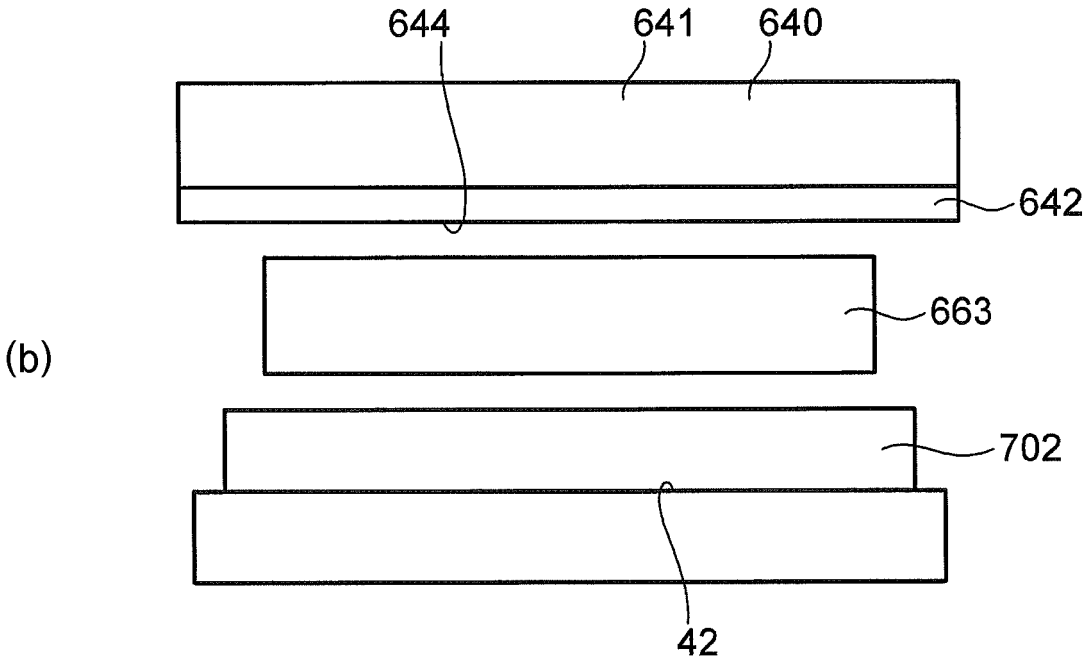


FIG. 11

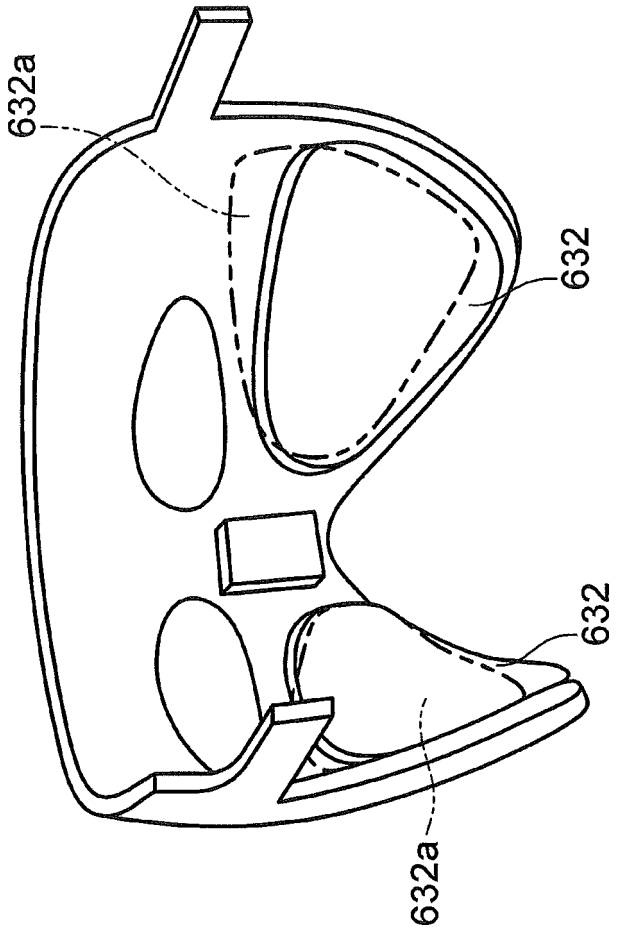


FIG. 12

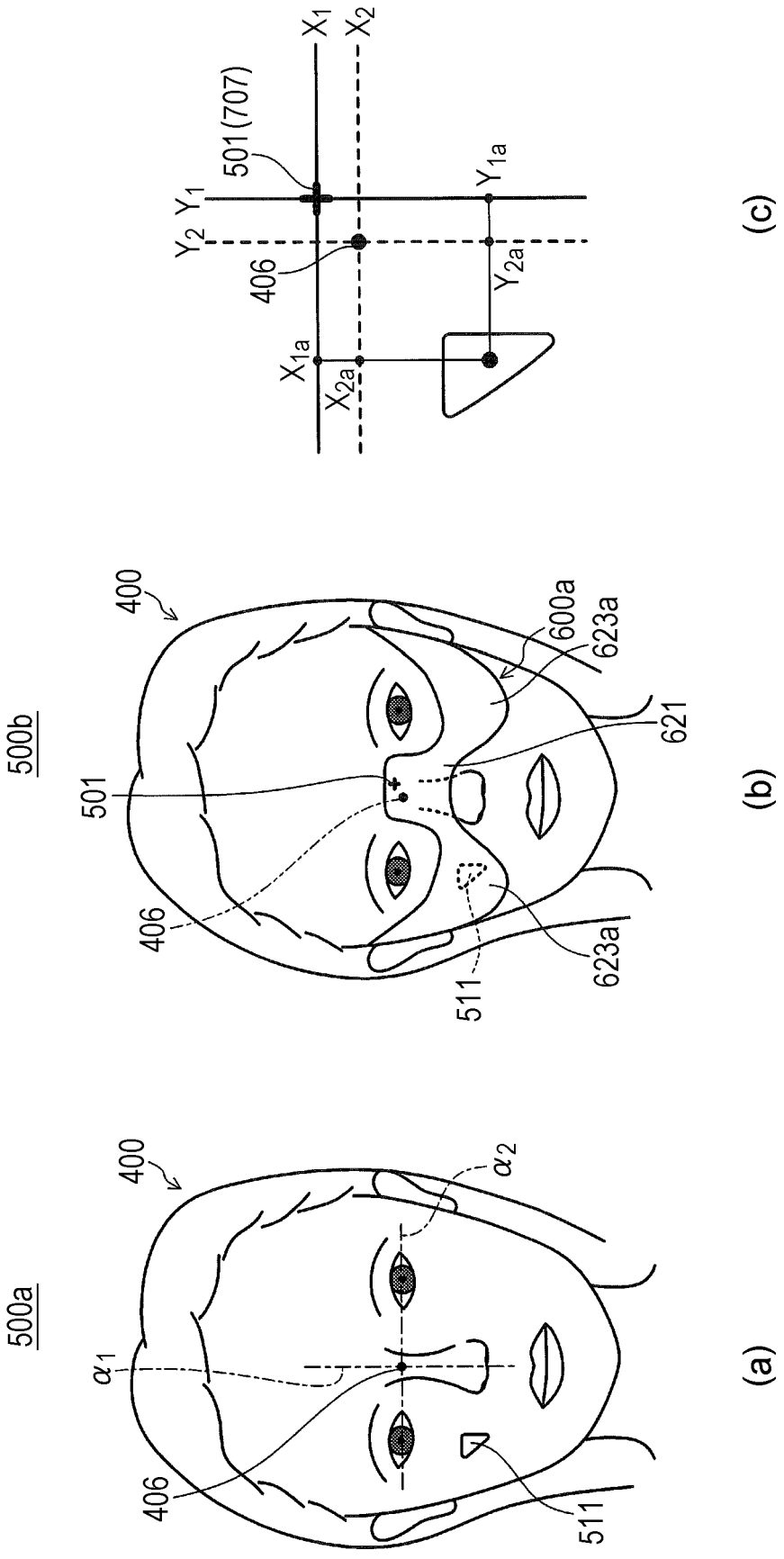

500a
400
406
511
α_1
α_2
(a)
500b
400
501
406
511
600a
623a
621
623a
(b)
X_1
X_2
501(707)
Y_1
Y_2
406
X_{1a}
X_{2a}
Y_{1a}
Y_{2a}
(c)

