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(71) Applicant: **Bridgestone Corporation**
Tokyo 104-0031 (JP)

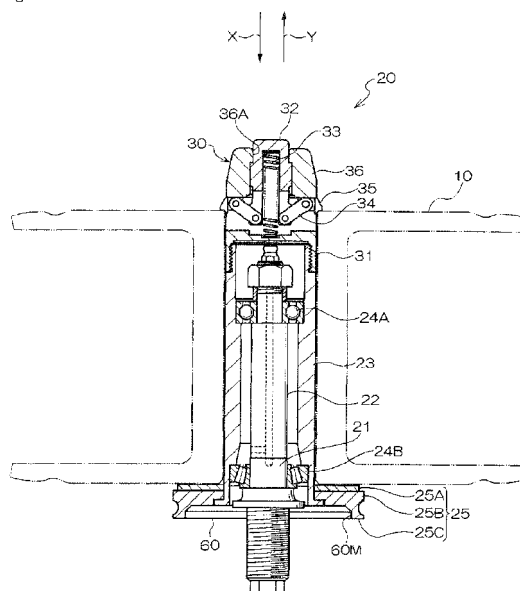
(72) Inventors:
• **UEDA, Shogo**
Nasushiobara-shi, Tochigi 329-3146 (JP)
• **TORISU, Kojiro**
Nasushiobara-shi, Tochigi 329-3146 (JP)

(74) Representative: **Jorio, Paolo et al**
Studio Torta S.r.l.
Via Viotti, 9
10121 Torino (IT)

(54) **BOBBIN FIXING DEVICE AND BOBBIN REMOVING DEVICE**

(57) The present invention provides a bobbin fixing device capable of fixing a bobbin easily with a simple structure and also provides a bobbin removing device capable of removing a bobbin readily with a simple structure. Stoppers 35 project from the level of the outer surface of a rotating shaft 23. Sloping surface of each stopper 35 is pressed by a bobbin 10, so that the stopper is moved to an inner position P2. The bobbin 10 is attached so as to position on a positioning member 25. When the bobbin 10 is brought into contact with the positioning member 25, each support 34B upwardly moves together with a release button 32 biased by a spring 33, so that one end of each arm 34A on the associated support 34B moves upward and the other end thereof close to the associated stopper 35 moves downward. Thus, each stopper 35 outwardly moves and projects until a restricting face 35C of the stopper 35 is brought into contact with the bobbin 10. At that time, a retaining face 35B of each stopper 35 is in contact with the top surface of the bobbin 10, thus restricting the movement of the bobbin 10 in the direction (Y direction) in which the bobbin 10 is removed from the rotating shaft 23.

Fig.1



Description

Technical Field

[0001] The present invention relates to bobbin fixing devices for rotatably holding a bobbin used in a winding machine or a stranding machine. The present invention also relates to bobbin removing devices for removing a bobbin from a bobbin fixing device which rotatably holds the bobbin used in a winding machine or a stranding machine.

Background Art

[0002] In general, in supplying a wire to a winding machine or a stranding machine, a bobbin fixing device for rotatably holding a bobbin is used so that the wire is drawn while the bobbin on which the wire is wound is being rotated. Methods for fixing a bobbin include methods using power, such as air or electric power, and manual mechanical methods using, for example, a slot lever, a screw, or a set pin.

[0003] The use of the method using air or electric power complicates the structure of the fixing device, resulting in an increase in size and cost of the device. On the other hand, the use of the method using a slot lever, a screw, or a set pin simplifies the structure of the device because power is not needed, thus reducing the cost of the device. Unfortunately, the number of steps for bobbin attachment/removal increases, leading to reduced working efficiency.

[0004] For example, a set-pin type bobbin fixing device 150 described in Patent Document 1 requires the following steps: Referring to Fig. 15, a rotating shaft 155 is inserted into a spool core 11 of a bobbin 10, the rotating shaft 155 is rotated and positioned so that an engagement groove 155C is at the front, and a retaining pin 158 is fitted into the engagement groove 155C. To remove the bobbin 10, an operator removes the retaining pin 158, so that the operator can remove the bobbin 10 from the rotating shaft 155.

Patent Document 1: Japanese Unexamined Patent Application Publication No. 2003-182935

Disclosure of Invention

Problems that the Invention is to Solve

[0005] The present invention is made in consideration of the above problems and an object of the present invention is to provide a bobbin fixing device capable of fixing a bobbin readily with a simple structure and further provide a bobbin removing device capable of removing a bobbin easily with a simple structure.

Means for Solving the Problems

[0006] To solve the problems, the bobbin fixing device

according to the present invention includes a rotating shaft to which a bobbin is attached, a positioning member which is in contact with a first surface of the attached bobbin to position the bobbin in the attaching direction in which the bobbin is attached to the rotating shaft, and movable members, each of which is movable between a projecting position where the movable member projects from the level of the outer surface of the rotating shaft and an inner position inside the level of the outer surface and is in contact with a second surface of the attached bobbin in the projecting position to restrict the movement of the bobbin in the removing direction in which the bobbin is removed from the rotating shaft.

[0007] According to the present invention, the bobbin fixing device has the rotating shaft to which the bobbin is attached. The first surface of the bobbin attached to the rotating shaft is in contact with the positioning member to position the bobbin in the attaching direction. The second surface of the bobbin attached to the rotating shaft is in contact with the movable members to restrict the movement of the bobbin in the removing direction. Each movable member is movable between the projecting position where the movable member projects from the level of the outer surface of the rotating shaft and the inner position inside the level of the outer surface. In the projecting position, each movable member is in contact with the second surface of the attached bobbin. During the attachment of the bobbin, each movable member is arranged in the inner position inside the level of the outer surface of the rotating shaft.

[0008] In the above-described structure, the movement of each movable member to the inner position enables easier attachment of the bobbin to the rotating shaft. Each movable member is moved to the projecting position after the attachment, thus readily fixing the bobbin to the rotating shaft.

[0009] The bobbin fixing device according to the present invention may further include a release member and connecting members. The release member is attached to one end of the rotating shaft and is movable in the axial direction of the rotating shaft. Each connecting member connects the corresponding movable member to the release member so that the movable member moves between the projecting position and the inner position in response to the movement of the release member in the axial direction.

[0010] In the above-described structure, the release member attached to the end of the rotating shaft is moved in the axial direction of the rotating shaft, thus allowing each movable member to move between the projecting position and the inner position.

[0011] In the bobbin fixing device according to the present invention, each movable member may have an outwardly downwardly sloping outer surface such that the height of projection increases toward the positioning member.

[0012] In the above-described structure, during the attachment of the bobbin, the first surface of the attached

bobbin presses the sloping outer surface of each movable member, thus easily moving the movable member to the inner position.

[0013] The bobbin fixing device according to the present invention may further include a biasing member, a release restricting portion, and projection restricting portions. The biasing member biases the release member away from the rotating shaft and allows each movable member to move to the projecting position. The release restricting portion restricts the movement of the release member away from the rotating shaft. Each projection restricting portion restricts the outward movement of the associated movable member from the projecting position.

[0014] In the above-described structure, the biasing member biases the release member away from the rotating shaft but the release restricting portion restricts this movement. Thus, the release member is arranged in the restricted position. The biasing member also allows each movable member to move to the projecting position but each projection restricting portion restricts the outward movement of the associated movable member from the projecting position. Thus, each movable member is arranged in the restricted position.

[0015] To solve the above-described problems, the bobbin removing device according to the present invention includes a holding member movable in the axial direction of a rotating shaft of a bobbin fixing device while holding a bobbin attached to the rotating shaft, the bobbin fixing device including the rotating shaft to which the bobbin is attached and movable members, each movable member being movable between a projecting position where the movable member projects from the level of the outer surface of the rotating shaft and an inner position inside the level of the outer surface and being in contact with a surface of the attached bobbin in the projecting position to restrict the movement of the bobbin in the removing direction in which the bobbin is removed from the rotating shaft. The bobbin fixing device includes a movement permitting member that allows each movable member to move to the inner position and keeps the movable member in the inner position until the holding member moves the bobbin in the removing direction by a predetermined distance.

[0016] The bobbin removing device with the above-described structure is used for a bobbin fixing device including a rotating shaft to which a bobbin is attached and movable members, each movable member being movable between a projecting position where the movable member projects from the level of the outer surface of the rotating shaft and an inner position inside the level of the outer surface and being in contact with a surface of the attached bobbin in the projecting position to restrict the movement of the bobbin in the removing direction in which the bobbin is removed from the rotating shaft. To attach a bobbin to the bobbin fixing device, the bobbin is moved in the attaching direction in which the bobbin is attached to the rotating shaft while the bobbin is being

held. During this movement, each movable member is disposed in the inner position. When the bobbin is arranged to a predetermined fixed position, each movable member is arranged in the projecting position. Each movable member in the projecting position is in contact with the surface of the attached bobbin to restrict the movement of the bobbin, thus fixing the bobbin. To remove the bobbin from the rotating shaft of the bobbin fixing device, the holding member holds the bobbin and the movement permitting member allows each movable member to move to the inner position. This movement enables the bobbin to move in the removing direction. The movement permitting member keeps each movable member in the inner position until the holding member moves the bobbin by a predetermined distance.

[0017] The bobbin removing device according to the present invention can readily remove a bobbin, fixed to the rotating shaft, from the rotating shaft without direct manual operation.

[0018] In the bobbin fixing device according to the present invention, the bobbin fixing device may include a release member attached to one end of the rotating shaft such that the release member allows each movable member to move to the inner position in response to the movement of the bobbin in the attaching direction in which the bobbin is attached to the rotating shaft. The movement permitting member may include a pushing portion for pushing the release member in the attaching direction.

[0019] In the above-described structure, pushing the release member through the pushing portion enables the bobbin to move in the removing direction.

[0020] In the bobbin removing device according to present invention, the movement permitting member may be mounted on the holding member and be moved to a pushing position, where the pushing portion pushes the release member to arrange each movable member in the inner position, in response to the movement of the holding member to a holding position where the holding member holds the bobbin.

[0021] In the above-described structure, the movement permitting member can be moved together with the holding member. The simple structure can be realized.

[0022] In the bobbin removing device according to the present invention, the holding member may include outer-edge holding portions capable of holding the outer-edge of a flange of the bobbin in the holding position. Each outer-edge holding portion may have an inwardly downwardly sloping inner surface.

[0023] In the bobbin removing device with the above-described structure, to hold the bobbin, the outer-edge holding portions hold the outer edge of the flange of the bobbin. At that time, the pushing portion is moved to the pushing position, thus pushing the release member. This allows the movement permitting member to be located in the inner position. Each outer-edge holding portion has an inwardly downwardly sloping inner surface. Therefore, the bobbin is moved along the sloping surfaces in

the removing direction while being held by the outer-edge holding portions. Thus, the bobbin can be easily removed from the rotating shaft while each movable member is kept in the inner position.

