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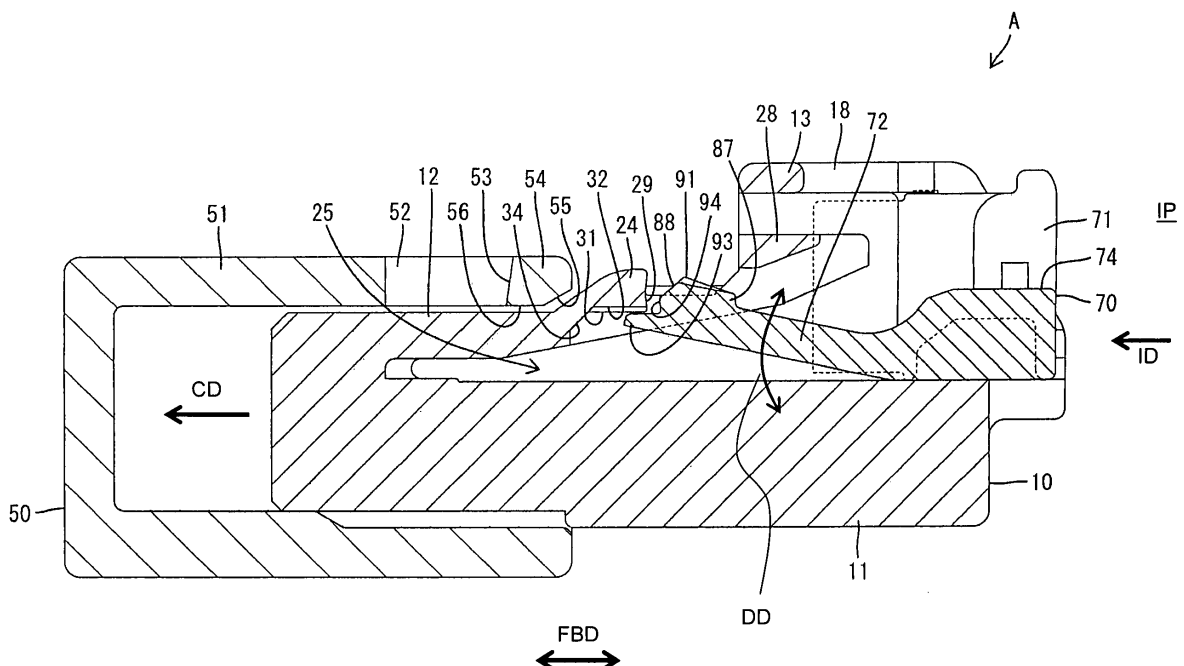
(54) **Connector, connector assembly and assembling method therefor**

(57) An object of the present invention is to improve locking reliability.

A lock arm 12 extends backward in a cantilever manner from a front end part of a housing main body 11. The lock arm 12 includes an accommodating recess 31 which

is open toward a deformation space 25 therefor and toward the back. When the housing main body 11 is properly connected to a mating housing 50 and a detecting member 70 is pushed from a standby position to a detection position, a part of the detecting member 70 is inserted into the accommodating recess 31.

FIG. 11



Description

[0001] The present invention relates to a connector, to a connector assembly and an assembling method therefor.

[0002] A connector disclosed in Japanese Unexamined Patent Publication No. 2004-103551 includes a mating housing with a lock receiving portion, a housing main body connectable to the mating housing, a lock arm extending backward in a cantilever manner from a front end part of the housing main body and configured to hold the housing main body and the mating housing in a connected state by being resiliently engaged with the lock receiving portion, and a detecting member to be mounted on the housing main body movably from an initial position to a detection position via a standby position and configured to detect whether or not the mating housing has been properly connected to the housing main body based on whether or not the detecting member can be moved from the standby position to the detection position.

[0003] A locking portion is formed to project on a leading end part of the detecting member. An engaging portion is formed on a rear end part of the lock arm. Further, the lock arm is formed with a through hole extending from a front end part connected to the housing main body to the engaging portion and penetrating in a height direction. When the detecting member reaches the detection position, the locking portion is resiliently fitted into the through hole and arranged to be engageable with the engaging portion from front.

[0004] The through hole is forced to make an opening on the front end part of the lock arm as a mold is pulled forward in molding the engaging portion. However, since the front end part of the lock arm constitutes a supporting point portion of resilient deformation, a resilient force of the lock arm is reduced if the through hole is open. Thus, with the configuration as described above, the lock arm tends to lack reliability in terms of strength.

[0005] The present invention was completed in view of the above situation and an object thereof is to improve locking reliability.

