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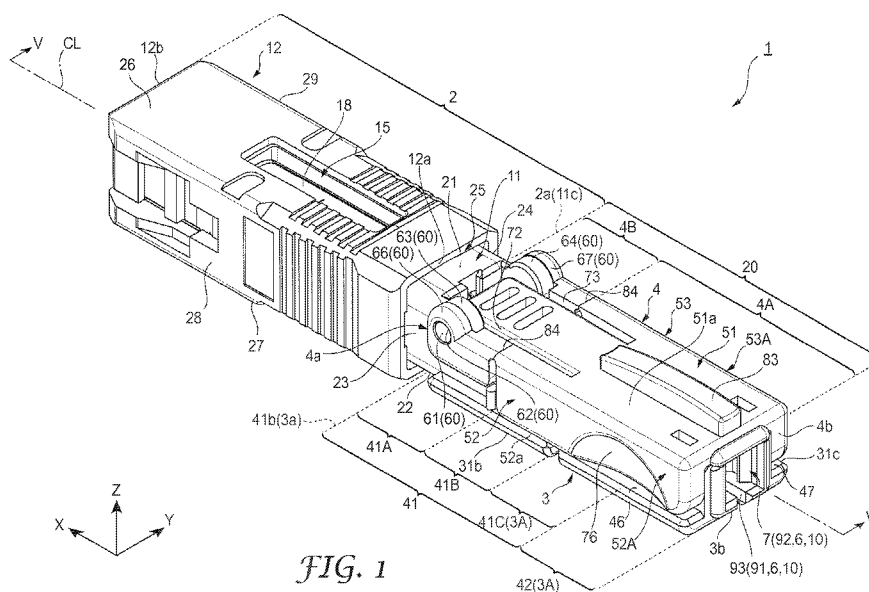
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(54) Title: OPTICAL FIBER CONNECTOR

**FIG. 1**(57) **Abstract:** An optical fiber connector is provided which includes a connector body to accommodate an optical fiber, an installation section where the optical fiber is installed in a rear section of the connector body, a cover section covering the installation section and engaging with the installation section, and an openable structure allowing opening of the cover section. In a first state, the cover section covers the installation section prior to insertion of the optical fiber in the installation section. In a second state, the openable structure enables the releasing of the cover section from the installation section. In this second state, the cover section is in a non-engaged state relative to the installation section such that the optical fiber can be inserted in the installation section.

OPTICAL FIBER CONNECTORTechnical Field

The present invention relates to an optical fiber connector.

Related Art

5 Conventionally, optical fiber connectors mounted on end sections of optical fibers are known. For example, Japanese Unexamined Patent Application Publication No. 2008-180958 (Patent Document 1) describes an optical fiber connector provided with a connector body connected with an optical fiber, and an anchor mechanism anchoring the optical fiber to the connector body in a state where the optical fiber is biased toward a connecting optical fiber of a ferrule inside the
10 connector body.

Disclosure of the InventionProblem to be Solved by the Invention

Here, the anchor mechanism of the optical fiber connector as described above is provided with an installation section where the optical fiber is installed, and a cover section engaging with the
15 installation section. The optical fiber is fixed by installing the optical fiber in the installation section and engaging the cover section with the installation section. In such an optical fiber connector, there are cases where the cover section is engaged with the installation section at an inappropriate timing or a timing before the start of operation in a state where the optical fiber is not installed in the installation section. In such a case, releasing the engagement between the cover section and the
20 installation section takes time and has an influence on the operation efficiency. Accordingly, there is a demand for an optical fiber connector where it is possible to easily open a cover section covering the installation section at an inappropriate timing or a timing before the start of operation.

SUMMARY OF THE INVENTION

An optical fiber connector according to an aspect of the present invention is mounted on an
25 end section of an optical fiber and is provided with a connector body connected with the optical fiber, an installation section where the optical fiber is installed in a rear section of the connector body, a cover section covering the installation section and engaging with the installation section, and an openable structure allowing opening of the cover section covering the installation section, where, in a first state where the cover section covers the installation section without the optical fiber being
30 installed in the installation section, the openable structure allows opening of the cover section by allowing releasing of the engagement between the installation section and the cover section or by setting the installation section and the cover section to a non-engaged state, and, in a second state

where the optical fiber is installed in the installation section and the cover section covers the installation section, the openable structure regulates the opening of the cover section by regulating the releasing of the engagement between the installation section and the cover section.

According to this aspect, the optical fiber connector is provided with the openable structure allowing opening of the cover section covering the installation section. Accordingly, it is possible to open the cover section using the openable structure even in a case where the cover section covers the installation section at an inappropriate timing or a timing before the start of operation. Here, the openable structure allows the opening of the cover section in the first state where the cover section covers the installation section without the optical fiber being installed in the installation section.

That is, covering the installation section with the cover section even though the optical fiber is not installed in the installation section is a state where the cover section covers the installation section inappropriately or before the start of operation, therefore, it is possible for an operator to easily open the cover section in this first state, because of the openable structure allowing the opening of the cover section by allowing releasing of the engagement between the installation section and the cover section or by setting the installation section and the cover section to the non-engaged state.

On the other hand, the openable structure regulates the opening of the cover section in the second state where the optical fiber is installed in the installation section and the cover section covers the installation section. That is, since the installing of the optical fiber in the installation section and the covering of the installation section by the cover section is a state where the cover section appropriately covers the installation section, it is possible to prevent the cover section in the second state covering the installation section at an appropriate timing from being mistakenly opened, due to the openable structure regulating the opening of the cover section by regulating the releasing of the engagement between the installation section and the cover section. Due to this, it is possible to easily open the cover section when the installation section is covered at an inappropriate timing or a timing before the start of operation. Furthermore, it is possible to prevent the cover section covering the installation section at an appropriate timing from being mistakenly opened.

In an optical fiber connector according to another aspect, the openable structure may be configured by a releasing structure which releases the engagement between the installation section and the cover section, and the releasing structure may allow the releasing of the engagement between the installation section and the cover section in the first state, and the releasing structure may regulate the releasing of the engagement between the installation section and the cover section in the second state.

In an optical fiber connector according to another aspect, the installation section may have an optical fiber installed to be arranged along a length direction of the installation section, the releasing structure may be able to change the shape of the installation section in a width direction orthogonal with the length direction, the releasing of the engagement between the installation section and the

cover section may be allowed by allowing the installation section to change shape in the first state, and the releasing of the engagement between the installation section and the cover section may be regulated by regulating the change in the shape with the optical fiber in the second state.

In an optical fiber connector according to another aspect, the releasing structure may be able to further press the cover section with respect to the installation section from a state where the installation section and the cover section are engaged, the releasing of the engagement between the installation section and the cover section may be allowed in the first state by allowing the pressing of the cover section with respect to the installation section, and the releasing of the engagement between the installation section and the cover section may be regulated in the second state by regulating the pressing of the cover section with respect to the installation section with the optical fiber.

In an optical fiber connector according to another aspect, the openable structure may set the installation section and the cover section to a non-engaged state in the first state by separating an engaging section provided in at least one of the installation section and the cover section and at least an engaged section provided in the other thereof, and may set the installation section and the cover section to an engaged state and regulate the releasing of the engagement between the installation section and the cover section with the optical fiber in the second state by engaging the engaging section with the engaged section in accordance with the installation of the optical fiber in the installation section.

In an optical fiber connector according to another aspect, the releasing structure may be provided with a slit section formed with respect to in the installation section and extending in the length direction.

In an optical fiber connector according to another aspect, an optical fiber fixing structure fixing an optical fiber may be provided in the installation section and/or the cover section.

In an optical fiber connector according to another aspect, the optical fiber fixing structure may be provided in the installation section.

In an optical fiber connector according to another aspect, the optical fiber fixing structure may be provided in the cover section.

In an optical fiber connector according to another aspect, the connector body may be connected with the optical fiber by pressing a cap, the cover section may be provided with a linking section which is linked with respect to the installation section and the connector body to be able to rotate in a front end side of the installation section or a rear end side of the connector body, and the cover section may be provided with a pressing section which presses the cap of the connector body on a surface on an opposite side to the installation section.

In an optical fiber connector according to another aspect, a rotation section which is able to rotate may be formed between the linking section and the pressing section in the cover section.

Effect of the Invention

According to one aspect of the present invention, it is possible to easily open a cover section covering an installation section at an inappropriate timing or a timing before the start of operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective diagram of an optical fiber connector according to the present embodiment.

FIG. 2 is a perspective diagram of the optical fiber connector in a state where a cover section is opened.

FIG. 3 is an exploded perspective diagram of the optical fiber connector shown in FIG. 1.

FIG. 4 is an enlarged planar diagram of an installation section.

FIG. 5 is a cross-sectional diagram along a line V-V shown in FIG. 1.

FIG. 6 is a perspective diagram showing an operation procedure for mounting the optical fiber connector onto an optical fiber.

FIG. 7 is a perspective diagram showing an operation procedure for mounting the optical fiber connector onto an optical fiber.

FIG. 8 is a perspective diagram showing an operation procedure for mounting the optical fiber connector onto an optical fiber.

FIGS. 9A and 9B are diagrams showing optical fiber connectors according to modified examples.

FIG. 10 is a diagram showing an optical fiber connector according to a modified example.

FIGS. 11A and 11B are diagrams showing optical fiber connectors according to modified examples.

FIGS. 12A, 12B, and 12C are diagrams showing optical fiber connectors according to modified examples.

FIGS. 13A and 13B are diagrams showing optical fiber connectors according to modified examples.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will now be described in greater detail below with reference to the attached drawings. In the following description, the same or the equivalent elements are given the same reference number, and duplicate descriptions are omitted. In addition, the terms “X axis direction”, “Y axis direction”, and “Z axis direction” are for convenience based on the directions shown in the diagrams.

FIG. 1 is a perspective diagram of an optical fiber connector 1 according to the present embodiment. FIG. 2 is a perspective diagram of the optical fiber connector 1 in a state where a cover section 4 is opened. FIG. 3 is an exploded perspective diagram of the optical fiber connector 1

shown in FIG. 1. FIG. 4 is an enlarged planar diagram of an installation section 3. FIG. 5 is a cross-sectional diagram along a line V-V shown in FIG. 1. However, to facilitate understanding, FIG. 5 shows an optical fiber cable 101 which is not shown in FIG. 1. The optical fiber connector 1 is mounted on an end section of an optical fiber 100. In the present embodiment, the optical fiber 100 is put into an exposed state by removing a cable jacket section 102 of a leading end portion of the optical fiber cable 101 and further removing an optical fiber covering section 103 (refer to FIG. 5). As shown in FIG. 1, the optical fiber connector 1 is provided with a connector body 2 connected with the optical fiber 100, the installation section 3 where the optical fiber 100 is installed in a rear section of the connector body 2, the cover section 4 which covers the installation section 3 and engages with the installation section 3, an openable structure 10 allowing opening of the cover section 4 covering the installation section 3, and an optical fiber fixing structure 7 which fixes the optical fiber 100. In the optical fiber connector 1, an anchor structure 20 for anchoring the optical fiber 100 with respect to the connector body 2 is configured by the installation section 3, the cover section 4, the openable structure 10, and the optical fiber fixing structure 7. Note that, for purposes of illustration, the length direction in which the optical fiber connector 1 extends is the “X axis direction”. In the present embodiment, the optical fiber connector 1 is mounted on the end section of the optical fiber 100 such that the optical fiber connector 1 extends along the length direction of the optical fiber connector 1. In addition, the thickness direction of the optical fiber connector 1 is the “Z axis direction”. The direction orthogonal with the X direction and the Z direction, that is, the width direction of the optical fiber connector 1 is the “axis direction”. Note that the leading end side of the optical fiber connector 1 is the “front (X axis positive side)” and the side where the optical fiber cable 101 is inserted is the “rear (X axis negative side)”. In addition, the side where a pressing operation of a cap 18 which will be described below is performed is the “upper (Z axis positive side)” and the opposite side thereto is the “lower (Z axis negative side)”. In addition, a central axis line CL is set to extend in parallel with the X axis direction with respect to the optical fiber connector 1. Unless otherwise noted, the optical fiber connector 1 has a surface symmetric structure where the XZ plane passing through the central axis line CL is set as a reference plane.

As shown in FIG. 3 and FIG. 5, the connector body 2 is provided with a base section 11, a shell 12, and an optical fiber connection section 13. The connector body 2 is configured by setting the optical fiber connection section 13 inside the base section 11 and covering the outside of the base section 11 with the shell 12. Note that it is possible to use, for example, an SC type optical connector as the connector body 2. As other examples, for instance, an FC type optical connector, an ST type optical connector, and the like may be considered. In the present specification, description will be given using the SC type connector for purposes of illustration. However, the SC type connector is only an example and the present invention is not limited to this type of connector.

The base section 11 is a member with a rectangular cylindrical shape extending in the length direction (the X axis direction) and is provided with an upper wall section 21 arranged on the upper side (Z axis positive side), a bottom wall section 22 arranged on the lower side (Z axis negative side) opposed to the upper wall section 21, and side wall sections 23 and 24 opposed in the width direction (Y axis direction). The shell 12 is a member with a rectangular cylindrical shape extending in the length direction and is provided with an upper wall section 26 arranged on the upper side, a bottom wall section 27 arranged on the lower side opposed to the upper wall section 26, and side wall sections 28 and 29 opposed in the width direction. The shell 12 engages with the base section 11 so as to cover the outer surface of the base section 11, and the upper wall section 26, the bottom wall section 27, and the side wall sections 28 and 29 of the shell 12 respectively cover the upper wall section 21, the bottom wall section 22, and the side wall sections 23 and 24 of the base section 11. Front ends 11b and 12b of the base section 11 and the shell 12 are arranged so as to coincide with each other in the length direction. However, the front ends 11b and 12b of the base section 11 and the shell 12 may be shifted from each other. In the present embodiment, a rear end 11c of the base section 11 extends further to the rear than a rear end 12c of the shell 12. That is, the rear end 12c of the shell 12 is arranged further forward than the rear end 11c of the base section 11 and a step section 25 between the shell 12 and the base section 11 is configured to be separated to the front from a rear end 2a of the connector body 2. Due to this, it is possible to rotate the cover section 4 without interfering with the shell 12 (detailed description of the configuration will be given below).

The optical fiber connection section 13 is provided with a cylindrical backbone 14 extending in the length direction (X axis direction), a ferrule 16 provided in a front end 14a of the backbone 14, a core wire fixing section 17 provided inside the backbone 14, and the cap 18 pressing the core wire fixing section 17. An optical fiber introduction hole is formed in the ferrule 16 along the central axis line CL and a connecting optical fiber 110 is inserted and fixed in the optical fiber introduction hole. The ferrule 16 is linked with the front end 14a such that the central axis line coincides with the backbone 14. An opening section 14b opening upward (in the Z axis positive direction) is formed in the backbone 14 and the core wire fixing section 17 is accommodated inside the opening section 14b. In addition, the cap 18 for pressing the core wire fixing section 17 from above is arranged in the opening section 14b of the backbone 14. Opening sections 11a and 12a are respectively formed in the upper wall section 21 of the base section 11 and the upper wall section 26 of the shell 12 at positions corresponding to the opening section 14b of the backbone 14. Accordingly, the cap 18 is in a state exposed from the shell 12. Note that, for the following description, the opening section which is configured by combining each of the opening sections 11a, 12a, and 14b is described as an “opening section 15” for exposing the cap 18. The opening section 15 has a rectangular shape extending in the length direction following the shape of the cap 18 and is arranged at substantially the center position of the base section 11 in the length direction; however, the shape and position are

not particularly limited. In addition, the backbone 14 has a through hole 14c through which the inserted optical fiber 100 passes on the rear end side of the connector body 2 in a rear end 14d. Note that a spring 19 is arranged so as to surround the backbone 14 on the rear end 14d side of the backbone 14. By the spring 19 applying an elastic force toward the connector leading end side on the backbone 14 inside the base section 11, the pressing of the ferrule 16 is secured and contact is preserved with a ferrule which is incorporated in another optical fiber connector which is to be fitted with the optical fiber connector 1.