[0024] In the bobbin removing device according to the present invention, the movement permitting member may have an elastic member retractable in the axial direction, one end of the elastic member being in contact with the holding member, the other end thereof being in contact with the pushing portion.

[0025] In the bobbin removing device with the above-described structure, the movement permitting member includes the elastic member. One end of the elastic member is in contact with the holding member and the other end thereof is in contact with the pushing portion. To hold the bobbin through the holding member, the holding member is moved and arranged in the holding position and the movement permitting member is arranged in the pushing position. At that time, the pushing portion pushes the release member while retracting the elastic member. After the bobbin is held by the holding member, the holding member is moved outwardly along the rotating shaft. At that time the elastic member extends until the holding member is moved to a predetermined position and the pushing portion continues to push the release member. Thus, the bobbin can be easily removed from the rotating shaft while each movable member is kept in the inner position.

Advantage of the Invention

[0026] As described above, the bobbin fixing device according to the present invention can fix a bobbin readily with a simple structure and the bobbin removing device according to the present invention can remove a bobbin easily with a simple structure.

Brief Description of the Drawings

[0027]

Fig. 1 is a cross-sectional view of a bobbin fixing device according to an embodiment of the present invention.

Fig. 2 is a cross-sectional view of part of the bobbin fixing device according to the embodiment of the present invention in a state where a bobbin is fixed.

Fig. 3 is a top view of the bobbin fixing device according to the embodiment of the present invention in the state where the bobbin is fixed.

Fig. 4 is a cross-sectional view of part of the bobbin fixing device according to the embodiment of the present invention during attachment of the bobbin.

Fig. 5 is a cross-sectional view of part of the bobbin fixing device according to the embodiment of the present invention during removal of the bobbin.

Fig. 6 is a cross-sectional view of a bobbin removing device according to a first embodiment of the present

invention.

Fig. 7 is a view illustrating the bobbin removing device pressing a release button in accordance with the first embodiment of the present invention.

Fig. 8 is a view showing the bobbin removing device holding a bobbin in accordance with the first embodiment of the present invention.

Fig. 9 is a view illustrating the bobbin removing device holding the bobbin in accordance with the first embodiment of the present invention, the bobbin being slightly raised.

Fig. 10 is a view showing the bobbin removing device in accordance with the first embodiment of the present invention, a pushing portion of the device being away from the release button.

Fig. 11 is a cross-sectional view of a bobbin removing device according to a second embodiment of the present invention.

Fig. 12 is a view showing the bobbin removing device pushing a release button in accordance with the second embodiment of the present invention.

Fig. 13 is a view illustrating the bobbin removing device holding a bobbin in accordance with the second embodiment of the present invention.

Fig. 14 is a view showing the bobbin removing device in accordance with the second embodiment of the present invention, a pushing portion of the device being away from the release button.

Fig. 15 is a cross-sectional view of a conventional bobbin fixing device.

Description of Reference Numerals

[0028]

10	bobbin
20	bobbin fixing device
21	base
23	rotating shaft
25	positioning member
32	release button
32A	upper part
32C	hole
33	spring
34A	arm
34B	support
34	connecting portion
35	stopper
35B	retaining face
35C	restricting face
40	bobbin removing device
42	body
44	holding arm
46	movement permitting member
46A	spring
46B	pushing portion
50	bobbin removing device
52	body

54 holding arm
 55 outer-edge holding portion
 56 movement permitting member
 P1 projecting position
 P2 inner position

Best Mode for Carrying Out the Invention

[0029] A bobbin fixing apparatus in accordance with a preferred embodiment of the present invention will now be described below with reference to the drawings. Referring to Fig. 1, a bobbin fixing device 20 according to the present embodiment includes a base 21, a stationary shaft 22, a rotating shaft 23, and a bobbin retainer 30. The base 21 is a block-shaped member for attachment of the bobbin fixing device 20 to a stationary stage 60 of an apparatus, e.g., a winding machine, to which a bobbin is mounted. The stationary shaft 22 is fixed on the base 21. The rotating shaft 23 is a spool on the exterior of the stationary shaft 22 and is coupled to the stationary shaft 22 through bearings 24A and 24B. A positioning member 25 projecting horizontally from the outer surface of the rotating shaft 23 to position the bobbin 10 in the direction X, in which the bobbin 10 is attached, is disposed at the lower end of the rotating shaft 23. The positioning member 25 includes a positioning plate 25A disposed to be in contact with the bobbin 10, a flange-shaped positioning-member body 25B on which the positioning plate 25A is mounted, and a projection 25C on the bottom surface of the positioning-member body 25B. The positioning member 25 is set such that the projection 25C is fitted into a guide groove 60M on the stationary stage 60 of the bobbin setting device.

[0030] The bobbin retainer 30 includes an attaching portion 31, a release button 32, a spring 33, connecting members 34, stoppers 35, and a retainer body 36.

[0031] Referring to Fig. 3, the retainer body 36 is circular as viewed from the axial direction of the rotating shaft 23. Referring to Fig. 1, the attaching portion 31 is integrated with the lower part of the retainer body 36. The attaching portion 31 is screwed to the upper part of the rotating shaft 23, thus attaching the bobbin retainer 30 to the rotating shaft 23.

[0032] Referring to Fig. 2, the release button 32 is fitted in a button hole 36A located in the middle of the retainer body 36. The diameter of upper part of the button hole 36A is larger than that of lower part thereof. A step 36B corresponds to the boundary between the upper and lower parts of the button hole 36A. The release button 32 is composed of an upper portion 32A and a lower portion 32B. The diameter of the upper portion 32A is slightly smaller than that of the upper part of the button hole 36A. The diameter of the lower portion 32B is larger than that of the upper part of the button hole 36A and slightly smaller than that of the lower part of the button hole 36A.

[0033] The release button 32 has a hole 32C opened at the end of the lower portion 32B so that the spring 33 can be arranged in the hole 32C. The retractable spring

33 is arranged in the hole 32C such that the release button 32 is spring-biased in the Y direction in which the release button 32 is away from the rotating shaft 23. The movement in the Y direction of the lower portion 32B of the release button 32 is restricted by the step 36B. The upper portion 32A of the release button 32 protrudes upward from the retainer body 36 while the lower portion 32B is in contact with the step 36B.

[0034] The retainer body 36 has three through-holes 36C radially extending from the lower part of the button hole 36A. An inner wall defining each through-hole 36C has a guide groove 36D extending in the radial direction of the retainer body 36. In each through-hole 36C, the connecting member 34 and the stopper 35, serving as a movable member, are arranged.

[0035] Each connecting member 34 includes a support 34B fixed to the bottom of the release button 32 and a long arm 34A extending outward in the corresponding through-hole 36C. One end of each arm 34A is pivotably secured to lower part of the corresponding support 34B through a pin N2. The other end thereof is pivotably secured to the corresponding stopper 35 through a pin N1.

[0036] Each stopper 35 has a fitting portion 35A, which is arranged above the corresponding arm 34A and fits into the corresponding guide groove 36D of the retainer body 36 such that the fitting portion 35A is movable along the guide groove 36D. In a normal state, an end portion of each stopper 35 projects from the level of the outer surface of the rotating shaft 23 (hereinafter, this position will be called "projecting position P1"). Each stopper 35 has an outwardly downwardly sloping outer surface such that the height of projection from the level of the outer surface of the rotary shaft 23 increases toward the lower side (the positioning member 25). The lower surface of the projecting part of each stopper 35 is shaped along a corner of the bobbin 10. The lower surface thereof has a retaining face 35B and a restricting face 35C. When the retaining face 35B is in contact with the upper surface of the bobbin 10, the retaining face 35B restricts the movement in the Y direction of the bobbin 10 and the restricting face 35C is in contact with the chamfered corner of the bobbin 10.

[0037] Methods of attaching and removing the bobbin 10 to/from the bobbin fixing device 20 with the above-described structure will now be described.

[0038] To attach the bobbin 10, the bobbin retainer 30 is inserted into a center hole of the bobbin 10. Referring to Fig. 4, each stopper 35, projecting from the level of the outer surface of the rotating shaft 23, inwardly moves to a position (hereinafter, referred to as "inner position P2") as the sloping surface is pressed by the bobbin 10. Thus, the bobbin 10 can be moved to a position where the positioning member 25 is disposed. During the movement of each stopper 35 to the inner position P2, the fitting portion 35A inwardly moves in the corresponding guide groove 36D, the end of the arm 34A close to the stopper 35 moves inward, and the other end thereof on the support 34B moves downward. Consequently, the

release button 32 moves downward.

[0039] When the bobbin 10 is brought into contact with the positioning member 25, as shown in Fig. 2, the spring 33 causes each support 34B to move upward together with the release button 32, so that the end of each arm 34A on the support 34B moves upward, the other end thereof close to the stopper 35 moves outward, and each restricting face 35C moves to a position where the restricting face 35C is in contact with the bobbin 10. At that time, the corresponding retaining face 35B is in contact with the upper surface of the bobbin 10, thus restricting the movement in the direction (Y direction) in which the bobbin 10 is removed from the rotating shaft 23.

[0040] In the bobbin fixing device 20 according to the present embodiment, when the bobbin retainer 30 is merely inserted into the bobbin 10, the stoppers 35 can easily prevent the bobbin 10 from coming off.

[0041] To remove the bobbin 10, the release button 32 is pressed downward. Thus, the supports 34B move downward as shown in Fig. 5, so that the end of each arm 34A close to the corresponding stopper 35 moves inward, the fitting portion 35A of each stopper 35 moves along the corresponding guide groove 36D, and each stopper 35 moves into the corresponding through-hole 36C. In this state, the bobbin 10 is moved upward, thus removing the bobbin 10 from the bobbin fixing device 20. Pressing the release button 32 is released, allowing the spring 33 to upwardly press the release button 32. Each stopper 35 is returned to the projecting position P1 as described above.

[0042] In the bobbin fixing device 20 in accordance with the present embodiment, the bobbin 10 can be easily removed by pressing the release button 32.

[0043] In accordance with the present embodiment, a mechanism for moving each stopper 35 between the projecting position P1 and the inner position P2 in response to the upward or downward movement of the release button 32 has been described. The mechanism for moving the stoppers 35 is not limited to the above one. Any other mechanism can be used.

[0044] Preferred embodiments of a bobbin removing device according to the present invention will now be described with reference to the drawings.