[0006] This object is solved according to the invention by the features of the independent claims. Particular embodiments of the invention are subject of the dependent claims.

[0007] According to one aspect of the invention, there is provided a connector, comprising: a housing main body to be connected to a mating housing; a lock arm projecting from the housing main body, resiliently deformable in a deforming direction intersecting with a connecting direction of the housing main body with the mating housing, forming a deformation space between the lock arm and the housing main body, configured to hold the housing main body connected to the mating housing in a connected state by being resiliently engaged with a lock receiving portion of the mating housing, and including an accommodating recess which is open toward the deformation space and/or toward the back; and a detecting

member to be mounted on or to the housing main body movably from an initial position to a detection position via a standby position and configured such that (i) a movement in a movement direction is restricted at the initial position by the contact thereof with the lock arm along the movement direction before the housing main body is connected to the mating housing, (ii) a movement restricted state at the initial position is released and the detecting member is kept at the standby position to substantially face the accommodating recess along the movement direction when the housing main body is properly connected to the mating housing, and (iii) the detecting member reaches the detection position by a displacement operation in the movement direction from the standby position, whereby at least one part of the detecting member is inserted into the accommodating recess.

[0008] Since the part of the detecting member is accommodated into the accommodating recess of the lock arm when the detecting member reaches the detection position, the lock arm and the detecting member are arranged at positions overlapping in the deforming direction (particularly the height direction) and the corresponding dimension (particularly height) of the connector can be reduced. In this case, the accommodating recess is open toward the deformation space for the lock arm and/or toward the back and particularly not open on a front end part connected to the housing main body. Thus, a reduction in the strength of the lock arm is avoided. As a result, locking reliability by the lock arm is improved so as to improve overall operability.

[0009] According to a particular embodiment of the invention, the lock arm extends backward in a cantilever manner from a front end part of the housing main body.

[0010] Particularly, the lock arm is formed with a lock projection to be at least partly fitted into the lock receiving portion at the time of proper connection.

[0011] Further particularly, the lock projection projects in the deforming direction toward a side opposite to the deformation space on the lock arm; and/or wherein the accommodating recess is open on the rear surface of the lock projection.

[0012] Further particularly, a protrusion to be at least partly inserted into the accommodating recess at the detection position is formed to project in the deforming direction on or near a distal end part of the detecting member and/or arranged at a position at least partly overlapping with the lock projection in the deforming direction at the standby position.

[0013] Further particularly, an inclined guide surface is formed on the front surface of the protrusion at a position to substantially face an opening edge of the accommodating recess on the rear surface of the lock projection in forward and backward directions at the standby position and/or comes into sliding contact with the opening edge of the accommodating recess in the process of reaching the detection position from the standby position, thereby guiding the insertion of the protrusion into the accommodating recess.

[0014] Further particularly, an auxiliary protrusion is formed to project in the deforming direction on a part of a projecting end of the protrusion.

[0015] Further particularly, an auxiliary guide surface continuous with the guide surface is formed on the front surface of the auxiliary protrusion; and/or a part of the inner surface of the accommodating recess is recessed to form an auxiliary recess into which the auxiliary protrusion is to be at least partly fitted at the detection position.

[0016] Further particularly, a narrow auxiliary protrusion is formed to project in the deforming direction on the protrusion; and a part of the inner surface of the accommodating recess is recessed to form an auxiliary recess into which the auxiliary protrusion is to be fitted at the detection position.

[0017] Further particularly, an area of the front surface of the protrusion corresponding to the auxiliary protrusion in a width direction is a steeply inclined surface inclined with respect to forward and backward directions and/or continuous and flush with the front surface of the auxiliary protrusion; and an area of the front surface of the protrusion not corresponding to the auxiliary protrusion in the width direction is a moderately inclined surface having a smaller angle of inclination with respect to forward and backward directions than the steeply inclined surface and receded more than the steeply inclined surface.

[0018] Further particularly, the moderately inclined surface comes into sliding contact with the opening edge of the accommodating recess in the process of moving the detecting member from the standby position to the detection position, thereby guiding the insertion of the protrusion into the accommodating recess.

[0019] Further particularly, the accommodating recess is obliquely cut to form at least one escaping portion in order to avoid an interference of the auxiliary protrusion with the lock projection during the process of moving the detecting member from the standby position to the detection position.