FIG. 13

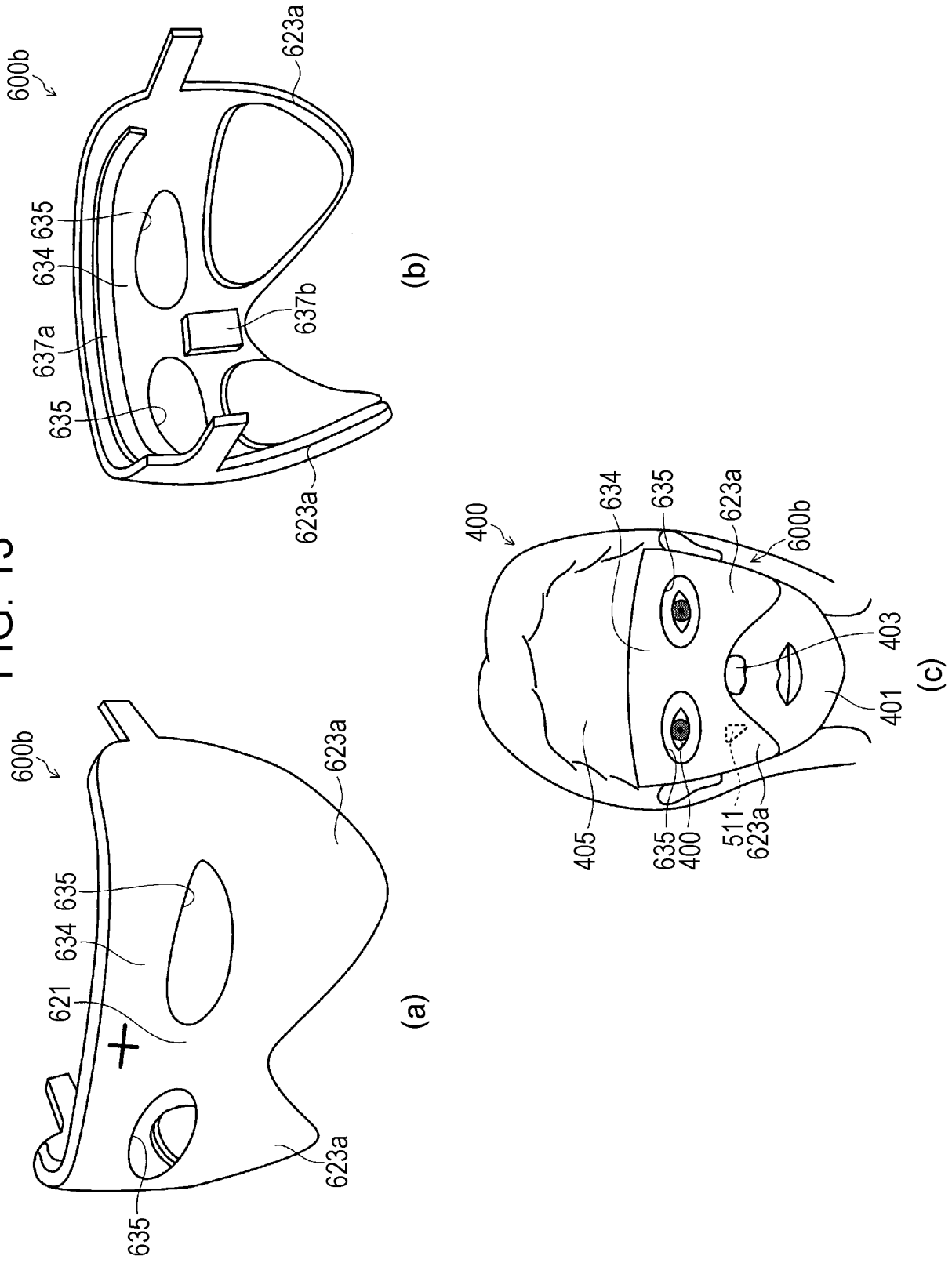

600b
623a
634 635
637a
637b
635
623a
(b)
600b
623a
635
634
621
635
623a
(a)
400
634
635
623a
600b
403
401
405
635
400
511
623a
(c)

