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(54) **Cup attaching apparatus**
Vorrichtung zum Anbringen eines Halteteils
Appareil de glantage pour lentilles

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Description

BACKGROUND OF THE INVENTION

Field of the Invention:

[0001] The present invention relates to a cup attaching apparatus.

Description of the Related Art:

[0002] When a subject lens is ground by a processing apparatus, a cup (a suction cup, a cup which is fixed with a pressure sensitive adhesive sheet placed in between, or the like) as a processing jig is attached to the subject lens by means of a cup attaching apparatus as a preliminary-step operation. Conventionally, the cup attaching operation is generally performed as follows.

[0003] In cases where the subject lens is a unifocal lens, the lens is first marked with a marked point in alignment with the optical center and the angle of the cylinder axis of the subject lens by using a lens meter. Subsequently, the subject lens is moved to the cup attaching apparatus, the marked point and a reference scale on the subject lens illuminated by an illuminating means are projected onto a screen, and while observing them, positioning is effected so that the reference scale and the marked point assume a predetermined relationship, and the cup is attached.

[0004] In addition, in the case of multifocal lenses such as a progressive multifocal lens and a bifocal lens, layout marks provided on the lens surface and a small lens portion of the lens are projected onto a screen, positioning is effected on the basis of the projected images and a reference scale, and the cup is attached.

[0005] However, the method using the above-described conventional apparatus, the lens meter and the cup attaching apparatus are required for attaching the cup to the unifocal lens, so that this method is disadvantageous in terms of the installation space and economic efficiency. In addition, the respective apparatuses must be operated, so that the operating efficiency is poor.

[0006] Further, on the cup attaching apparatus side, an alignment operation for effecting positioning in conformity with the marked point is required, it is not easy for a person unskilled in the operation to speedily perform the positioning with high accuracy. The poor positioning accuracy leads to an error at the time of processing. Particularly in processing centers where subject lenses are processed in a concentrated manner, there has been a demand for controlling the occurrence of processing errors due to cup attachment and for improving the operating efficiency as much as possible.

[0007] Furthermore, when the cup is attached to the subject lens, confirmation is necessary as to whether or not the lens diameter is sufficiently large enough for an eyeglasses frame into which the lens is fitted, but this confirmation operation has not been easy.

[0008] An apparatus forming the closest state of the art is known from EP 0 409 760 A1. This reference discloses an apparatus for centering and blocking an ophthalmic lens, and the apparatus makes a cup adhere to the ophthalmic lens precisely on the geometric and optical center thereof. To execute the blocking by this apparatus, it is required to preliminarily apply a marked point onto the optical center of the lens using a lens meter. That is, since an image of the mark provided on the screen is always focussed on the same position of a camera, the optical center cannot be obtained unless the mark point is aligned.

[0009] JP 03 060 960 A discloses an eyeglass lens machining device that includes optical characteristics measuring means for measuring optical characteristics such as spherical degree S, astigmatic degree C and astigmatic axial degree θ . Furthermore, the device comprises a lens fixing tool suction means for making a lens fixing tool adhere to a lens, as well as prescription data input means for manual input of the prescription data.

[0010] Processing data using the adhered position of the lens fixing tool as a reference is computed based on frame shape data, lens data output from the optical characteristics measuring means, prescription data and position and direction of the lens fixing tool. The periphery of the lens is machined based on the obtained processing data.

[0011] However, the device cannot confirm whether or not a diameter of lens is short with respect to a frame shape when a cup (lens fixing tool) is attached to the lens in such a state that an optical center of the lens is offset from the attaching (adhering) reference axis of the cup.

[0012] EP 0 426 551 A discloses an apparatus for judging whether an uncut lens should be machined and lens grinding machine having the same. The apparatus can judge machine interference by comparing a lens frame image (corresponding to intended lens shape figure of the present invention) with a sucking disk external configuration image (corresponding to a cup shape figure of the present invention). The apparatus includes position input means for inputting an optical center position of the material lens relative to a geometrical center of a lens frame, and image display means for displaying sucking disk external configuration image such that the center of the sucking disk is located in the optical center position. That is, the apparatus merely checks the machine interference in a state that the sucking disk is attached to the optical center of the material lens.

[0013] In view of the above-described problems, it is an object of the present invention to provide an apparatus which makes it possible to efficiently perform the cup attaching operation by facilitating the alignment for attaching the cup without performing the marking operation on the subject lens, and which makes it possible to easily confirm processability.

[0014] The solution of this object is achieved by the combination of features of new claim 1. The dependent claims contain advantageous embodiments of the

present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is an external view of the apparatus in accordance with a first embodiment;

Fig. 2 is a diagram illustrating an optical system of the apparatus in accordance with the first embodiment;

Fig. 3 is a diagram illustrating a controlling system of the apparatus in accordance with the first embodiment;

Fig. 4 is a diagram illustrating the offset of the central position of a ring image projected onto a screen plate when the subject lens is mounted;

Fig. 5 is a diagram illustrating the ring image projected onto screen plate when the subject lens has cylindrical refractive power;

Figs. 6A and 6B are diagrams explaining the intended lens shape and the subject lens which are displayed on a monitor in a unifocal lens;

Fig. 7 is a diagram explaining the intended lens shape and the subject lens which are displayed on the monitor in a progressive multifocal lens;

Fig. 8 is a diagram explaining the intended lens shape and the like which are displayed on the monitor in a bifocal lens;

Fig. 9 is an external view of the apparatus in accordance with a second embodiment;

Fig. 10 is a diagram schematically illustrating the configuration of an optical system of the apparatus in accordance with the second embodiment;

Fig. 11 is a diagram illustrating a controlling system of the apparatus in accordance with the second embodiment;

Fig. 12 is a diagram illustrating a method for detecting the optical center of the subject lens from an index image;

Fig. 13 is a diagram illustrating an example of the monitor in the unifocal lens;

Fig. 14 is a diagram illustrating an example of the monitor in a multifocal lens; and

Fig. 15 is a diagram illustrating an example of the monitor in the bifocal lens.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment (only the second embodiment is in accordance with the invention)

[0016] Referring now to Figs. 1 to 8, a description will be given of a first embodiment. Fig. 1 is an external view of the apparatus in accordance with the first embodiment of the present invention. Reference numeral 1 denotes an apparatus main body having substantially U-shaped side surfaces, and an illuminating optical system and an

imaging optical system shown in Fig. 2 are disposed therein. A monitor 2 such as a liquid-crystal display is provided on an upper front surface of the main body 1, and a switch panel 3 is provided on a lower front surface.

5 Displayed on the monitor 2 are an image of a subject lens 5 which is imaged by a CCD camera, which will be described later, a mark for alignment, a layout screen, and the like.

[0017] Numeral 4 denotes a mounting portion for mounting the lens 5. The bottom of the mounting portion 4 is formed of a transparent member so that illumination light from above passes through the lens 5 and reaches a screen plate 15 (see Fig. 2) inside the main body 1. Three lens supporting portions 4a are embedded in the mounting portion 4 at equal intervals with a reference axis L as a center, thereby supporting the lens 5 stably without tilting. Distal ends of the supporting portions 4a are formed of a material such as a soft synthetic resin so as not to damage the lens 5.

20 [0018] Numeral 7 denotes a lens attaching portion for attaching a cup 6 to the lens. The attaching portion 7 is comprised of a motor 31 provided inside the main body 1, a shaft 7a which rotates and moves vertically by means of a motor 32 (see Fig. 3), and an arm 7b fixed to the shaft 7a. An attaching portion 7c for fitting a proximal portion of the cup 6 is provided on the underside of a distal end of the arm 7b. The cup 6 is attached in a predetermined direction in accordance with a positioning mark provided on an upper surface of the arm 7b. When the arm 7b rotates to the position indicated by the dotted lines in conjunction with the rotation of the shaft 7a, the center of the cup 6 is adapted to arrive at the reference axis L. It should be noted that the cup 6 may be of a type in which it is sucked onto the surface of the lens 5 or a type in which it is fixed with a pressure sensitive adhesive sheet placed in between.

30 [0019] Fig. 2 is a diagram illustrating a schematic configuration of the optical system inside the main body 1. Numeral 10 denotes an illuminating light source for illuminating the lens 5. The illuminating light from the light source 10 passes through reflecting mirrors 11 and 12, is converted into parallel rays of light having a larger diameter than that of the lens 5 by means of a collimator lens 13, and is then transmitted through an index plate 14. A ring index with its center set on the reference axis L is formed on the index plate 14, and the illuminating light including the ring index beam illuminates the lens 5 from above along the reference axis L.

35 [0020] Numeral 15 denotes the screen plate formed of a semitransparent material (e.g., ground glass), and an image of the lens 5 illuminated by the illuminating light from above as well as an image of the ring index which passed through the lens are projected onto the screen plate 15. The images projected onto the screen plate 15 are imaged from the rear by a CCD camera 17 having an imaging lens through a mirror 16, and are displayed on the monitor 2.

[0021] Further, the screen plate 15 is movable be-

tween a position A in the vicinity of the mounting portion 4 in Fig. 2 and a position B spaced apart a predetermined distance therefrom by means of a screen driving motor 33 (see Fig. 3). In multifocal lenses such as a bifocal lens and a progressive lens, since positioning is effected on the basis of projected images of the layout marks provided on the lens and the small lens portion (which will be described later) the screen plate 15 is disposed at the position A so as to minimize the distortion of the projected image due to the refractive power of the lens 5. In the unifocal lens, on the other hand, since the optical center and the axial direction of cylindrical refractive power are determined on the basis of the displacement of the ring image due to the refractive power of the lens (which will be described later), the screen plate 15 is disposed at the position B spaced apart from the lens 5 so as to facilitate the detection of the displacement of the ring image.

[0022] In addition, the CCD 17 is also movable in the direction of the arrow (in the direction of the imaging optical axis) by means of a camera driving motor 39 (see Fig. 3), and at the same time as the screen plate 15 moves from the position A to the position B, the CCD 17 also moves from the position A' to the position B', thereby focusing the image projected onto the screen plate 15.

[0023] Fig. 3 is a diagram illustrating a controlling system of the apparatus. An image signal from the CCD 17 is inputted to an image synthesizing circuit 35, and the circuit 35 combines the image signal with characters and marks generated by a display circuit 36 connected to a control unit 30, and displays the same on the monitor 2. The image signal from the CCD 17 is inputted to an image processing circuit 34 as well. The circuit 34 detects the position of the ring image projected onto the screen plate 15 through the lens 5, and inputs the detected signal to the control unit 30. On the basis of the detected signal, the control unit 30 obtains the offset of the central position of the ring image projected onto the screen plate 15 in correspondence with the mounted position of the lens 5, i.e., the amount of displacement of the position of the optical center, as shown in Fig. 4. When the lens 5 has cylindrical refractive power, the ring image projected onto the screen plate 15 changes into an elliptical shape as shown in Fig. 5, so that the angle of the cylinder axis is obtained on the basis of the inclination (in the direction of the long axis) of the elliptical shape. In addition, the angle of the cylinder axis may be alternatively determined from the short axis direction of the ellipse.