[First Embodiment]

[0045] A bobbin removing device according to a first embodiment of the present invention will now be described with reference to the drawings. Referring to Fig. 6, a bobbin fixing device 20 according to the present embodiment is a device for fixing a bobbin 10 including a flange 10A and a shaft 10B. The structure of the bobbin fixing device 20 according to the first embodiment is the same as that of the foregoing bobbin fixing device 20 in accordance with the present invention. A bobbin removing device 40 is a device for removing the bobbin 10 fixed to the bobbin fixing device 20.

[0046] Referring to Fig. 6, the bobbin removing device

40 in accordance with the present embodiment includes a body 42, holding arms 44, and a movement permitting member 46. The body 42 includes a shaft 42A and a flange 42B. The shaft 42A is disposed on the extension of a rotating shaft 23 of the bobbin fixing device 20. The shaft 42A is movable along the axial direction of the rotating shaft 23. The shaft 42A includes a cylindrical portion and a flange portion on the bottom of the cylindrical portion and further has a hole R opened to the bobbin fixing device 20. The flange 42B is disposed on the bottom of the flange portion of the shaft 42A.

[0047] The flange 42B is disc-shaped. The holding arms 44 are attached to the edge of the flange 42B. Each holding arm 44 includes an attaching portion 44A and an outer-edge holding portion 44B. Each attaching portion 44A is attached to the flange 42B and is movable in the direction, shown by the arrow D, parallel to the top surface of the flange 10A of the bobbin 10. Each outer-edge holding portion 44B is L-shaped such that one part of the L-shaped outer-edge holding portion 44B is perpendicular to the flange 10A and the other part thereof is parallel to the attaching portion 44A.

[0048] Referring to Fig. 7, the movement permitting member 46 includes a spring 46A and a pushing portion 46B. The spring 46A is arranged in the hole R such that the direction in which the spring 46A is retractable matches the axial direction of the rotating shaft 23. One end of the spring 46A is in contact with the internal surface of the body 42 defining the hole R and the other end thereof is in contact with the pushing portion 46B. The elastic force of the spring 46A is set larger than that of a spring 33. The pushing portion 46B has a flange part 46C at its one end adjacent to the spring 46A. The flange part 46C has a diameter larger than that of the opening of the hole R. The other end of the pushing portion 46B is projected from the hole R so that the pushing portion 46B can push the release button 32.

[0049] The relative positions of the pushing portion 46B and the outer-edge holding portions 44B are determined so that when the outer-edge holding portion 44B of each holding arm 44 is located in a holding position H1 under the flange 10A of the bobbin 10 in the axial direction of the rotating shaft 23, the pushing portion 46B is located in a pushing position H2 where the pushing portion 46B pushes a release button 32 downward.

[0050] As for methods of attaching and removing the bobbin 10 to/from the bobbin fixing device 20 with the above-described structure, the method for attaching the bobbin is the same as that described above.

[0051] To remove the bobbin 10, the bobbin removing device 40 is moved downward, i.e., in the X direction, thus arranging the outer-edge holding portion 44B of each holding arm 44 in the holding position H1. When the pushing portion 46B is located in the pushing position H2, the downward movement of the bobbin removing device 40 is stopped. In this position, the end of the pushing portion 46B is in contact with the release button 32, so that the release button 32 is pushed in the X direction

against the elastic force of the spring 46A through the pushing portion 46B. Consequently, each stopper 35 is retracted to the inner position P2 as shown in Fig. 7, so that the bobbin 10 is movable in the Y direction.

[0052] Referring to Fig. 8, each outer-edge holding portion 44B is inwardly moved in the direction shown by the arrow D while the pushing portion 46B is kept in that position, thus clamping the flange 10A of the bobbin 10 (the position of each outer-edge holding portion 44B at that time will be called "clamping position H3"). Then, the body 42 is moved in the direction shown by the arrow Y. Since the elastic force of the spring 46A is larger than that of the spring 33, the pushing portion 46B is kept in the pushing position H2 until the spring 46A returns to a predetermined state. Consequently, while each stopper 35 is arranged in the inner position P2, the holding arms 44 can move the bobbin 10 in the direction shown by the arrow Y.

[0053] When the spring 46A extends to the predetermined state, the pushing portion 46B moves in the direction shown by the arrow Y as shown in Fig. 9. Since the inner surface of the bobbin 10 is in contact with the stoppers 35 at that time, each stopper 35 is held in the inner position P2. Referring to Fig. 10, the body 42 is further moved in the direction shown by the arrow Y, so that the bobbin 10 can be removed from the bobbin fixing device 20.

[0054] According to the present embodiment, the pushing portion 46B continues to push the release button 32 until the holding arms 44 moves the bobbin 10 to the position where the bobbin 10 can arrange each stopper 35 in the inner position P2. Advantageously, an operator does not have to operate the release button 32. The bobbin 10 can be easily removed from the bobbin fixing device 20.

[Second Embodiment]

[0055] A bobbin removing device according to a second embodiment of the present invention will now be described with reference to the drawings. The same components and portions as those of the first embodiment are designated by the same reference numerals and a detailed description thereof is omitted.

[0056] A bobbin fixing device 20 according to the present embodiment is the same as that according to the first embodiment. Referring to Fig. 11, a bobbin removing device 50 includes a body 52, holding arms 54, and a movement permitting member 56. The body 52 includes a shaft 52A and a flange 52B. The shaft 52A is disposed on the extension of a rotating shaft 23 of the bobbin fixing device 20. The shaft 52A is movable along the axial direction of the rotating shaft 23. The shaft 52A includes a cylindrical portion and a flange portion on the bottom of the cylindrical portion. The flange 52B is disposed on the bottom of the flange portion of the shaft 52A.

[0057] The flange 52B is disc-shaped. The holding arms 54 are attached to the edge of the flange 52B. Each

holding arm 54 includes an attaching portion 54A and an outer-edge holding portion 55. Each attaching portion 54A is attached to the flange 52B and is movable in the direction, shown by the arrow D, parallel to the upper surface of a flange 10A of a bobbin 10. Each outer-edge holding portion 55 is L-shaped. One part of each L-shaped outer-edge holding portion 55 serves as holding part 55A that is perpendicular to the flange 10A and the other part thereof serves as holding part 55B that is parallel to the attaching portion 54A. Each holding part 55B has an inwardly downwardly sloping surface (slope S) which corresponds to part of the inner surface of the shape "L".

[0058] Referring to Fig. 12, the movement permitting member 56 projects from the middle of the flange 52B such that a pushing portion 56A can push a release button 32.

[0059] The relative positions of the pushing portion 56A and the outer-edge holding portions 55 are determined so that when the outer-edge holding portion 55 of each holding arm 54 is located in a holding position H1 under the flange 10A of the bobbin 10 in the axial direction of the rotating shaft 23, the pushing portion 56A is located in a pushing position H2 where the pushing portion 56A pushes the release button 32 downward.

[0060] Methods of attaching and removing the bobbin 10 using the bobbin removing device 50 with the above-described structure will now be described.

[0061] The method of attaching the bobbin 10 is the same as that according to the first embodiment. To remove the bobbin 10, the bobbin removing device 50 is moved downward, i.e., in the X direction, thus arranging the outer-edge holding portion 55 of each holding arm 54 in the holding position H1. When the pushing portion 56A is located in the pushing position H2, the downward movement of the bobbin removing device 50 is stopped (refer to Fig. 12). In this position, the end of the pushing portion 56A pushes the release button 32 in the X direction. Consequently, each stopper 35 is retracted to an inner position P2, so that the bobbin 10 is movable in the Y direction.

[0062] Referring to Fig. 13, each outer-edge holding portion 55 is inwardly moved in the direction shown by the arrow D while the pushing portion 56A is kept in that position, thus clamping the flange 10A of the bobbin 10. Since each holding part 55B has the slope S, the bobbin 10 slides on the slope S toward the direction shown by the arrow Y. Then, the body 52 is moved in the direction shown by the arrow Y. Referring to Fig. 14, the release button 32 is moved in the direction shown by the arrow Y. Since the bobbin 10 is moved in the direction shown by the arrow Y and each stopper 35 is in contact with the inner surface of the bobbin 10, the stopper 35 is kept in the inner position P2.

Accordingly, the body 52 is further moved in the direction shown by the arrow Y, so that the bobbin 10 can be removed from the bobbin fixing device 20.

[0063] According to the present embodiment, while the

pushing portion 56A pushes the release button 32, the slope S of each holding part 55E allows the bobbin 10 to move to a position where the bobbin 10 can arrange each stopper 35 in the inner position P2. Advantageously, an operator does not have to operate the release button 32. The bobbin 10 can be easily removed from the bobbin fixing device 20.

Claims

1. A bobbin fixing device comprising:

a rotating shaft to which a bobbin is attached;
a positioning member which is in contact with a first surface of the attached bobbin to position the bobbin in the attaching direction in which the bobbin is attached to the rotating shaft; and
movable members, each of which is movable between a projecting position where the member projects from the level of the outer surface of the rotating shaft and an inner position inside the level of the outer surface and is in contact with a second surface of the attached bobbin in the projecting position to restrict the movement of the bobbin in the removing direction in which the bobbin is removed from the rotating shaft.

2. The bobbin fixing device according to Claim 1, further comprising:

a release member attached to one end of the rotating shaft, the release member being movable in the axial direction of the rotating shaft; and
connecting members, each of which connects the corresponding movable member to the release member so that the movable member moves between the projecting position and the inner position in response to the movement of the release member in the axial direction.

3. The bobbin fixing device according to Claim 1 or 2, wherein each movable member has an outwardly downwardly sloping outer surface such that the height of projection increases toward the positioning member.

4. The bobbin fixing device according to Claim 2 or 3, further comprising:

a biasing member that biases the release member away from the rotating shaft and allows each movable member to move to the projecting position;
a release restricting portion that restricts the movement of the release member away from the rotating shaft; and

projection restricting portions, each of which restricts the outward movement of the associated movable member from the projecting position.

5. A bobbin removing device comprising:

a holding member movable in the axial direction of a rotating shaft of a bobbin fixing device while holding a bobbin attached to the rotating shaft, the bobbin fixing device including the rotating shaft to which the bobbin is attached and movable members, each movable member being movable between a projecting position where the movable member projects from the level of the outer surface of the rotating shaft and an inner position inside the level of the outer surface and being in contact with a surface of the attached bobbin in the projecting position to restrict the movement of the bobbin in the removing direction in which the bobbin is removed from the rotating shaft; and

a movement permitting member that allows each movable member to move to the inner position and keeps the movable member in the inner position until the holding member moves the bobbin in the removing direction by a predetermined distance.

6. The bobbin removing device according to Claim 5, wherein the bobbin fixing device includes a release member attached to one end of the rotating shaft such that the release member allows each movable member to move to the inner position in response to the movement of the bobbin in the attaching direction in which the bobbin is attached to the rotating shaft, and the movement permitting member includes a pushing portion for pushing the release member in the attaching direction.