The core wire fixing section 17 is configured by two side plates extending in the length direction and opposed in the width direction. Since the optical fiber is received on the inner surfaces of each of the side plates, a groove section 17a extending in the length direction is formed. The connecting optical fiber 110 of the ferrule 16 is inserted from a front end 17b with respect to the groove section 17a of the core wire fixing section 17 and an end section of the optical fiber 100 passing through the opening section 14b of the backbone 14 is inserted from a rear end 17c. Due to this, the connecting optical fiber 110 and the optical fiber 100 inside the groove section 17a of the core wire fixing section 17 are abutted to enter a state of being optically connected with each other. By pressing the cap 18 in this state, a gap between the side plates of the core wire fixing section 17 is narrowed. Due to this, the space of groove section 17a narrows to fix the connecting optical fiber 110 and the optical fiber 100. Due to the above, the connector body 2 is connected with the optical fiber 100 due to the pressing of the cap 18. Note that the state where the connector body 2 is “connected” with the optical fiber 100 in the present specification indicates a state where the connecting optical fiber 110 of the ferrule 16 and the optical fiber 100 are optically connected by the optical fiber 100 being fixed by the optical fiber connection section 13 as a representative method. In addition, the state where the optical fiber connector 1 is “mounted” on an end section of the optical fiber 100 in the present specification indicates a state where the optical fiber 100 is fixed by connecting the connector body 2 with the optical fiber 100 and engaging the cover section 4 with the installation section 3, and the entirety of the optical fiber connector 1 is completely attached to the end section of the optical fiber 100 such that connection with another connector is possible.

Next, description will be given of the anchor structure 20 formed of the installation section 3 and the cover section 4 with reference to FIG. 1 to FIG. 5. The anchor structure 20 is provided at a rear section (portion on the X axis negative side) of the connector body 2 and, as described above, is provided with the installation section 3, the cover section 4, the openable structure 10, and the optical fiber fixing structure 7. Specifically, the anchor structure 20 is provided so as to extend toward the rear (the X axis negative direction) from the rear end 2a of the connector body 2.

The installation section 3 is for installing an optical fiber arranged along the length direction of the installation section 3. The installation section 3 forms a substantially U-shaped cross-section so that the top thereof is open. The installation section 3 extends in the length direction toward the

rear from the rear end 11c of the base section 11 of the connector body 2. In the present embodiment, the base section 11 and the installation section 3 are configured as integrally formed members from the point of view of ease of manufacturing. However, the base section 11 and the installation section 3 may be configured so as to be separate members and to be linked during assembly. The installation section 3 is provided with a bottom wall section 31 arranged at the lower side and side wall sections 32 and 33 opposed in the width direction. The bottom wall section 31 of the installation section 3 extends in the length direction so as to be continuous with the bottom wall section 22 of the base section 11. The side wall sections 32 and 33 of the installation section 3 extend in the length direction so as to be continuous with the side wall sections 23 and 24 of the base section 11.

Specifically, the installation section 3 is provided with, in order from the front side toward the rear side (in order from the X axis positive side), an optical fiber covering accommodation space 41 which accommodates the optical fiber 100 in an exposed state where the cable jacket section 102 is removed, and a cable jacket arrangement section 42 which arranges the optical fiber 100 in a state of being covered by the cable jacket section 102. In a space SP inside the optical fiber covering accommodation space 41, that is, in the space SP which is surrounded by the bottom wall 31, and the side wall sections 32 and 33 (and the cover section 4) in the optical fiber covering accommodation space 41, a space is secured where it is possible to carry out arrangement in a state where the optical fiber 100 bends to a certain extent (refer to FIG. 5). Here, the optical fiber covering accommodation space 41 is provided with, in order from the front side toward the rear side (in order from the X axis positive side), a first region 41A limiting movement of the optical fiber 100 at the front side, a second region 41B where a widened space SP is secured in order to allow bending in the optical fiber 100, and a third region 41C limiting movement of the optical fiber 100 at the rear side. Note that corner sections between the bottom wall section 31 and the side wall sections 32 and 33 inside the optical fiber covering accommodation space 41 have a cross-sectional shape where a large diameter R is formed and the lateral cross-sectional shape of the space SP curves downward.

The cross-sectional shape of an inner surface 41Ba in the second region 41B has a fixed shape and size along the length direction. An inner surface 41Aa in the first region 41A tapers such that the size of the cross-sectional shape gradually decreases from the second region 41B toward the front. The cross-sectional shape of the inner surface 41Aa is smallest at a front end 41b of the optical fiber covering accommodation space 41, that is, the boundary portion between the base section 11 of the connector body 2 and the installation section 3. An inner surface 41Ca in the third region 41C tapers such that the size of the cross-sectional shape gradually decreases from the second region 41B toward the rear. The cross-sectional shape of the inner surface 41Ca is smallest at a rear end 41c of the optical fiber covering accommodation space 41, that is, the boundary portion between the optical fiber covering accommodation space 41 and the cable jacket arrangement section 42 in

the installation section 3. According to the above configuration, the optical fiber 100 is allowed to bend in the second region 41B. In addition, by limiting movement of the front end of the optical fiber 100 in the first region 41A, it is possible to easily carry out insertion into the backbone 14 of the optical fiber connection section 13.

5 In the cable jacket arrangement section 42, the size of the space surrounded by the bottom wall section 31 and the side wall sections 32 and 33 is secured so that it is possible to arrange at least an end section 101a of the cable jacket section 102 in the space. The height of the upper surface 31Da of the bottom wall section 31 in the cable jacket arrangement section 42 is set to a height such that the position of the optical fiber 100 inside the cable jacket section 102 substantially coincides
10 with the central axis of the ferrule 16, the backbone 14, or the like of the connector body 2 when the cable jacket section 102 is arranged on the upper surface 31Da (refer to FIG. 5). The inner surfaces 32Da and 33Da of the side wall sections 32 and 33 in the cable jacket arrangement section 42 are opposed to be parallel to each other. The dimension between the inner surfaces 32Da and 33Da is set to be slightly larger than the dimension of the cable jacket section 102 in the width direction.

15 However, since it is possible for the cable jacket arrangement section 42 to change shape so as to widen in the width direction in the present embodiment, the dimension between the inner surfaces 32Da and 33Da may be equal to or less than the dimension of the cable jacket section 102 in the width direction as long as it is possible to engage the cover section 4. Note that, in the present embodiment, the dimension from the central axis line CL between the inner surfaces 32Da and 33Da
20 in the cable jacket arrangement section 42 is smaller than between the inner surfaces 32Ba and 33Ba (in a portion in the vicinity of the upper ends) of the side wall sections 32 and 33 in the second region 41B in the optical fiber covering accommodation space 41 (refer to FIG. 4). Note that, in a boundary section between the cable jacket arrangement section 42 and the optical fiber covering accommodation space 41, protruding wall sections 43 and 44 which protrude toward the inner side
25 are formed in the side wall sections 32 and 33 due to the space SP tapering toward the rear side in the third region 41C. The end surfaces 43a and 44a on the rear side of the protruding wall sections 43 and 44 form a plane, which extends in the YZ direction, and oppose an end surface 102b of the cable jacket section 102 arranged on the cable jacket arrangement section 42. Due to this, it is possible for the protruding wall sections 43 and 44 to regulate forward movement of the cable jacket section 102.
30 Note that the protruding wall sections 43 and 44 need not be provided.

Note that, in the outer surfaces of the side wall sections 32 and 33 of the installation section 3 in the present embodiment, outer surfaces 32b and 33b according to positions corresponding to the first region 41A and the second region 41B in the optical fiber covering accommodation space 41 form the same plane as the outer surfaces of the side wall sections 23 and 24 of the base section 11 of
35 the connector body 2. In the outer surfaces of the side wall sections 32 and 33 of the installation section 3, outer surfaces 32c and 33c according to positions corresponding to the third region 41C in

the optical fiber covering accommodation space 41 and the cable jacket arrangement section 42 are arranged further inside (to the central axis line CL side) than the outer surfaces 32b and 33b. The heights of the upper ends 32d and 33d of the side wall sections 32 and 33 are fixed at both of the positions of the optical fiber covering accommodation space 41 and the cable jacket arrangement section 42. Both the end sections 31b and 31c of the bottom wall section 31 in the width direction protrude further to the outside than the outer surfaces 33b, 34b, 33c, and 34c of the side wall sections 33 and 34. Due to this, receiving sections 46 and 47 for receiving the cover section 4 are formed at positions further to the outside than the side wall sections 33 and 34. Note that the positions of both the end sections 31b and 31c in the width direction are fixed in both regions of the optical fiber covering accommodation space 41 and the cable jacket arrangement section 42. Accordingly, the sizes of the receiving surfaces of the receiving sections 46 and 47 corresponding to the third region 41C of the optical fiber covering accommodation space 41 and the cable jacket arrangement section 42 are larger than the sizes of the receiving surfaces of the receiving sections 46 and 47 corresponding to positions corresponding to the first region 41A and the second region 41B in the optical fiber covering accommodation space 41.

The cover section 4 is for covering the installation section 3 from the upper side by engaging with the installation section 3. The cover section 4 forms a substantially U-shaped cross-section so that the bottom thereof is open (in a state engaged with the installation section 3). The cover section 4 extends in the length direction toward the rear from the rear end 11c of the base section 11 of the connector body 2. The cover section 4 is provided with an upper wall section 51 arranged at the upper side, and side wall sections 52 and 53 opposed in the width direction in a state engaged with the installation section 3. In the state engaged with the installation section 3, the upper wall section 51 of the cover section 4 extends in the length direction in a state opposing the bottom wall section 31 of the installation section 3 and covering the upper ends 32d and 33d of the side wall sections 32 and 33. The side wall sections 52 and 53 of the cover section 4 extend in the length direction in a state opposing the side wall sections 32 and 33 of the installation section 3 and covered from the outside.

Out of the side wall sections 52 and 53 of the cover section 4, thick sections 52A and 53A which are set to have a greater wall thickness are formed in a region of a part on a rear end 4b side (in particular, refer to FIG. 2). The thick sections 52A and 53A are formed at positions corresponding to the third region 41C and the cable jacket arrangement section 42 where the receiving sections 46 and 47 of the installation section 3 are set to be wide when the cover section 4 is made to engage with the installation section 3. On the outer surface sides of the thick sections 52A and 53A, concave sections 76 and 77 recessed in a bay shape are formed at parts on the sides of lower ends 52a and 53a. By forming the concave sections 76 and 77, when the engagement between the cover section 4 and the installation section 3 is released, it is easy for the operator to press the

receiving sections 46 and 47 of the installation section 3 to the inside in the width direction using fingers. In addition, engaging sections 78 and 79 with a hook shape extending toward the inside from the lower ends 52a and 53a are formed in the vicinity of the rear end 4b of the thick sections 52A and 53A (in particular, refer to FIG. 2). With respect to the engaging sections 78 and 79, engaged sections 81 and 82 are formed in the installation section 3 on the side wall sections 32 and 33 in the cable jacket arrangement section 42. The engaged sections 81 and 82 are configured by providing a step section so as to make it possible to engage with the engaging sections 78 and 79 with a hook shape by cutting away parts in the vicinity of the lower ends of the side wall sections 32 and 33. A protruding section 55 which protrudes downward from a lower surface of the upper wall section 51 of the cover section 4 and extends in the width direction is formed at a position corresponding to the thick sections 52A and 53A, (refer to FIG. 2 and FIG. 5). The protruding section 55 enters a groove section 65 formed in the third region 41C of the installation section 3 and extending in the width direction. Due to this, the protruding section 55 and the groove section 65 have a position aligning function of aligning the positions of the installation section 3 and the cover section 4. Note that inclined sections 81a and 82a which incline downward are formed on the upper side of the engaged sections 81 and 82 such that it is easy for the engaging sections 78 and 79 to engage with the engaged sections 81 and 82 when the cover section 4 is engaged with the installation section 3. Note that the engaging sections are formed in the cover section 4 and the engaged sections are formed in the installation section 3 in the present embodiment. However, the engaging sections may be formed in the installation section 3 and the engaged sections may be formed in the cover section 4. In addition, the forming positions of the set of engaging sections and engaged sections may be anywhere and there may be a plurality of pairs instead of only one pair.

The cover section 4 is provided with a linking section 60 (an element of part of the linking section 60) linked to be able to rotate with respect to the base section 11 of the installation section 3 and the connector body 2 on a front end 3a side of the installation section 3. The cover section 4 rotates centering on the central axis line extending in parallel to the width direction. The linking section 60 links the cover section 4 and the installation section 3 so as to be able to rotate and is configured by a shaft section 61 formed on the front end 3a side of the installation section 3 and a through hole 62 linked with the shaft section 61 formed on a front end 4a side (the front end in a state engaged with the installation section 3) of the cover section 4. Note that the cover section 4 may be linked to be able to rotate with respect to the installation section 3 and the connector body 2 on the rear end 2a side of the connector body 2. In the side wall sections 32 and 33 of the installation section 3, flange sections 63 and 64 with a semi-circular shape which protrude upward more than the upper ends 32d and 33d are formed in the vicinity of the front end 3a. The shaft section 61 with a columnar shape protrudes in the width direction to the outside from the outer surfaces of the flange sections 63 and 64. In the side wall sections 52 and 53 of the cover section 4, flange sections 66 and

67 with a semi-circular shape which protrude upward more than the upper wall section 51 are formed in the vicinity of the front end 4a. The through hole 62 with a circular shape is formed in the flange sections 66 and 67. Due to this, the linking section 60 is configured by passing the shaft section 61 through the through hole 62 such that the flange sections 63 and 64 of the installation section 3 are
5 pinched between the flange sections 66 and 67 of the cover section 4 from the outside. Note that, in a region in the vicinity of the front end 4a of the upper wall section 51 of the cover section 4, notch sections 72 and 73 are formed which extend up to a mid-way position to the rear inside both of the flange sections 63 and 64 of the installation section 3. Due to the notch sections 72 and 73, the ease of assembly is improved with respect to the installation section 3 and the connector body 2 of the
10 cover section 4.

The cover section 4 is provided with a pressing section 83, which presses the cap 18 of the connector body 2, on an upper surface 51a (the surface on the opposite side to the installation section 3) of the upper wall section 51. The pressing section 83 is configured by a protruding section with a rectangular shape protruding upward from the upper surface 51a of the upper wall section 51. In
15 addition, a rotation section 84 which is able to rotate is formed in the cover section 4 between the linking section 60 and the pressing section 83 in the length direction. This rotation section 84 is formed at a position which contacts the rear end 12a of the shell 12 when the cover section 4 is rotated to the connector body 2 side around the shaft section 61 (refer to FIG. 2). Due to this, by the cover section 4 contacting the rear end 12a of the shell 12 and rotating at the position of the rotation
20 section 84, the upper wall section 51 is in surface contact with the upper wall section 26 of the shell 12 in the cover section 4 in a first region 4A further to the rear end 4b side than the rotation section 84 (refer to FIG. 7). The pressing section 83 is formed at a position and with a shape where it is possible to press the cap 18 by entering the opening section 15 of the connector body 2 in a state where the upper wall section 51 is in surface contact with the upper wall section 26 of the shell 12.
25 At a boundary section between the first region 4A and a second region 4B further to the front end 4a side than the rotation section 84, the rotation section 84 is formed by forming slits in the side wall sections 52 and 53 and decreasing the thickness by providing a groove in the lower surface of the upper wall section 51. Note that, in the first region 4A, the lower ends 52a and 53a of the side wall sections 52 and 53 of the cover section 4 extend from the upper wall section 51 up to a receiving
30 surface of the receiving section 46 of the installation section 3. However, in the second region 4B, the lower ends 52a and 53a of the side wall sections 52 and 53 of the cover section 4 are separated from the receiving surface 46 of the installation section 3. Note that the rotation section 84 is not formed in the region between the notch sections 72 and 73 in the upper wall section 51. In addition, it may be possible to sufficiently press the cap 18 by enlarging the protruding amount of the pressing
35 section 83 without forming the rotation section 84.

