INTRAOCULAR LENS INSERTION TOOL

[Field]

[0001] The present invention relates to an intraocular lens insertion apparatus that inserts an intraocular lens into an eye.

[Background]

[0002] In treatment of a cataract, an intraocular lens that is to be inserted as a substitute lens to replace a human opaque lens for refraction correction has become available. In intraocular lens insertion surgery, an incision of several millimeters is formed on the edge of the cornea or sclera, for example, the lens is pulverized by phacoemulsification or the like and removed through the incision, and thereafter the intraocular lens is inserted through the incision by an intraocular lens insertion apparatus.

[0003] The intraocular lens is inserted into the eye from the incision by an intraocular insertion apparatus. PTL 1 describes an intraocular lens insertion apparatus.

[Citation List]

[Patent Literature]

[0004]

[PTL 1] Japanese Laid-open Patent Application Publication No. 2020-137894

[Summary of Invention]

[Technical Problem]

[0005] When a load is applied to the intraocular lens at the time of extrusion of the intraocular lens by the intraocular lens insertion apparatus, there is a possibility that the intraocular lens will be scratched, or the behavior of the intraocular lens will become unstable.

[0006] An object of the technology of the present disclosure is to provide an intraocular lens insertion apparatus that enables an intraocular lens to be appropriately folded, and that enables behavior of the intraocular lens to be stabilized.

[Solution to Problem]

[0007] An intraocular lens insertion apparatus according to the present disclosure is an intraocular lens insertion apparatus inserting an intraocular lens through an incision formed in an eye, and includes an apparatus main body that includes a storage portion that stores the intraocular lens in a space formed by a top face portion and a bottom face portion, and a nozzle portion that is disposed further toward a distal end side than the storage portion and that communicates with the storage portion, and moreover that has, on the distal end side, an insertion tube portion that is inserted into the incision, and an extruding member that moves the intraocular lens stored in the storage portion to the distal end side, in which the intraocular lens has an optical portion, a support that is disposed further toward a basal end side than the optical portion when stored in the storage

portion, and a connecting part that connects the optical portion and the support, the extruding member has a support abutting face that faces the distal end side and that abuts a part of the support, and an upward notched portion that has a bottom face formed on the basal end side from the support abutting face and facing upward, and the upward notched portion is formed at a position at which a gap formed between the bottom face and the nozzle portion is greater than a thickness of the connecting part of the intraocular lens. Accordingly, the intraocular lens insertion apparatus can reduce load applied to the intraocular lens, by preventing the support of the intraocular lens from being caught between the extruding member and the apparatus main body.

[0008] In the intraocular lens insertion apparatus, the upward notched portion may be formed at a position at which a gap formed between the bottom face and the insertion tube portion is greater than the thickness of the connecting part of the intraocular lens.

[0009] In the intraocular lens insertion apparatus, the extruding member may have an optical portion abutting face that faces the distal end side and that abuts a rear end of the optical portion when moving the intraocular lens, and a corrugated face of which corrugation changes at an interval smaller than an edge thickness of the optical portion may be formed on the optical portion abutting face.

[0010] In the intraocular lens insertion apparatus, the

corrugated face of the extruding member may have a groove portion and a convex portion that extend with a width smaller than the edge thickness of the optical portion, and the groove portion and the convex portion may extend in a direction that is orthogonal to a front-rear direction connecting the distal end side and the basal end side, and to an optical axis of the optical portion.

[0011] In the intraocular lens insertion apparatus, the extruding member may include an optical portion abutting face that faces the distal end side and that abuts a rear end of the optical portion when moving the intraocular lens, and an upper-side protruding portion that is formed between the optical portion abutting face and the support abutting face, and that protrudes farther to the distal end side than the optical portion abutting face and the support abutting face.

[0012] In the intraocular lens insertion apparatus, the upper-side protruding portion of the extruding member may press the optical portion toward an inner face of the insertion tube portion by a frontmost end portion disposed farthest on the distal end side.

[0013] In the intraocular lens insertion apparatus, the upper-side protruding portion may have an upper face on which the support can be placed, the upper face being inclined upward from the basal end side toward the distal end side.

[0014] In the intraocular lens insertion apparatus, the upper-side protruding portion may be formed at a position at

which a gap formed between the upper face and the insertion tube portion is greater than the thickness of the connecting part of the intraocular lens.

[0015] In the intraocular lens insertion apparatus, the extruding member may have a sideward notched portion, at which a side face on a side where the support of the intraocular lens extends, is notched out, and the sideward notched portion may be formed at a position forming, together with the nozzle portion, a space in which the support of the intraocular lens can be stored.

[Advantageous Effects of Invention]

[0016] According to the technology of the present disclosure, load applied to the intraocular lens when discharging the intraocular lens can be reduced.

[Brief Description of Drawings]

[0017]

[Fig. 1] Fig. 1 is a perspective diagram of an intraocular lens insertion apparatus according to an embodiment.

[Fig. 2] Fig. 2(a) is a plan view of a nozzle main body of the intraocular lens insertion apparatus according to the embodiment as viewed from above, and Fig. 2(b) is a left-side view of the nozzle main body of the intraocular lens insertion apparatus according to the embodiment as viewed from the left side.

[Fig. 3] Fig. 3(a) is a plan view of a plunger of the

intraocular lens insertion apparatus according to the embodiment as viewed from above, and Fig. 3(b) is a left-side view of the plunger of the intraocular lens insertion apparatus according to the embodiment as viewed from the left side.

[Fig. 4] Fig. 4(a) is a plan view of an intraocular lens as viewed from an optical axis side, and Fig. 4(b) is a side view of the intraocular lens as viewed from the side.

[Fig. 5] Fig. 5 is a plan view of a holding member of the intraocular lens insertion apparatus according to the embodiment as viewed from above.

[Fig. 6] Fig. 6(a) is a perspective view of the holding member of the intraocular lens insertion apparatus according to the embodiment as viewed obliquely from above, and Fig. 6(b) is a cross-sectional view of the holding member taken along line AA in Fig. 6(a).

[Fig. 7] Fig. 7 is a perspective view of a stage portion of the intraocular lens insertion apparatus according to the embodiment, illustrated in an enlarged manner.

[Fig. 8] Fig. 8 is a top view of the nozzle main body, illustrating a state in which the intraocular lens is placed in the stage portion of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 9] Fig. 9 is a diagram illustrating inside of the stage portion with the intraocular lens stored within the stage portion of the intraocular lens insertion apparatus

according to the embodiment.

[Fig. 10] Fig. 10 is a plan view of the stage portion as viewed from above, in a state in which the holding member is detached from the intraocular lens insertion apparatus according to the embodiment.