7. The bobbin removing device according to Claim 6, wherein the movement permitting member is mounted on the holding member and is moved to a pushing position, where the pushing portion pushes the release member to arrange each movable member in the inner position, in response to the movement of the holding member to a holding position where the holding member holds the bobbin.

8. The bobbin removing device according to Claim 7, wherein the holding member includes outer-edge holding portions capable of holding the outer-edge of a flange of the bobbin in the holding position, and each outer-edge holding portion has an inwardly downwardly sloping inner surface.

9. The bobbin removing device according to Claim 7,

wherein the movement permitting member has an elastic member retractable in the axial direction, one end of the elastic member being in contact with the holding member, the other end thereof being in contact with the pushing portion.

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Fig.1

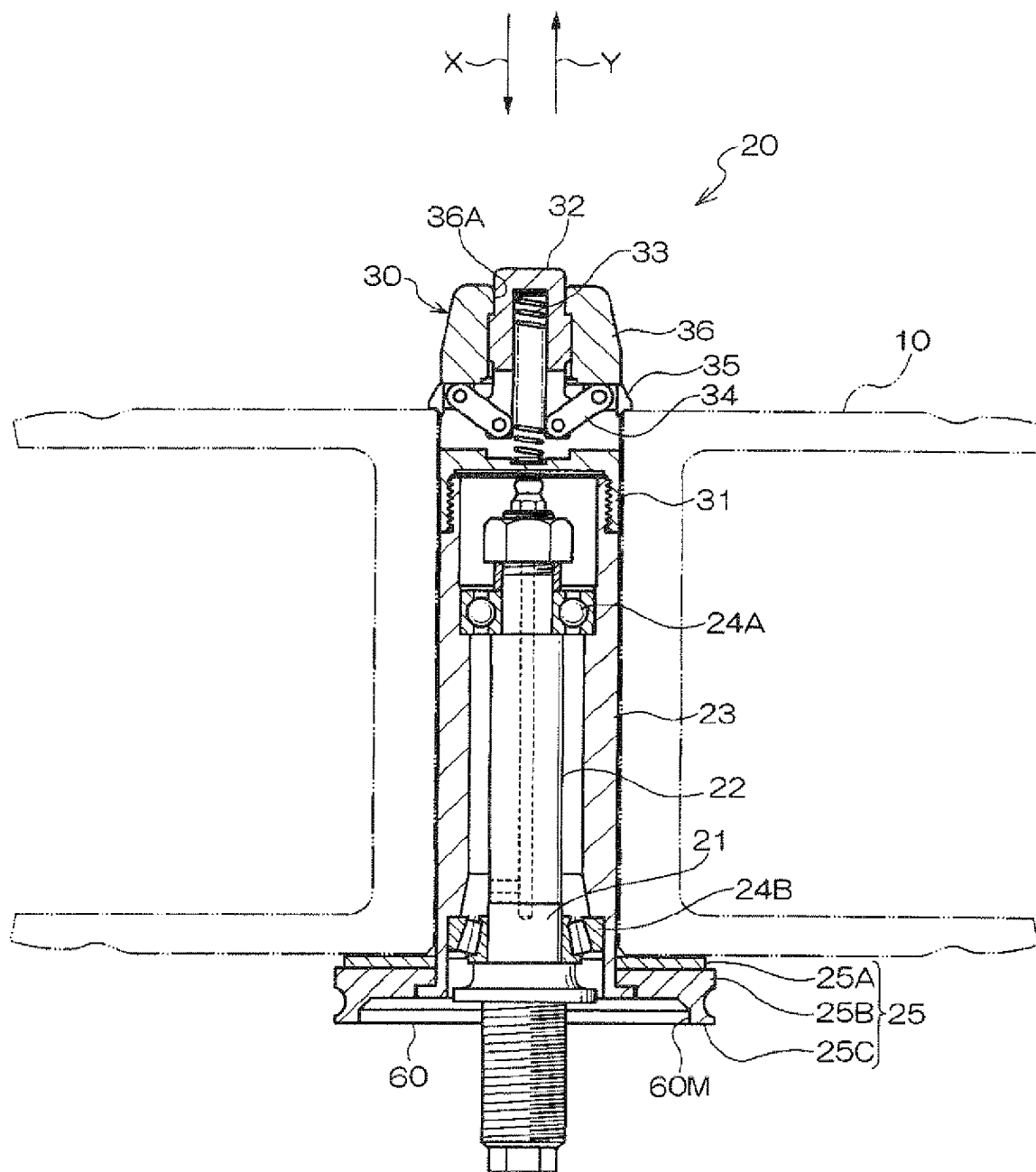


Fig.2

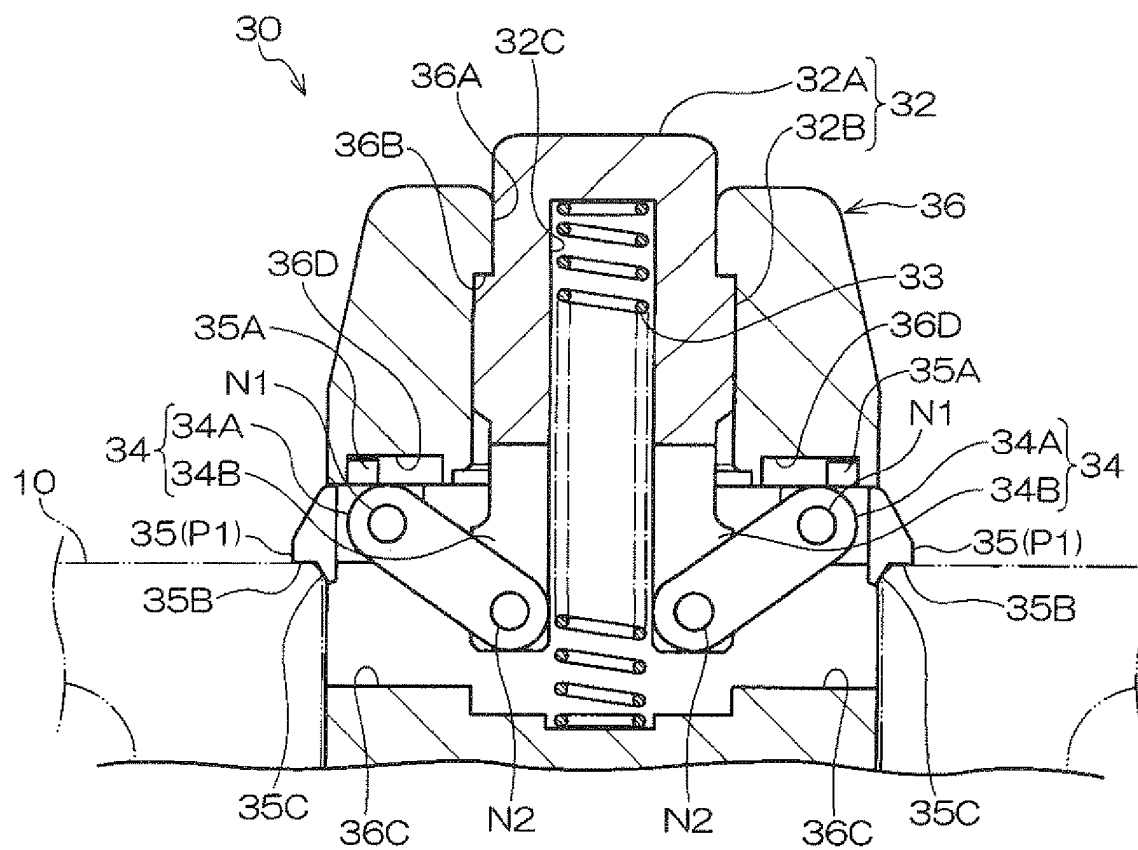