The optical fiber fixing structure 7 fixes the optical fiber 100 and is provided in the installation section 3 in the present embodiment. Specifically, the optical fiber fixing structure 7 is provided with the side wall sections 32 and 33 of the cable jacket arrangement section 42 of the installation section 3 and tooth sections 86 respectively formed on the inner surfaces 32Da and 33Da of the side wall sections 32 and 33. The tooth sections 86 have substantially triangular shapes which protrude from the inner surfaces 32Da and 33Da when viewed from above (when viewed from the Z axis positive side) and extend in the up and down direction between the upper surface 31Da of the bottom wall section 31 and the upper ends 32d and 33d of the side wall sections 32 and 33. In the present embodiment, three of the tooth sections 86 are respectively formed on the inner surfaces 32Da and 33Da of the side wall sections 32 and 33 so as to be lined up spaced with gaps in the length direction. However, there may be more than three of the tooth sections 86. The dimension in the width direction between the leading ends of the tooth sections 86 of the inner surface 32Da and the leading ends of the tooth sections 86 of the inner surface 33Da is larger than the dimension of the cable jacket section 102 in the width direction (refer to FIG. 4). Accordingly, it is possible for the optical fiber fixing structure 7 to fix the optical fiber 100 by pinching the cable jacket section 102 with the tooth sections 86. Note that, when the cable jacket section 102 is pinched by the tooth sections 86, the cable jacket arrangement section 42 of the installation section 3 changes shape so as to widen outward to both sides in the width direction due to the action of a shape change facilitating section of a releasing structure 6 (the openable structure 10) which will be described below. The size of the widening to the outside in the width direction is larger toward the rear end (that is, the widening is larger toward the tooth sections 86 of the sets at the rear end side). However, even in the case of such widening, the dimension between the leading ends of the tooth sections 86 is narrowed toward the rear end side (that is, the protruding amount is larger toward the tooth sections 86 on the rear end side) such that it is possible to reliably fix the cable jacket section 102 with three sets of the tooth sections 86.

When the cover section 4 covers the installation section 3 by being closed with respect to the installation section 3, the openable structure 10 allows the opening of the cover section 4. In a state where the cover section 4 covers the installation section 3 without the optical fiber 100 being installed in the installation section 3 (this state is referred to below as the “first state”), the openable structure 10 allows the opening of the cover section 4 by allowing the releasing of the engagement between the installation section 3 and the cover section 4 (or may allow the opening by setting the installation section 3 and the cover section 4 to a non-engaged state; however, description will be given below of this modified example). In addition, in a state where the optical fiber 100 is installed in the installation section 3 and the cover section 4 covers the installation section 3 (this state is referred to below as the “second state”), the openable structure 10 regulates the opening of the cover section 4 by regulating the releasing of the engagement between the installation section 3 and the

cover section 4. In the present embodiment, the openable structure 10 is configured by the releasing structure 6 which releases the engagement between the installation section 3 and the cover section 4. The releasing structure 6 releases the engagement between the cover section 4 and the installation section 3 when the engaging sections 78 and 79 of the cover section 4 are engaged with the engaged sections 81 and 82 of the installation section 3 due to the cover section 4 being closed (that is, due to the cover section 4 covering the installation section 3). In the first state, the releasing structure 6 allows the releasing of the engagement between the installation section 3 and the cover section 4. In addition, in the second state, the releasing structure 6 regulates the releasing of the engagement between the installation section 3 and the cover section 4. In addition, it is possible for the releasing structure 6 to change the shape of the installation section 3 in the width direction orthogonal with the length direction. The releasing of the engagement between the installation section 3 and the cover section 4 is allowed in the first state by allowing the change in the shape of the installation section 3. In addition, in the second state, the releasing of the engagement between the installation section 3 and the cover section 4 is regulated by the change in the shape of the installation section 3 being regulated by the optical fiber 100. In order to realize the functions described above, the releasing structure 6 in the present embodiment is provided with a shape change facilitating section 91 which facilitates the change in the shape of the installation section 3 in order to release the engagement between the installation section 3 and the cover section 4, and a shape change regulating section 92 which regulates the change in the shape of the installation section 3 in the second state.

The shape change facilitating section 91 is configured by a slit section 93 formed with respect to the installation section 3 and extending in the length direction (in particular, refer to FIG. 4). The slit section 93 extends in a straight line from a rear end 3b of the installation section 3 toward the front at the central position in the width direction. The slit section 93 is not particularly limited as long as a length where it is possible to change the shape of the installation section 3 to the extent that it is possible to release the engagement is secured. However, the length may extend so as to include the engagement positions according to at least the engaging sections 78 and 79 and the engaged sections 81 and 82. In the present embodiment, the length extends so as to include the entirety of the cable jacket arrangement section 42 and extends up to the boundary section between the second region 41B and the third region 41C of the optical fiber covering accommodation space 41. Note that, in the following description, description will be given with the cable jacket arrangement section 42, which is the region where the slit section 93 extends, and the third region 41C set as a shape change region 3A. The size of the slit section 93 in the width direction, that is, the dimension between inner surfaces 93a and 93b opposed in the width direction of the slit section 93 is not particularly limited as long as the shape changing stroke of the installation section 3 is secured to an extent that it is possible to release the engagement. However, in the present embodiment, the above dimension is set to be smaller than the dimension between the pairs of tooth sections 86 and

smaller than the dimension between the protruding wall sections 43 and 44. In addition, at the boundary section between the second region 41B and the third region 41C, notch sections 94 and 96, which extend from both end sections 31b and 31c of the bottom wall section 31 in the width direction up to the outer surfaces 32c and 33c of the side wall sections 32 and 33, are formed with respect to the receiving sections 46 and 47. In this manner, it is easier for the shape change region 3A of the installation section 3 to change shape. According to the above configuration, due to the operator pinching both end sections 31b and 31c of the bottom wall section 31 in the shape change region 3A by finger in the first state, the entirety of the shape change region 3A changes shape to the inside in the width direction such that the gap between the inner surfaces 93a and 93b of the slit section 93 is narrowed. In this manner, the engaging sections 78 and 79 are detached from the engaged sections 81 and 82 and the engagement between the installation section 3 and the cover section 4 is released.

The shape change regulating section 92 regulates the change in shape in the shape change region 3A in the installation section 3 in the second state using supporting force of the optical fiber 100 (via the cable jacket section 102) by the optical fiber 100 being installed in the installation section 3 (by the cable jacket section 102 being arranged in the cable jacket arrangement section 42 in the present embodiment). Specifically, the shape change regulating section 92 is configured by the optical fiber fixing structure 7 described above. By fixing the cable jacket section 102 with the optical fiber fixing structure 7, the position of the optical fiber 100 is fixed via the cable jacket section 102, while movement of the side wall sections 32 and 33 and the tooth sections 86 to the inside is regulated, due to being supported by the optical fiber 100 via the cable jacket section 102 on the optical fiber fixing structure 7 side. Due to this, in the second state, even when the operator pinches both the end sections 31b and 31c of the bottom wall section 31 in the shape change region 3A by finger, the change in the shape of the shape change region 3A of the installation section 3 is regulated due to being supported by the optical fiber 100 via the cable jacket section 102.

Next, description will be given of an example of the operation procedure for mounting the optical fiber connector 1 onto the end section of the optical fiber 100 with reference to FIG. 6 to FIG. 8.

First, as shown in FIG. 6, the optical fiber connector 1 is prepared according to state where the cover section 4 is opened. Additionally, the optical fiber cable 101 is prepared in a state where the optical fiber 100 is exposed by removing the cable jacket section 102 and the optical fiber covering section 103 of the end section, and the optical fiber cable 101 is installed in a jig 150. The jig 150 is for aligning the positions of the optical fiber connector 1 and the optical fiber 100 and is provided with a connector installation section 151 for installing the optical fiber connector 1 on the front side and provided with a groove section 152 for arranging the cable jacket section 102 of the optical fiber cable 101 on the rear side. Note that the jig 150 is not limited to the shape shown in the

diagram as an example. Furthermore, since the jig 150 is used for improving the operation efficiency and the operation precision, the operation may be performed without using the jig 150.

Next, as shown in FIG. 7, the optical fiber connector 1 is installed in the connector installation section 151 of the jig 150, and the cable jacket section 102 is arranged in the cable jacket arrangement section 42 of the installation section 3. Furthermore, the optical fiber 100 is arranged in the optical fiber covering accommodation space 41 of the installation section 3 and the optical fiber 100 is inserted into the connector body 2. At this time, by setting the optical fiber length such that there is some bending in the optical fiber 100, a buckling force acts on the optical fiber 100 which is inserted into the connector body 2. In this manner, the optical fiber 100 and the connecting optical fiber inside the connector body 2 are reliably abutted. Next, by further rotating the first region 4A of the cover section 4 to the connector body 2 side in the rotation section 84, the connector body 2 is connected with the optical fiber 100 by pressing the cap 18 of the connector body 2. After that, by rotating the cover section 4 to the installation section 3 side, the installation section 3 is covered by the cover section 4 and the cover section 4 engages with the installation section 3 as shown in FIG. 8. In this state, the optical fiber 100 is fixed in position by the cable jacket section 102 being pinched by the optical fiber fixing structure 7. In this manner, the optical fiber connector 1 is mounted on the end section of the optical fiber 100. The operation is completed by taking out the optical fiber connector 1 and the optical fiber cable 101 from the jig 150.

Next, description will be given of the actions and effects of the optical fiber connector 1 according to the present embodiment.

The optical fiber connector 1 according to the present embodiment is provided with the openable structure 10 which allows the opening of the cover section 4 covering the installation section 3. Accordingly, even in a case where the cover section 4 covers the installation section 3 at an inappropriate timing or a timing before the start of operation, it is possible to open the cover section 4 using the openable structure 10. Here, the openable structure 10 allows the opening of the cover section 4 in the first state where the cover section 4 covers the installation section 3 without the optical fiber 100 being installed in the installation section 3. That is, covering of the installation section 3 by the cover section 4 even though the optical fiber 100 is not installed in the installation section 3 is a state where the cover section 4 has covered the installation section 3 at an inappropriate timing or a timing before the start of operation, therefore, in this first state, it is possible for the operator to easily open the cover section 4, due to the openable structure 10 allowing the opening of the cover section 4 by allowing the releasing of the engagement between the installation section 3 and the cover section 4. On the other hand, the openable structure 10 regulates the opening of the cover section 4 in the second state where the optical fiber 100 is installed in the installation section 3 and the cover section 4 covers the installation section 3. That is, since the installing of the optical fiber 100 in the installation section 3 and the covering of the installation section 3 by the cover

section 4 is a state where the cover section 4 appropriately covers the installation section 3, in this second state, it is possible to prevent the cover section 4 covering the installation section 3 at an appropriate timing from being mistakenly opened, due to the openable structure 10 regulating the opening of the cover section 4 by regulating the releasing of the engagement between the installation section 3 and the cover section 4. Due to this, it is possible to easily open the cover section 4 when the installation section 3 is covered at an inappropriate timing or a timing before the start of operation. Furthermore, it is possible to prevent the cover section 4 covering the installation section 3 at an appropriate timing from being mistakenly opened.

The openable structure 10 in the optical fiber connector 1 according to the present embodiment is configured by the releasing structure 6 which releases the engagement between the installation section 3 and the cover section 4. In addition, the releasing structure 6 allows the releasing of the engagement between the installation section 3 and the cover section 4 in the first state and the releasing structure 6 regulates the releasing of the engagement between the installation section 3 and the cover section 4 in the second state. Accordingly, even in a case where the cover section 4 is engaged with the installation section 3 at an inappropriate timing or a timing before the start of operation, it is possible to release the engagement using the releasing structure 6. Here, the releasing structure 6 allows the releasing of the engagement between the installation section 3 and the cover section 4 in the first state. That is, covering of the installation section 3 by the cover section 4 even though the optical fiber 100 is not installed in the installation section 3 is a state where the cover section 4 has covered the installation section 3 at an inappropriate timing or a timing before the start of operation, therefore, in this first state, it is possible for the operator to easily release the engagement in the first state due to the releasing structure 6 allowing the releasing of the engagement. On the other hand, the releasing structure 6 regulates the releasing of the engagement between the installation section 3 and the cover section 4 in the second state. That is, since the installing of the optical fiber 100 in the installation section 3 and the covering of the installation section 3 by the cover section 4 is a state where the cover section 4 appropriately covers the installation section 3, in this second state, it is possible to prevent the engagement carried out at an appropriate timing from being released in the second state, due to the releasing structure 6 regulating the releasing of the engagement. Due to the above, since it is possible to easily release the engagement carried out at an inappropriate timing or a timing before the start of operation and it is possible to prevent the engagement carried out at an appropriate timing from being mistakenly released, it is possible to improve the operation efficiency of the mounting of the optical fiber connector 1.

In the optical fiber connector 1 according to the present embodiment, the optical fiber 100 which is arranged along the length direction (the X axis direction) of the installation section 3 is installed in the installation section 3 and the releasing structure 6 is able to change the shape of the

installation section 3 in the width direction (the Y axis direction) orthogonal with the length direction. In addition, the releasing of the engagement between the installation section 3 and the cover section 4 is allowed in the first state by allowing the change in the shape of the installation section 3 and the releasing of the engagement between the installation section 3 and the cover section 4 is regulated in the second state by using the optical fiber 100 to regulate the change in the shape of the installation section 3. In this manner, since the releasing of the engagement between the installation section 3 and the cover section 4 is allowed by allowing the change in the shape of the installation section 3 in the width direction in the releasing structure 6, it is possible for the operator to easily release the engagement with a simple operation of applying a force to the installation section 3 in the width direction (for example, pinching the installation section 3 with the fingers).

In addition, since the releasing of the engagement is regulated in the releasing structure 6 by regulating the change in the shape of the installation section 3 with the optical fiber 100 in the second state, it is possible to automatically regulate the releasing of the engagement when the optical fiber 100 is installed in the installation section 3 even without a particular operation.

In the optical fiber connector 1 according to the present embodiment, the releasing structure 6 is provided with the slit section 93 formed with respect to the installation section 3 and extending in the length direction. In this manner, it is possible to configure the releasing structure 6 using a simple structure provided only with the slit section 93.