[Fig. 11] Fig. 11(a) is a perspective view in which a distal end side of the plunger of the intraocular lens insertion apparatus according to the embodiment is viewed from the upper left. Fig. 11(b) is a perspective view in which the distal end side of the plunger of the intraocular lens insertion apparatus according to the embodiment is viewed from the upper right.

[Fig. 12] Fig. 12(a) is a left-side view in which the distal end side of the plunger of the intraocular lens insertion apparatus according to the embodiment is viewed from the left side. Fig. 12(b) is a top view in which the distal end side of the plunger of the intraocular lens insertion apparatus according to the embodiment is viewed from above.

[Fig. 13] Fig. 13(a) is a perspective view in which the distal end side of the intraocular lens insertion apparatus according to the embodiment is illustrated in an enlarged manner. Fig. 13(b) is a frontal view in which the distal end side of the intraocular lens insertion apparatus according to the embodiment is illustrated from an opening portion side.

[Fig. 14] Fig. 14 is a bottom view of the plunger of the intraocular lens insertion apparatus according to the

embodiment, as illustrated by orthographic projection.

[Fig. 15] Fig. 15 is a plan view of the plunger of the intraocular lens insertion apparatus according to the embodiment, as illustrated by orthographic projection.

[Fig. 16] Fig. 16 is a frontal view of the plunger of the intraocular lens insertion apparatus according to the embodiment, as illustrated by orthographic projection.

[Fig. 17] Fig. 17 is a rear view of the plunger of the intraocular lens insertion apparatus according to the embodiment, as illustrated by orthographic projection.

[Fig. 18] Fig. 18 is a left-side view of the plunger of the intraocular lens insertion apparatus according to the embodiment, as illustrated by orthographic projection.

[Fig. 19] Fig. 19 is a right-side view of the plunger of the intraocular lens insertion apparatus according to the embodiment, as illustrated by orthographic projection.

[Fig. 20] Fig. 20 is a partial enlarged view of portion A-A′ in Fig. 16.

[Fig. 21] Fig. 21 is a partial enlarged view of portion B-B′ in Fig. 17.

[Fig. 22] Fig. 22 is a partial enlarged view of portion C-C′ in Fig. 18.

[Fig. 23] Fig. 23 is a partial enlarged view of portion D-D′ in Fig. 19.

[Fig. 24] Fig. 24 is a first perspective view of the plunger of the intraocular lens insertion apparatus according

to the embodiment.

[Fig. 25] Fig. 25 is a second perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 26] Fig. 26 is a third perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 27] Fig. 27 is a fourth perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 28] Fig. 28 is an enlarged first perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 29] Fig. 29 is an enlarged second perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 30] Fig. 30 is an enlarged third perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Fig. 31] Fig. 31 is an enlarged fourth perspective view of the plunger of the intraocular lens insertion apparatus according to the embodiment.

[Description of Embodiment]

[0018] An intraocular lens insertion apparatus according to an embodiment of the present disclosure will be described below with reference to the drawings. It should be noted that

the configuration of the embodiment below is exemplary, and that the present invention is not limited to the configuration of these embodiments.

[0019] Fig. 1 is a perspective view of an intraocular lens insertion apparatus 1 according to the present embodiment, as viewed from obliquely above. The intraocular lens insertion apparatus 1 includes a nozzle main body 10 (example of “apparatus main body”), and a plunger 30 (example of “extruding member”) inserted into the nozzle main body 10. The nozzle main body 10 has a tubular shape having a substantially rectangular cross-section, has a rear end portion 10d whose entire end face is open at an end portion on one end side, and a distal end portion 10a (example of “insertion tube portion”) on an end portion on another end side thereof, on which is formed a nozzle portion 15 that is tapered to a narrow shape, with an opening portion 10b formed on the distal end thereof.

[0020] In the following description, a direction heading from the rear end portion 10d of the nozzle main body 10 toward the distal end portion 10a will be referred to as “front”, the opposite direction as “rear”, an upper side in the plane of the drawing in Fig. 1 as “up”, an opposite direction as “down”, a left side when facing frontward as “left”, and an opposite direction as “right”. Note that an upper side corresponds to an optical-axis front side of a lens main body 2a that will be described later, a lower side to an optical-axis rear side of the lens main body 2a, and a front

side to an extrusion direction of the plunger 30, respectively.

[0021] The distal end portion 10a provided on a front side end portion of the nozzle main body 10 communicates with the nozzle portion 15 internally, and has a circular tube form that is narrower in diameter than the nozzle portion 15. Near the rear end portion 10d of the nozzle main body 10, a hold portion 11, on which a surgeon can hook his/her fingers when pushing the plunger 30 toward a distal end side of the nozzle main body 10, is integrally provided with the nozzle main body 10, the hold portion 11 extending upward and downward in a plate form. Also, the nozzle main body 10 has a stage portion 12 that is provided on a rear side of the nozzle portion 15 and stores an intraocular lens 2. The nozzle portion 15 and the distal end portion 10a are disposed on a distal end side from the stage portion 12, and communicate with the stage portion 12. The stage portion 12 is linked to a stage lid portion 13, by which an upper side thereof can be opened and closed, via a linking portion 14 (see Fig. 2). The stage portion 12 and the stage lid portion 13 in a closed state make up an storage portion that is a space in which the intraocular lens 2 is stored. A bottom face side of the storage portion is the stage portion 12, and a top face side of the storage portion is the stage lid portion 13. Also, the space accommodating the intraocular lens 2 can be opened by opening the stage lid portion 13. Also, a holding member 50 is

attached to the stage portion 12, from a lower side of the nozzle main body 10. This holding member 50 stably holds the intraocular lens 2 within the stage portion 12 even when prior to use (during transportation).

[0022] Also, a confirmation window 17 is formed in a portion of the stage lid portion 13 by making this portion thinner than the surroundings, whereby an inner side of the stage lid portion 13 can be confirmed. Note that how much thinner the confirmation window 17 is to be made than the surroundings can be decided as appropriate on the basis of a material from which the stage lid portion 13 is formed, and visibility of the intraocular lens 2 through the confirmation window 17. Also, effects of reducing defective forming at the time of molding the stage lid portion 13 can be anticipated by forming the confirmation window 17.

[0023] The intraocular lens insertion apparatus 1 according to the present embodiment is a preset type, in which the intraocular lens 2 is stored in the stage portion 12 when shipping. In intraocular lens insertion apparatus 1 of a preset type, the intraocular lens 2 is placed on the stage portion 12 with the forward side on an optical axis facing upward during manufacturing, in a state in which the stage lid portion 13 is opened and the holding member 50 is attached to the stage portion 12. The intraocular lens insertion apparatus 1 is then shipped after the stage lid portion 13 is closed.