[0024] Furthermore, also connected to the control unit 30 are the motor 31 for rotating the shaft 7a of the attaching portion 7, the motor 32 for vertically moving the shaft 7a, the motor 33 for moving the screen 15, a frame-shape measuring device 37 for measuring the shape of an eyeglasses frame, a processing apparatus 33 for grinding the lens 5, the motor 39 for moving the CCD 17, a memory 40 for storing the inputted data and the like, and the switch panel 3.

[0025] A description will be given of the operation of

the apparatus having the above-described configuration. First, the shape of the eyeglasses frame into which the lens 5 is fitted is measured in advance by the measuring device 37, and its data is inputted. The inputted frame data is stored in the memory 40, and an intended lens shape (a target lens configuration) 20 based on the inputted frame data is displayed on the monitor 2 (the intended lens shape for the right eye is initially displayed). The operator inputs frame-fitting conditions, including the layout of the lens with respect to the frame shape and the type of the lens, by operating the switch panel 3. The type of the lens is selected by a MODE key 3a. Hereafter, a description will be given of cases where the types of the lenses to be processed are a unifocal lens, a progressive multifocal lens, and a bifocal lens, respectively.

<Unifocal Lens>

[0026] In the unifocal lens mode, the optical center mode for axially positioning the cup at the optical center of the lens and the frame center mode for axially positioning the cup at the geometric center of each eyeglasses frame portion can be further selected by the key 3a.

(A) Optical Center Mode

[0027] Since input items for the layout of the lens are displayed on the left-hand side of the screen of the monitor 2, a highlighted cursor 21 is moved by a cursor moving key 3b to select items to be inputted. The values of the input items can be changed by a "+" "-" key 3c or a ten-key pad 3d, and layout data including FPD (the distance between geometric centers of both eyeglasses frame portions), PD (pupillary distance), and U/D (the height of the optical center with respect to the geometric center of each eyeglasses frame portion) are inputted. In addition, a cross reticle 22 having a center at the position aligned with the reference axis L is displayed on the screen of the monitor 2, and the intended lens shape (the target lens configuration) 20 and an intended lens center 20a are displayed after being moved with respect to the center of the reticle 22 on the basis of the inputted layout data.

[0028] When the lens 5 has astigmatic power, the cursor 21 is moved to an item AXIS, and the axial angle in the prescription is inputted in advance. An AXIS reticle 23 corresponding to the inputted axial angle is displayed on the monitor 2.

[0029] Incidentally, this layout data may be transferred to the processing apparatus 38, and the type of the lens 5 (the type such as plastics and glass) and the type of the eyeglasses frame may be inputted in advance by a LENS key 3e and a FRAME key 3f, respectively, so that processing can be performed directly by using the layout data.

[0030] When necessary inputs have been made, an ENTER key 3g is pressed. In the case of the unifocal lens mode, the control unit 30 causes the screen plate 15 and the CCD 17 to move to the positions B and B',

respectively, by operating the motors 33 and 39.

[0031] When the setting of the apparatus is completed, the operator mounts the lens 5 on the mounting portion 4, and performs adjustment for centering. When the lens 5 is mounted on the mounting portion 4, images of the lens 5 and a ring index beam which passed it are projected onto the screen plate 15, and are imaged by the CCD 17. In the case of the unifocal lens mode, the control unit 30 continuously obtains the amount of offset of the position of the optical center from the reference axis L and the axial angle of cylindrical refractive power on the basis of the position detected signal of the ring image detected by the circuit 34. As shown in Fig. 6A, a target 24 indicating the optical center and an AXIS target 25 are displayed by the circuit 36 based on information of the amount of offset of the position of the optical center and the axis angle which the control unit 30 obtained. While viewing this display, the operator moves the lens 5 in such a manner that the center of the larger 24 coincides with the center of the reticle 22, thereby effecting the positioning of the optical center of the lens 5 with respect to the reference axis L. Further, the lens 5 is rotated in such a manner that the inclination of the target 25 is aligned with the reticle 23, thereby adjusting the axial angle of the lens to the angle of astigmatic axis in the prescription. When the optical center of the lens 5 and the axial angle are aligned, if the shapes of the targets 24 and 25 are changed and the operator is notified to that effect, ease of use is further facilitated.

[0032] After the centering is thus completed, that state is kept intact, and a LAYOUT key 3h is pressed. The control unit 30 causes the screen plate 15 to move from the position B to the position A in the vicinity of the mounting portion 4, and moves the CCD 17 to the point A'. As a result, the an outside diameter contour image of the lens 5 projected onto the screen plate 15 is projected as a real size substantially without being affected by its refractive power. By observing a lens image 5' and the intended lens shape (the target lens configuration) 20 which are displayed on the monitor 2 (see Fig. 6B), the operator is able to easily determine processability as to whether or not the lens diameter is lacking for processing. Incidentally, when the lens diameter is clearly sufficient for the frame shape, the screen plate 15 may not necessarily be moved.

[0033] If there is no problem with the diameter of the lens 5, a BLOCK key 3i is pressed. The control unit 30 drives the motor 31 to rotate the shaft 7a so that the cup 6 fitted in advance on the attaching portion 7 arrives at the reference axis L, and the control unit 30 then drives the motor 32 to lower the cup 6, and allows the cup 6 to suck the lens 5.

(B) Frame Center Mode

[0034] A brief description will be given of portions which differ from the case of the optical center mode. It should be noted that it is advisable to employ the frame

center mode when the amount of moving over is large in the optical-center layout, and the so-called processing interference occurs on the processing apparatus 38 side.

[0035] In the same way as in the optical center mode, the layout data, including FPD, PD, and U/D, and the axial angle of astigmatism are entered. The display of the intended lens center 20a is fixed as aligned with the reference axis L, and the reticle 22 and the reticle 23 are displayed at the positions where they are moved on the basis of the inputted layout data. The target 24 which is displayed when the lens 5 is mounted on the mounting portion 4 is aligned with the reticle 22, thereby performing the centering adjustment. In the case of a lens having cylindrical refractive power, after the target 25 displayed in the same way as in the optical center mode is aligned with the reticle 23, the cup 6 is attached. It should be noted that, in this case as well, if the screen plate 15 is moved in advance to the position A before the attachment of the cup 6, it is possible to easily determine the processability by observing the lens image 5' and the intended lens shape (the target lens configuration) 20.

<Progressive Multifocal Lens>

[0036] A description will be given of the case of the progressive multifocal lens. In the progressive multifocal lens mode, the screen plate 15 is disposed at the position A. In the same way as described above, the layout data is entered by using the respective keys on the panel 3. In the progressive multifocal lens mode, the reticle 22 is displayed fixedly with its center aligned with the reference axis L, and the displayed positions of the intended lens shape (the target lens configuration) 20 and the intended lens center 20a change in correspondence with the inputted layout data. Incidentally, the frame center mode may also be provided in the same way as with the unifocal lens.

[0037] Since the progressive multifocal lens in the state supplied from a lens manufacturer is provided with the layout marks indicating such as an eyepoint for far use and the horizontal direction, the centering adjustment is effected while observing the layout mark images which are projected onto the screen plate 15 and displayed on the monitor 2. Fig. 7 shows an example of the screen at this time, in which reference numeral 50 denotes an image of the eyepoint mark for far use, and numeral 51 denotes an image of the horizontal line mark. The eyepoint mark for far use and the horizontal line mark are clearly displayed by being projected onto the screen plate 15. After the operator completes centering adjustment by moving the lens such that the mark image 50 and the mark image 51 are superposed on the reticle 22, the operator allows the cup 6 to suck the lens.

<Bifocal Lens>

[0038] In this mode, the screen plate 15 is disposed at the position A. As shown in Fig. 8, in the bifocal lens

mode, a small lens portion layout mark 45 is displayed in addition to the intended lens shape (the target lens configuration) 20. The layout data is entered by operating the panel 3 in accordance with the input items shown on the left side. In an item 200, the pupillary distance for near use is entered. In an item 201, the distance from the center of the upper line of the small lens portion to the bottom side of the intended lens shape immediately therebelow (that is to say, the height of the small lens portion) is fitted is entered. As a result, an upper center position 45a of the mark 45 is determined by using the intended lens center 20a as a reference.

[0039] The axial positioning of the bifocal lens is performed as follows. When the lens 5 is mounted on the mounting portion 4, a projected image obtained by the illuminating light is displayed on the monitor 2, and the small lens portion of the lens 5 is clearly displayed by being projected onto the screen plate 15. The lens 5 is moved in such a manner that a displayed image 52 of the small lens portion is superposed on the mark 45, and positioning is effected in such a manner that the upper center of the small lens image 52 is superposed on the upper center portion 45a of the mark 45. This completes the axial positioning, so that after confirming the processability by comparing the intended lens shape 20 and the lens image 5', the key 3i is pressed to attach the cup.

[0040] Although in this embodiment the screen plate 15 is moved to two locations, the screen plate 15 may be moved vertically without steps and may be stopped at such a position that allows the optical center to be determined easily.

[0041] Further, a mechanism which allows the index plate 14 to move into and away from the optical path may be provided, and the index plate 14 may be moved away from the optical path when the detection of the position of the optical center is not required as in the case of a multifocal lens. If such an arrangement is adopted, when the image of the lens is observed to make positional adjustment, an image of the index does not come in the way and is easy to observe.

[0042] Further, although in this embodiment the index plate 14 is disposed between the light source 10 and the lens 5, the present invention is not limited to the same, and the index plate 14 may be disposed between the lens 5 and the screen plate 15, or the mounting plate 4 may be used to serve as the index plate 14.

Second Embodiment

[0043] Referring now to Figs. 9 to 15, a description will be given of an embodiment of the present invention. Fig. 9 is an external view of the apparatus in accordance with the second embodiment of the present invention, and Fig. 10 is a diagram illustrating a schematic configuration of an optical system in the apparatus. Reference numeral 101 denotes an apparatus main body having substantially U-shaped side surfaces, and an illuminating optical system and an imaging optical system shown in Fig. 10

are disposed therein. A monitor 102 such as a liquid-crystal display is provided on an upper front surface of the main body 101, and a switch panel 103 is provided on a lower front surface. Displayed on the monitor 102 are an image of a subject lens LE which is imaged by a CCD camera, which will be described later, a mark for alignment, a layout screen, and the like.

[0044] Numeral 105 denotes a screen plate made of semitransparent or translucent material (for instance, frosted or grounded glass). Three lens supporting portions 104 are implanted or projectingly provided on the screen plate 105 at equal angular intervals about a reference axis L so as to place the lens LE thereon. Each of the lens supporting portions 104 has such a length that the lens LE is distanced about 15mm from the screen plate 105 when the lens LE is placed. An index plate 114 on which a prescribed pattern is formed is mounted to the supporting portions 104a so as to be located below the lens LE when the lens LE is placed. The index plate 114 in this embodiment is constructed by a transparent glass plate on which black dots are provided at 0.5mm pitches in an square area of 20mm x 20mm about the reference axis L to define a grid index. The index plate 114 may be disposed on the illumination light source side with respect to the lens LE.