FIG. 14

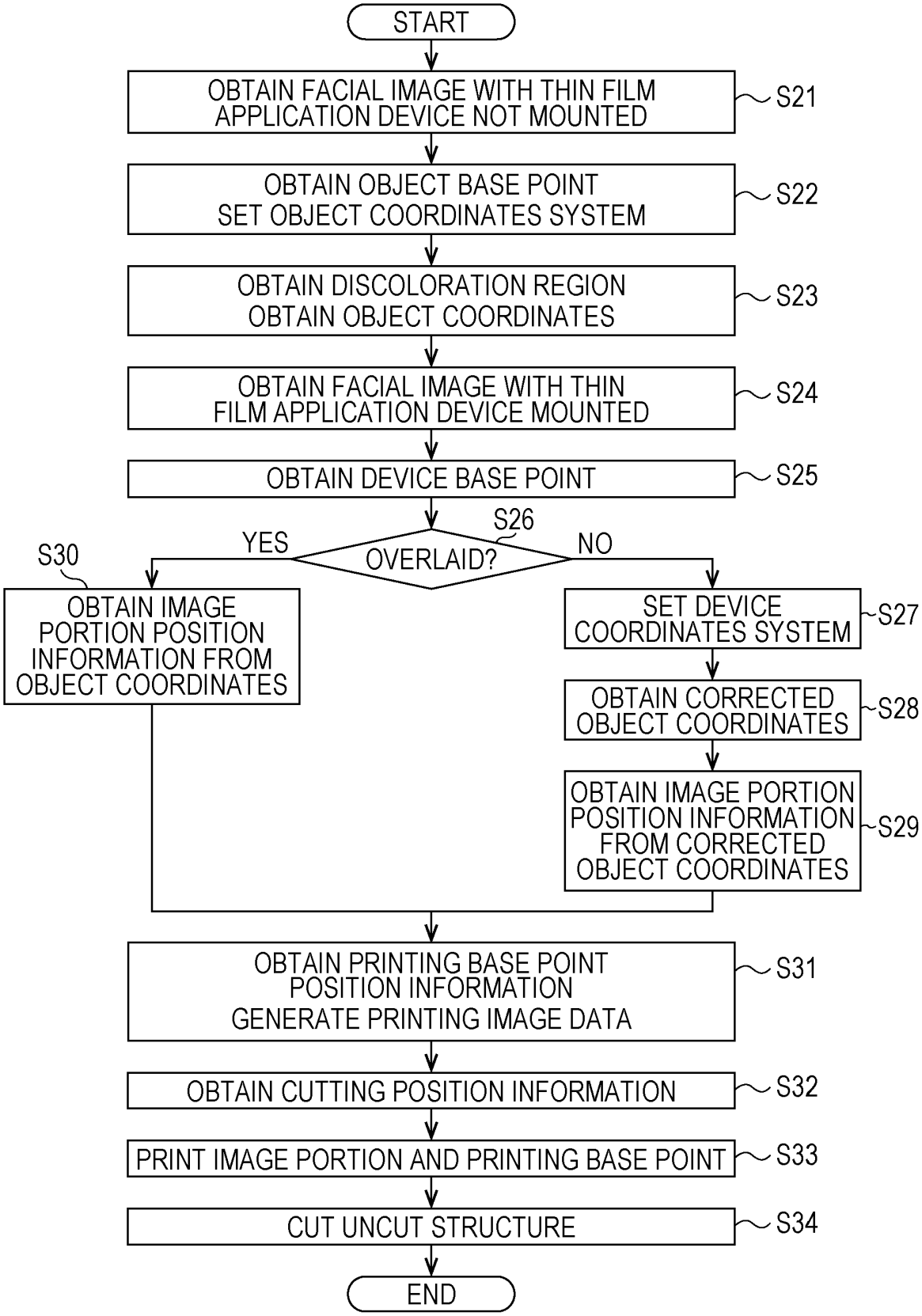

START
OBTAIN FACIAL IMAGE WITH THIN FILM APPLICATION DEVICE NOT MOUNTED
S21
OBTAIN OBJECT BASE POINT
SET OBJECT COORDINATES SYSTEM
S22
OBTAIN DISCOLORATION REGION
OBTAIN OBJECT COORDINATES
S23
OBTAIN FACIAL IMAGE WITH THIN FILM APPLICATION DEVICE MOUNTED
S24
OBTAIN DEVICE BASE POINT
S25
S26
OVERLAID?
YES
NO
S30
OBTAIN IMAGE PORTION POSITION INFORMATION FROM OBJECT COORDINATES
SET DEVICE COORDINATES SYSTEM
S27
OBTAIN CORRECTED OBJECT COORDINATES
S28
OBTAIN IMAGE PORTION POSITION INFORMATION FROM CORRECTED OBJECT COORDINATES
S29
OBTAIN PRINTING BASE POINT POSITION INFORMATION
GENERATE PRINTING IMAGE DATA
S31
OBTAIN CUTTING POSITION INFORMATION
S32
PRINT IMAGE PORTION AND PRINTING BASE POINT
S33
CUT UNCUT STRUCTURE
S34
END