[0024] Also, the stage lid portion 13 is provided with an

injection hole 18 for injecting a viscoelastic substance onto the stage portion 12 prior to moving the intraocular lens 2 forward. The viscoelastic substance functions as a lubricant for reducing friction occurring when the intraocular lens 2 moves. The injection hole 18 is a hole that connects the inside of the accommodating portion with the outside when the stage lid portion 13 is closed. The surgeon can inject the viscoelastic substance from the injection hole 18 onto the stage portion 12 using a syringe.

[0025] Also, the stage lid portion 13 is provided with a guide wall 19 for guiding an injection needle, for injecting the viscoelastic substance, to the injection hole 18. The guide wall 19 is provided on the stage lid portion 13 so as to continuously surround the injection hole 18, starting from a left side of an opening end thereof, past a front side of the opening end and to a right side of the opening end. The surgeon brings the injection needle of the syringe that injects the viscoelastic substance into contact with the guide wall 19, and further moves a distal end of the injection needle into the injection hole 18. Thus, the guide wall 19 can guide the injection needle for injecting the viscoelastic substance to the injection hole 18. The surgeon detaches the holding member 50 after wetting the intraocular lens 2 with the viscoelastic substance in a state in which the stage lid portion 13 remains closed. Next, the surgeon depresses the plunger 30 into the distal end side of the nozzle main body

10. The distal end portion 10a communicates with the stage portion 12 via the nozzle portion 15, and the intraocular lens 2 that is pressed by the plunger 30 can pass through the nozzle portion 15 and move into the distal end portion 10a. The intraocular lens insertion apparatus 1 presses the interocular lens 2 by the plunger 30 in a state in which the distal end portion 10a is inserted into the incision formed in the eye, and discharges the intraocular lens 2 from the opening portion 10b into the eye. Thus, the intraocular lens insertion apparatus 1 can insert the intraocular lens 2 into the eye from the incision.

[0026] The plunger 30 is inserted into the nozzle main body 10 from the rear end portion 10d, and is movable forward and rearward. The intraocular lens insertion apparatus 1 discharges the intraocular lens 2 into the eye from the opening portion 10b via the nozzle portion 15 and the distal end portion 10a, by moving the plunger 30 forward.

[0027] The nozzle main body 10, the plunger 30, and the holding member 50 of the intraocular lens insertion apparatus 1 are made of a resin such as polypropylene. Polypropylene is a field-proven material for medical equipment, and is also a material with high reliability in chemical resistance and so forth.

[0028] Figs. 2(a) and 2(b) are diagrams in which the nozzle main body 10 is extracted from the intraocular lens insertion apparatus 1 and illustrated. Fig. 2(a) is a plan view of the

nozzle main body 10 as viewed from above, and Fig. 2(b) is a left-side view in which the nozzle main body 10 is viewed from the left side. Note that Fig. 2(a) illustrates a state in which the stage lid portion 13 is open, and Fig. 2(b) illustrates a state in which the stage lid portion 13 is closed.

[0029] A through hole 10c on a front side, of which a cross-sectional shape changes in accordance with change in an outer form of the nozzle main body 10, and a through hole 10g on a rear side, are provided inside the nozzle main body 10. The through hole 10c is disposed on a front side from the stage portion 12, and the through hole 10g is disposed on a rear side from the stage portion 12. The through hole 10c is a hole serving as a moving path for when the intraocular lens 2 moves by being pressed by the plunger 30, and the through hole 10g is a hole through which the plunger 30 is inserted. The intraocular lens 2 is in a folded state while passing through the inside of the through hole 10c, and is discharged into the eyeball of the patient from the opening portion 10b of the distal end portion 10a. Note that the intraocular lens 2 is folded into a valley fold as viewed from above. Also, the opening end of an opening portion 10b is formed so as to be oblique with respect to a direction in which the distal end portion 10a extends. Specifically, the opening end of the opening portion 10b is formed so as to be inclined toward the upper side from the rear side toward the front side, as

illustrated in Fig. 2(b).

[0030] A stage groove 12a, that has a width slightly larger than the diameter of the lens main body of the intraocular lens 2 (lens main body 2a illustrated in Figs. 4(a) and 4(b)), is formed in the stage portion 12. The dimensions of the stage groove 12a in the front-rear direction are set to be larger than the largest dimensions including supports 2b, 2c (see Figs. 4(a) and 4(c)) that extend in both front and rear sides of the intraocular lens 2. Also, the stage portion 12 stores the intraocular lens 2 in a space formed by a bottom face portion 12b of the stage groove 12a, and a top face portion 13a that is situated on the inner side of the storage portion in a state in which the stage lid portion 13 is closed. The bottom face portion 12b and the top face portion 13a form the space in which the intraocular lens 2 is stored in the state in which the stage lid portion 13 is closed. Note that an up-down direction position of the bottom face portion 12b is set to be further upward from the height position of a bottom face of the through hole 10g of the nozzle main body 10, and the bottom face portion 12b and the bottom face of the through hole 10g are linked by a bottom portion inclined face 10e, as illustrated in Fig. 2(b).

[0031] The stage portion 12 and the stage lid portion 13 are integrally formed. The stage lid portion 13 has front-rear direction dimensions that are equivalent to those of the stage portion 12. The stage lid portion 13 is linked by the linking

portion 14 that is in a form of a thin plate, by a right side face of the stage portion 12 formed extending to the outer side. The linking portion 14 is formed so as to be bendable at the middle portion, and the stage lid portion 13 is capable of being opened and closed about the middle portion of the linking portion 14, by bending the linking portion 14. The stage lid portion 13 overlays the stage portion 12 from the upper side and can place the stage portion 12 in a closed state in which the stage portion 12 is shielded from the outside.

[0032] A rib 13b, for reinforcing the stage lid portion 13 and stabilizing the position of the intraocular lens 2, is formed on the top face portion 13a of the stage lid portion 13. Also, a guide groove 13c that is formed in the middle portion of the rib 13b and that extends in the front and rear, for guiding reciprocal movement of the plunger 30, is formed in the top face portion 13a of the stage lid portion 13. The top face portion 13a further has a post-like form protruding from the top face portion 13a, and an upward positioning portion 13d is formed that fixes the lens main body 2a and a rear support 2c of the intraocular lens 2, along with a pair of second positioning portions 67 of the holding member 50, which will be described later.

[0033] Also, a retaining hole 10f that is capable of engaging a claw portion 32a of the plunger 30, which will be described later, is formed on an upper face side of the nozzle

main body 10, as illustrated in Fig. 2(a).