[0045] Numeral 107 denotes a cup attaching portion for attaching a cup 106 as a processing jig to the lens. The attaching portion 107 is comprised of a motor 131 provided inside the main body 101, a shaft 107a which rotates and moves vertically by means of a motor 132 (see Fig. 11), and an arm 107b fixed to the shaft 107a. An attaching portion 107c for fitting a proximal portion of the cup 106 is provided on the underside of a distal end of the arm 107b. The cup 106 is attached in a predetermined direction in accordance with a positioning mark provided on an upper surface of the arm 107b. When the arm 107b rotates to the position indicated by the dotted lines in conjunction with the rotation of the shaft 107a, the center of the cup 106 is adapted to arrive at the reference axis L.

[0046] In Fig. 10, numeral 110 denotes an illuminating light source. The illuminating light from the light source 110 is converted into parallel rays of light having a larger diameter than that of the lens LE by means of a collimator lens 113, and is projected onto the lens LE. The light rays which were transmitted through the lens LE further illuminate an index plate 114, so that an entire image of the lens LE as well as a grid index image of the index plate 114 subjected to the prismatic action of the lens LE are projected onto a screen plate 105. A half mirror 115 is disposed below the screen plate 105, and a first CCD camera 117a is provided on the reference axis L in the direction of its transmittance. This first CCD 117a is disposed at a position for imaging in enlarged form only a central region with the reference axis L set as a center so that the grid index image projected onto the screen plate 105 can be detected. Meanwhile, a mirror 116 as well as a second CCD camera 117b for imaging an image

reflected by the mirror 116 are disposed in the reflecting direction of the half mirror 115. This second CCD 117b is disposed at a position for imaging the entire screen plate 105 so that the overall image of the lens LE projected onto the screen plate 105 can be obtained.

[0047] Fig. 11 is a diagram illustrating a controlling system of the apparatus. An image signal from the first CCD 117a is inputted to an image processing unit 134. The processing unit 134 effects image processing to detect the position of the index image projected onto the screen plate 105, and inputs the detected signal to a control unit 130. On the basis of the detected signal, the control unit 130 determines the position of the optical center of the lens LE and the direction of the axis of the cylinder (which will be described later). Meanwhile, an image signal from the second CCD 117b is inputted to an image synthesizing circuit 135, and the circuit 135 combines the image signal with characters and marks generated by a display circuit 136 connected to the control unit 130, and displays the same on the monitor 102.

[0048] Furthermore, also connected to the control unit 130 are the motor 131 for rotating the shaft 107a of the attaching portion 107, the motor 132 for vertically moving the shaft 107a, a memory for storing the inputted data and the like, the switch panel 103, a frame-shape measuring device 137 for measuring the shape of an eyeglasses frame, and a processing apparatus 138 for grinding the lens LE.

[0049] A description will be given of a method of determining the position of the optical center of the lens LE and the direction of the axis of the cylinder on the basis of the image obtained by the first CCD 117a.

[0050] When the lens LE is not mounted, the grid index on the index plate 114 is illuminated by the parallel rays of light, so that the index image is projected as it is onto the screen plate 105. On the basis of the image picked up by the first CCD 117a with the lens LE not mounted, the processing unit 134 determines the coordinate positions of images of dots of the grid index, and stores the same in advance. When the lens LE is mounted, the position of the dot image located immediately below the vicinity of the optical center of the lens LE remains the same irrespective of the presence or absence of the lens LE, but the coordinate positions of the dot images at portions which are not at the optical center move due to the prismatic action of the lens LE. Accordingly, to detect the optical center, a change in the coordinate position of each dot image with the lens LE mounted with respect to the coordinate position of each dot image with the lens LE not mounted is examined, and the position from or toward which the dot images diverge or converge as the center is determined. Namely, the center of this divergence or convergence can be detected as the optical center. In the example shown in Fig. 12, for instance, since the coordinate positions of the dot images with the lens LE not mounted converge with P0 as the center, the coordinate position of P0 can be detected as the optical center. Even if the optical center is located between dots, it

suffices if the optical center is determined by interpolating the center of movement on the basis of the moving directions of the dot images and the amounts of their movement.

[0051] When the lens LE has cylindrical power, the dot images move in a direction toward (or away from) a generating line of the lens LE. Hence, the direction of the axis of the cylinder can be similarly detected by examining in which direction the dot images are moving with respect to the coordinate positions of the dot images with the lens LE not mounted.

[0052] Next, a description will be given of the operation of the apparatus having the above-described configuration. First, after the shape of the eyeglasses frame into which the lens LE is fitted is measured in advance by the measuring device 137 connected to the main body 101, if a DATA key 103j is pressed, data on the measured frame shape (which is also referred to as the intended lens shape) is inputted. The inputted frame data is stored in the memory 140, and an intended lens shape figure 120 based on the inputted frame data is displayed on the monitor 102 (the intended lens shape for the right eye is initially displayed). The operator inputs frame-fitting conditions, including the layout of the lens with respect to the frame shape and the type of the lens, by operating the switch panel 103. The type of the lens is selected by a TYPE key 103a. Hereafter, a description will be given of cases where the types of the lenses LE to be processed are a unifocal lens, a progressive multifocal lens, and a bifocal lens, respectively.

<Unifocal Lens>

[0053] The unifocal lens mode is selected by the TYPE key 103a. Since input items for the layout of the unifocal lens are displayed on the left-hand side of the screen of the monitor 102, a highlighted cursor 121 is moved by a cursor moving key 103b to select items to be inputted. The values of the input items can be changed by a "+" "-" key 103c or a ten-key pad 103d, and layout data including FPD (the distance between geometric centers of both eyeglasses frame portions), PD (pupillary distance), and U/D (the height of the optical center with respect to the geometric center of each eyeglasses frame portion) are inputted. In addition, when the lens LE has cylindrical power, the cursor 121 is moved to the item AXIS, and the axial angle in the prescription is inputted in advance.

[0054] In addition to the intended lens shape figure 120, a cup figure 123 showing the shape of the cup 106 to be attached to the lens LE and a cross reticle 122 are both displayed on the screen of the monitor 2 (see Fig. 11) by using as the center the position on the screen corresponding to the reference axis L. The cup shape 123 is stored in advance in the memory 140. On the screen, a mark 124 shows the geometric center of the lens, and in the state prior to the mounting of the lens LE, the mark 124 and the lens shape figure 120 are displayed after being moved by using the center of the cup

figure 123 (the cup attaching center) as a reference on the basis of the inputted layout data. In addition, if the data on the angle of the cylinder axis is inputted, the reticle 122 is displayed with its long axis inclined in such a manner as to conform to that angle.

[0055] Incidentally, at the time of inputting data, the layout data may be transferred to the processing apparatus 138, and the type of the lens LE (the type such as plastics and glass) and the type of the eyeglasses frame may be inputted in advance by a LENS key 103e and a FRAME key 103f, respectively, so that processing can be performed directly by using the layout data.

[0056] When necessary data have been inputted, the operator mounts the lens LE on a supporting portion 104a, and performs rough positioning such that the center of the lens LE is located in the vicinity of the center of the screen plate 105 (such that the optical center of the lens LE is located within the grid index of the index plate 114). An image of the lens LE and an index image of the index plate 114 are projected onto the screen plate 15, and the entire image of the lens LE is picked up by the second CCD 117b. Its image LE' is displayed on the screen of the monitor 102 (see Fig. 13). In addition, the index image projected onto the screen plate 115 is picked up by the first CCD 117a. That image signal is inputted to the processing unit 134, and the control unit 130 continuously obtains information on the displacement of the optical center from the reference axis L and information on the direction of the cylinder axis on the basis of information on the coordinate positions of dot images of the grid index detected by the processing unit 134.

[0057] After these items of information are obtained, a cross mark 125 showing the optical center of the lens LE is displayed by the circuit 136, as shown in Fig. 13. This mark 125 is displayed with its center conforming to the optical center of the lens LE and with its long axis inclined in such a manner as to conform to the information on the direction of the cylinder axis detected. Further, when the information on the displacement of the optical center is obtained, the lens shape figure 120 comes to be displayed by using the optical center as the reference. Namely, the lens shape figure 120 is displayed such that optical center of the lens LE and the optical center of the intended lens which is determined by the input of the layout data are aligned with each other. Since this lens shape figure 120 is displayed by being superposed on the lens image LE', by observing the two images at this stage the operator is able to instantly determine whether or not the lens diameter is lacking for processing. If the lens LE is moved, the center of the mark 125 also moves on the screen, and the lens shape figure 120 also moves correspondingly.

[0058] If there is no problem with the lens diameter, the alignment of the lens LE is effected in the following manner while further observing the display on the screen. First, in the alignment of the optical center with respect to the cup attaching center, the lens LE is moved in such a manner that the cup figure 123 is kept within the lens

shape figure 120. In this state, the cup can be attached.

[0059] When the cup is attached to the lens, the cup center and the optical center are generally made to align with each other, but with this apparatus accurate alignment is not necessarily required. The reason for this is that since information on the displacement of the optical center from the cup attaching center is already known as described above, that displacement is corrected at the time of processing on the processing apparatus 138 side. Incidentally, the reason that the alignment is effected so that the cup figure 123 is kept within the lens shape figure 120 is to ensure that the cup LE attached at the time of processing will not cause processing interference. Instead of observing the lens shape figure 120 and the cup figure 123, a region where the optical center should be located to avoid processing interference may be determined from various data by using the cup attaching center as a reference, and this region may be displayed as alignment information. In the alignment, the center of the mark 125 is made to fall within that region.

[0060] In the alignment in the direction of the axial angle, the lens LE is rotated in such a manner that the inclination of the long axis of the reticle 122 and the inclination of the long axis of the mark 125 are aligned with each other as much as possible. As for the axial angle as well, since the amount of offset with respect to the inputted axial angle can be known, that amount of offset is corrected at the time of processing on the processing apparatus 138 side. In this embodiment, however, since the lens shape figure 120 is not displayed in correspondence with the detected axial angle, if the offset of the axial angle is large, there are cases where it is impossible to accurately ascertain the processing interference due to the aforementioned positional relationship between the lens shape figure 120 and the cup figure 123. If the cup figure 123 can be sufficiently kept within the lens shape figure 120, the accurate alignment operation of the axial angle is unnecessary.

[0061] It should be noted that, the lens shape figure 120 may be displayed after being rotated by using the optical center as a reference on the basis of the information on the detected axial angle. This makes it possible to accurately confirm the processing interference due to the positional relationship between the lens shape figure 120 and the cup figure 123 without performing the alignment operation of the axial angle.

[0062] After the alignment has been made, a BLOCK key 103i is turned ON. The control unit 130 drives the motor 131 to rotate the shaft 107a so as to allow the cup 106 mounted in advance on the attaching portion 107 to arrive at the reference axis L. The control unit 130 then drives the motor 132 to lower the cup 106 and allows the lens LE to be sucked by the cup 106. At the same time, the information on the displacement of the position of the optical center and the information on the axial angle are stored in the memory 140. After the cup for the right eye lens has been attached, a switch between the right and left eye lenses is effected by pressing an R/L key 103k

to attach the cup for the left eye lens. Incidentally, when the cup is attached, a job number is inputted in advance by operating a JOB key 103m and the ten-key pad 103d, thereby allowing the lens data stored in the memory 140 to be managed by the job numbers.