In the optical fiber connector 1 according to the present embodiment, the optical fiber fixing structure 7 which fixes the optical fiber 100 is provided in the installation section 3. It is possible to prevent the connection between the connector body 2 and the optical fiber 100 from being lost by fixing the optical fiber 100 with the optical fiber fixing structure 7. In addition, by providing the optical fiber fixing structure 7 in the installation section 3, it is also possible to fix the optical fiber 100 at the same time as installing the optical fiber 100 in the installation section 3. Accordingly, it is possible to further improve the reliability of the operation. In addition, by slightly widening the slit section 93 when the optical fiber 100 is fixed in the optical fiber fixing structure 7 in the present embodiment, the distance between the tooth sections 86 is also slightly wider to match the size of the cable jacket section 102. Due to this, it is easy for the optical fiber cable to be fitted into the optical fiber fixing structure 7. On the other hand, due to the slightly widened installation section 3 being fastened by the cover section 4 in the width direction after engaging the cover section 4 with the installation section 3, it is possible to sufficiently support the cable jacket section 102 with the tooth sections 86.

In the optical fiber connector 1 according to the present embodiment, the connector body 2 is connected with the optical fiber 100 by pressing the cap 18. The cover section 4 may be provided with the linking section 60 which is linked so as to be able to rotate with respect to the installation section 3 and the connector body 2 on the front end 3a side of the installation section 3 (or on the rear

end 2a side of the connector body 2). The cover section 4 may be provided with the pressing section 83 which presses the cap 18 of the connector body 2 on the upper surface 51a (the surface of the opposite side to the installation section 3). Due to this, it is possible to press the cap 18 of the connector body 2 with the pressing section 83 and to link the connector body 2 with the optical fiber 100 by rotating the cover section 4 to the connector body 2 side. Due to this, it is not necessary to use a special tool for pressing the cap 18 and it is possible to press the cap 18 with an easy operation of simply rotating the cover section 4 to the connector body 2 side.

In the optical fiber connector 1 according to the present embodiment, the rotation section 84 which is able to rotate between the linking section 60 and the pressing section 83 is formed in the cover section 4. In the present embodiment, by attaching the shell 12 to the base section 11 on the connector body 2 side, the upper surface of the connector body 2 (the upper surface of the shell 12) is arranged above the center of rotation of the shaft section 61 of the linking section 60. Even in such a case, since the rotation section 84 is formed in the cover section 4, by rotating the cover section 4 with the rotation section 84 when the cover section 4 contacts the shell 12, the upper surface 51a of the first region 4A of the cover section 4 is in surface contact with the upper wall section 26 of the shell 12 and it is possible for the pressing section 83 to sufficiently press the cap 18.

The present invention is not limited to the embodiment as described above.

In the embodiment described above, the optical fiber fixing structure was provided in the installation section; however, the optical fiber fixing structure may be provided in the cover section or may be provided in both of the installation section and the cover section. For example, an optical fiber connector 300 as shown in FIG. 10 may be adopted. A cover section 304 of the optical fiber connector 300 is provided with an optical fiber fixing structure 307 configured by side wall sections 381 and 382 and tooth sections 386 on the rear end section side. A space for accommodating the optical fiber fixing structure 307 of the cover section 304 is provided between the side wall sections 332 and 333 in a cable outer arrangement section 342 of an installation section 303. In this manner, by closing and engaging the rear cover section 304 with the installation section 303 after the optical fiber cable 101 is installed in the installation section 303, it is possible to fix the optical fiber by pinching the optical fiber cable 101 with the tooth sections 386 of the optical fiber fixing structure 307 of the cover section 304. Note that, in the example shown in FIG. 10, the optical fiber fixing structure 307 and the side wall sections 332 and 333 of the installation section 303 configure a shape change regulating section 392 of a releasing structure 306 (an openable structure 310). Specifically, in a case where the operator pinches both end sections of the installation section 303 in the width direction, movement of the side wall sections 381 and 382 of the cover section 304 to the inside in the width direction is regulated by being supported by the optical fiber cable 101 and movement of the side wall sections 332 and 333 of the installation section 303 to the inside in the width direction is regulated via the side wall sections 381 and 382. In this manner, the shape change regulating

section 392 regulates changes in the shape of the installation section 303. Note that the thicknesses of the side wall sections 381 and 382 of the cover section 304 are set to thicknesses which do not inhibit changes in the shape of the installation section 303 in the width direction when the operator pinches the installation section 303 in a state where the optical fiber cable 101 is not installed.

5 The openable structure is not limited to the embodiment described above. For example, the releasing structure which releases the engagement between the cover section 4 and the installation section 3 is not limited to the embodiment described above and may adopt any structure as long as the releasing of the engagement between the installation section 3 and the cover section 4 is allowed by the releasing structure in the first state and the releasing of the engagement between the
10 installation section 3 and the cover section 4 is regulated by the releasing structure in the second state. For example, the releasing structure in the embodiment described above is able to change the shape of the installation section 3 in the width direction (the Y axis direction); however, the releasing structure may be able to change the shape of the installation section 3 in the length direction (the X axis direction). Specifically, an optical fiber connector 200 shown in FIGS. 9A and 9B may be
15 adopted. A releasing structure 206 (an openable and closable structure 210) of the optical fiber connector 200 has a shape change facilitating section 291 which facilitates changes in shape of an installation section 203 in the length direction. In addition, the installation section 203 has an engaging portion (engaging section or engaged section) 281 with the cover section in a rear end section 203b. The shape change facilitating section 291 partially decreases the strength of the
20 installation section 203 by cutting away a part thereof, and the vicinity of the rear end section 203b of the installation section 203 changes shape such that the engaging portion 281 moves forward (refer to FIG. 9B) due to the operator pressing the rear end section 203b of the installation section 203 forward. Due to this, the engagement between the cover section and the installation section 203 is released. On the other hand, when the optical fiber cable 101 is installed in the installation section
25 203, it is difficult for the operator to press the rear end section 203b due to being inhibited by the cable jacket section 102. Due to this, when the optical fiber cable 101 is installed in the installation section 203, the releasing structure 206 regulates the releasing of the engagement between the installation section 203 and the cover section. In the embodiment described above, the releasing structure regulates the releasing by suppressing the changes in shape using the supporting force of
30 the optical fiber cable 101 even when the operator attempts to change the shape of the installation section. However, the releasing structure may regulate the releasing by making it difficult to perform the operation of changing the shape of the installation section as in the examples in FIGS. 9A and 9B. Note that, the change in shape may be facilitated by pinching an elastic member instead of a structure where it is easy to change the shape by providing a notch as in FIGS. 9A and 9B. Note
35 that, in the aspect shown in FIG. 4, instead of providing a notch with a slit shape, the change in shape may also be facilitated by pinching an elastic member in this portion.

In addition, it is possible to adopt an optical fiber connector 400 as shown in FIGS. 11A and 11B. In the optical fiber connector 400, an openable structure 410 allows opening of the cover section 404 by setting an installation section 403 and a cover section 404 to a non-engaged state and the openable structure 410 regulates the opening of the cover section 404 by the installation section 403 and the cover section 404 being in an engaged state and the releasing of the engaged state being regulated. Specifically, the openable structure 410 is configured by providing wall sections 409 and 411, which have engaged sections 416 and 417, in a cable outer arrangement section 442 of the installation section 403. As shown in FIG. 11A, the wall sections 409 and 411 in the first state are in a state of being closed to the inside in the width direction to the extent that the engaged sections 416 and 417 are separated from engaging sections 478 and 479 of side wall sections 452 and 453 of the cover section 404. In the present embodiment, the wall sections 409 and 411 extend upward in a state inclined so as to approach each other from the installation section 403 to the inside in the width direction. In addition, protruding sections 412 and 413 which protrude to the inside in the width direction are provided in upper end sections of the wall sections 409 and 411. Since the wall sections 409 and 411 change shape such that rotation is possible in the width direction centering on the lower end side, the wall sections 409 and 411 are formed at positions which are different from the optical fiber fixing structure in the length direction so as not to interfere with the optical fiber fixing structure (not shown in the diagram). In this manner, in the first state shown in FIG. 11A, even when the installation section 403 is covered by the cover section 404, since the wall sections 409 and 411 are closed to the inside in the width direction, the engaging sections 478 and 479 of the cover section 404 are in a non-engaged state not engaged with the engaged sections 416 and 417 of the wall sections 409 and 411 (or, even if engaged, only slightly engaged), whereby the opening of the cover section 404 is allowed. On the other hand, in the second state shown in FIG. 11B, by installing the cable jacket section 102 of the optical fiber 100 in the installation section 403 and arranging the cable jacket section 102 between the wall sections 409 and 411, the protruding sections 412 and 413 of the wall sections 409 and 411 come into contact with the cable jacket section 102 and the wall sections 409 and 411 are entirely pressed to the outside in the width direction. Accordingly, when the cover section 404 covers the installation section 403 in this state, the engaging sections 478 and 479 engage with the engaged sections 416 and 417, and the cover section 404 and the installation section 403 are in an engaged state. In addition, since movement of the wall sections 409 and 411 to the inside in the width direction is regulated according to the supporting force of the cable jacket section 102 of the optical fiber 100, the releasing of the engagement between the cover section 404 and the installation section 403 is regulated and the opening of the cover section 404 is regulated due to this.

As described above, in the optical fiber connector 400 according to the modified examples shown in FIGS. 11A and 11B, the openable structure 410 sets the installation section 403 and the cover section 404 to a non-engaged state, in the first state, by separating the engaging sections 478

and 479 provided in at least one of the installation section 403 and the cover section 404 (here, the cover section 404, but not limited thereto) and the engaged sections 416 and 417 provided in the other thereof (here, the installation section 403, but not limited thereto). In addition, by engaging the engaging sections 478 and 479 with the engaged sections 416 and 417 in accordance with the installation of the optical fiber 100 in the installation section 403 (by covering the installation section 403 with the cover section 404 in a state where the optical fiber 100 is installed), in the second state, the installation section 403 and the cover section 404 are set to the engaged state and the releasing of the engagement between the installation section 403 and the cover section 404 is regulated by the optical fiber 100. Due to this structure, since the cover section 404 and the installation section 403 are in a non-engaged state, it is possible for the operator to open the cover section 404 immediately in the first state without performing an operation to release the engagement.

In addition, an optical fiber connector 500 shown in FIGS. 12A, 12B, and 12C may be adopted. A releasing structure 506 of the optical fiber connector 500 (an openable structure 510) allows releasing of the engagement between an installation section 503 and a cover section 504 by allowing further pressing with respect to the installation section 503 of the cover section 504. Specifically, the releasing structure 506 is configured by wall sections 581 and 582 extending downward from an upper wall section 551 of the cover section 504 and having lower ends separated from a bottom wall section 531 of the installation section 503, and wall sections 516 and 517 extending upward from the bottom wall section 531 of the installation section 503 and having upper ends separated from the upper wall section 551 of the cover section 504. Engaged sections 518 and 519 are formed on the outer surfaces of the wall sections 516 and 517. Note that the wall sections 581 and 582 of the cover section 504 are side wall sections configuring an optical fiber fixing structure and the optical fiber fixing structure may be provided on the installation section 503 side.

As shown in FIG. 12A, the cover section 504 and the installation section 503 are in an engaged state, in the first state, due to engaging sections 578 and 579 of the cover section 504 engaging with the engaged sections 518 and 519 of the installation section 503. In addition, a gap GP1 is formed between the lower ends of the wall sections 581 and 582 of the cover section 504 and the bottom wall section 531 of the installation section 503, and a gap GP2 (larger than the gap GP1) is formed between the upper ends of the wall sections 516 and 517 of the installation section 503 and the upper wall section 551 of the cover section 504. Since the gaps GP1 and GP2 are formed, it is possible to further press the cover section 504 with respect to the installation section 503 from the state where the installation section 503 and the cover section 504 are engaged. As shown in FIG. 12B, by further pressing the cover section 504 with respect to the installation section 503, it is possible to press the cover section 504 up to a position where at least the lower ends of the wall sections 581 and 582 come into contact with the bottom wall section 531 of the installation section 503 (such that the gap GP1 disappears). In accordance with this, due to the engaging sections 578

and 579 also moving downward, the engagement with the engaged sections 518 and 519 is released. Due to this, it is possible for the operator to easily release the cover section 504 from the installation section 503. In the present embodiment, it is even easier to open the cover section 504 since the entireties of the side wall sections 552 and 553 of the cover section 504 are widened by being
5 pressed to the outside in the width direction by end sections 531a and 531b of the bottom wall section 531 of the installation section 503.

On the other hand, in the second state shown in FIG. 12C, due to the cable jacket section 102 of the optical fiber 100 being installed in the installation section 503, the supporting force of the cable jacket section 102 regulates movement of the upper wall section 551 of the cover section 504
10 toward the bottom wall section 531 of the installation section 503 and regulates the pressing of the cover section 504 with respect to the installation section 503. Accordingly, the releasing of the engagement between the installation section 503 and the cover section 504 is regulated and the opening of the cover section 504 is regulated. Note that the size of the cable jacket section 102 in the up and down direction is larger than the wall sections 581, 582, 516, and 517.

As described above, in the optical fiber connector 500 according to the modified example shown in FIGS. 12A, 12B, and 12C, the releasing structure 506 makes it possible to further press the cover section 504 with respect to the installation section 503 from the state where the installation section 503 and the cover section 504 are engaged. In the first state, the releasing of the engagement between the installation section 503 and the cover section 504 is allowed by allowing pressing with
20 respect to the installation section 503 of the cover section 504. In the second state, the releasing of the engagement between the installation section 503 and the cover section 504 is regulated by regulating the pressing of the cover section 504 with respect to the installation section 503 with the optical fiber 100.

In addition, the shape of the slit section configuring the releasing structure and the structure
25 inside the installation section are not limited to the embodiment described above. For example, an optical fiber connector 600 shown in FIGS. 13A and 13B may be adopted (note that the cover section is omitted in FIGS. 13A and 13B). As shown in FIGS. 13A and 13B, an installation section 603 of the optical fiber connector 600 has an optical fiber coating accommodation space 641 and a cable outer arrangement section 642. In addition, while the optical fiber coating accommodation space 641
30 is provided with a first region 641A and a second region 641B, a third region is not provided. That is, as long as it is possible to stop the cable jacket section 102 at a position corresponding to the protruding wall sections 43 and 44 using a jig or the like, it is not necessary to have a configuration corresponding to the protruding wall sections 43 and 44 as shown in FIG. 4. In this manner, a wide space surrounded by a bottom wall section 631 and the side wall sections 632 and 633 may be
35 secured. Note that the cable outer arrangement section 642 does not have an optical fiber fixing structure and the cover section as shown in FIG. 10 is provided with the optical fiber fixing structure.

In addition, a slit section 693 of the optical fiber connector 600 does not extend in a straight line in the front and back direction and portions with a concave and convex shape in the width direction are provided at a plurality of locations along the length direction when viewed from the up and down direction. Due to this, when the optical fiber 100 is installed in the installation section 603, it is possible to suppress the pinching of the optical fiber 100 (a portion covered by the optical fiber covering section 103) by the slit section 693.

Note that examples where the optical fiber fixing structure is provided in both of the installation section and the cover section include a structure in which the side wall sections and the tooth sections are divided into two in the up and down direction and one of the two is provided in the installation section and the other is provided in the cover section. Alternatively, a structure may be adopted where, in the pairs of side wall sections and tooth sections opposed in the Y axis direction, the side wall section and the tooth section on the Y axis positive side are provided in either one of the installation section or the cover section and the side wall section and the tooth section on the Y axis negative side are provided in the other one of the installation section or the cover section.