[0034] Figs. 3(a) and 3(b) are diagrams in which the plunger 30 is extracted from the intraocular lens insertion apparatus 1 and illustrated. Fig. 3(a) is a plan view of the plunger 30 of the as viewed from above, and Fig. 3(b) is a left-side view in which the plunger 30 is viewed from the left side. The plunger 30 can move the intraocular lens 2 stored in the stage portion 12 to the distal end portion 10a side by moving to the front side thereof. The length of the plunger 30 is slightly longer in the front-rear direction than the nozzle main body 10. The plunger 30 also has an operating portion 31 on the front side that presses the intraocular lens 2, and an insertion portion 32 on the rear side that has a rectangular rod shape. The operating portion 31 has a round post portion 31a with a round post form extending in the front-rear direction, and a flat portion 31b that has a thin plate shape, extending in a left-right direction of the round post portion 31a. Details of the operating portion 31 will be described later. Also, a pressing plate portion 33, which is disc-like and spreads in the up-down and left-right directions, is formed at a rear end of the insertion portion 32.

[0035] At portion of the insertion portion 32 on the front side from the middle thereof in the front-rear direction, the claw portion 32a is formed so as to protrude upward from the insertion portion 32, and is vertically deformable due to elasticity of the material of the plunger 30. In a case in

which the plunger 30 is inserted into the nozzle main body 10, the retaining hole 10f that is provided on the upper face of the nozzle main body 10 (see Fig. 2(a)) and the claw portion 32a are engaged, and relative positions of the nozzle main body 10 and the plunger 30 in an initial state are decided by this engaging. Note that in a state in which the claw portion 32a and the retaining hole 10f are engaged, the position at which the claw portion 32a and the retaining hole 10f are formed is set to a position at which a distal end of the operating portion 31 can support the rear support 2c situated on the rear side of the lens main body 2a of the intraocular lens 2 placed on the stage portion 12.

[0036] Figs. 4(a) and 4(b) are diagrams illustrating a schematic configuration of the intraocular lens 2 to be inserted into the eye by the intraocular lens insertion apparatus 1 according to the present embodiment. Fig. 4(a) is a plan view of the intraocular lens 2 as viewed from an optical axis side, and Fig. 4(b) is a side view of the intraocular lens 2 as viewed from the side. The intraocular lens 2 is provided with the lens main body 2a (example of “optical portion”) with a predetermined refractive power, and a front support 2b and the rear support 2c that are linked to the lens main body 2a. The intraocular lens 2 is placed on the stage portion 12 of the nozzle main body 10 such that the front support 2b is situated on the front side in the intraocular lens insertion apparatus 1 and the rear support 2c

is situated on the rear side in the intraocular lens insertion apparatus 1. The front support 2b and the rear support 2c are provided for holding the lens main body 2a in the eye, and the supports 2b, 2c are formed having forms of elongated plates. The front support 2b and the rear support 2c are connected to the lens main body 2a via connecting parts 2d. In the present embodiment, the intraocular lens 2 is a so-called one-piece type, in which the lens main body 2a, the front support 2b, the rear support 2c, and the connecting parts 2d are integrally molded from the same material. The intraocular lens 2 is formed of a flexible resin material, for example. Note that the intraocular lens 2 may be a three-piece type, in which the lens main body 2a and the forward and rear supports 2b, 2c are made of different materials.

[0037] Note that the front support 2b and the rear support 2c of the intraocular lens 2 are subjected to roughening treatment. Thus, the supports 2b, 2c can be prevented from becoming stuck to the lens main body 2a when the intraocular lens 2 is folded in the through hole 10c of the nozzle main body 10.

[0038] Figs. 5 to 6(b) are diagrams illustrating the holding member 50 that is detachably configured on the lower side of the stage portion 12. Fig. 5 is a plan view of the holding member 50 as viewed from above. Fig. 6(a) is a perspective view of the holding member 50 as viewed obliquely from above. Fig. 6(b) is a cross-sectional view of the holding

member 50 taken along line AA in Fig. 6(a), as viewed from the front side. The holding member 50 is formed as a separate member from the nozzle main body 10, so as to be detachable from the nozzle main body 10.

[0039] The holding member 50 has a base portion 51 disposed in the middle thereof, and a pair of grip portions 52 disposed on both of left and right sides of the base portion 51. The base portion 51 and the grip portions 52 are linked by linking members 53. The linking members 53 link the base portion 51 and the pair of grip portions 52 with gap portions 54 provided between the base portion 51 and the pair of grip portions 52. The holding member 50 also has a left and right pair of side wall portions 55 that are provided on both left and right sides of the base portion 51 and that extend in the front-rear direction. Also, outer wall portions 52a that have an upward height such that the holding member 50 is fitted to the left and right outer walls of the stage portion 12, and that extend in the front-rear direction, are formed on respective ones of the pair of grip portions 52. A first placing portion 56 and a second placing portion 66 that protrude to the upper side are formed on the base portion 51. The first placing portion 56 and the second placing portion 66 are an example of a pair of lens fixing portions that have post-like forms. Further, on an upper end face of the first placing portion 56 that is on a far side from the optical axis of the lens main body 2a, a first positioning portion 57 is formed protruding further to

the upper side than the upper end face of the first placing portion 56. Also, on an upper end face of the second placing portion 66, the pair of second positioning portions 67, which positions the lens main body 2a and the rear support 2c of the intraocular lens 2, is formed protruding further to the upper side than the upper end face of the second placing portion 66. The first positioning portion 57 is disposed at the right side and also to the front side of the lens main body 2a, the second positioning portions 67 are disposed at the left side and also to the rear side of the lens main body 2a, and the length of separation of the first positioning portion 57 and the second positioning portion 67 is set to be slightly larger than the diameter dimension of the lens main body 2a of the intraocular lens 2. The pair of second positioning portions 67 is disposed with a gap provided therebetween that is slightly greater than the width of the rear support 2c, and placing the rear support 2c on the connecting part 2d side between the pair of second positioning portions 67 clamps the rear support 2c between the pair of second positioning portions 67, whereby the lens main body 2a and the rear support 2c are positioned as to the holding member 50.

[0040] Also, a pair of third placing portions 58 protruding to the upper side is formed on the base portion 51. The pair of third placing portions 58 is disposed on the front side and also the left side, and on the rear side and also the right side, of the lens main body 2a, respectively. A pair of third

positioning portions 59 that protrudes further to the upper side of the third placing portions 58 is formed on upper end faces of the pair of third placing portions 58, on far sides from the optical axis of the lens main body 2a, respectively. The pair of third placing portions 58 and the pair of third positioning portions 59 are an example of a pair of lens fixing portions that have post-like forms. The length of separation between the pair of third positioning portions 59 is set to be slightly larger than the diameter dimension of the lens main body 2a of the intraocular lens 2.