[0063] After the attachment of the cup, the stored data is read out by designating a job number, and is inputted to the processing apparatus 138. As the processing apparatus 138, it is possible to use the one disclosed in U.S. Pat. No. 5,716,256. In the processing apparatus 138, if the job number is inputted by an input section 138b (e.g., a work slip with a bar code attached in correspondence with the job number is read by a bar-code scanner), the lens data corresponding to the job number is read from the cup attaching apparatus body 101, and is inputted. In the processing apparatus 138, the lens LE is chucked by two lens rotating shafts 138c, and a moving mechanism 138e for changing the distance between a rotating shaft of a grinding wheel 138d for processing and the lens rotating shaft 138c is operated so as to perform processing on the basis of the inputted data. At this time, with respect to the processing data obtained from the shape data of the eyeglasses frame and layout data, a control unit 138a of the processing apparatus 138 obtains new processing data by effecting the coordinate transformation of the displacement of the position of the optical center and the offset of the axial angle when the cup is attached, and the control unit 138a controls the processing on the basis of it. Thus, even if the cup is attached to an arbitrary position, since that position is corrected, the lens LE is processed without an error. Accordingly, since accurate alignment is not required for the cup attaching apparatus body 101, even a person unskilled in the operation can speedily perform the operation very easily, and the cup attaching operation can be conducted efficiently.

[0064] Although a description has been given above of the case in which the cup is attached to an arbitrary position, it is also possible to easily effect the optical-center layout in which the cup is attached to the optical center of the lens LE as well as the frame-center layout in which the cup is attached to the geometric center of each eyeglasses frame portion.

[0065] In the case of the optical-center layout, the lens LE is moved so that the center of the mark 125 displayed on the screen is aligned with the center of the reticle 122. In the case of the frame-center layout, the lens LE is moved so that the mark 124 showing the frame center of the eyeglasses frame is aligned with the center of the reticle 122. The alignment of the angle of the cylinder axis is effected by rotating the lens LE such that, in both cases, the numerical value 126a displayed on the screen agrees with the numerical value 126b of the inputted angle thereabove, or the long axis of the mark 125 assumes the same inclination as that of the long axis of the reticle 122.

[0066] In these layouts as well, the confirmation of processability concerning the lens diameter on the basis

of the lens image LE' and the lens shape figure 120, as well as the confirmation of processing interference on the basis of the cup figure 123 and the lens shape figure 120, can be performed simply.

[0067] When the lens is processed by narrowing the vertical length of the lens, i.e., when the lens is processed into the so-called crab eye lens or lens for "granny's glasses" (which is often used for eyeglasses designed especially for near use), since a cup designed especially for the crab eye lens is attached to avoid processing interference, in such a case it suffices if the shape of the cup figure 123 is displayed in the crab eye shape.

<Progressive Multifocal Lens>

[0068] The progressive multifocal lens mode is selected by the TYPE key 103a, and layout data for the progressive multifocal lens is inputted. Since the progressive multifocal lens is provided with the layout marks indicating such as the eyepoint for far use and the horizontal direction, the layout mark images together with the lens image are clearly projected onto the screen plate 105, and these images are picked up by the second CCD 117b and are displayed on the monitor 102.

[0069] Fig. 14 shows an example of the screen at this time, and the lens shape figure 120 in this mode is displayed after being moved on the basis of the inputted layout data by using the center of the cup figure 123 (cup attaching center) as a reference. Reference numeral 150 denotes an image of the eyepoint mark for far use, and numeral 151 denotes an image of the horizontal line mark. Alignment is effected by moving the lens LE in such a manner that these images are superposed on the reticle 122. After completing the alignment, the operator confirms the processability concerning the lens diameter through comparison of the lens image LE' with the lens shape figure 120, confirms processing interference through comparison of the cup figure 123 and the lens shape figure 120, and then presses the BLOCK key 103i to attach the cup 106.

<Bifocal Lens>

[0070] The bifocal lens mode is selected by the TYPE key 103a. As shown in Fig. 15, a small lens portion layout mark 145 is displayed at a predetermined position on the screen with respect to the cup attaching center (e.g., in the case of the right eye use, a small lens upper side center 145a is located at a position offset about 5 mm toward the right side and the lower side, respectively, with respect to the cup attaching center). The layout data is inputted by operating the panel switch 103 in accordance with the input items displayed on the left-hand side. In an item 153, the pupillary distance for near use is entered. In an item 154, the distance from the center of the upper line of the small lens portion to the bottom side of the lens immediately therebelow (that is to say, the height of the small lens portion) is entered. As a result, the dis-

play position of the lens shape figure 120 is determined.

[0071] The alignment of the bifocal lens is performed as follows. Although the small lens image of the bifocal lens is shot only unclearly even if the lens is shot directly, if the lens is illuminated by parallel rays of light, the small lens image of the bifocal lens is clearly projected onto the screen plate 105. As this image is picked up by the second CCD 117b, a clear small lens image is displayed on the monitor 102. The operator moves the lens LE such that a displayed small lens image 152 is superposed on the mark 145, and such that an upper center of the small lens image 152 is superposed on the small lens upper side center 145a of the mark 145. This completes the alignment, so that the operator confirms the processability concerning the lens diameter through comparison of the lens image LE' with the lens shape figure 120, confirms processing interference through comparison of the cup figure 123 and the lens shape figure 120, and then presses the BLOCK key 103i to attach the cup 106.

[0072] As described above, alignment for attaching a cup in the unifocal lens, the multifocal lens or the like which are not provided with marked points can be performed easily. With respect to the unifocal lense, in particular, even a person unskilled in the operation is able to speedily perform the alignment operation very easily, and is able to reduce processing errors. For this reason, the cup attaching operation can be conducted efficiently.

[0073] In addition, the confirmation of processability concerning the lens diameter and the confirmation of processing interference at the cup attaching portion can be performed simply.

Claims

1. A cup attaching apparatus comprising

- attaching means (107) having a reference axis (L) for attaching a cup (106) as a processing jig to a lens along the reference axis (L);
- illuminating means (110) for projecting light onto the lens (LE) by means of substantially parallel rays of light having a larger diameter than the diameter of the lens (LE);
- a screen (105) arranged at a position where an entire image of the lens is projected;
- imaging means (117b) for picking up the lens image projected onto said screen; and
- display means (102) for displaying the lens image (LE') of the lens (LE) picked by said imaging means,

wherein

- said illuminating means (110) project the light onto the lens (LE) and an index plate (114) having an index of a predetermined pattern by means of the substantially parallel rays of light;

- said screen (105) is arranged at a position where an image of the index formed by the light transmitted through the lens and said index plate is projected;

- said imaging means (117b) pick up the entire lens image projected onto said screen; and

- said display means (102) display in a superposed manner the entire lens image (LE') of the lens (LE) picked by said imaging means and an intended lens shape figure (120) formed on the basis of the data inputted by input means (103, 137),

- wherein said input means (103, 137) are for inputting data on a shape of an eyeglasses frame into which the subjected lens is fitted and data on the intended lens shape figure,

the apparatus further comprises:

- index detecting means (117a) for detecting the index image projected onto said screen;

- optical-center sensing means (130, 134) for obtaining a position of an optical center of the lens (LE) on the basis of positional variation of the index image detected by said index detecting means and obtaining positional displacement of the optical center position of the lens with respect to the reference axis (L);

- position storing means (140) for storing data on the positional displacement of the optical center position of the lens obtained by said optical-center sensing means when said cup is attached to the lens by said attaching means;

- wherein the data on the positional displacement of the optical center position of the lens stored by said position storing means is used at the time of correcting processing data for processing by an eyeglass lens processing apparatus (138);

- wherein said display means (102) displays the intended lens shape figure such that a position of an optical center of the intended lens shape figure determined on the basis of the data inputted by said input means (103, 137) is located at the optical center position of the lens (LE) obtained by said optical-center sensing means (130, 134);

- shape storing means (140) for storing data on a shape of the cup (106) which is attached to the lens (LE),

- wherein said display means (102) displays a cup shape figure (123) formed on the basis of the cup shape data stored by said shape storing means such that the center of the cup shape figure corresponds to said reference axis as a cup attaching center, and displays alignment information for avoiding processing interference, the alignment information including the cup

shape figure displayed on the basis of the cup shape data stored by said shape storing means, the intended lens shape figure displayed on the basis of the data inputted by said input means, and the position displacement of the optical center position of the lens with respect to the reference axis (L).

2. The cup attaching apparatus according to claim 1, wherein said display means (102) displays a region for aligning the optical center position obtained by said optical center sensing means with respect to the reference axis (L).

3. The cup attaching apparatus according to claim 1, further comprising:

- cylinder-axis sensing means (130; 134) for obtaining a direction of a cylinder axis of the lens (L) on the basis of a result of detection by said index detecting means;
- input means (103) for inputting data on an angle of the cylinder axis obtained by prescription; and
- displacement detecting means (130) for obtaining displacement in a direction of the cylinder axis direction obtained by said cylinder-axis sensing means with respect to the angle of the cylinder axis inputted by said input means,

wherein said storing means (140) stores data on the displacement obtained by said displacement detecting means when the cup (106) is attached to the lens (LE) by said attaching means, and wherein the displacement data stored by said storing means is also used at the time of correcting the processing data for processing by said eyeglass lens processing apparatus.

Patentansprüche

1. Schalenbefestigungsvorrichtung, umfassend:

- eine Befestigungseinrichtung (107) mit einer Bezugsachse (L) zum Befestigen einer Schale (106) als eine Bearbeitungseinspannvorrichtung an einer Linse entlang der Bezugsachse (L);
- eine Beleuchtungseinrichtung (110) zum Projizieren von Licht auf die Linse (LE) mittels im Wesentlichen paralleler Lichtstrahlen mit einem größeren Durchmesser als der Durchmesser der Linse (LE);
- einen Bildschirm (105), der an einer Position angeordnet ist, an der ein Gesamtbild der Linse projiziert wird;
- eine bildgebende Einrichtung (117b) zum Aufnehmen des Linsenbildes, das auf den Bild-

schirm projiziert wird;

- eine Anzeigeeinrichtung (102) zum Anzeigen des von der bildgebenden Einrichtung aufgenommenen Linsenbildes (LE') der Linse (LE)

wobei

- die Beleuchtungseinrichtung (110) das Licht auf die Linse (LE) und eine Indexplatte (114) mit einem Index eines vorbestimmten Musters mittels der im Wesentlichen parallelen Lichtstrahlen projiziert;
- der Bildschirm (105) an einer Position angeordnet ist, an der ein Bild des Index, der durch das durch die Linse und die Indexplatte übertragene Licht gebildet wird, projiziert wird;
- die bildgebende Einrichtung (117b) das gesamte Linsenbild, das auf den Bildschirm projiziert wird, aufnimmt; und
- die Anzeigeeinrichtung (102) in einer überlagerten Weise das gesamte Linsenbild (LE') der Linse (LE), das von der bildgebenden Einrichtung aufgenommen wurde, und eine beabsichtigte Linsenformfigur (120), ausgebildet auf der Basis der von der Eingabeeinrichtung (103, 137) eingegebenen Daten, darstellt,
- wobei die Eingabeeinrichtung (103, 137) zum Eingeben von Daten einer Form eines Brillenrahmens, in den die bearbeitete Linse einpasst wird, und Daten einer beabsichtigten Linsenformfigur dient,

wobei die Vorrichtung ferner umfasst:

- eine Indexerfassungseinrichtung (117a) zum Erfassen eines Bildes des Index, der auf den Bildschirm projiziert wird;
- eine Messeinrichtung des optischen Zentrums (130, 134) zum Erhalten einer Position eines optischen Zentrums der Linse (LE) auf der Basis einer Positionsveränderung des Indexbildes, erfasst durch die Indexerfassungseinrichtung, und zum Erhalten einer Positionsverschiebung der Position des optischen Zentrums in Bezug auf die Bezugsachse (L);
- eine Positionsspeichereinrichtung (140) zum Speichern von Daten der Positionsverschiebung der Position des optischen Zentrums der Linse, erhalten durch die Messeinrichtung des optischen Zentrums, wenn die Schale durch die Befestigungseinrichtung an der Linse befestigt ist,
- wobei die Daten über die Positionsverschiebung der Position des optischen Zentrums der Linse, die von der Positionsspeichereinrichtung gespeichert sind, zum Zeitpunkt der Korrektur der Bearbeitungsdaten für eine Bearbeitung mittels einer Brillenlinsenbearbeitungsvorrichtung

(138) verwendet werden;

- wobei die Anzeigeeinrichtung (102) die beabsichtigte Linsenformfigur so anzeigt, dass eine Position eines optischen Zentrums der beabsichtigten Linsenformfigur, bestimmt auf der Basis der von der Eingabeeinrichtung (103, 137) eingegebenen Daten, an der Position des optischen Zentrums der Linse (LE) liegt, die von der Messeinrichtung des optischen Zentrums (130, 134) erhalten wird;

- eine Formspeichereinrichtung (140) zum Speichern von Daten über eine Form der Schale (106), die an der Linse (LE) befestigt ist,

- wobei die Anzeigeeinrichtung (102) eine Schalenformfigur (123), ausgebildet auf der Basis der von der Formspeichereinrichtung gespeicherten Schalenformdaten, so anzeigt, dass das Zentrum der Schalenformfigur mit der Referenzachse als ein Schalenbefestigungszentrum übereinstimmt, und Ausrichtungsinformationen zum Vermeiden einer Bearbeitungsstörung anzeigt, wobei die Ausrichtungsinformationen die Schalenformfigur, angezeigt auf der Basis der von der Formspeichereinrichtung gespeicherten Schalenformdaten, die beabsichtigte Linsenformfigur, angezeigt auf der Basis der von der Eingabeeinrichtung eingegebenen Daten, und die Positionsverschiebung der Position des optischen Zentrums der Linse in Bezug auf die Referenzachse (L) umfassen.

2. Schalenbefestigungsvorrichtung nach Anspruch 1, wobei die Anzeigeeinrichtung (102) einen Bereich zum Ausrichten der Position des optischen Zentrums, erhalten von der Messeinrichtung des optischen Zentrums, in Bezug auf die Bezugsachse anzeigt (L).

3. Schalenbefestigungsvorrichtung nach Anspruch 1, ferner umfassend:

- eine Zylinderachsen-Messeinrichtung (130; 134) zum Erhalten einer Richtung einer Zylinderachse der Linse (LE) auf der Grundlage eines Erfassungsergebnisses der Indexerfassungseinrichtung;

- eine Eingabeeinrichtung (103) zum Eingeben von Daten über einen Winkel der Zylinderachse, erhalten aus der Verschreibung;

- eine Verschiebungserfassungseinrichtung (130) zum Erhalten einer Verschiebung in einer Richtung der Zylinderachsenrichtung, erhalten durch die Zylinderachsen-Messeinrichtung, in Bezug auf den Winkel der Zylinderachse, der durch die Eingabeeinrichtung eingegeben wurde;

wobei die Speichereinrichtung (140) Daten über die

Verschiebung speichert, die durch die Verschiebungserfassungseinrichtung erhalten werden, wenn die Schale (106) durch die Befestigungseinrichtung an der Linse (LE) befestigt ist, und

wobei die von der Speichereinrichtung gespeicherten Verschiebungsdaten auch zu einem Zeitpunkt der Korrektur der Bearbeitungsdaten für die Bearbeitung durch die Brillenlinsen-Bearbeitungsvorrichtung verwendet werden.

Revendications

1. Appareil de glantage pour lentilles comprenant

- un moyen de glantage (107) ayant un axe de référence (L) pour glanter une lentille (106) en tant que montage de traitement sur un verre le long de l'axe de référence (L) ;

- un moyen d'illumination (110) pour projeter de la lumière sur le verre (LE) à l'aide de rayons de lumière sensiblement parallèles ayant un plus grand diamètre que la diamètre du verre (LE);

- un écran (105) disposé à une position où une image entière du verre est projetée ;

- un moyen d'imagerie (117b) pour capturer l'image du verre projetée sur ledit écran ; et

- un moyen d'affichage (102) pour afficher l'image (LE') du verre (LE) prise par ledit moyen d'imagerie,

dans lequel

- ledit moyen d'illumination (110) projette la lumière sur le verre (LE) et une plaque d'indices (114) ayant un indice d'un modèle prédéterminé à l'aide de rayons de lumière sensiblement parallèles ;

- ledit écran (105) est disposé à une position où une image de l'indice formée par la lumière transmise à travers le verre et ladite plaque d'indices est projetée ;

- ledit moyen d'imagerie (117b) capture l'image entière du verre projetée sur ledit écran ; et

- ledit moyen d'affichage (102) affiche de manière superposée l'image (LE') entière du verre (LE) capturée par ledit moyen d'imagerie et une représentation d'une forme de verre voulue (120) formée sur la base des données entrées par des moyens d'entrée (103, 137),

- dans lequel lesdits moyens d'entrée (103, 137) sont prévus pour entrer des données concernant une forme d'une monture de lunettes sur laquelle le verre en question est ajusté et des données concernant la représentation de la forme de verre voulue,

l'appareil comprend en outre :

- un moyen de détection d'indice (117a) pour détecter l'image d'indice projetée sur ledit écran ;

- un moyen de détection de centre optique (130, 134) pour obtenir une position d'un centre optique du verre (LE) sur la base de la variation positionnelle de l'image de l'indice détectée par ledit moyen de détection d'indice et pour obtenir le déplacement positionnel de la position du centre optique du verre par rapport à l'axe de référence (L) ;

- un moyen de stockage de position (140) destiné à stocker des données concernant le déplacement positionnel de la position du centre optique du verre obtenues par ledit moyen de détection du centre optique lorsque ladite lentille est glantée sur le verre par ledit moyen de glantage ;

- dans lequel les données concernant le déplacement positionnel de la position du centre optique du verre stockées par ledit moyen de stockage de position sont utilisées au moment de la correction des données de traitement pour le traitement par un appareil de traitement de verre de lunettes (138) ;

- dans lequel ledit moyen d'affichage (102) affiche la représentation de la forme de verre voulue de sorte qu'une position d'un centre optique de la représentation de la forme de verre voulue déterminée sur la base des données entrées par lesdits moyens d'entrée (103, 137) est située à la position du centre optique du verre (LE) obtenue par ledit moyen de détection de centre optique (130, 134) ;

- un moyen de stockage de forme (140) pour stocker des données sur une forme de la lentille (106) qui est glantée sur le verre (LE),

- dans lequel ledit moyen d'affichage (102) affiche une représentation de la forme de lentille (123) formée sur la base des données de forme de lentille stockées par ledit moyen de stockage de forme de sorte que le centre de la représentation de la forme de lentille correspond audit axe de référence comme centre de fixation de lentille, et affiche des informations d'alignement pour éviter une interférence de traitement, les informations d'alignement incluant la représentation de la forme de lentille affichée sur la base des données de forme de lentille stockées par ledit moyen de stockage de forme, la représentation de la forme de verre voulue affichée sur la base des données entrées par lesdits moyens d'entrée, et le déplacement positionnel de la position du centre optique du verre par rapport à l'axe de référence (L).

2. Appareil de glantage pour lentilles selon la revendication 1, dans lequel ledit moyen d'affichage (102)

affiche une région pour aligner la position du centre optique obtenue par ledit moyen de détection de centre optique par rapport à l'axe de référence (L).

3. Appareil de glantage pour lentilles selon la revendication 1, comprenant en outre :

- un moyen de détection d'axe cylindrique (130, 134) pour obtenir une direction d'un axe cylindrique du verre (L) sur la base d'un résultat de détection par ledit moyen de détection d'indice ;

- des moyens d'entrée (103) pour entrer des données concernant un angle de l'axe cylindrique obtenu par prescription ; et

- un moyen de détection de déplacement (130) pour obtenir le déplacement dans une direction de la direction de l'axe cylindrique obtenue par ledit moyen de détection d'axe cylindrique par rapport à l'angle de l'axe cylindrique entré par lesdits moyens d'entrée,

dans lequel ledit moyen de stockage (140) stocke des données concernant le déplacement obtenues par ledit moyen de détection de déplacement lorsque la lentille (106) est glantée sur le verre (LE) par ledit moyen de glantage, et

dans lequel les données de déplacement stockées par ledit moyen de stockage sont également utilisées au moment de la correction des données de traitement pour le traitement par ledit appareil de traitement de verre de lunettes.