Explanation of Reference Numerals

1, 200, 300, 400, 500, 600	Optical Fiber Connector
2	Connector Body
3, 203, 303, 403, 503, 603	Installation Section
4, 303, 403, 503	Cover Section
6, 206, 306, 506	Releasing Structure
7, 307	Optical Fiber Fixing Structure
10, 210, 310, 410, 510	Openable Structure
18	Cap
60	Linking Section
83	Pressing Section
93	Slit Section
100	Optical Fiber

What is claimed is:

1. An optical fiber connector mounted on an end section of an optical fiber, comprising:
a connector body connected with the optical fiber;
an installation section where the optical fiber is installed in a rear section of the connector
5 body;
a cover section covering the installation section and engaging with the installation section;
and
an openable structure allowing opening of the cover section covering the installation section;
in a first state where the cover section covers the installation section without the optical fiber
10 being installed in the installation section, the openable structure allowing opening of the cover
section by allowing releasing of the engagement between the installation section and the cover
section or by setting the installation section and the cover section to a non-engaged state; and
in a second state where the optical fiber is installed in the installation section and the cover
section covers the installation section, the openable structure regulating the opening of the cover
15 section by regulating the releasing of the engagement between the installation section and the cover
section.

2. The optical fiber connector according to claim 1, wherein: the openable structure is
configured by a releasing structure which releases the engagement between the installation section
and the cover section;
20 the releasing structure allows the releasing of the engagement between the installation section
and the cover section in the first state; and
the releasing structure regulates the releasing of the engagement between the installation
section and the cover section in the second state.

3. The optical fiber connector according to claim 2, wherein:
25 the installation section has an optical fiber installed to be arranged along a length direction of
the installation section;
the releasing structure is able to change a shape of the installation section in a width direction
orthogonal with the length direction;
the releasing of the engagement between the installation section and the cover section is
30 allowed by allowing the installation section to change shape in the first state; and
the releasing of the engagement between the installation section and the cover section is
regulated by regulating the change in the shape with the optical fiber in the second state.

4. The optical fiber connector according to claim 3, wherein the releasing structure is provided with a slit section formed with respect to the installation section and extending in the length direction.

5. The optical fiber connector according to claim 2, wherein:

the releasing structure is able to further press the cover section with respect to the installation section from a state where the installation section and the cover section are engaged;

the releasing of the engagement between the installation section and the cover section is allowed in the first state by allowing the pressing of the cover section with respect to the installation section; and

the releasing of the engagement between the installation section and the cover section is regulated in the second state by regulating the pressing of the cover section with respect to the installation section with the optical fiber.

6. The optical fiber connector according to claim 1, wherein the openable structure:

sets the installation section and the cover section to a non-engaged state in the first state by separating an engaging section provided in at least one of the installation section and the cover section and at least an engaged section provided in the other thereof; and

sets the installation section and the cover section to an engaged state and regulates the releasing of the engagement between the installation section and the cover section with the optical fiber in the second state by engaging the engaging section with the engaged section in accordance with the installation of the optical fiber in the installation section.

7. The optical fiber connector according to any one of claims 1 to 6, wherein an optical fiber fixing structure fixing the optical fiber is provided in the installation section and/or the cover section.

8. The optical fiber connector according to claim 7, wherein the optical fiber fixing structure is provided in the installation section.

9. The optical fiber connector according to claim 7, wherein the optical fiber fixing structure is provided in the cover section.

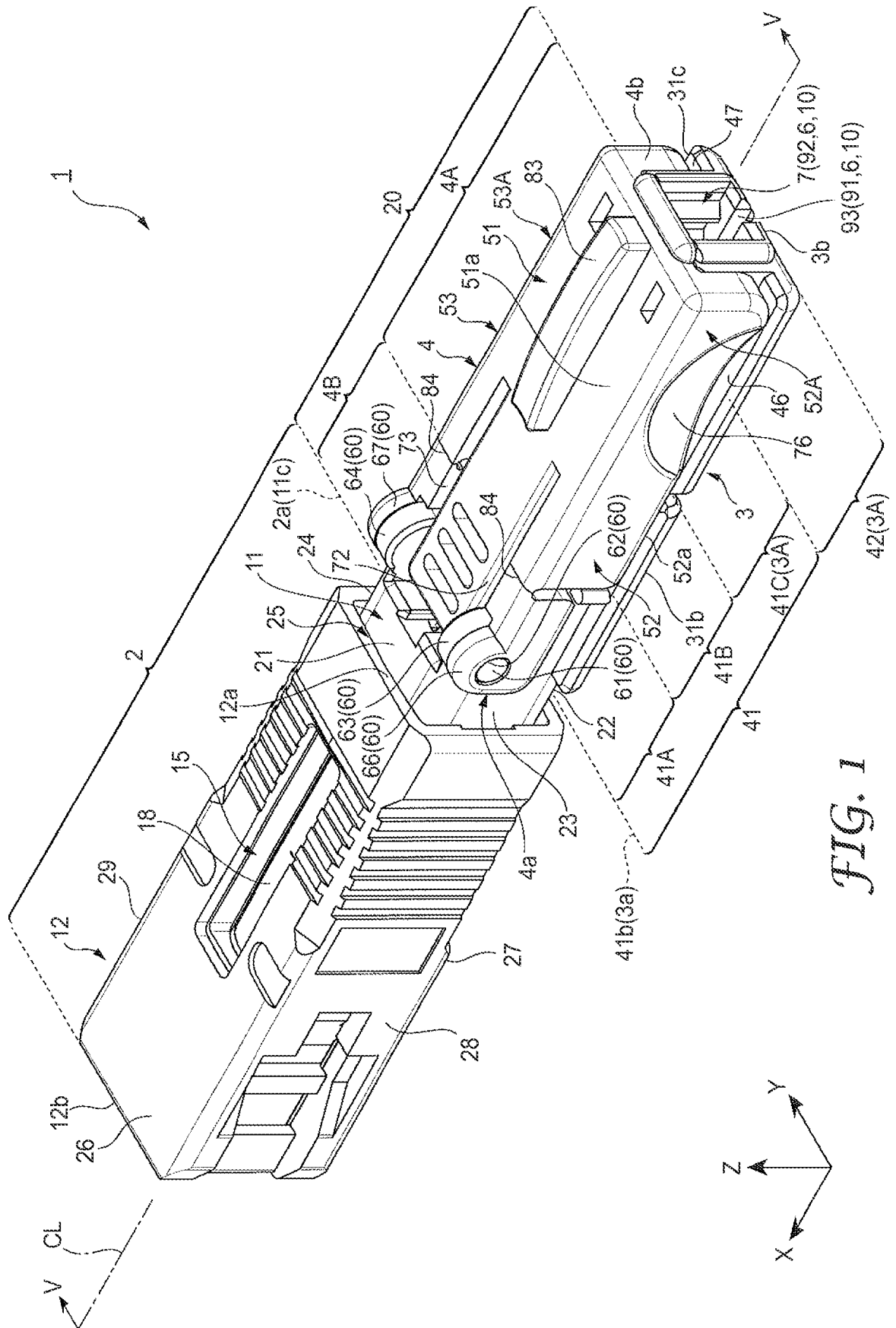
10. The optical fiber connector according to any one of claims 1 to 9, wherein:

the connector body is connected with the optical fiber by pressing a cap;

the cover section is provided with a linking section which is linked to be able to rotate with respect to the installation section and the connector body in a front end side of the installation section or a rear end side of the connector body; and

the cover section is provided with a pressing section which presses the cap of the connector body on a surface on an opposite side to the installation section.

11. The optical fiber connector according to claim 10, wherein a rotation section that is able to rotate is formed between the linking section and the pressing section in the cover section.