FIG. 15

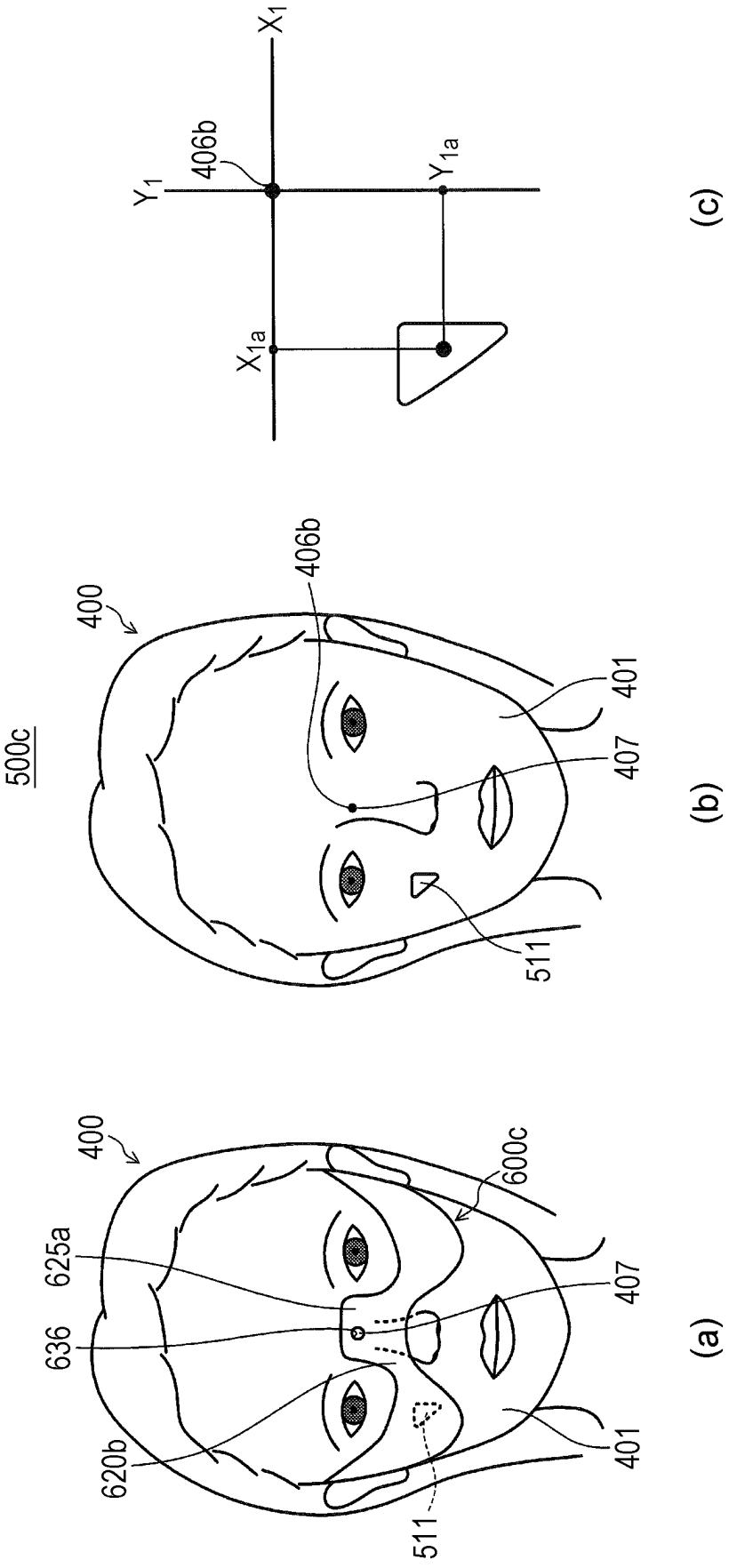


FIG. 16

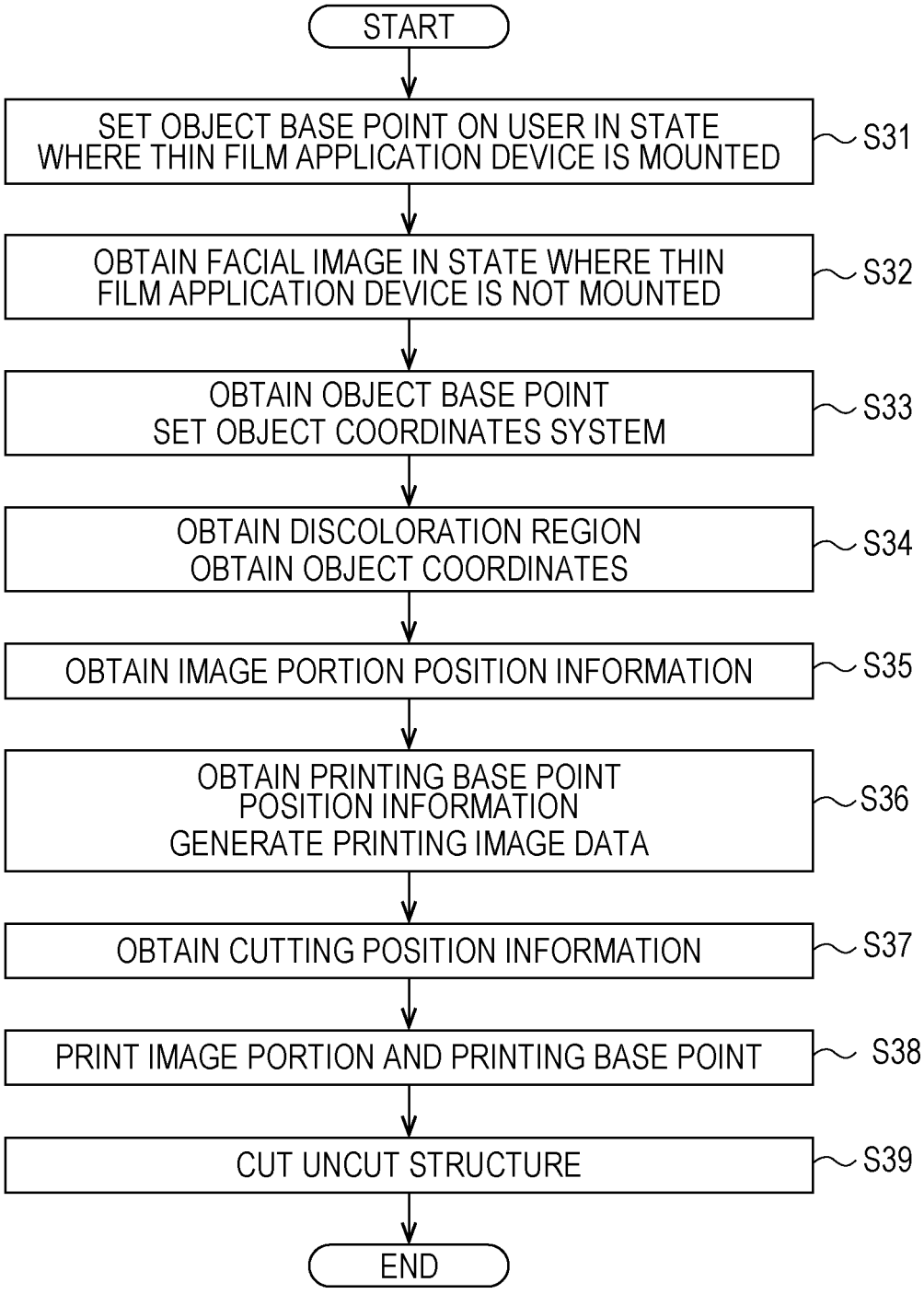

START
SET OBJECT BASE POINT ON USER IN STATE WHERE THIN FILM APPLICATION DEVICE IS MOUNTED
S31
OBTAIN FACIAL IMAGE IN STATE WHERE THIN FILM APPLICATION DEVICE IS NOT MOUNTED
S32
OBTAIN OBJECT BASE POINT
SET OBJECT COORDINATES SYSTEM
S33
OBTAIN DISCOLORATION REGION
OBTAIN OBJECT COORDINATES
S34
OBTAIN IMAGE PORTION POSITION INFORMATION
S35
OBTAIN PRINTING BASE POINT POSITION INFORMATION
GENERATE PRINTING IMAGE DATA
S36
OBTAIN CUTTING POSITION INFORMATION
S37
PRINT IMAGE PORTION AND PRINTING BASE POINT
S38
CUT UNCUT STRUCTURE
S39
END