[0041] Also, the holding member 50 has, in a state of being attached to the nozzle main body 10, a tubular protrusion 61 that is provided at a position facing the injection hole 18 illustrated in Fig. 1, and extends to the top face portion 13a side and also is open to the rear side (basal end side) thereof. The tubular protrusion 61 functions as a channel that guides the viscoelastic substance injected from the injection hole 18.

[0042] Also, the holding member 50 has a pair of claw portions 62 extending to inner sides in the left-right direction from each of the pair of third placing portions 58. The claw portions 62 are provided to fix the holding member 50 to the stage portion 12 by being engaged with the stage portion 12.

[0043] Attaching and detaching the holding member 50 to and from the stage portion 12 will be described next by way of

Fig. 7, with reference to Fig. 2(a). Fig. 7 is a perspective view of stage portion 12 of the nozzle main body 10, illustrated in an enlarged manner. As illustrated in Fig. 2(a), four through holes 12c and one through hole 12d, which pass through the bottom face portion 12b in the up-down direction, are formed in the bottom face portion 12b of the stage portion 12. The four through holes 12c are formed at positions corresponding to the first to third placing portions and the first to third positioning portions, respectively, such that the first to third placing portions and the first to third positioning portions can be inserted therein. The through hole 12d is formed at a position corresponding to the tubular protrusion 61, such that the tubular protrusion 61 can be inserted therein. The outer shapes of the through holes 12c are substantially similar to the shapes of the first to third placing portions and the first to third positioning portions of the holding member 50 as viewed from above, but slightly larger. The outer shape of the through hole 12d is formed to be substantially the same size and the same shape as the tubular protrusion 61 of the holding member 50 as viewed from above. As illustrated in Fig. 7, when the holding member 50 is attached to the nozzle main body 10, the first to third placing portions and the first to third positioning portions are inserted into the through holes 12c from the lower side of the bottom face portion 12b, the tubular protrusion 61 is inserted into the through hole 12d from the lower side of the

bottom face portion 12b, and the first to third placing portions and first to third positioning portions, and the tubular protrusion 61, protrude to the upper side of the bottom face portion 12b.

[0044] The holding member 50 is fixed to the stage portion 12 by the claw portions 62 provided to the third placing portions 58 engaging the bottom face portion 12b. The holding member 50 is removed from the stage portion 12 before moving the intraocular lens 2 by the plunger 30. At this time, the pair of grip portions 52 is operated by the surgeon so as to be brought closer to each other on the inner side in the left-right direction. The pair of grip portions 52 is linked to the base portion 51 via the linking members 53, and when the surgeon grasps the pair of grip portions 52 between finger and thumb so as to be moved toward the inner side in the left-right direction, the pair of claw portions 62 opens toward the outer side in the left-right direction, and the engaging of the pair of claw portions 62 and the bottom face portion 12b is disengaged. Thus, the holding member 50 is configured to be removable from the stage portion 12.

[0045] Fig. 8 is a top view of the nozzle main body 10, illustrating a state in which the intraocular lens 2 is placed in the stage portion 12. Fig. 8 illustrates a state in which the holding member 50 is attached to the stage portion 12. In the state in which the intraocular lens 2 is placed on the stage portion 12, a circumferential portion bottom face of the

lens main body 2a is placed on upper faces of the first placing portion 56, the second placing portion 66, and the pair of third placing portions 58. Also, an edge portion of the lens main body 2a is fixed with respect to the front-rear and left-right directions by the first positioning portion 57, the second positioning portions 67, and the pair of third positioning portions 59. Further, the front support 2b of the intraocular lens 2 is placed on a fourth placing portion 12e that will be described later, the rear support 2c of the intraocular lens 2 is fixed by the pair of second positioning portions 67, and moreover the rear support 2c is retained by a retaining portion provided to the operating portion 31 of the plunger 30. A configuration by which the rear support 2c is retained will be described later.

[0046] When removing the holding member 50 from the stage portion 12, the surgeon operates the pair of grip portions 52 so that they move toward the inner side in the left-right direction as described above, whereby the first positioning portion 57, the second positioning portion 67, and the pair of third positioning portions 59 that fix the lens main body 2a open toward the outer side in the left-right direction, and the fixation of the lens main body 2a is configured to be capable of being disengaged. Accordingly, the fixing of the intraocular lens 2 by the holding member 50 in the intraocular lens insertion apparatus 1 can be disengaged without applying any unnecessary impact to the intraocular lens 2. Also, the

holding member 50 can be easily removed from the stage portion 12 in the intraocular lens insertion apparatus 1.

[0047] Fig. 10 is a plan view of the stage portion 12 as viewed from above, in a state in which the holding member 50 is removed. The stage portion 12 has a stage upper end face 12g that serves as an upper end face of the stage portion 12 in a state in which the stage lid portion 13 is open, on which is formed the fourth placing portion 12e (example of “front support shelf”) protruding from the stage upper end face 12g toward the stage groove 12a. The front support 2b is placed on the fourth placing portion 12e in a case in which the intraocular lens 2 is placed. A fourth positioning portion 12f, which protrudes further to an upper side of the fourth placing portion 12e, is formed on an upper end face of the fourth placing portion 12e, on a far side from the optical axis of the lens main body 2a.

[0048] The front support 2b of the intraocular lens 2 is placed on the stage portion 12 in a state of being situated on the front side from the lens main body 2a, with the fourth placing portion 12e supporting the front support 2b. The fourth placing portion 12e is formed with a height so as to support at least part of the front support 2b further on the top face portion 13a side than an end portion on a distal end side of the lens main body 2a.

[0049] Next, a distal end side of the plunger 30 that moves the intraocular lens 2 will be described in detail. Fig. 11(a)

is a perspective view in which a distal end side of the operating portion 31 of the plunger 30 is viewed from the upper left side, and Fig. 11(b) is a perspective view in which the distal end side of the operating portion 31 of the plunger 30 is viewed from the upper right side. Fig. 12(a) is a left-side view in which the distal end side of the operating portion 31 of the plunger 30 is viewed from the left side, and Fig. 12(b) is a top view in which the distal end side of the operating portion 31 of the plunger 30 is viewed from above. The operating portion 31 has an upper-side protruding portion 31c provided on the distal end side thereof, and a lower-side protruding portion 31d provided on the distal end side thereof. Also, the operating portion 31 has a distal end recessed portion 31e that is formed between the upper-side protruding portion 31c and the lower-side protruding portion 31d, and that is recessed to the rear side from the upper-side protruding portion 31c and the lower-side protruding portion 31d. The operating portion 31 moves to the front side while clamping the intraocular lens 2 between the upper-side protruding portion 31c and the lower-side protruding portion 31d.