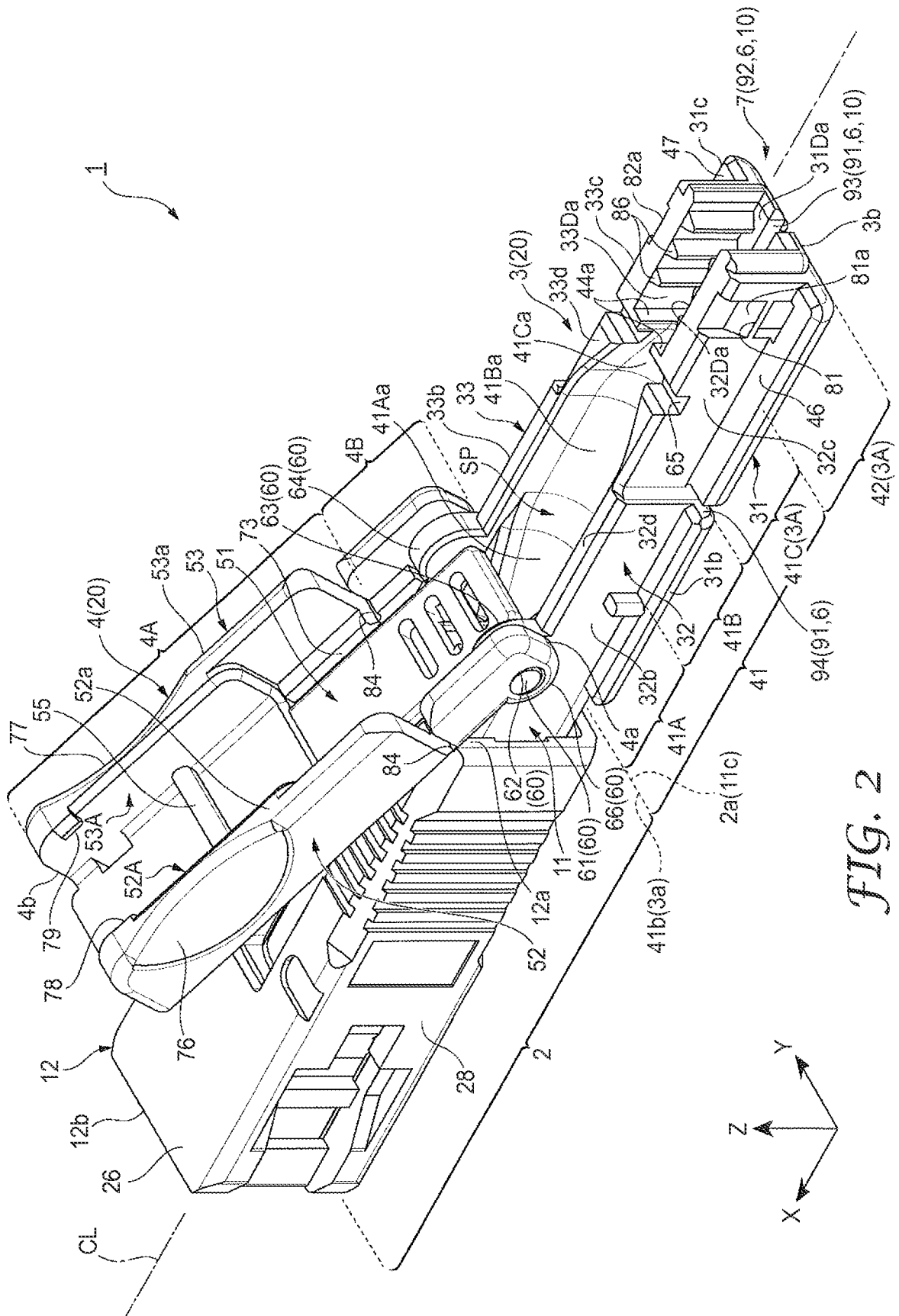


FIG. 2

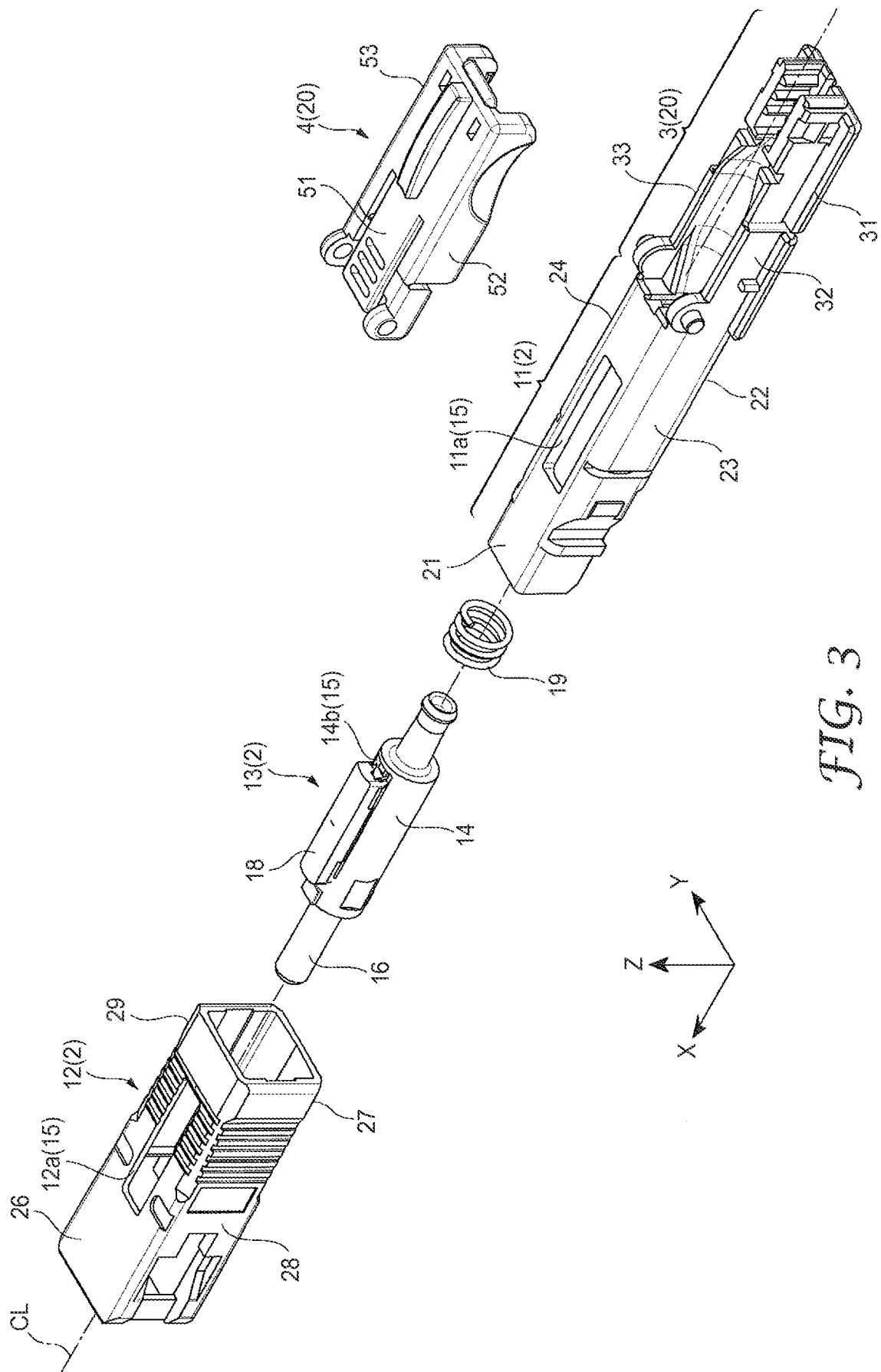


FIG. 3

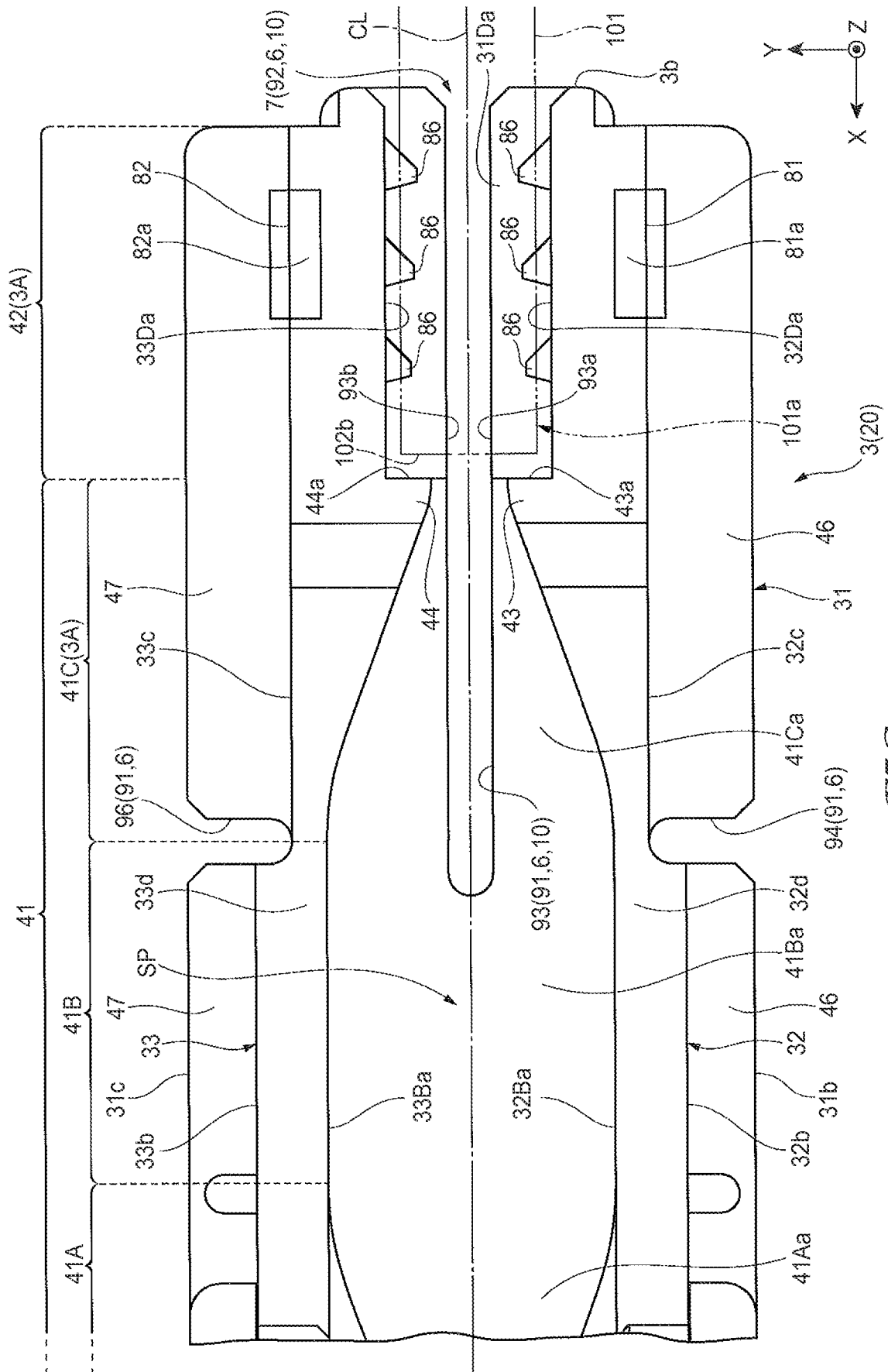
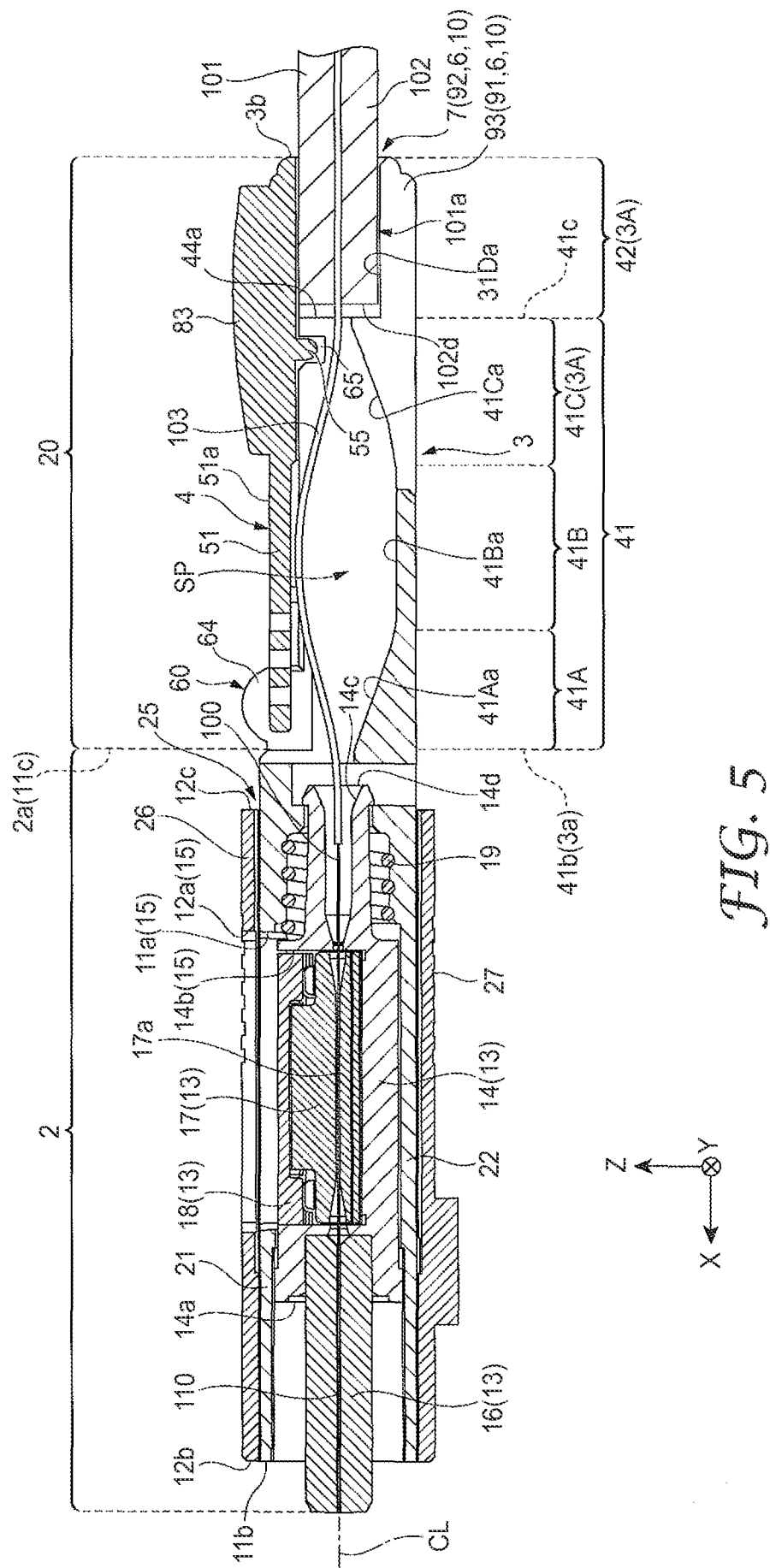
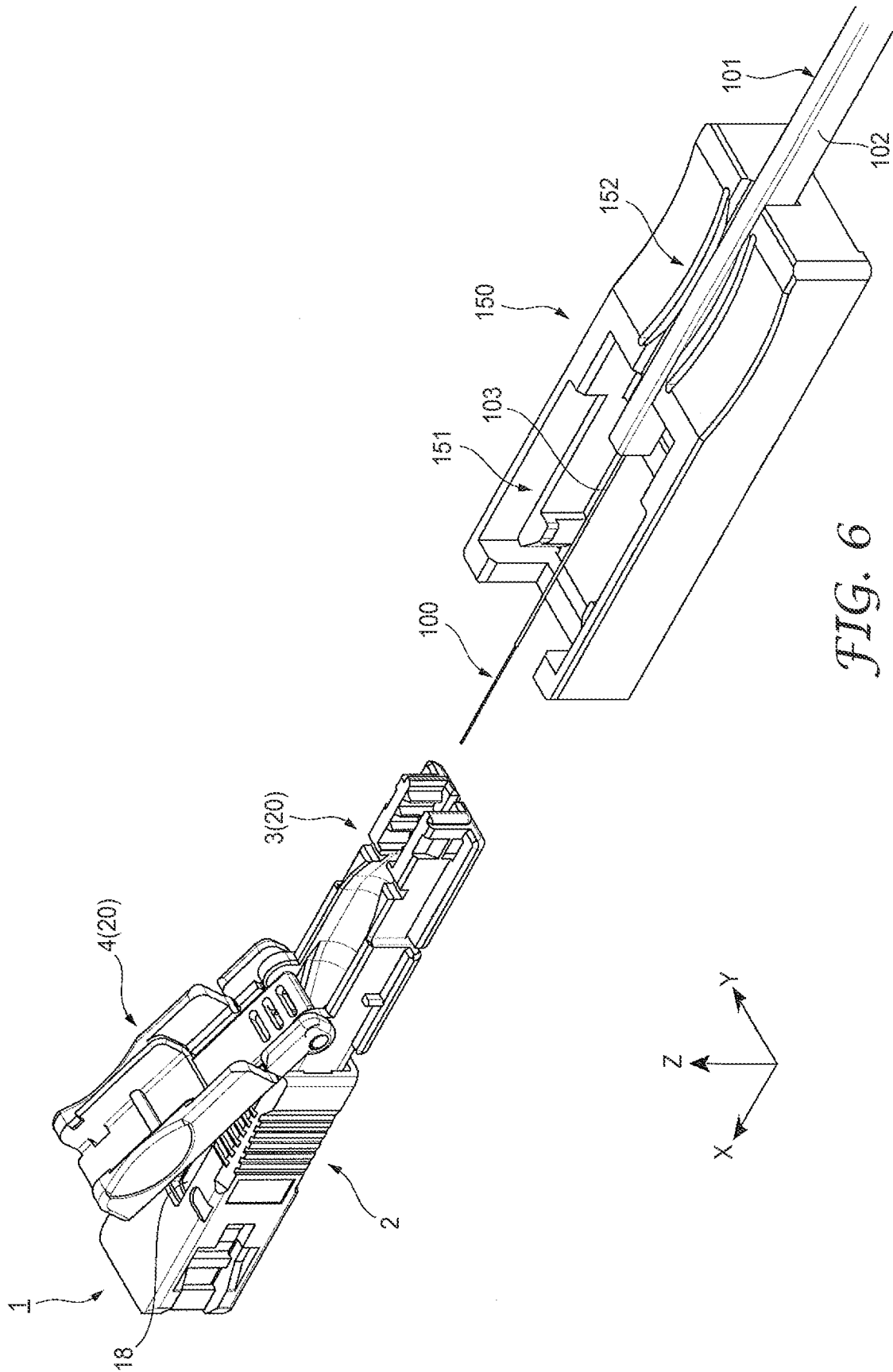
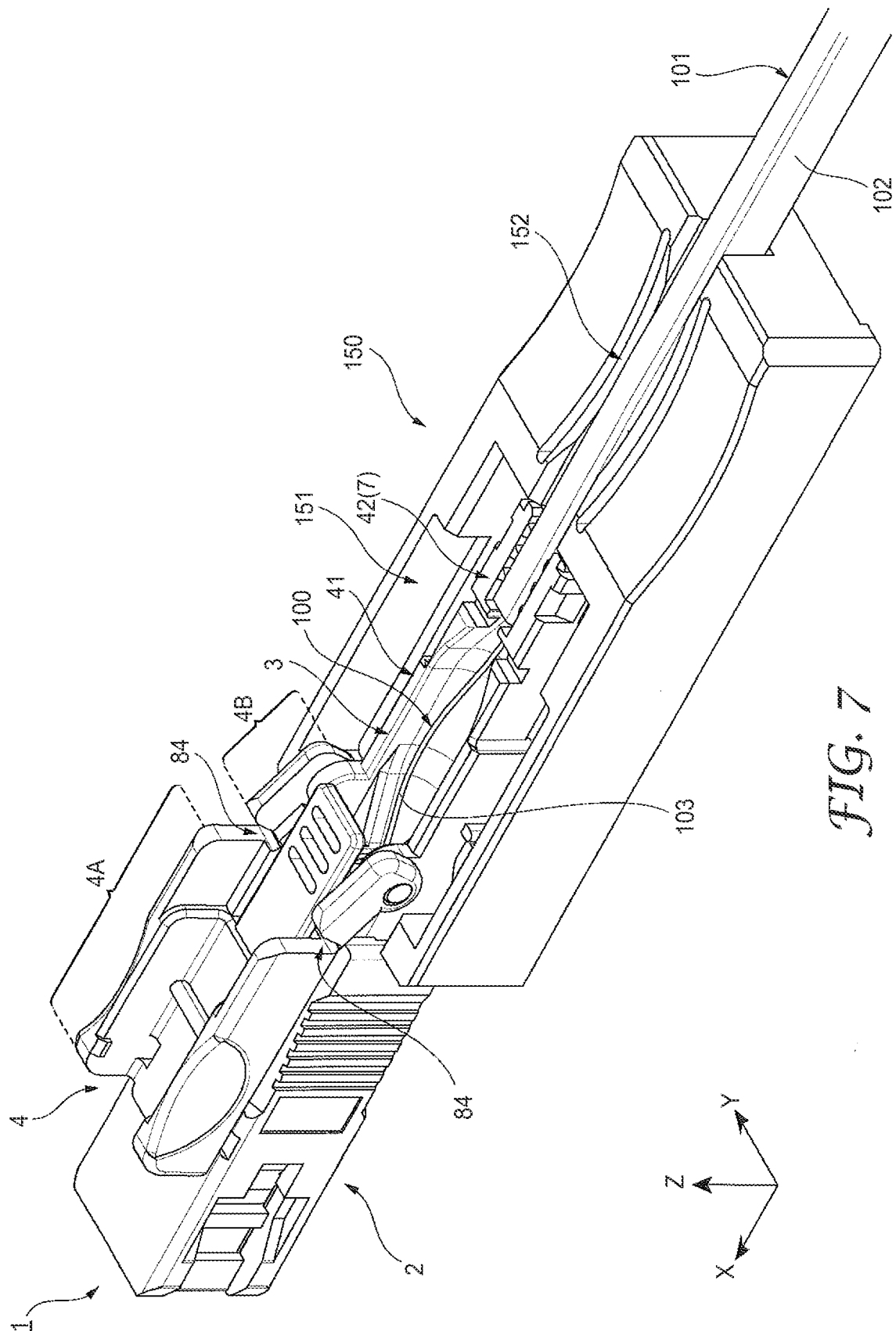
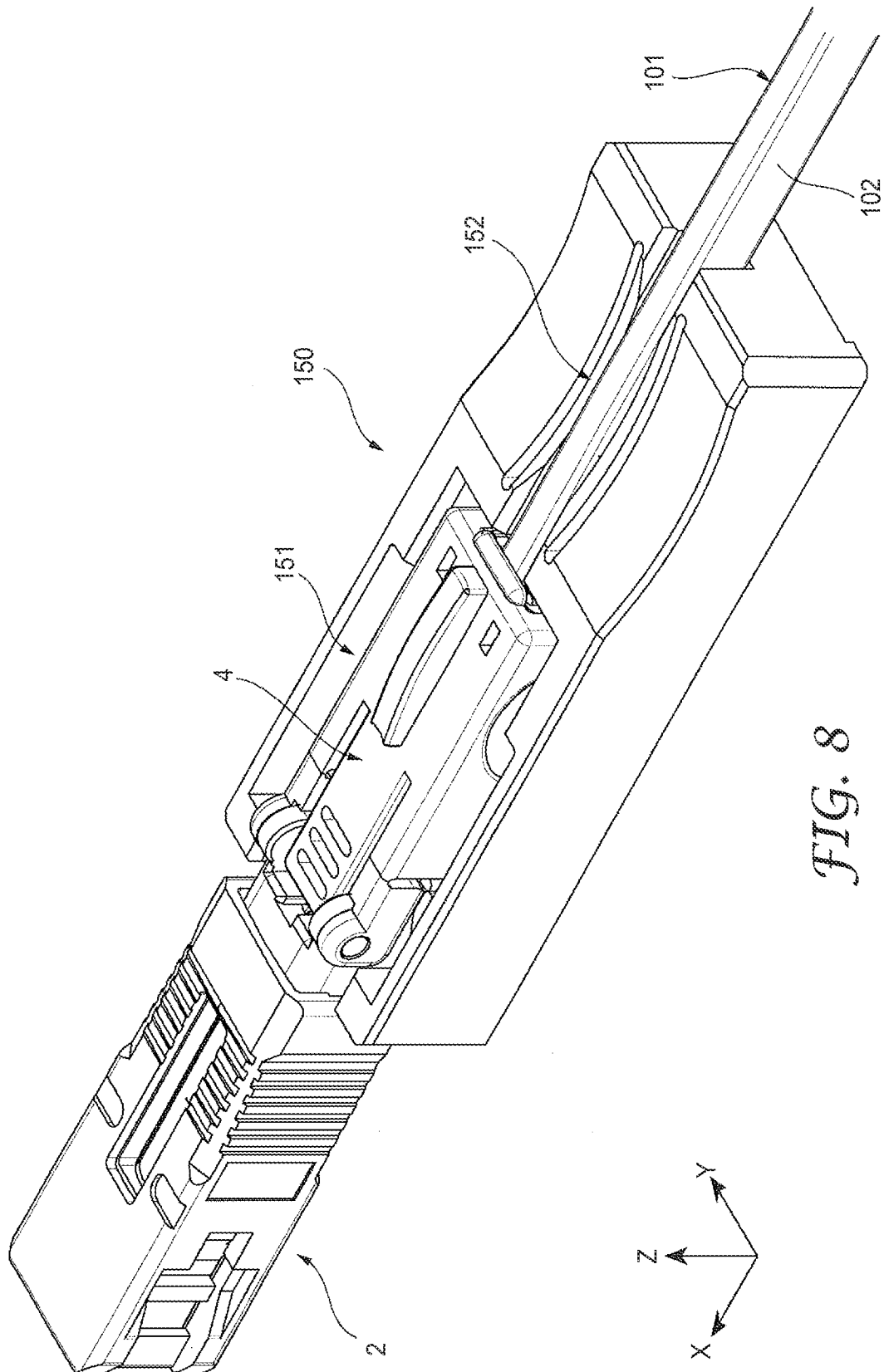