Fig.3

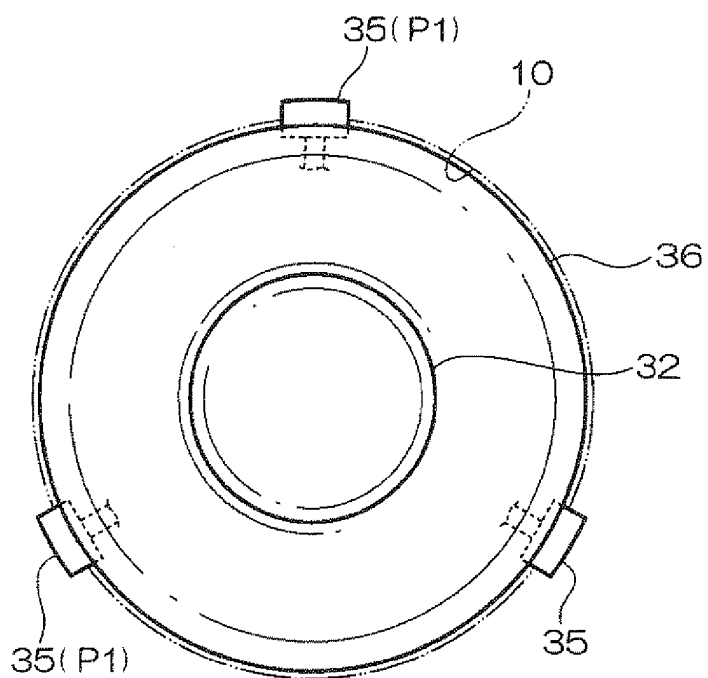


Fig.4

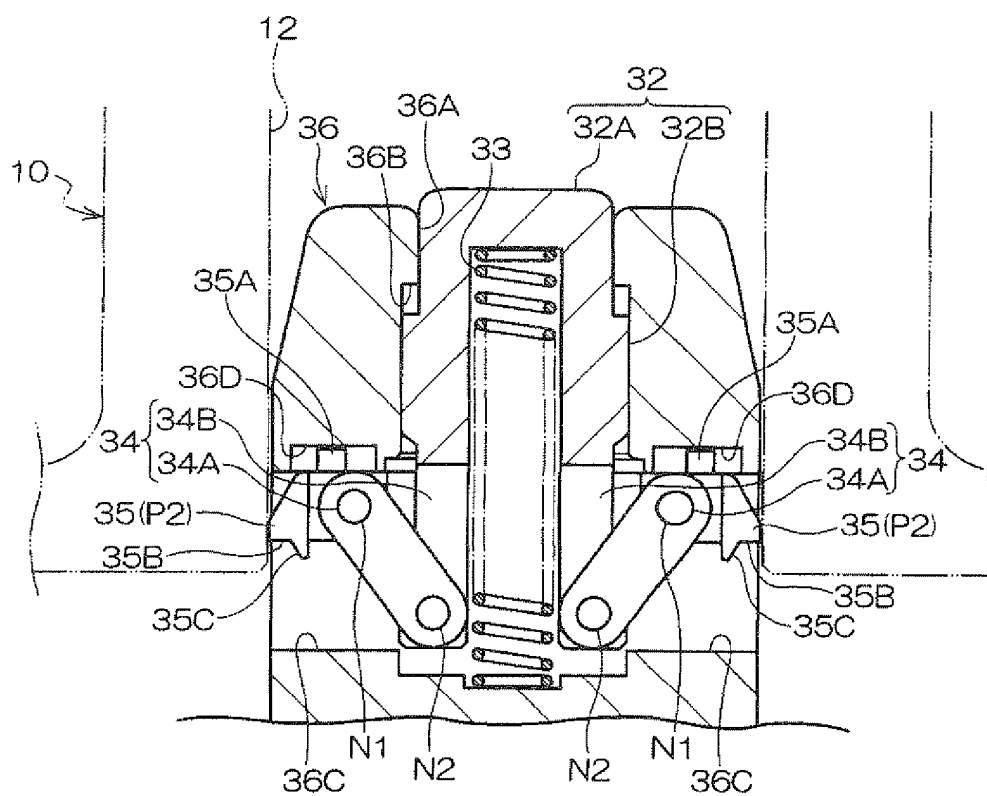


Fig.5

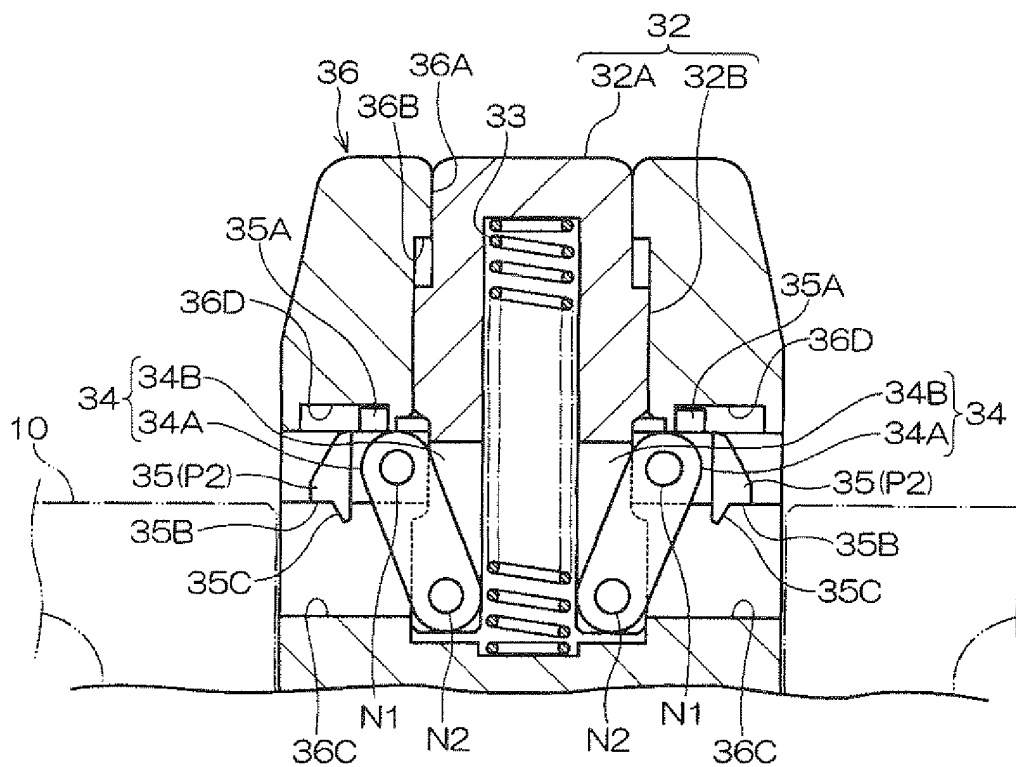


Fig.6

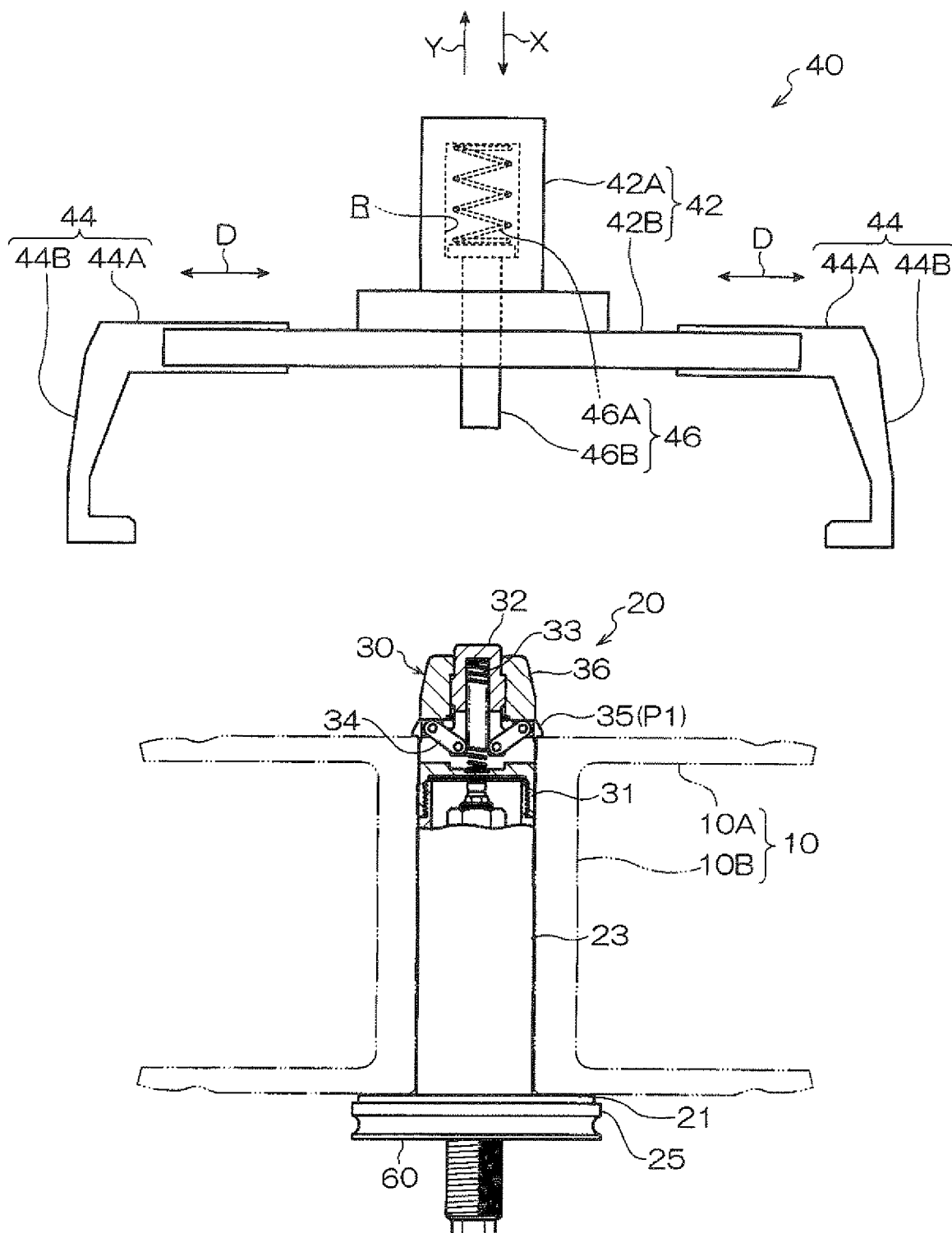


Fig.7

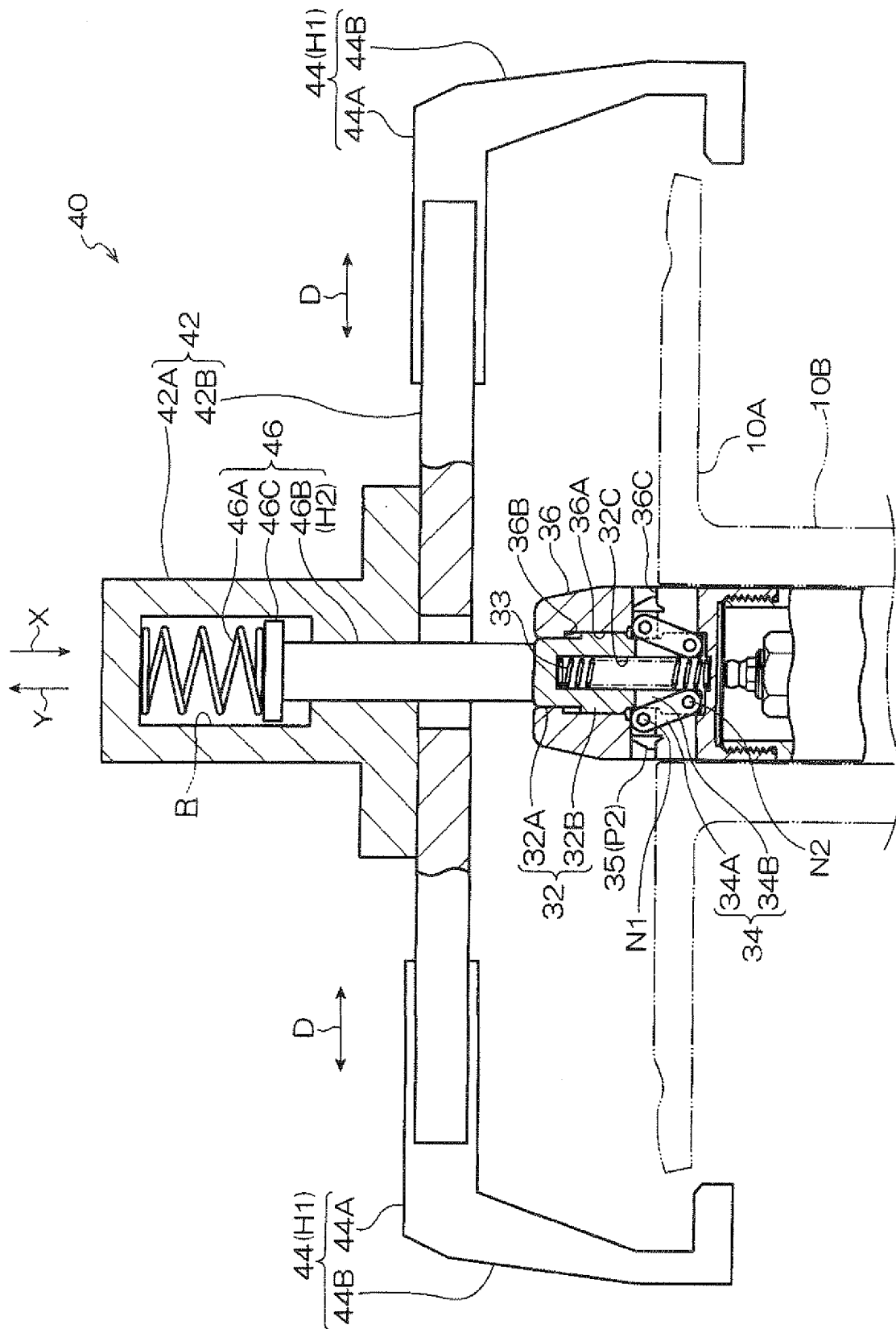


Fig.8

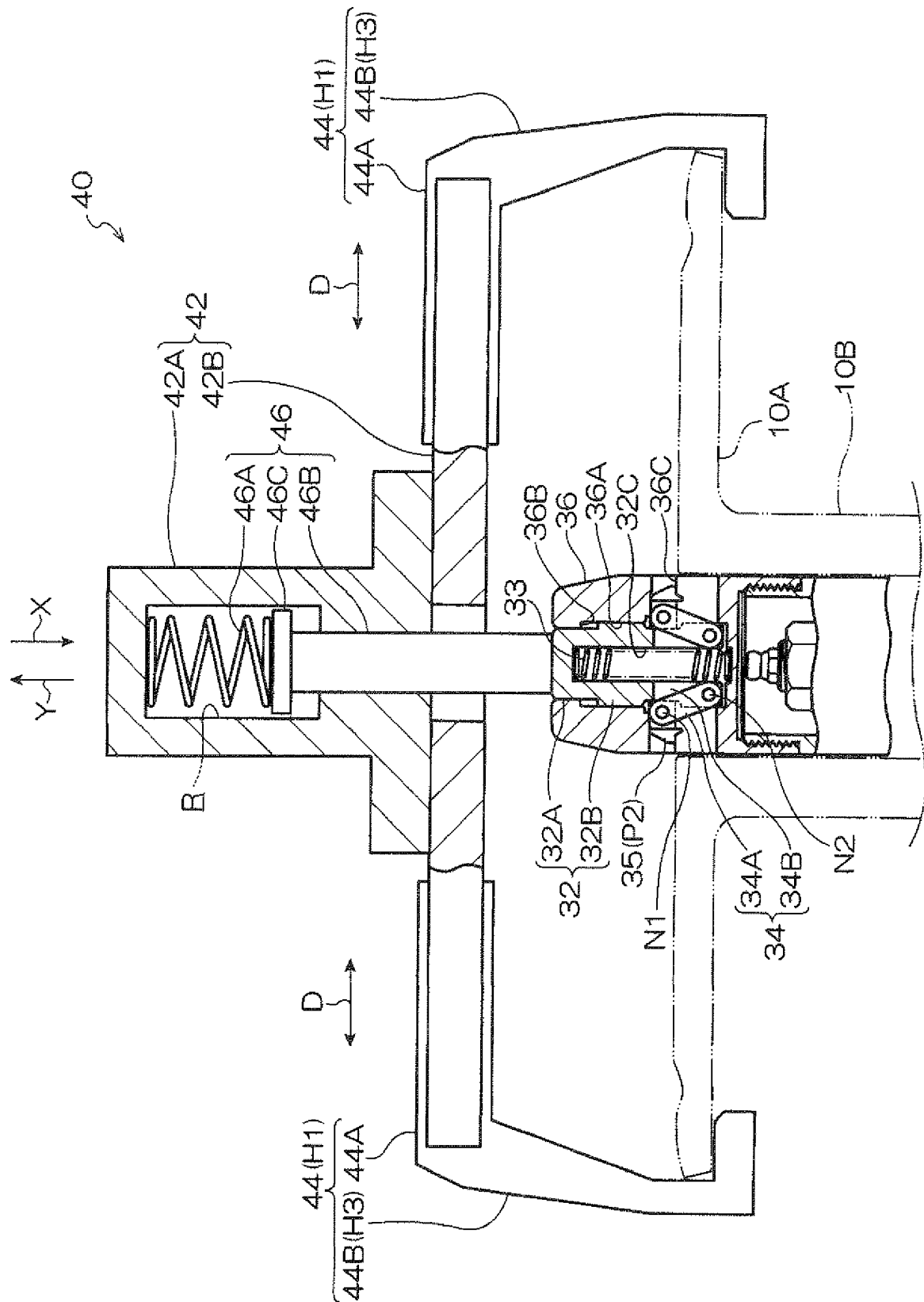


Fig.9

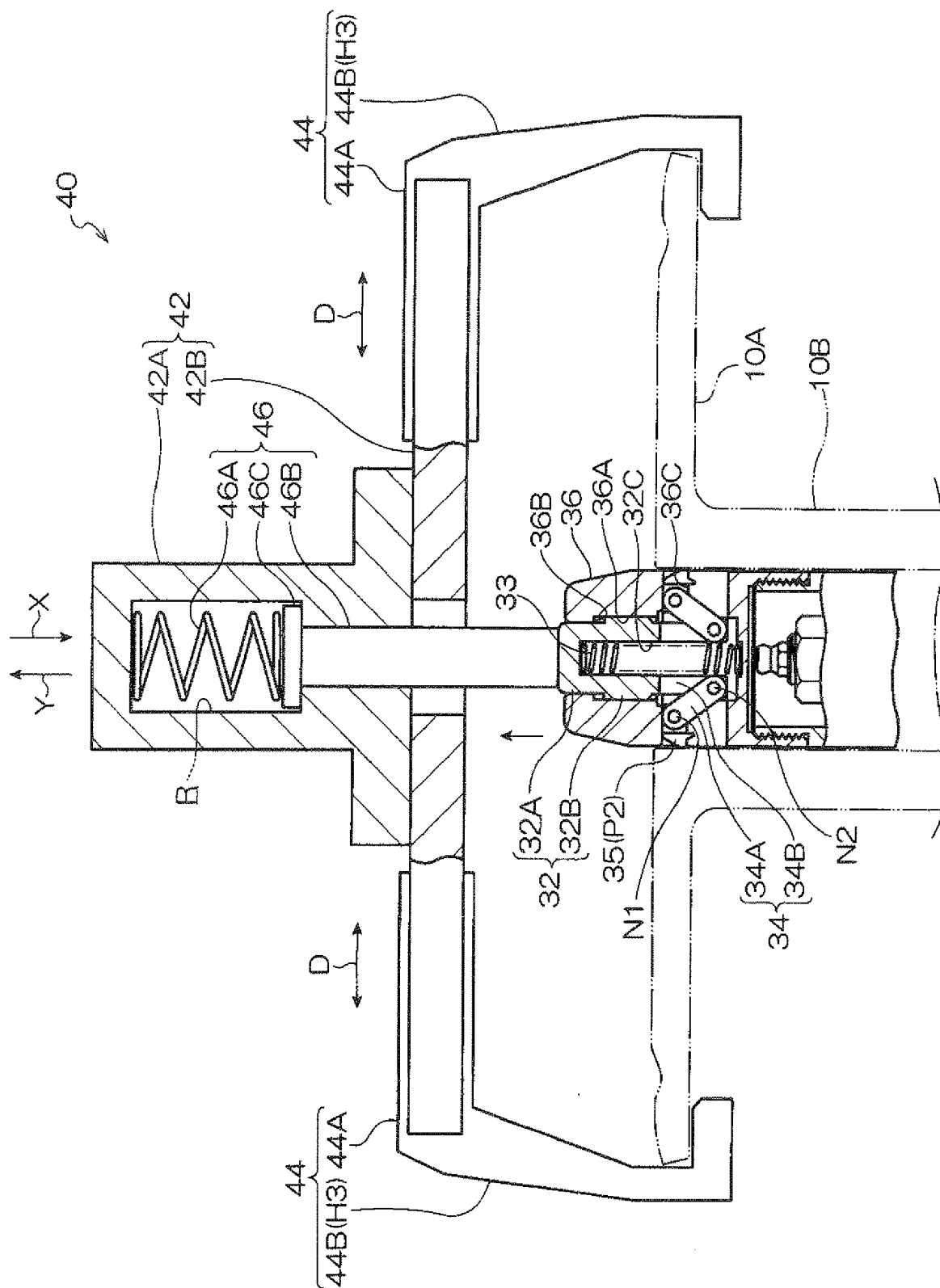


Fig.10

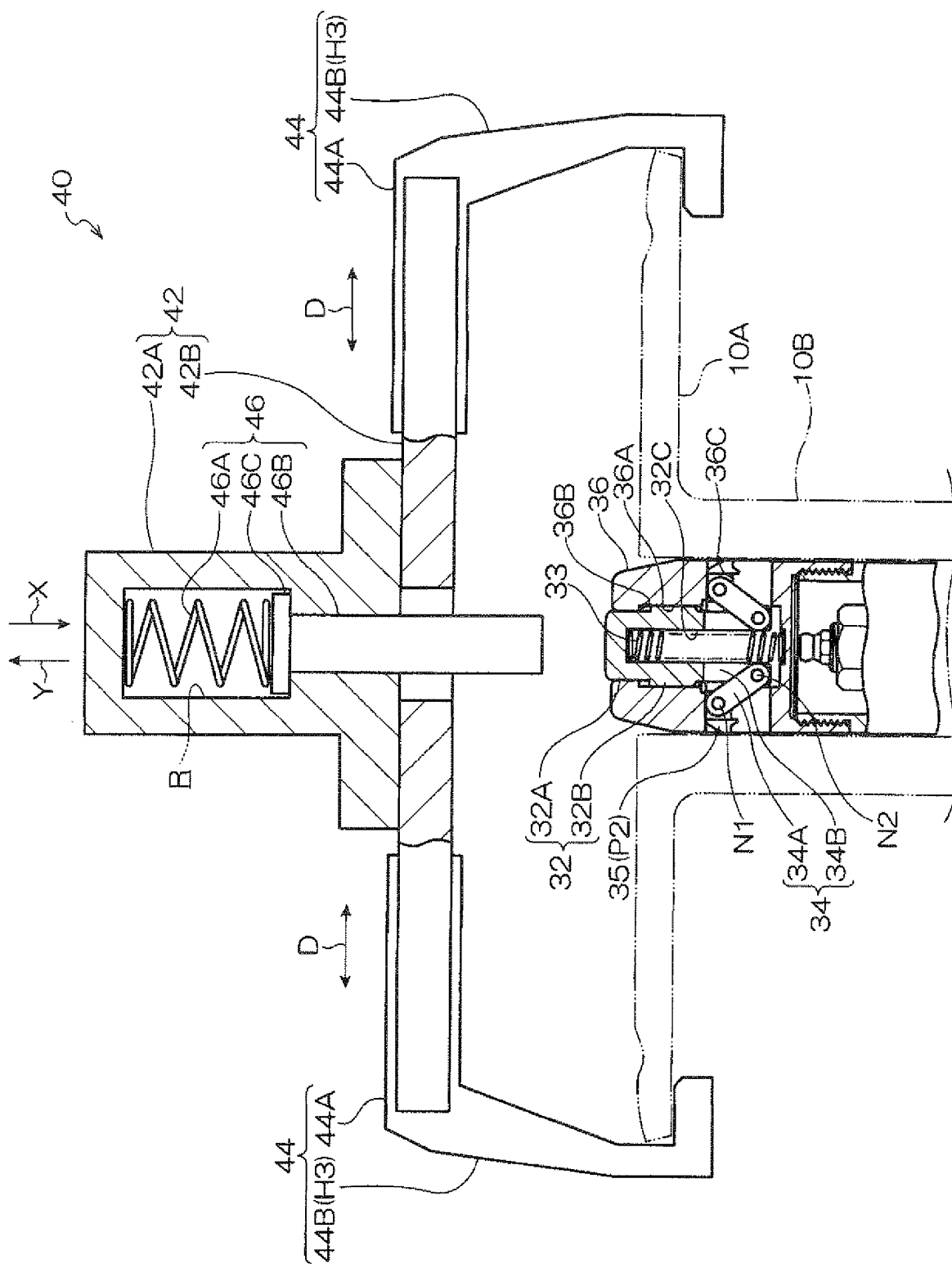


Fig.11

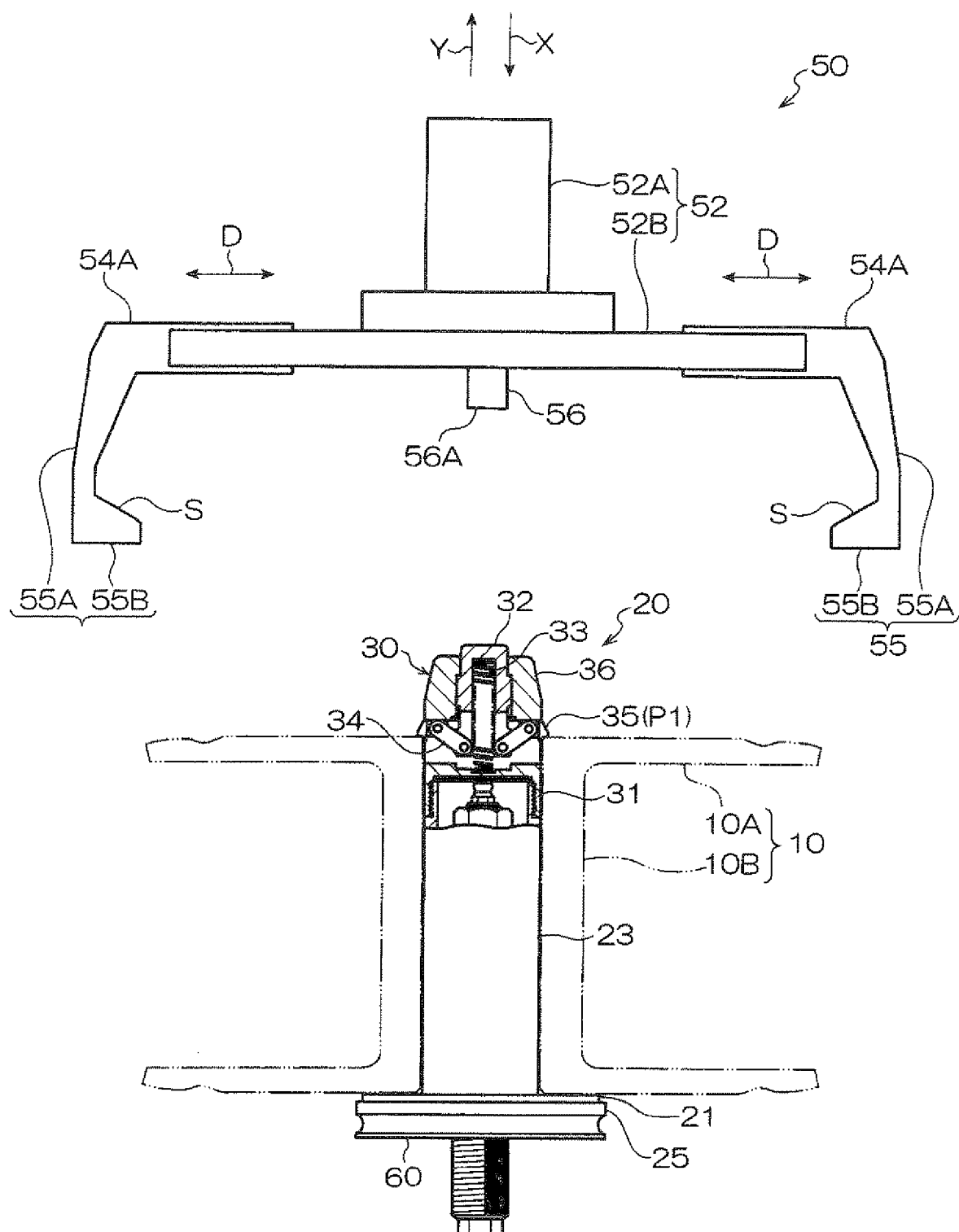


Fig.12

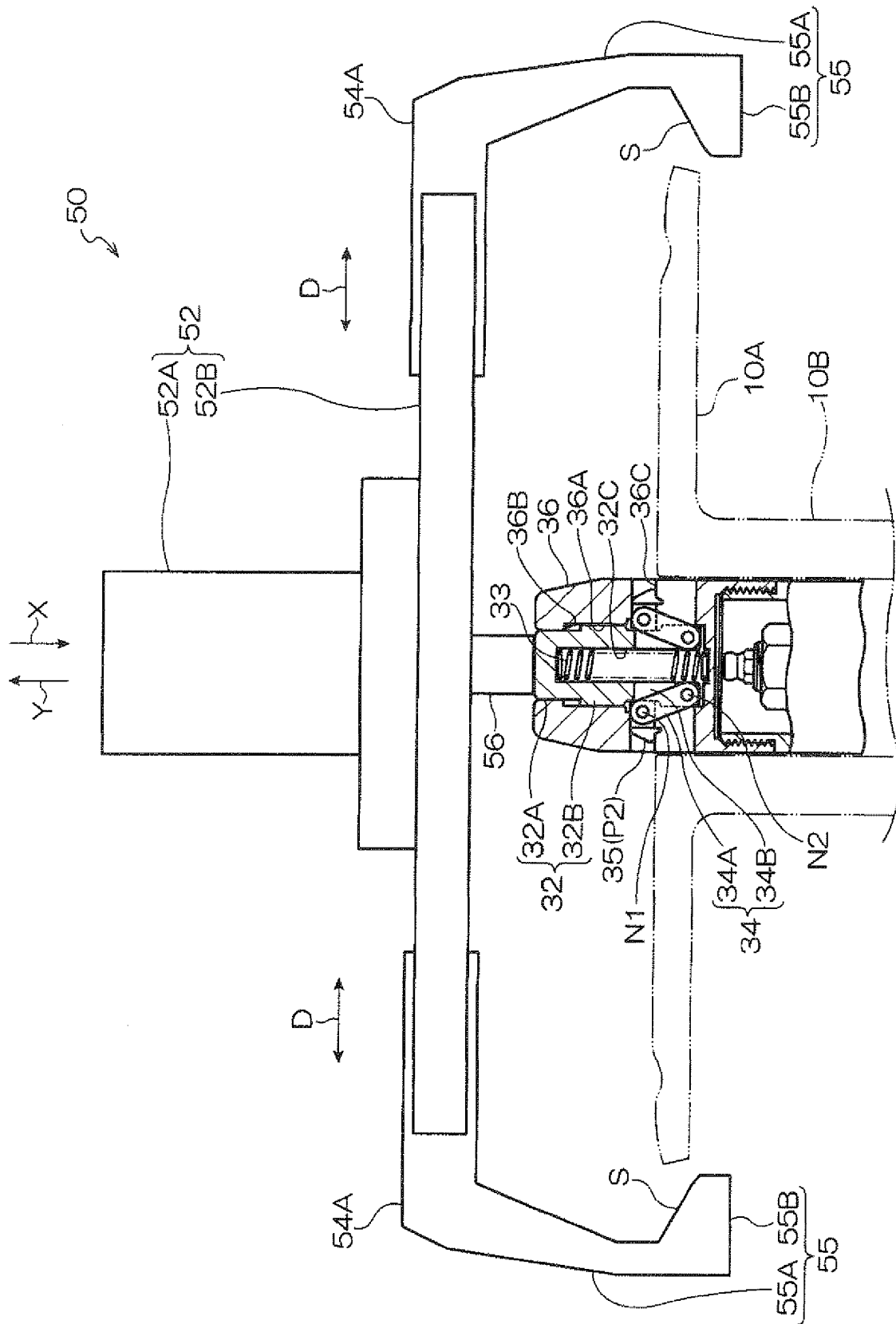


Fig.13

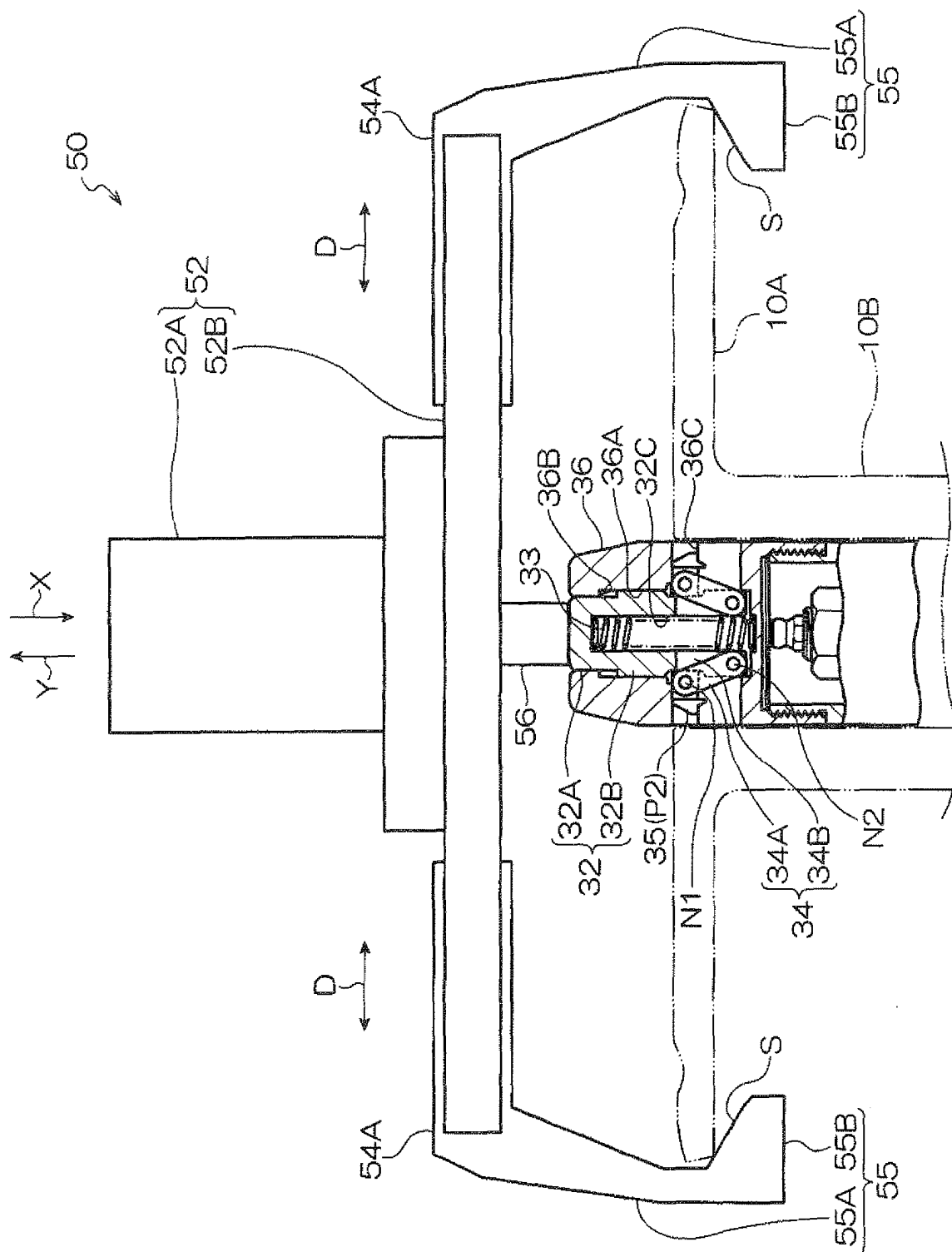