FIG. 1

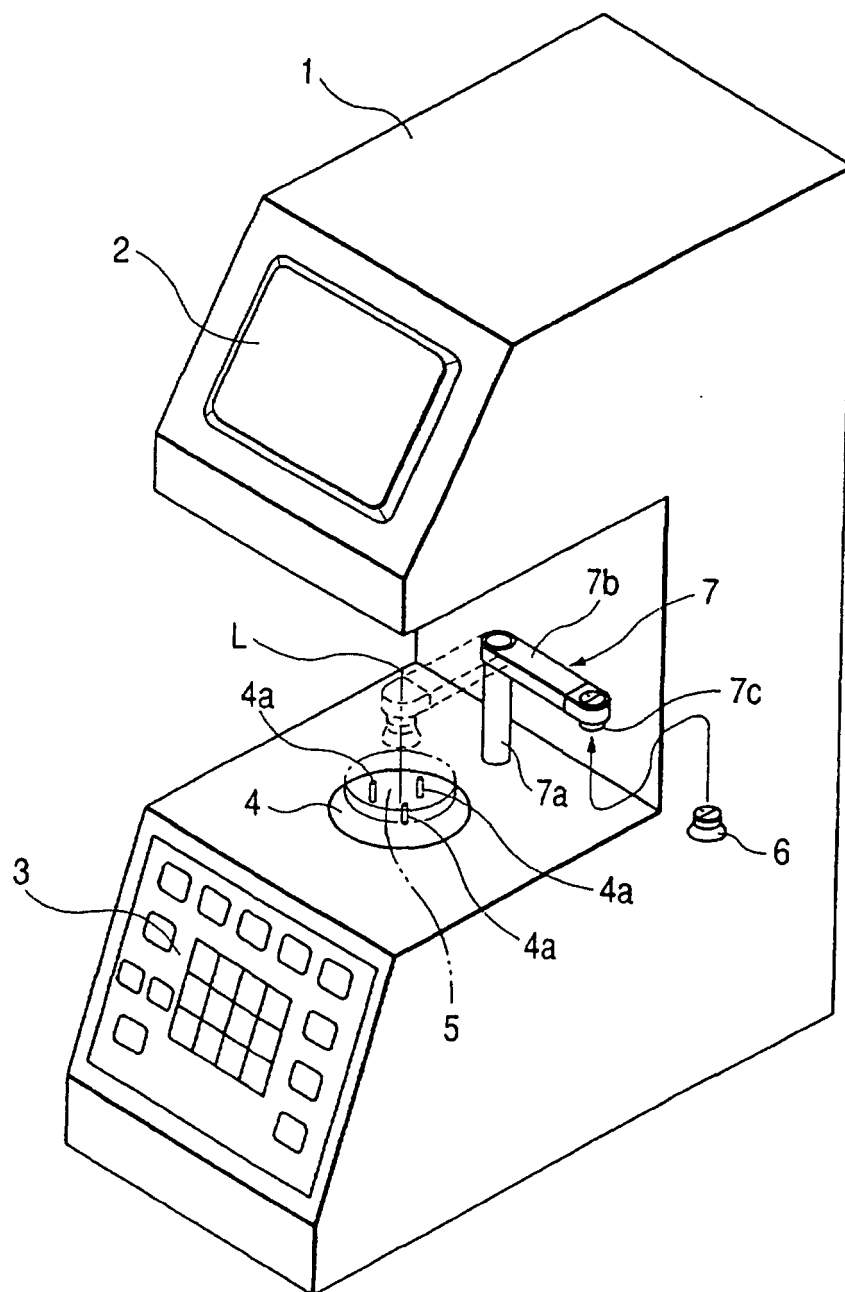


FIG. 2

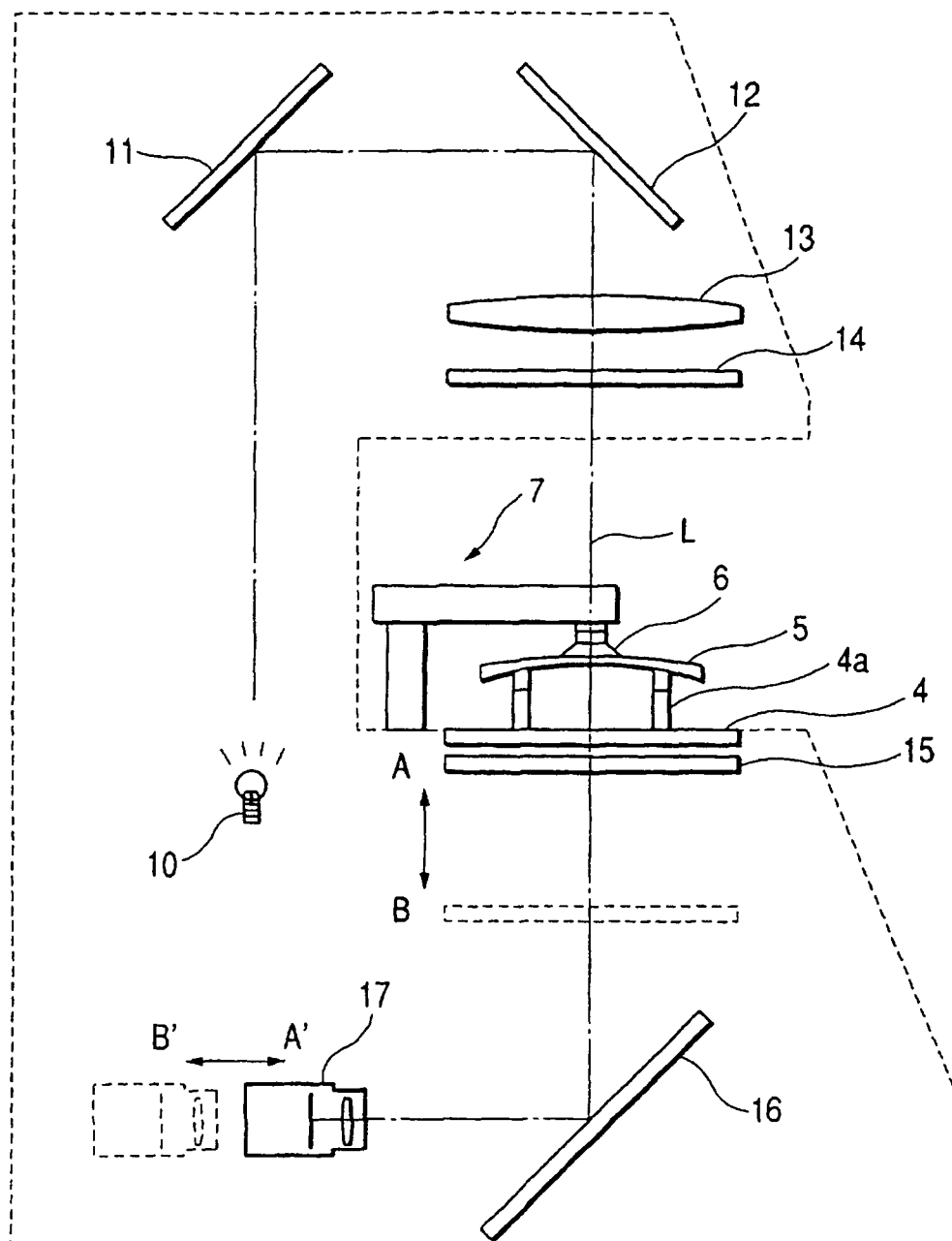


FIG. 3

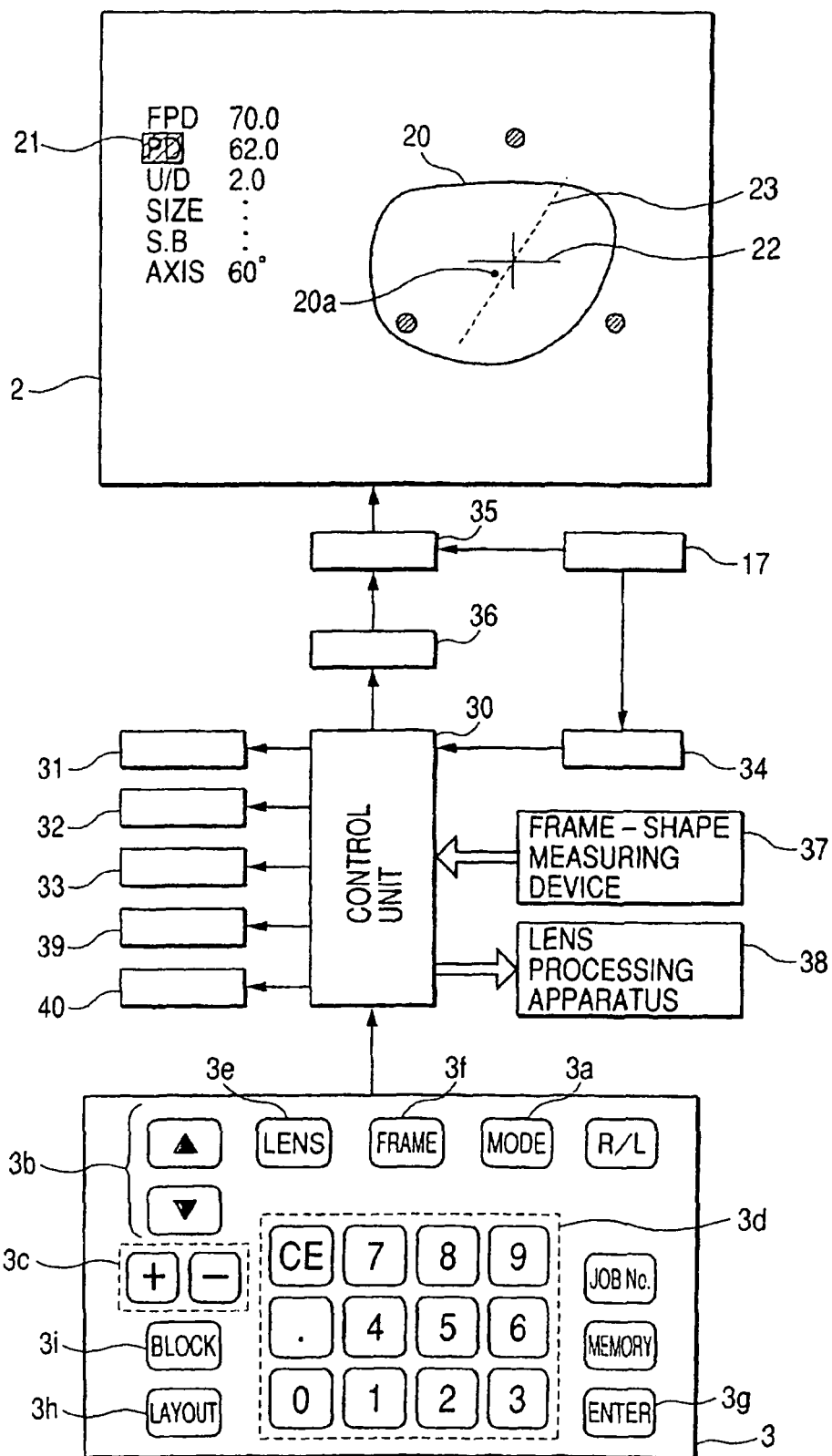


FIG. 4

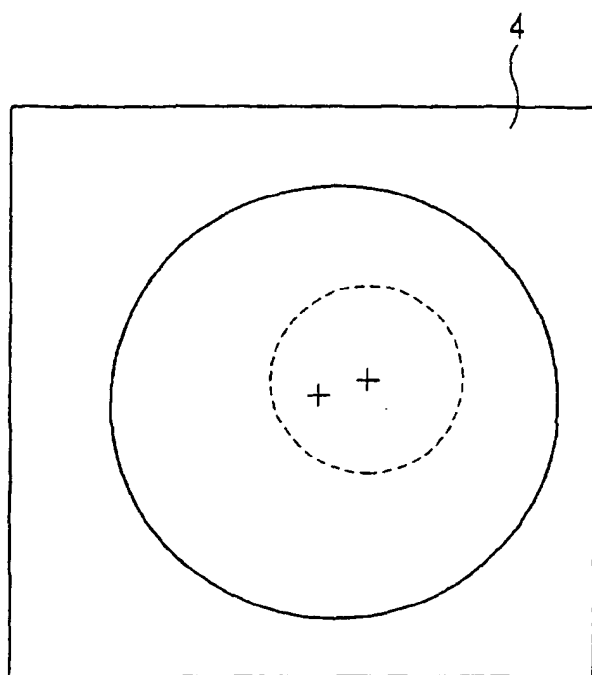


FIG. 5

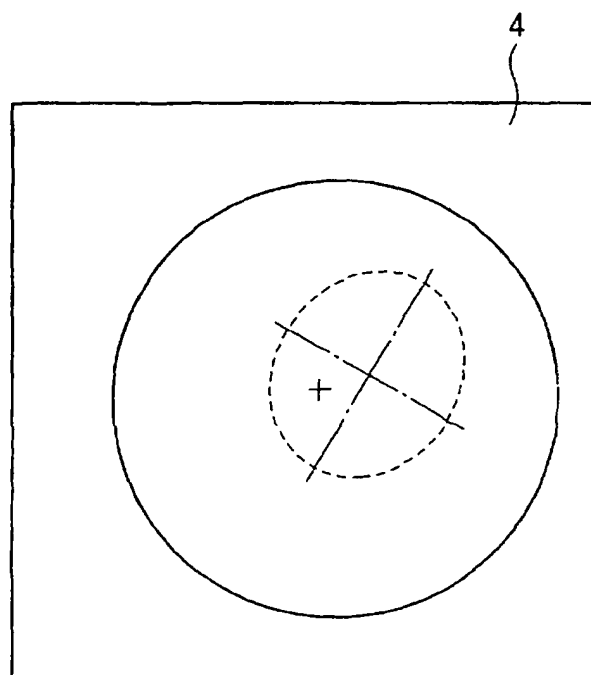


FIG. 6(a)