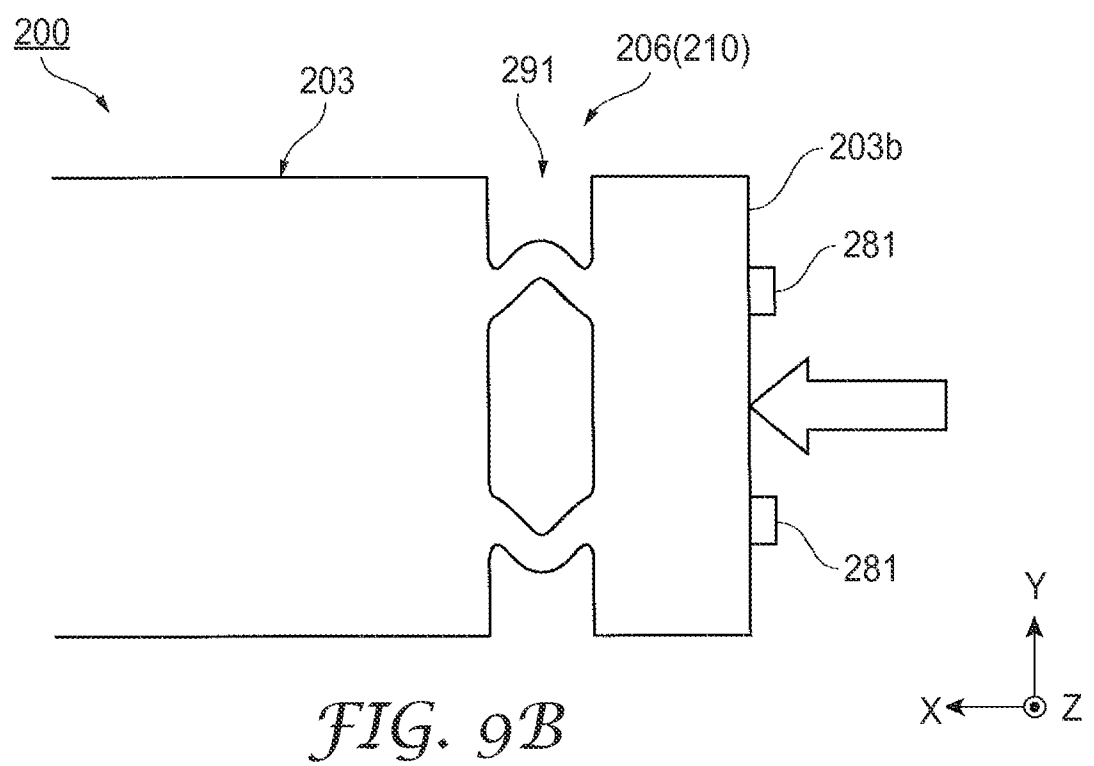
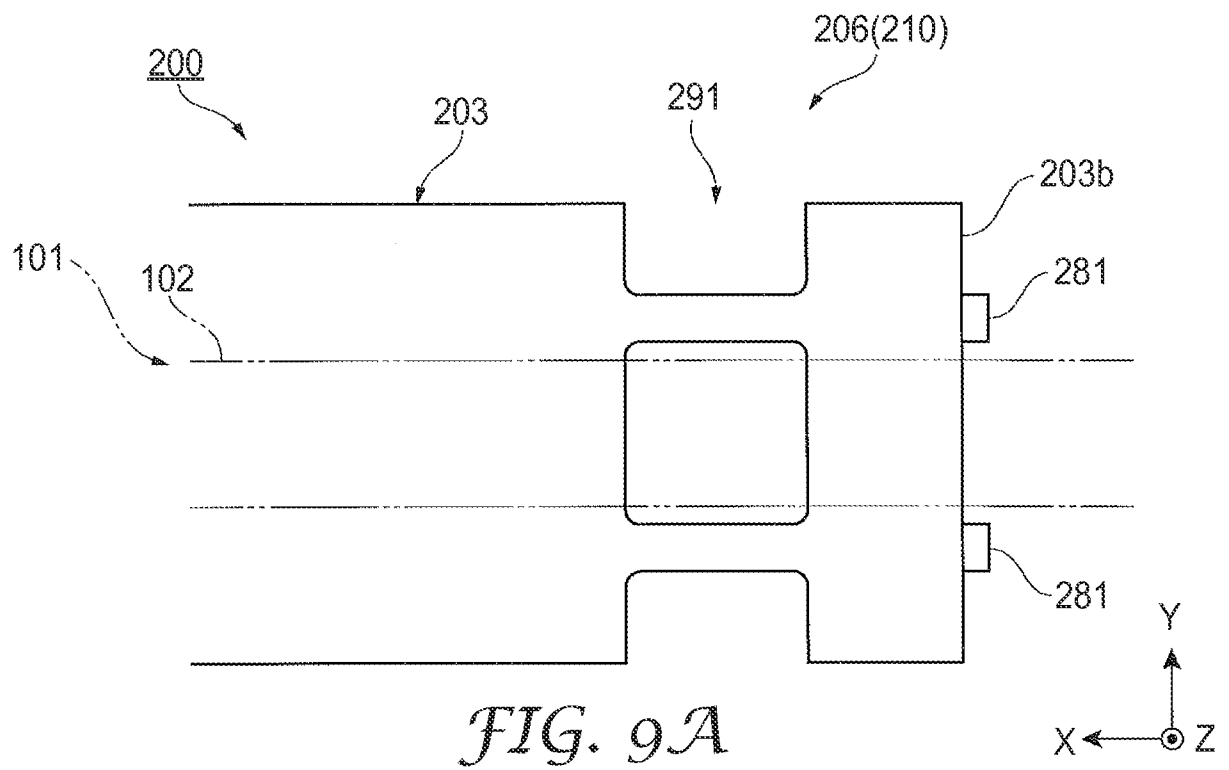
FIG. 4

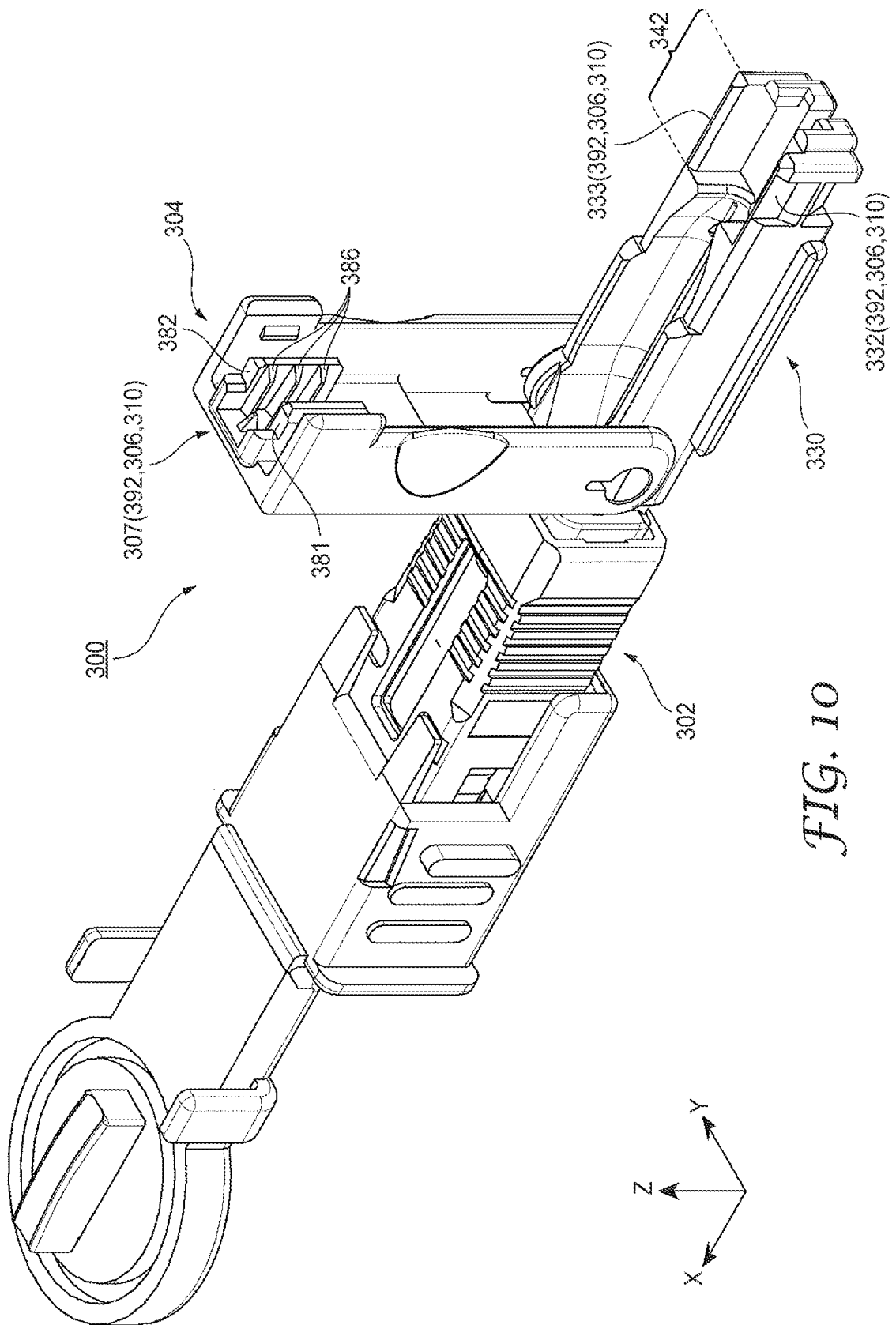


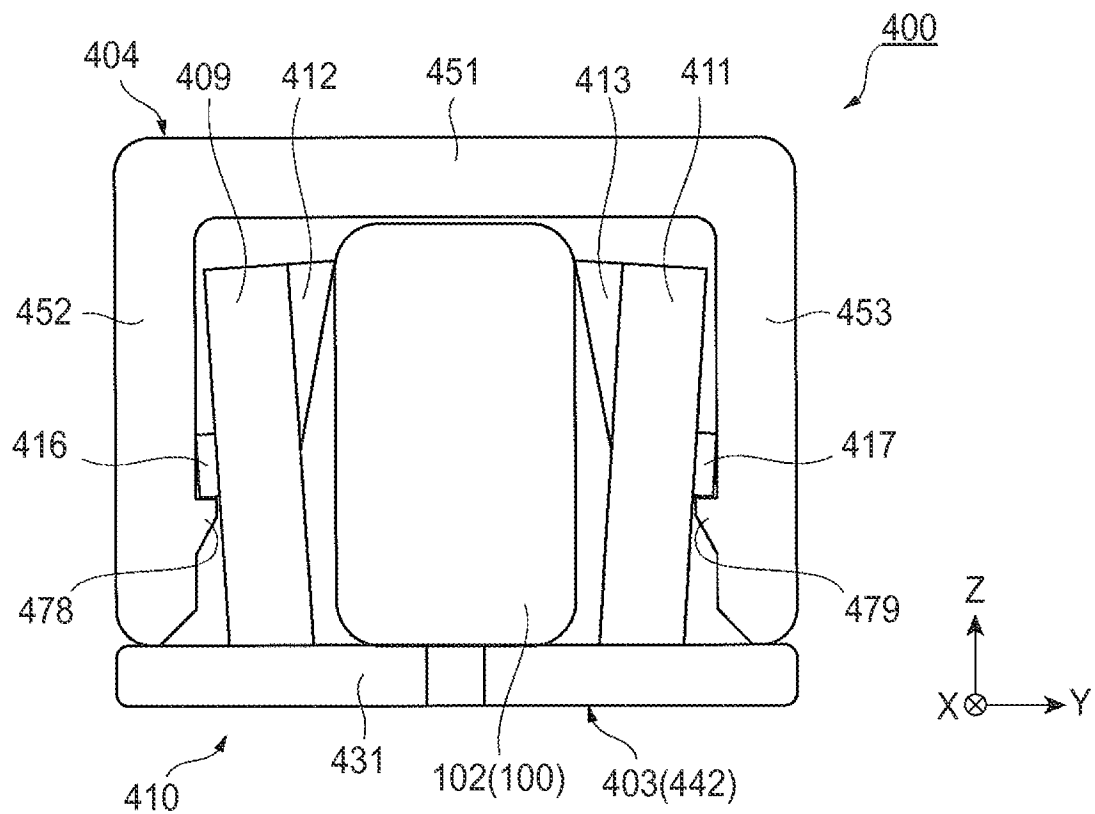
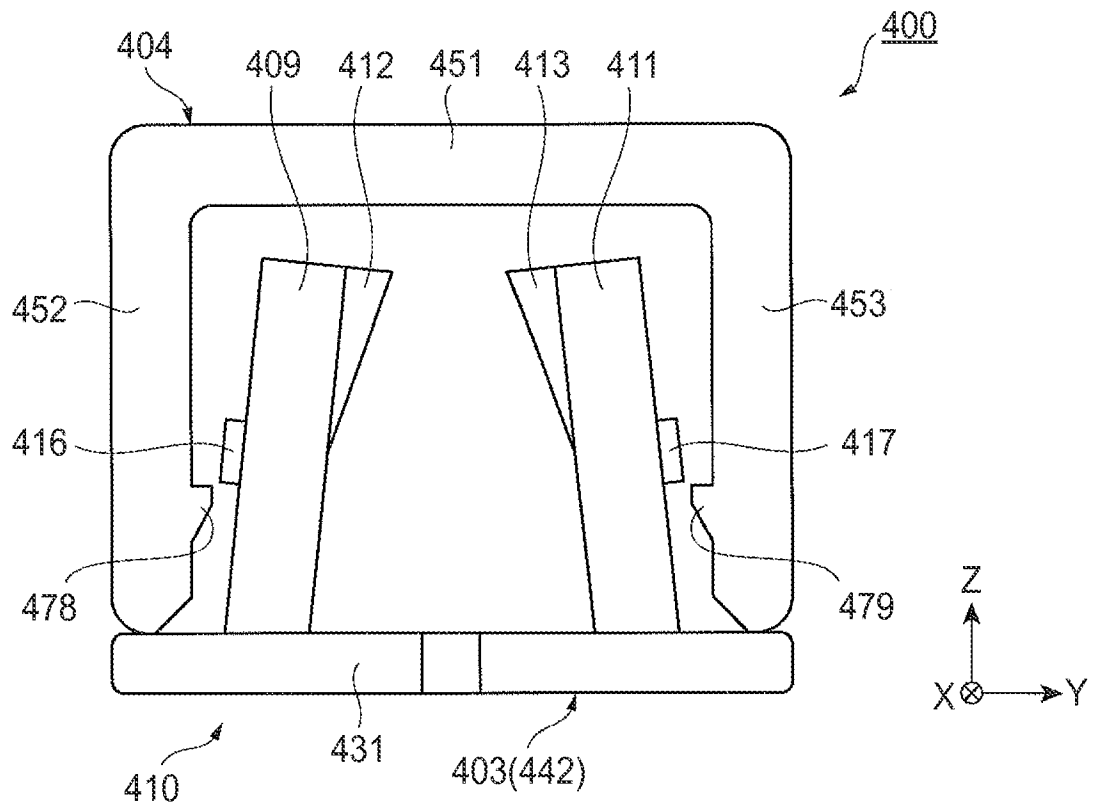