[0050] The upper-side protruding portion 31c has an upper face 310c extending toward the rear side from the protruding front side. As illustrated in Fig. 12(a), the upper face 310c inclines upward from the rear side toward the front side. Also, the operating portion 31 has a wall portion 31f (example

of “support abutting face”) that extends to the upper side from a rear end of the upper face 310c and faces the front side. As illustrated in Fig. 9, the distal end side of the operating portion 31 is exposed within the stage portion 12 at an initial position of the plunger 30, and the rear support 2c of the intraocular lens 2 is placed on the upper face 310c of the upper-side protruding portion 31c. When the plunger 30 moves the intraocular lens 2, the wall portion 31f abuts a part of the rear support 2c, and moves the rear support 2c forward with the wall portion 31f. The rear support 2c moves to the upper side of the lens main body 2a due to the distal end side thereof being pushed forward, the intraocular lens 2 is folded in a valley fold in this state, and is discharged into the eye. Note that Fig. 9 illustrates a state in which the rear support 2c is placed on the upper face 310c of the upper-side protruding portion 31c, and the rear support 2c is retained on the upper face 310c of the upper-side protruding portion 31c and the wall portion 31f. The upper-side protruding portion 31c is formed between the distal end recessed portion 31e and the wall portion 31f, and protrudes farther to the front side than a rear end face of the distal end recessed portion 31e and the wall portion 31f. The upper-side protruding portion 31c presses the lens main body 2a toward an inner face of the distal end portion 10a by a frontmost end portion 311c disposed on the frontmost side of the upper-side protruding portion 31c.

[0051] Also, the operating portion 31 has an upward notched portion 31g that is formed on the rear side of the wall portion 31f. The upward notched portion 31g has a bottom face 310g that extends rearward from an upper end portion of the wall portion 31f facing upward, and the bottom face 310g is formed such that the front-rear direction thereof is longer than the left-right direction thereof. The upward notched portion 31g is a notch formed by notching out an upper side of the operating portion 31. The operating portion 31 has two steps formed by the upward notched portion 31g and the upper-side protruding portion 31c, from the basal end side thereof. When moving the intraocular lens 2 by the operating portion 31, the rear support 2c upon the upper face 310c is pressed by the wall portion 31f, and at the time of the intraocular lens 2 advancing and being folded, the connecting part 2d on the rear side is in a state of having ridden up on the upward notched portion 31g.

[0052] The distal end recessed portion 31e is made up of a lower face of the upper-side protruding portion 31c, an upper face of the lower-side protruding portion 31d, and the rear end face, and is a part that is further recessed to the rear side than distal end portions of the upper-side protruding portion 31c and the lower-side protruding portion 31d. The rear end face that defines a rear end of the distal end recessed portion 31e is a corrugated face 310e facing forward (example of “optical portion abutting face”). The corrugated

face 310e abuts a rear end of the lens main body 2a when the operating portion 31 moves the intraocular lens 2. The vertical length of the distal end recessed portion 31e is a length that is necessary to clamp the lens main body 2a of the intraocular lens 2. The lens main body 2a is folded into a valley fold while the rear end side thereof is being pushed forward by the corrugated face 310e, advances though the distal end portion 10a in a state of being clamped between the upper-side protruding portion 31c and the lower-side protruding portion 31d, and is discharged from the opening portion 10b. Also, the upper face 310c of the upper-side protruding portion 31c is preferably formed as a curved face that is convex to the upper side thereof, so as not to damage the connecting part 2d that comes into contact with the upper face 310c when folding the intraocular lens 2. In order to form the upper face 310c as a curved face that is convex to the upper side, the upper-side protruding portion 31c needs to be made thicker by an amount equivalent to an amount of the upper face 310c bulging to the upper side. The upper-side protruding portion 31c is inclined to the upper side from the basal end side toward the distal end side, in order to secure a thickness for forming the upper face 310c as a curved face that is convex to the upper side, while securing vertical length of the distal end recessed portion 31e for clamping the lens main body 2a. Accordingly, while there is a need to make the upper-side protruding portion 31c thicker as compared to a

cases in which the upper face 310c flat in the front and rear, forming the upper-side protruding portion 31c such that the upper face 310c is inclined to the upper side from the basal end side toward the distal end side enables the vertical length of the distal end recessed portion 31e to be secured, and the lens can be moved without being gripped excessively.

[0053] Formed in the corrugated face 310e are, in order from the upper side to the lower side, a groove portion 311e that is concave, a convex portion 312e, and a groove portion 311e, and the vertical lengths of the groove portions 311e and the convex portion 312e are formed to be smaller than an edge thickness of the lens main body 2a. Accordingly, the corrugated face 310e is formed as a face in which the corrugation changes at smaller intervals than the edge thickness of the lens main body 2a. The groove portions 311e and the convex portion 312e extend in the left-right direction with smaller widths than the edge thickness of the lens main body 2a. Note that the edge thickness is the thickness of the lens main body 2a at a peripheral edge portion thereof, and the left-right direction is a direction that is orthogonal to the front-rear direction connecting the distal end side and the basal end side, and to the optical axis of the lens main body 2a.

[0054] Also, the operating portion 31 has a sideward notched portion 31h on the distal end side thereof, where a side of the operating portion 31 is notched out. The sideward

notched portion 31h is formed by notching out the left side where a base of the rear support extends, as illustrated in Fig. 8. Moving the intraocular lens 2 to the front side causes the rear support 2c to be in a state of having ridden up on the lens main body 2a, on the optical axis front side thereof. The sideward notched portion 31h is provided such that the rear support 2c and the connecting part 2d are not caught between the operating portion 31 and an inner wall face of the nozzle portion 15 and the distal end portion 10a when the operating portion 31 moves the intraocular lens 2 further forward in this state. The sideward notched portion 31h is formed at a position where a space is formed that can accommodate the rear support 2c of the intraocular lens 2 with an inner wall face of the nozzle main body 10 when moving the intraocular lens 2. The operating portion 31 can move the intraocular lens 2 while accommodating the rear support 2c between the sideward notched portion 31h and the inner wall face of the nozzle portion 15 and the distal end portion 10a.

[0055] Also, as illustrated in Fig. 12(b), the sideward notched portion 31h is formed in a shape most recessed rightward at the middle in the front-rear direction. The operating portion 31 has the corrugated face 310e expose leftward in a case of viewing from above. The corrugated face 310e, which abuts the lens main body 2a when moving the intraocular lens 2, is formed exposed further leftward from the upper-side protruding portion 31c and the lower-side

protruding portion 31d as viewed from above, and the sideward notched portion 31h expands leftward the farther toward the front side from the middle, in continuation with the corrugated face 310e. The operating portion 31 has the corrugated face 310e formed broader on the front side from the sideward notched portion 31h, and thereby can reliably move the lens main body 2a by the corrugated face 310e.