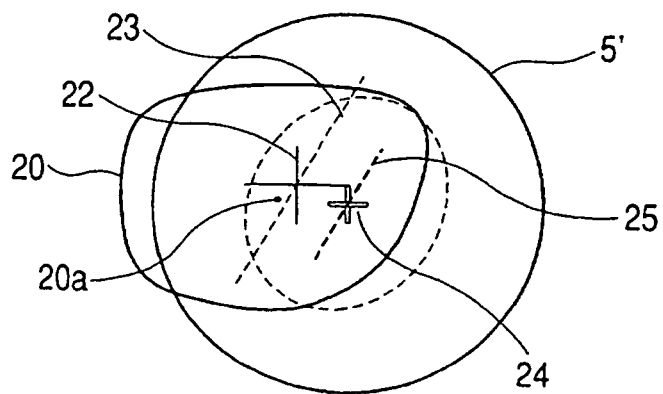


FIG. 6(b)

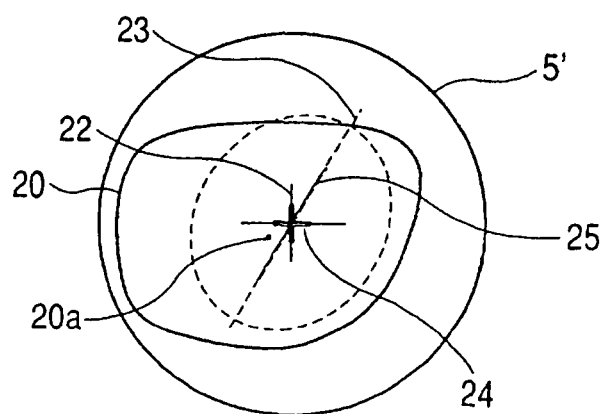


FIG. 7

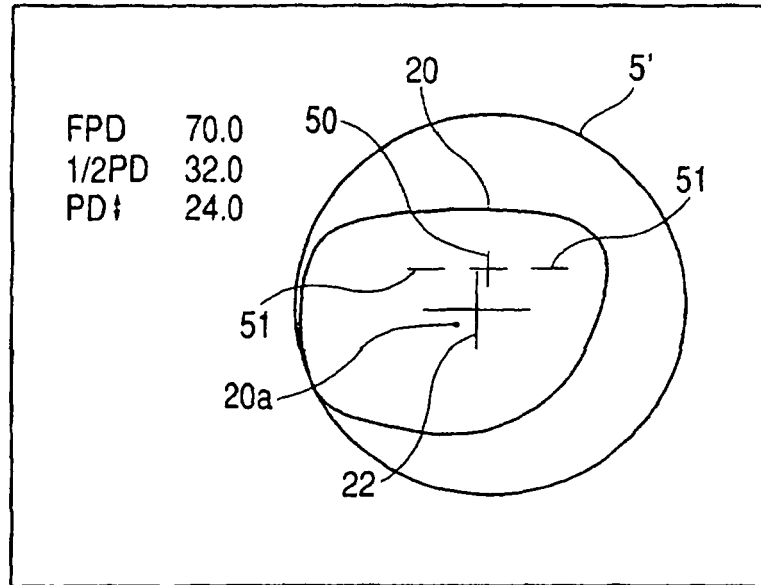


FIG. 8

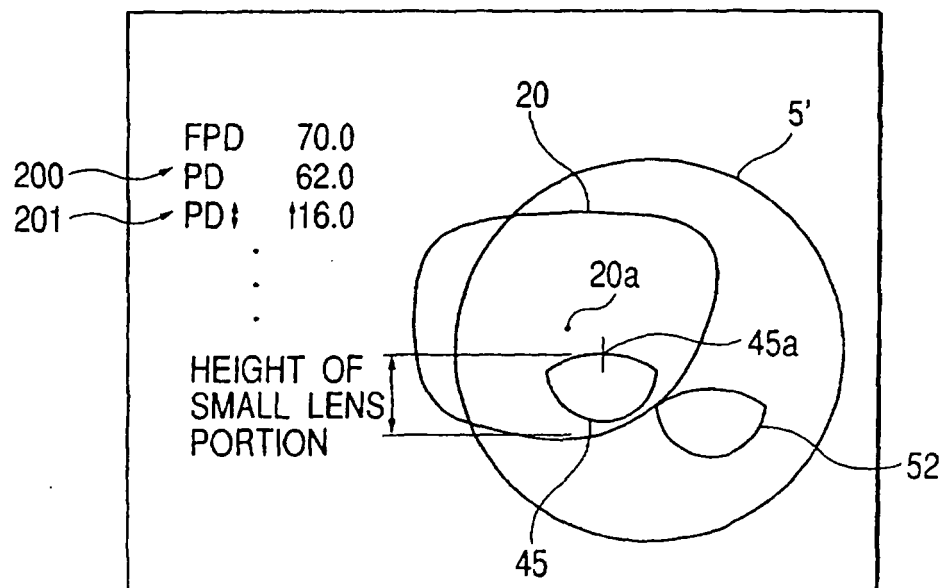


FIG. 9

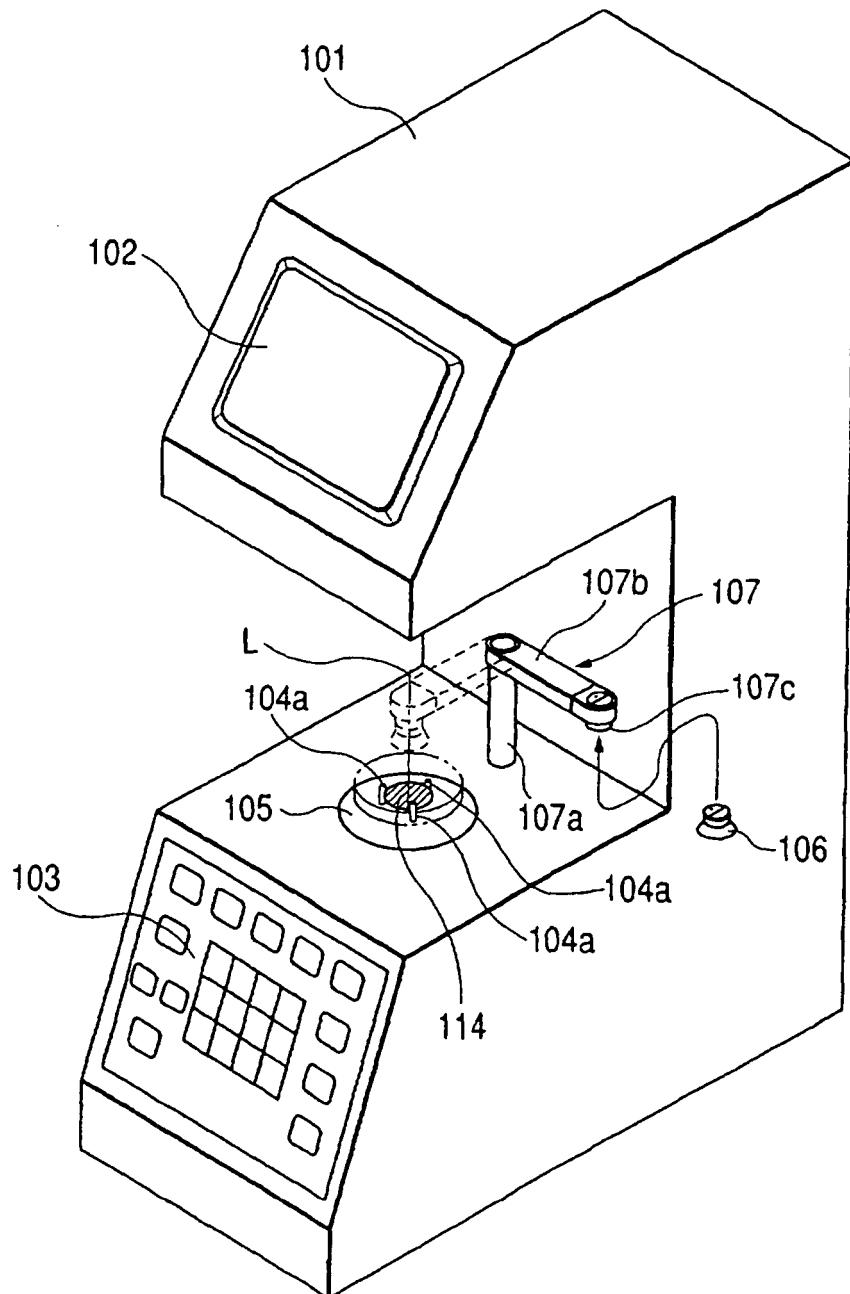


FIG. 10

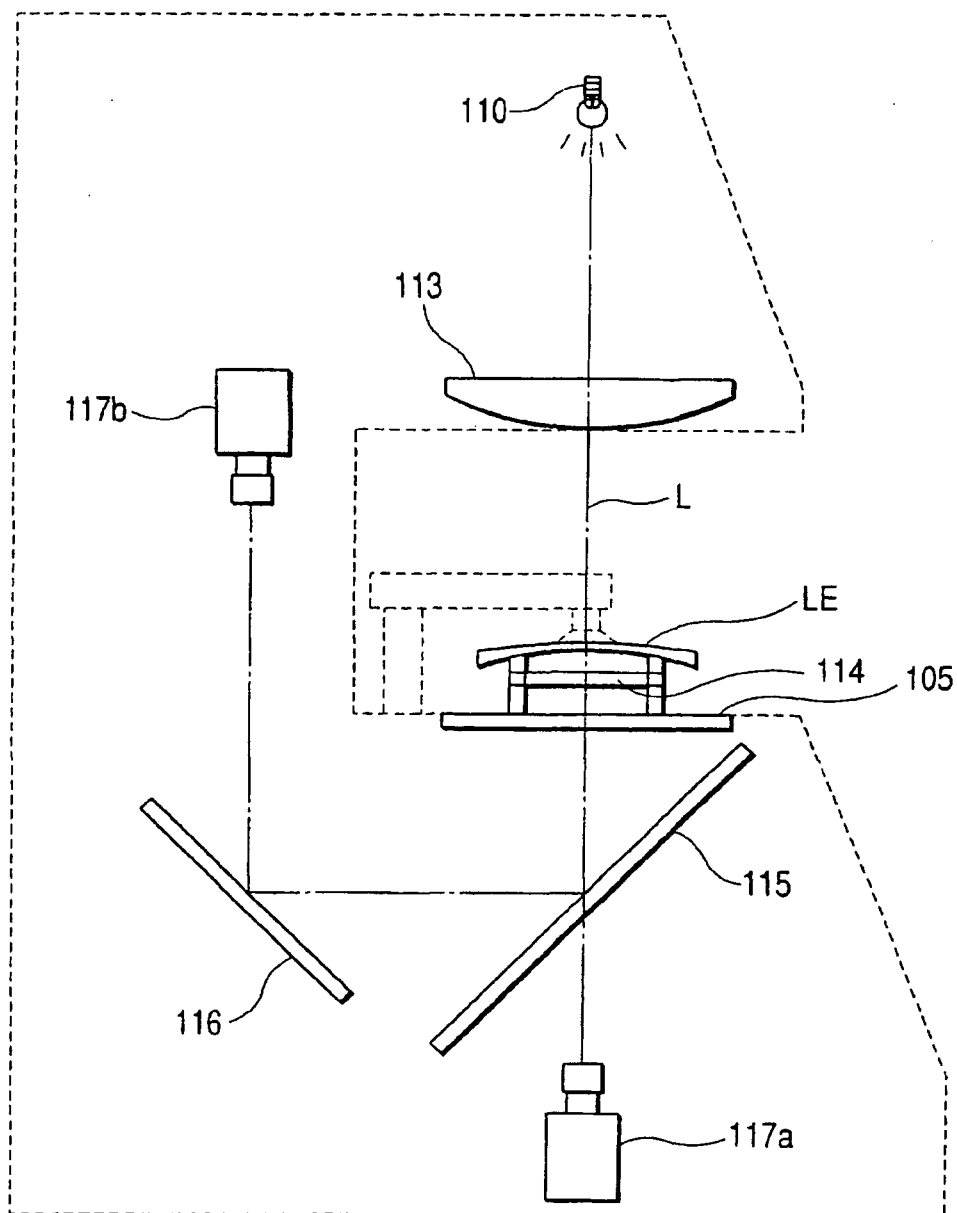


FIG. 11