FIG. 17

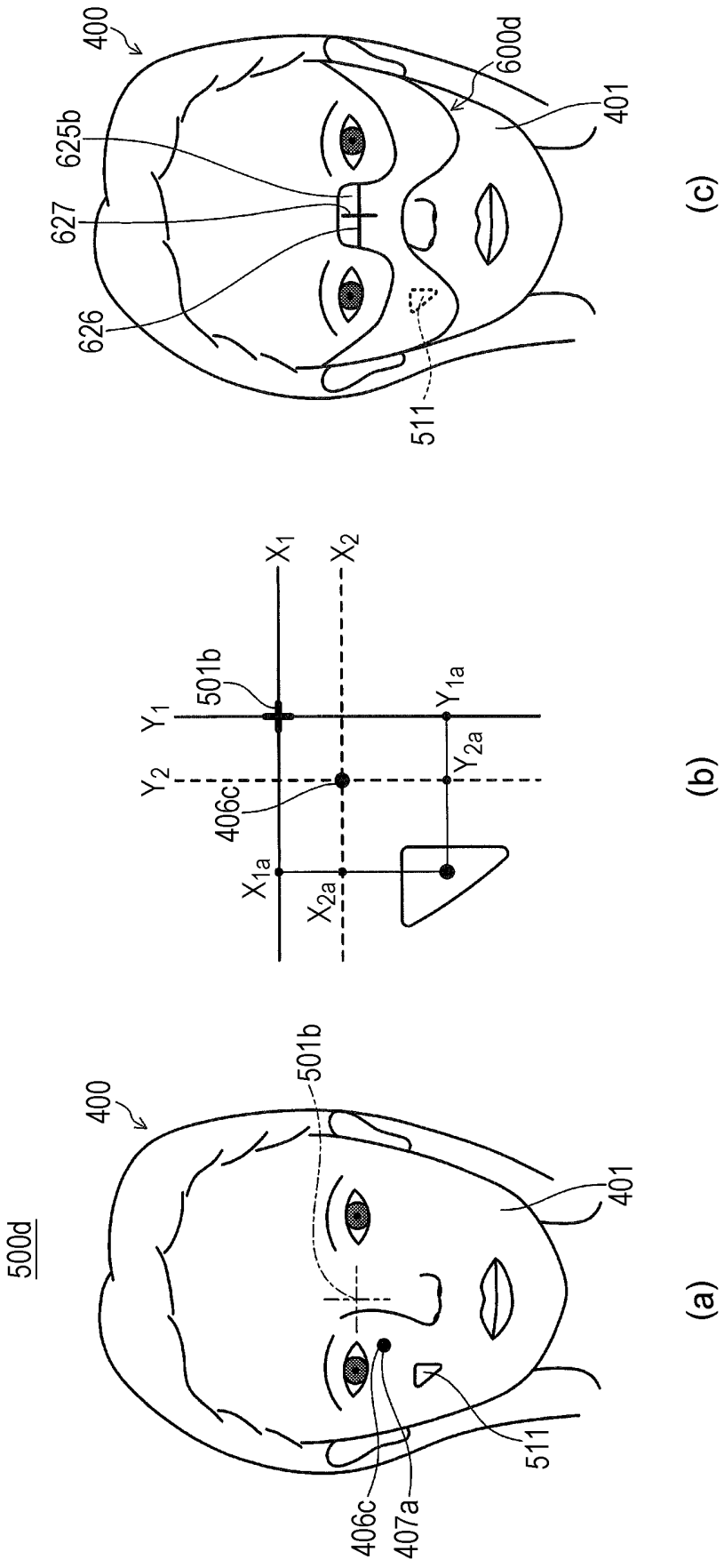
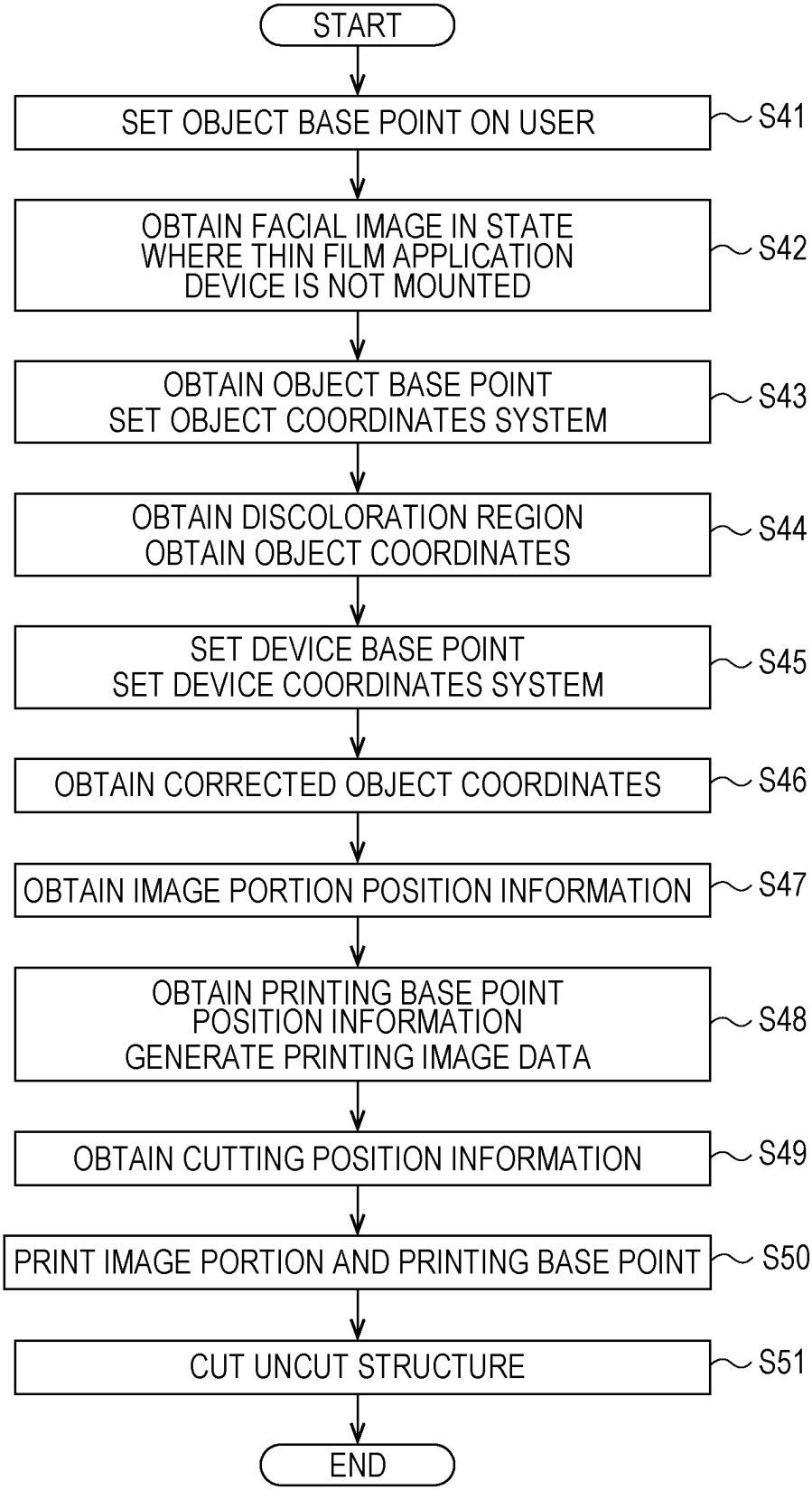