[0056] Next, operations when moving the intraocular lens 2 by the operating portion 31 will be described with reference to Fig. 13. Fig. 13(a) is a perspective view in which the distal end side of the intraocular lens insertion apparatus 1 is illustrated in an enlarged manner. Fig. 13(b) is a frontal view in which the distal end portion 10a of the intraocular lens insertion apparatus 1 is viewed from the opening portion 10b side. In the state illustrated in Figs. 13(a) and 13(b), the distal end of the operating portion 31 of the plunger 30 has moved to partway along the distal end portion 10a of the nozzle main body 10. Note that in Fig. 13, the intraocular lens 2 that is moved by the operating portion 31 is omitted from illustration.

[0057] In the present embodiment, the intraocular lens 2 is a one-piece type in which the lens main body 2a and the supports 2b, 2c are formed integrally. In the intraocular lens 2 that is a one-piece type, the connecting parts 2d are thinner than the connecting parts of an intraocular lens that is a three-piece type. Accordingly, in order to improve

stability within the lens capsule, the connecting parts 2d need to be provided with a certain area or larger in the intraocular lens 2, but when the rear support 2c becomes caught between the insertion apparatus and the plunger 30 when moving the intraocular lens 2, there is a possibility that a load will be applied to the intraocular lens 2 and the connecting part 2d will be scratched, or that the behavior of the intraocular lens 2 will become unstable.

[0058] Accordingly, the intraocular lens insertion apparatus 1 according to the present embodiment has the operating portion 31 that is configured such that load applied to the intraocular lens 2 can be reduced. Specifically, the operating portion 31 has the upward notched portion 31g. The upward notched portion 31g is formed at a position at which a gap, which is greater than the thickness of the connecting parts 2d of the intraocular lens 2, is provided between the bottom face 310g thereof and the nozzle portion 15. In other words, a gap that is greater than the thickness of the connecting parts 2d is formed between the upward notched portion 31g and an inner wall face of the nozzle portion 15 when the operating portion 31 advances as far as the nozzle portion 15. When the operating portion 31 moves the intraocular lens 2, the connecting part 2d on the rear side is in a state of having ridden up on the bottom face 310g of the upward notched portion 31g. Providing the upward notched portion 31g in the operating portion 31 prevents the

connecting part 2d from becoming caught between the operating portion 31 and the nozzle portion 15. Accordingly, the intraocular lens insertion apparatus 1 can reduce the load applied to the intraocular lens 2.

[0059] Also, the upward notched portion 31g is formed at a position at which a gap that is greater than the thickness of the connecting parts 2d of the intraocular lens 2 is formed between the bottom face 310g thereof and the distal end portion 10a of the nozzle portion 15. In other words, a gap that is greater than the thickness of the connecting parts 2d is formed between the upward notched portion 31g and the inner wall face of the distal end portion 10a when the operating portion 31 advances as far as the distal end portion 10a. In the operating portion 31, providing the upward notched portion 31g prevents the connecting part 2d from becoming caught between the operating portion 31 and the distal end portion 10a. Accordingly, the load applied to the intraocular lens 2 can be reduced in the intraocular lens insertion apparatus 1.

[0060] Also, the upper-side protruding portion 31c is formed at a position at which the upper face 310c thereof forms a gap between the upper face 310c and the distal end portion 10a that is greater than the thickness of the connecting parts 2d of the intraocular lens 2. In other words, when the operating portion 31 advances to the distal end portion 10a, a gap that is greater than the thickness of the connecting parts 2d is formed between the upper face 310c of

the upper-side protruding portion 31c and the inner wall face of the distal end portion 10a. Accordingly, the connecting part 2d on the rear side can be prevented from being caught between the upper-side protruding portion 31c and the distal end portion 10a when the operating portion 31 moves the intraocular lens 2.

[0061] The intraocular lens insertion apparatus 1 according to the present embodiment is used in a case of inserting the intraocular lens 2 having the connecting parts 2d with improved stability in the lens capsule, into the eye as described above, and thereby prevents the connecting parts 2d from being caught between the operating portion 31 and inner wall faces of the apparatus main body. Accordingly, the intraocular lens insertion apparatus 1 can reduce the load applied to the intraocular lens 2. The intraocular lens insertion apparatus 1 according to the present embodiment prevents the intraocular lens 2 from becoming caught when inserting the intraocular lens 2 made of a relatively soft material into the eye, and accordingly can suppress the intraocular lens 2 from being scratched, and the behavior of the intraocular lens 2 becoming unstable.

[0062] Also, forming the width of the vertical lengths of the groove portions 311e and the convex portion 312e formed in the corrugated face 310e to be smaller than the edge thickness of the lens main body 2a enables prevention of the intraocular lens 2 from becoming stuck to the corrugated face 310e.

Generally, the intraocular lens 2 is made of a soft acrylic, which has a certain level of adhesiveness, and accordingly the distal end of the plunger is subjected to processing such as surface roughening or the like, to prevent sticking of the intraocular lens 2. However, there is concern that subjecting the distal end of the plunger to surface roughening in a minute form smaller than the edge thickness of the lens main body 2a may result in defective molding when molding the plunger. The intraocular lens insertion apparatus 1 according to the present embodiment can prevent the intraocular lens 2 from becoming stuck to the corrugated face 310e of the operating portion 31 while preventing defective molding of the operating portion 31.

[0063] Also, intraocular lenses are generally discharged from an insertion apparatus in a state in which the front and rear supports are non-symmetrically folded. There is concern that the intraocular lens made of a soft material may be discharged in a state of being inclined to one of the left or right, due to the lens main body also being non-symmetrically folded. In the intraocular lens insertion apparatus 1 according to the present embodiment, the upper-side protruding portion 31c is provided on the upper portion of the distal end of the operating portion 31, whereby the frontmost end portion 311c of the upper-side protruding portion 31c can be made to press the lens main body 2a against the inner face of the distal end portion 10a when the plunger 30 is advanced by

pressing forward and the lens main body 2a of the intraocular lens 2 passes the distal end portion 10a. Accordingly, the intraocular lens insertion apparatus 1 can delay the timing of the lens main body 2a departing from the operating portion 31, and motion of the intraocular lens 2 becoming inclined can be mitigated due to the operating portion 31 holding the lens main body 2a.