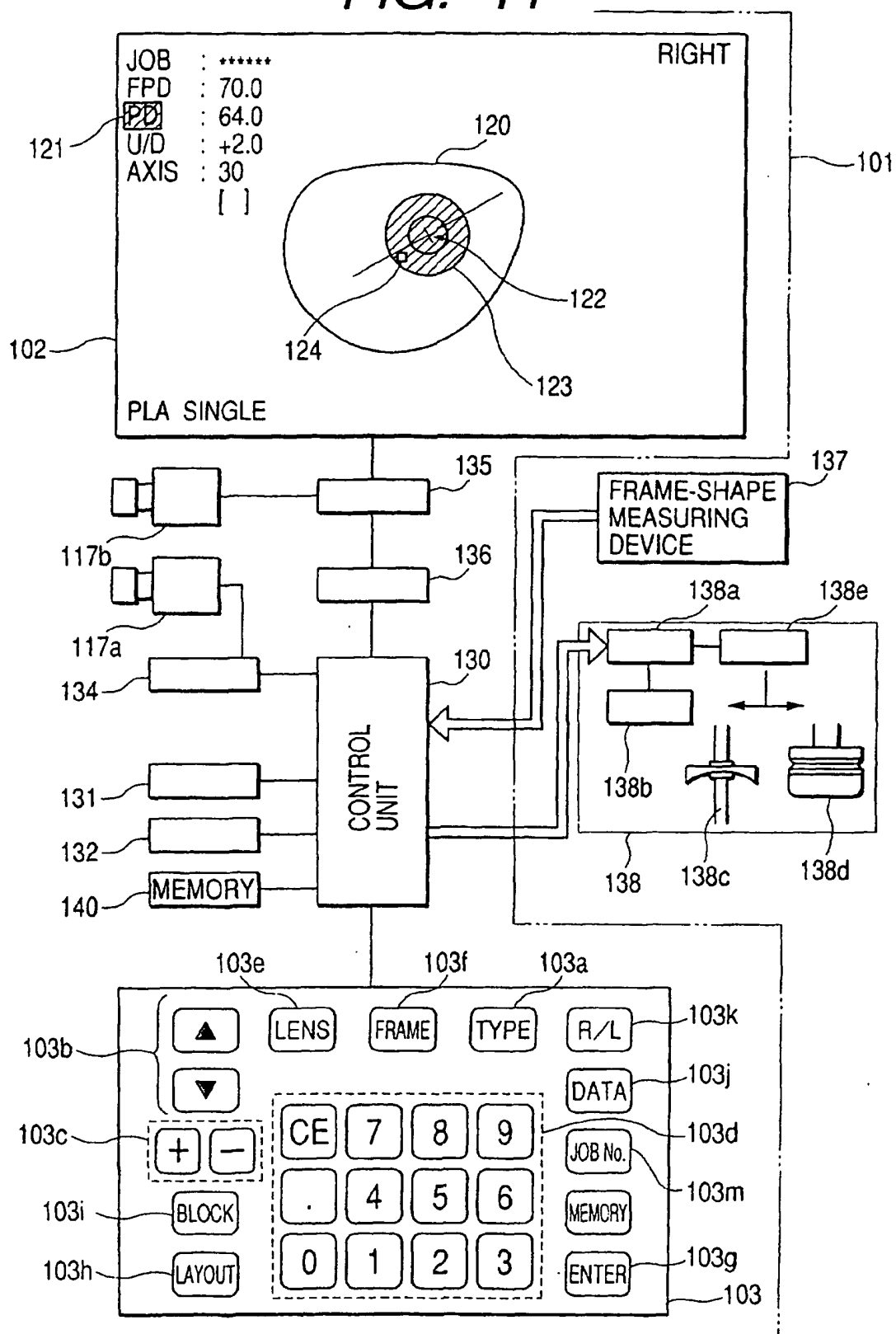


FIG. 12

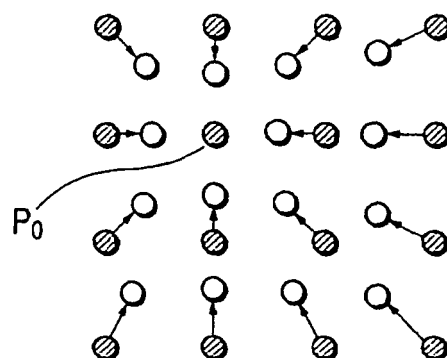


FIG. 13

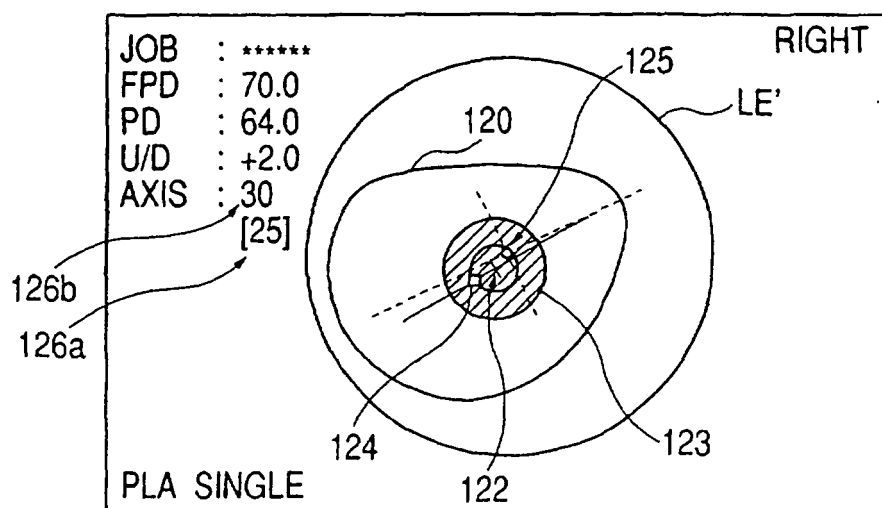


FIG. 14

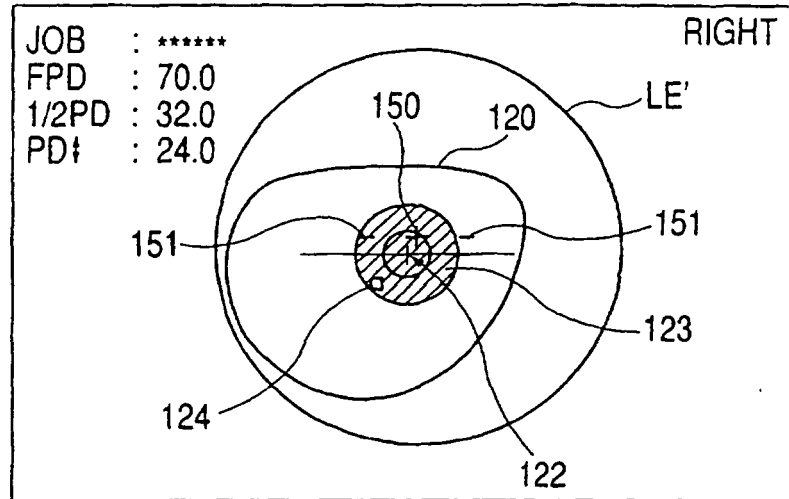
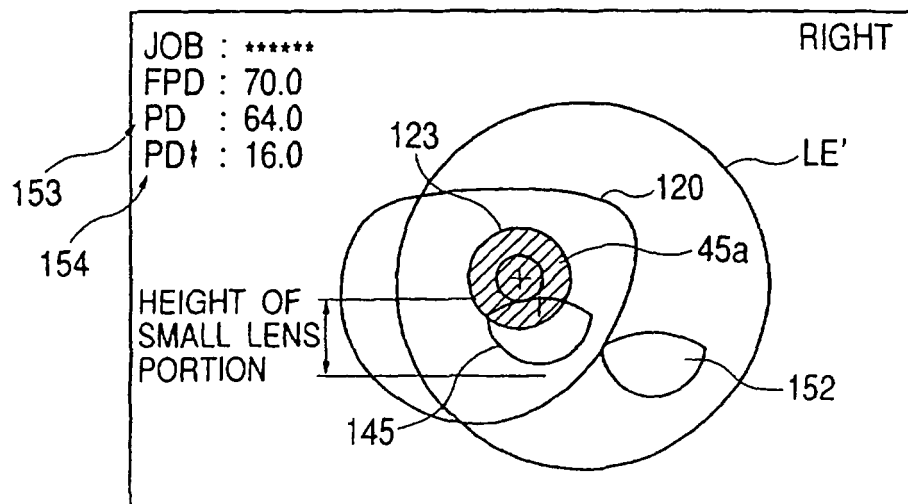


FIG. 15



REFERENCES CITED IN THE DESCRIPTION

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