500d
400
501b
401
406c
407a
511
(a)
X_1
X_2
Y_1
501b
Y_{1a}
Y_2
Y_{2a}
406c
X_{1a}
X_{2a}
(b)
400
600d
401
625b
627
626
511
(c)

FIG. 18


START
SET OBJECT BASE POINT ON USER
S41
OBTAIN FACIAL IMAGE IN STATE WHERE THIN FILM APPLICATION DEVICE IS NOT MOUNTED
S42
OBTAIN OBJECT BASE POINT
SET OBJECT COORDINATES SYSTEM
S43
OBTAIN DISCOLORATION REGION
OBTAIN OBJECT COORDINATES
S44
SET DEVICE BASE POINT
SET DEVICE COORDINATES SYSTEM
S45
OBTAIN CORRECTED OBJECT COORDINATES
S46
OBTAIN IMAGE PORTION POSITION INFORMATION
S47
OBTAIN PRINTING BASE POINT POSITION INFORMATION
GENERATE PRINTING IMAGE DATA
S48
OBTAIN CUTTING POSITION INFORMATION
S49
PRINT IMAGE PORTION AND PRINTING BASE POINT
S50
CUT UNCUT STRUCTURE
S51
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/031299

A. CLASSIFICATION OF SUBJECT MATTER
A45D44/22(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)
A45D44/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2017
Registered utility model specifications of Japan	1996-2017
Published registered utility model applications of Japan	1994-2017

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.
X Y A	JP 3175155 U (SHIMAZAKI, Hideo) 26 April 2012, paragraphs [0027]-[0039], figures 1-11 (Family: none)	1-3, 5-6 7-8, 10 4, 9
Y A	JP 2015-43836 A (DAINIPPON PRINTING CO., LTD.) 12 March 2015, paragraphs [0017]-[0059], [0149]-[0164], figures 1-3, 12-13 (Family: none)	7-8, 10 1-6, 9

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

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2014/132593 A1 (PANASONIC CORP.) 04 September 2014, paragraphs [0001]-[0069], figures 1-3 & US2015/0059968 A1, paragraphs [0001]-[0058], figures 1-3	1-10
A	JP 2012-236087 A (HITACHI MAXELL, LTD.) 06 December 2012, paragraphs [0082]-[0090], figures 1, 5 (Family: none)	1-10

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