Fig.14

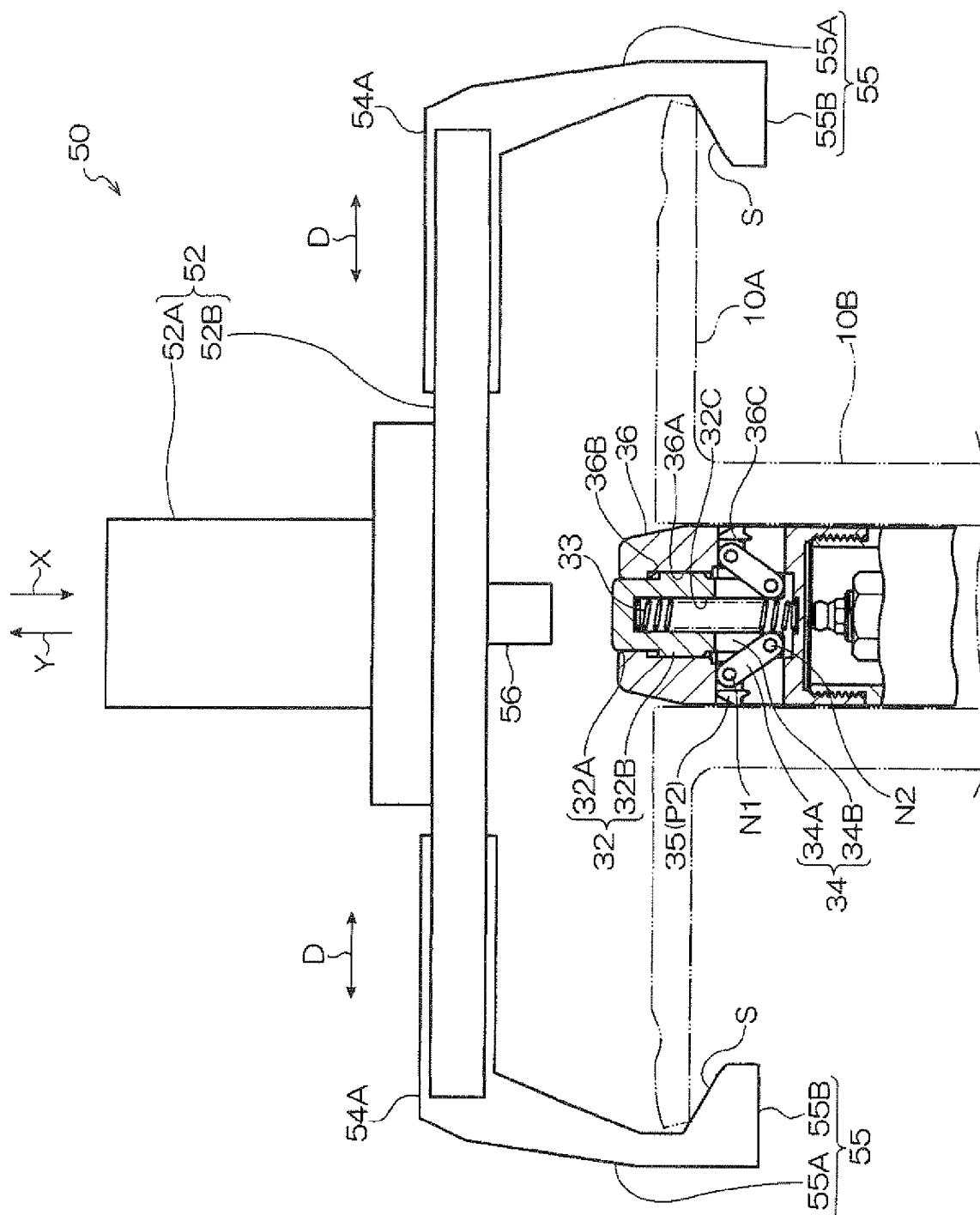
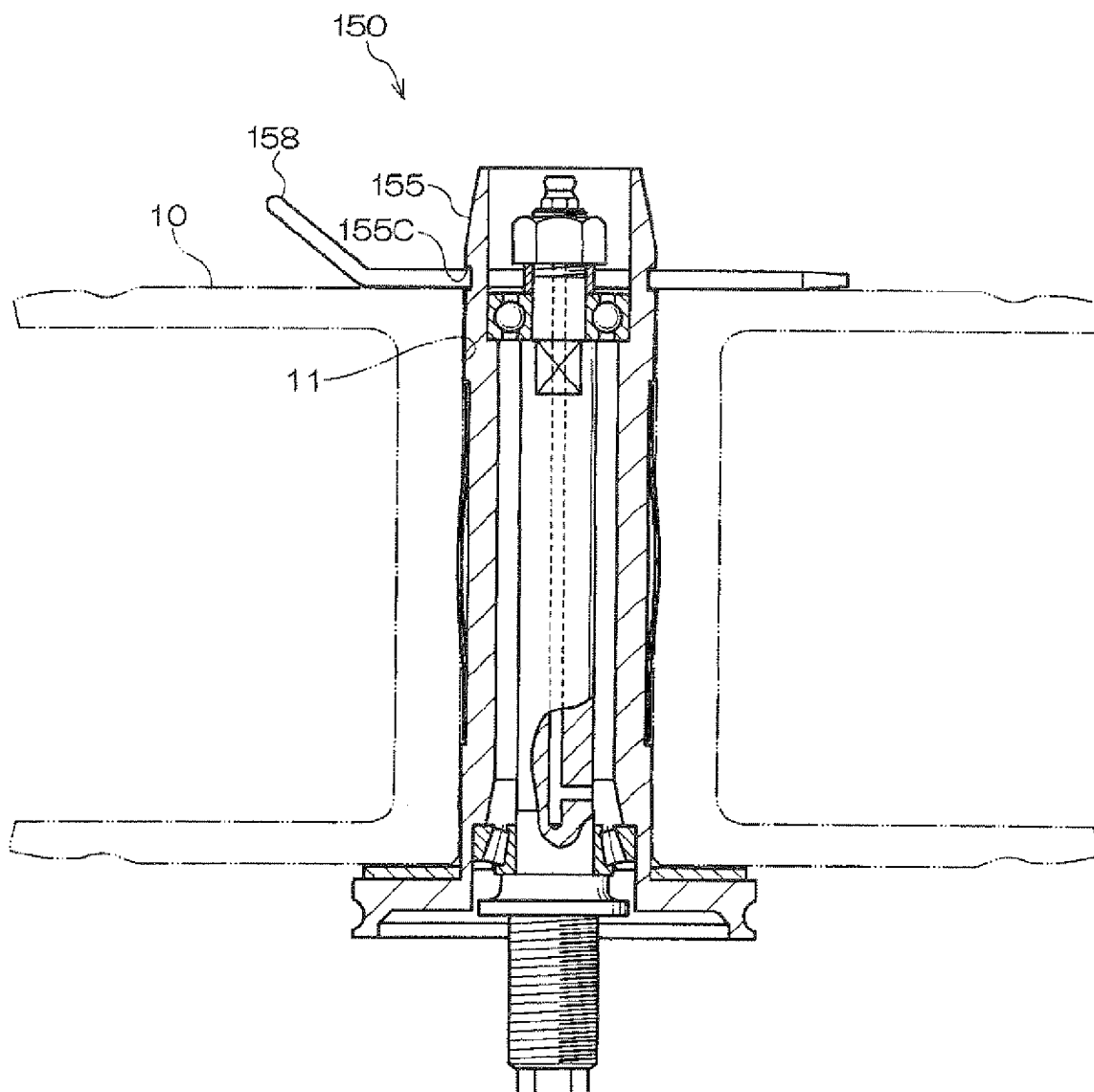


Fig.15



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/320620

A. CLASSIFICATION OF SUBJECT MATTER

B65H49/20(2006.01)i, B65H54/547(2006.01)i, B65H67/04(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65H49/20, B65H54/547, B65H67/04

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
 Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 55642/1992 (Laid-open No. 18361/1994) (Hiroyuki KANAI), 08 March, 1994 (08.03.94), Par. Nos. [0002], [0009] to [0012] (Family: none)	1-4
A	JP 61-31021 B2 (Teijin Seiki Co., Ltd.), 17 July, 1986 (17.07.86), Column 8 (Family: none)	5-9

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

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search
05 January, 2007 (05.01.07)Date of mailing of the international search report
23 January, 2007 (23.01.07)Name and mailing address of the ISA/
Japanese Patent Office

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Facsimile No.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003182935 A [0004]