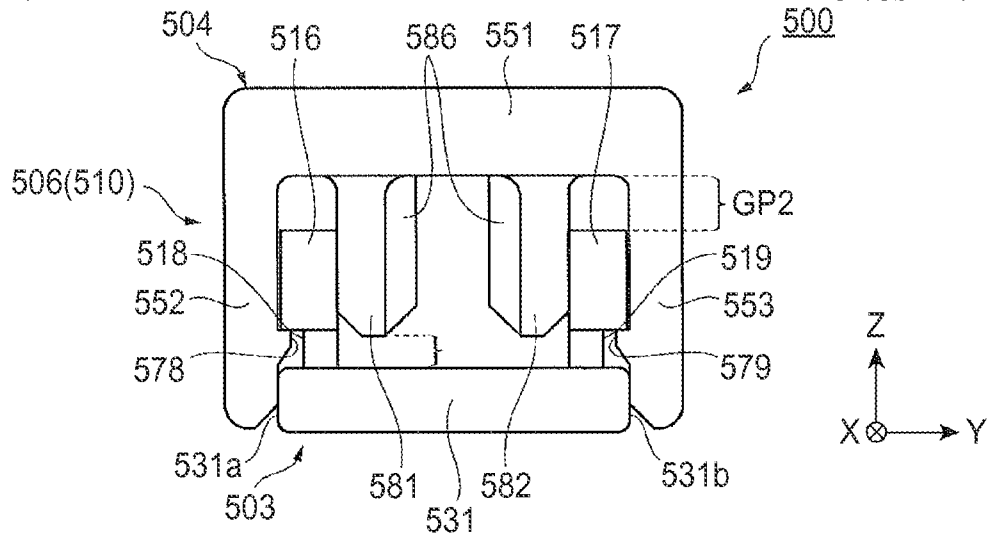


FIG. 12A

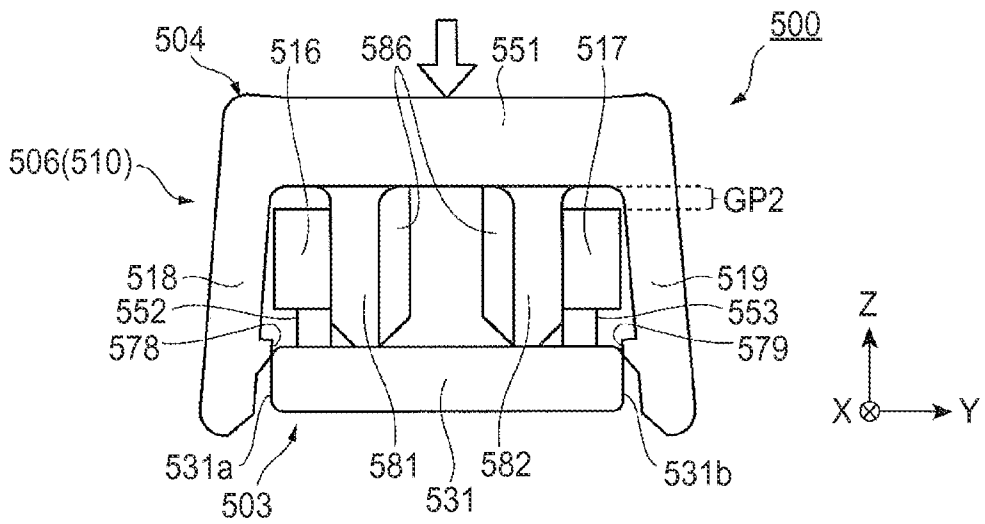


FIG. 12B

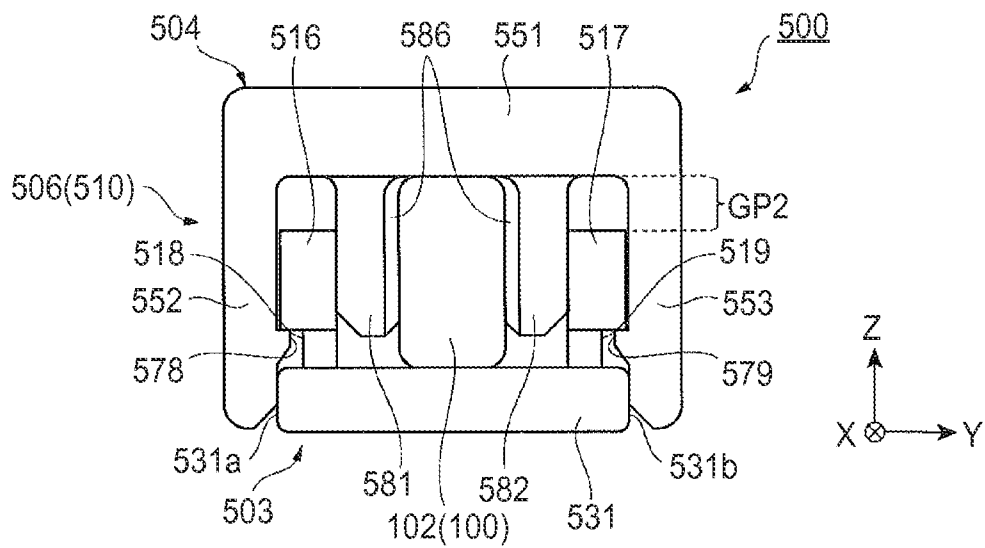
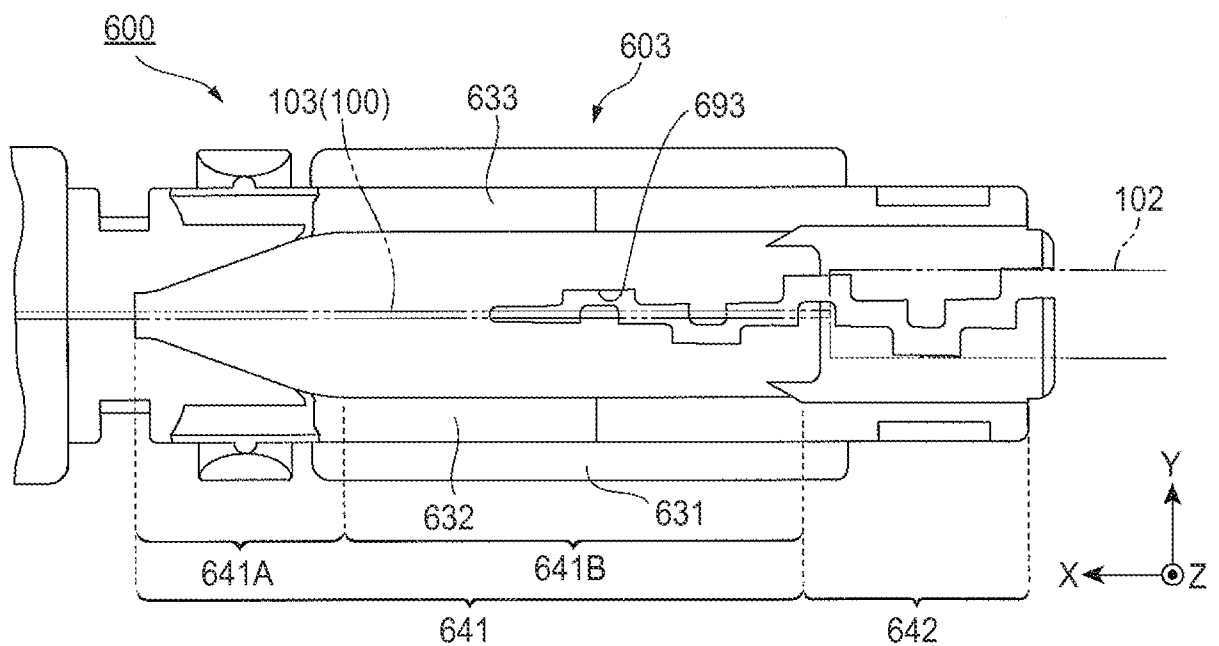
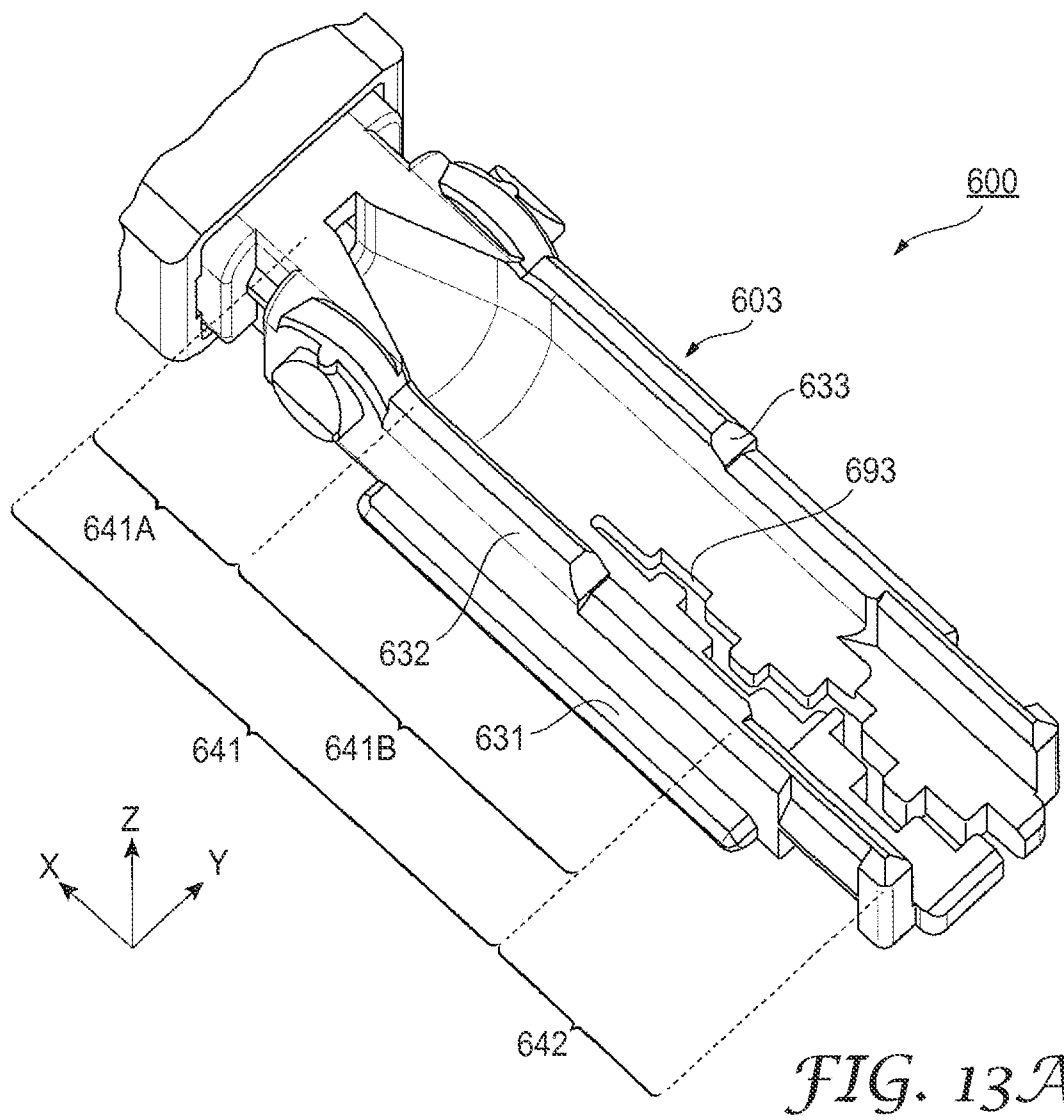


FIG. 12C



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/053325**A. CLASSIFICATION OF SUBJECT MATTER****G02B 6/36(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)

G02B 6/36; G02B 6/255; G02B 6/38; H01R 17/04

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords:connector, cover, openable structure, installation

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013-059959 A1 (CORNING CABLE SYSTEMS (SHANGHAI) CO., LTD.) 02 May 2013 See abstract, pages 6, 10 and figures 2-3B, 8A-8C.	1-9
A	US 2007-0211997 A1 (SAITO et al.) 13 September 2007 See abstract, paragraph [0051] and figures 12A-12B.	1-9
A	US 2011-0044588 A1 (LARSON et al.) 24 February 2011 See abstract, paragraph [0044] and figures 3-5.	1-9
A	US 2009-0148109 A1 (TAKAHASHI et al.) 11 June 2009 See abstract, paragraphs [0245]-[0250] and figures 20-28.	1-9
A	JP 03-145079 A (DAIICHI DENSHI KOGYO K.K. et al.) 20 June 1991 See abstract, claim 1 and figure 1.	1-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

08 December 2014 (08.12.2014)

Date of mailing of the international search report

08 December 2014 (08.12.2014)

Name and mailing address of the ISA/KR

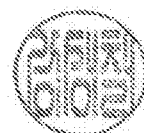
International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

KANG, Sung Chul

Telephone No. +82-42-481-8405



INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2014/053325**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 11
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claim 11 has been drafted as dependent claim on multiple dependent claim. Lack of clarity of the claim as a whole arises, since the dependent claim makes it difficult to determine the matter for which protection is sought.
3. ☒ Claims Nos.: 10
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/053325

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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