[0064] Also, as described above, the intraocular lens 2 maintains a rearward inclined attitude even after the holding member 50 is removed. The upper-side protruding portion 31c and the wall portion 31f retain at least part of the rear support 2c in the rearward inclined attitude of the intraocular lens 2, further on the top face portion 13a side from the basal end side end portion of the lens main body 2a. In the intraocular lens insertion apparatus 1, retaining the rear support 2c further on the top face portion 13a side than the lens main body 2a enables the rear support 2c to be placed on the lens main body 2a when the plunger 30 moves forward, and the intraocular lens 2 is appropriately folded in the state in which the rear support 2c is folded upon the lens main body 2a. Accordingly, the intraocular lens insertion apparatus 1 can stabilize the behavior of the intraocular lens. Note that the rear support 2c retained upon the upper-side protruding portion 31c can be placed on the upper side of the lens main body 2a more readily by the lens main body 2a being pressed by the corrugated face 310e.

[0065] In the present application, six orthogonal views, illustrated by orthographic projection of the plunger 30 of the intraocular lens insertion apparatus 1 according to the present embodiment, are included. Figs. 14 to 19 are six orthogonal views of the plunger 30 of the intraocular lens insertion apparatus 1 according to the present embodiment. Fig. 14 is a bottom view, Fig. 15 is a plan view, Fig. 16 is a frontal view, Fig. 17 is a rear view, Fig. 18 is a left-side view, and Fig. 19 is a right-side view. Fig. 20 is a partial enlarged view of portion A-A’ in Fig. 16. Fig. 21 is a partial enlarged view of portion B-B’ in Fig. 17. Fig. 22 is a partial enlarged view of portion C-C’ in Fig. 18. Fig. 23 is a partial enlarged view of portion D-D’ in Fig. 19. Fig. 24 is a first perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the upward right side. Fig. 25 is a second perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the upward left side. Fig. 26 is a third perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the downward right side. Fig. 27 is a fourth perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated

by orthographic projection, as viewed obliquely from the downward left side. Fig. 28 is an enlarged first perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the upward right side. Fig. 29 is an enlarged second perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the upward left side. Fig. 30 is an enlarged third perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the downward right side. Fig. 31 is an enlarged fourth perspective view of the plunger 30 of the intraocular lens insertion apparatus 1 according to the embodiment, illustrated by orthographic projection, as viewed obliquely from the downward left side.

[0066] While the present embodiment has been described above, the intraocular lens insertion apparatus 1 according to the present disclosure is not limited to the above embodiment, and various modifications can be made without departing from the technical spirit of the present invention.

[0067] In the above-described embodiment, the intraocular lens insertion apparatus 1 is of a preset type in which the intraocular lens 2 is stored in the stage portion 12 in advance, but the intraocular lens insertion apparatus 1

disclosed herein is not limited to this. For example, the intraocular lens insertion apparatus 1 may be of a separate type in which the surgeon him/herself places the intraocular lens 2 in the intraocular lens insertion apparatus 1 at the time of use.

[Reference Signs List]

[0068]

1 Intraocular lens insertion apparatus

2 Intraocular lens

2a Lens main body

2b Front support

2c Rear support

2d connecting part

10 Nozzle main body

11 Hold portion

12 Stage portion

13 Stage lid portion

14 Linking portion

15 Nozzle portion

17 Confirmation window

18 Injection hole

19 Guide wall

30 Plunger

50 Holding member

[CLAIMS]

[Claim 1]

An intraocular lens insertion apparatus for inserting an intraocular lens through an incision formed in an eye, the intraocular lens insertion apparatus comprising:

an apparatus main body that includes a storage portion that stores the intraocular lens in a space formed by a top face portion and a bottom face portion, and a nozzle portion that is disposed further toward a distal end side than the storage portion and that communicates with the storage portion, and moreover that has, on the distal end side, an insertion tube portion that is inserted into the incision; and

an extruding member that moves the intraocular lens stored in the storage portion to the distal end side, wherein

the intraocular lens has an optical portion, a support that is disposed further toward the basal end side than the optical portion when stored in the storage portion, and a connecting part that connects the optical portion and the support,

the extruding member has a support abutting face that faces the distal end side and that abuts a part of the support, and an upward notched portion that has a bottom face formed on the basal end side from the support abutting face and facing upward, and

the upward notched portion is formed at a position at which a gap formed between the bottom face and the nozzle

portion is greater than a thickness of the connecting part of the intraocular lens.

[Claim 2]

The intraocular lens insertion apparatus according to claim 1, wherein

the upward notched portion is formed at a position at which a gap formed between the bottom face and the insertion tube portion is greater than the thickness of the connecting part of the intraocular lens.

[Claim 3]

The intraocular lens insertion apparatus according to claim 1 or 2, wherein

the extruding member has an optical portion abutting face that faces the distal end side and that abuts a rear end of the optical portion when moving the intraocular lens, and

a corrugated face of which corrugation changes at an interval smaller than an edge thickness of the optical portion is formed on the optical portion abutting face.

[Claim 4]

The intraocular lens insertion apparatus according to claim 3, wherein

the corrugated face of the extruding member has a groove portion and a convex portion that extend with a width smaller than the edge thickness of the optical portion, and

the groove portion and the convex portion extend in a direction that is orthogonal to a front-rear direction

connecting the distal end side and the basal end side, and to an optical axis of the optical portion.

[Claim 5]

The intraocular lens insertion apparatus according to claim 1, wherein

the extruding member includes

an optical portion abutting face that faces the distal end side and that abuts a rear end of the optical portion when moving the intraocular lens, and

an upper-side protruding portion that is formed between the optical portion abutting face and the support abutting face, and that protrudes farther to the distal end side than the optical portion abutting face and the support abutting face.

[Claim 6]

The intraocular lens insertion apparatus according to claim 5, wherein

the upper-side protruding portion of the extruding member presses the optical portion toward an inner face of the insertion tube portion by a frontmost end portion disposed farthest on the distal end side.

[Claim 7]

The intraocular lens insertion apparatus according to claim 5 or 6, wherein

the upper-side protruding portion has an upper face on which the support can be placed, the upper face being inclined

upward from the basal end side toward the distal end side.

[Claim 8]

The intraocular lens insertion apparatus according to claim 7, wherein

the upper-side protruding portion is formed at a position at which a gap formed between the upper face and the insertion tube portion is greater than the thickness of the connecting part of the intraocular lens.

[Claim 9]

The intraocular lens insertion apparatus according to claim 1 or 2, wherein

the extruding member has a sideward notched portion, at which a side face on a side where the support of the intraocular lens extends, is notched out, and

the sideward notched portion is formed at a position forming, together with the nozzle portion, a space in which the support of the intraocular lens can be stored.