[0020] Further particularly, the detecting member is configured such that (i) the insertion movement is restricted at the initial position by the contact of a resilient arm portion of the detecting member with the lock arm before the housing main body is connected to the mating housing; (ii) the movement restricted state at the initial position is released and the detecting member is capable of reaching the detection position where the resilient arm portion at least partly enters the deformation space by being displaced from the initial position when the housing main body is properly connected to the mating housing; and/or (iii) the resilient arm portion is held in contact with the lock arm in the deforming direction at the initial position to apply a pre-load to the lock arm.

[0021] According to another aspect of the invention, there is provided a connector assembly comprising: a connector according to the above aspect of the invention or a particular embodiment thereof, having a housing; and a mating connector having a mating housing con-

nectable with the housing, the mating housing having a lock receiving portion engageable with the lock arm to lock the housings in the connected state.

[0022] According to a further particular embodiment of the invention, there is provided a connector assembly, comprising a mating housing including a lock receiving portion; a housing main body connectable to the mating housing; a lock arm extending backward in a cantilever manner from a front end part of the housing main body, resiliently deformable in a height direction intersecting with a connecting direction of the housing main body and the mating housing, forming a deformation space between the lock arm and the housing main body, configured to hold the housing main body and the mating housing in a connected state by being resiliently engaged with the lock receiving portion, and including an accommodating recess which is open toward the deformation space and toward the back; and a detecting member to be mounted on the housing main body movably from an initial position to a detection position via a standby position and configured such that a forward movement is restricted at the initial position by the contact thereof with the lock arm from behind before the housing main body is connected to the mating housing, a movement restricted state at the initial position is released and the detecting member is kept at the standby position to face the accommodating recess from behind when the housing main body is properly connected to the mating housing, and the detecting member reaches the detection position by a forward pushing operation from the standby position, whereby a part of the detecting member is inserted into the accommodating recess.

[0023] Since the part of the detecting member is accommodated into the accommodating recess of the lock arm when the detecting member reaches the detection position, the lock arm and the detecting member are arranged at positions overlapping in the height direction and the height of the connector can be reduced. In this case, the accommodating recess is open toward the deformation space for the lock arm and toward the back and not open on a front end part connected to the housing main body. Thus, a reduction in the strength of the lock arm is avoided. As a result, locking reliability by the lock arm is improved.

[0024] In the connector according to a particular embodiment of the present invention, the lock arm may be formed with at least one lock projection to be at least partly fitted or inserted into the at least one lock receiving portion at the time of proper connection, the lock projection may project in the height direction or the deforming direction toward a side substantially opposite to the deformation space on the lock arm, and the at least one accommodating recess may be open on the rear surface of the lock projection.

[0025] According to this particular configuration, since the lock projection is formed to project in the height direction or the deforming direction on the lock arm and the accommodating recess is open on the rear surface

of the lock projection, a large opening area of the accommodating recess can be ensured in the height direction or the deforming direction within the height range or corresponding dimension of the lock projection.

[0026] In the connector according to a particular embodiment of the present invention, at least one protrusion to be at least partly inserted or fitted into the at least one accommodating recess at the detection position may be formed to project in the height direction or the deforming direction on or near a front end part of the detecting member and/or arranged at a position overlapping with the lock projection in the height direction or the deforming direction at the standby position.

[0027] According to this particular configuration, since the protrusion and the lock projection are arranged at the positions overlapping in the height direction or the deforming direction at the standby position, the height of the connector can be further reduced.

[0028] In the connector according to a particular embodiment of the present invention, an inclined guide surface may be formed on or near the front surface of the protrusion at a position to substantially face an opening edge of the accommodating recess on the rear surface of the lock projection in forward and backward directions at the standby position and substantially come into sliding contact with the opening edge of the accommodating recess in the process of reaching the detection position from the standby position, thereby guiding the insertion of the protrusion into the accommodating recess.

[0029] According to this particular configuration, since the insertion of the protrusion into the accommodating recess is guided by the sliding contact of the guide surface of the protrusion with the opening edge of the accommodating recess in the process of moving the detecting member from the standby position to the detection position, stability in the moving operation of the detecting member is ensured.

[0030] In the connector according to a particular embodiment of the present invention, an auxiliary protrusion may be formed to project in the height direction on a part of a projecting end of the protrusion, an auxiliary guide surface continuous with the guide surface may be formed on or near the front surface of the auxiliary protrusion, and a part of the inner surface of the accommodating recess may be recessed to form an auxiliary recess into which the auxiliary protrusion is to be at least partly fitted or inserted at the detection position.

[0031] According to this particular configuration, since the auxiliary protrusion is formed to project in the height direction or the deforming direction on the part of the projecting end of the protrusion and the auxiliary guide surface substantially continuous with the guide surface is formed on the front surface of the auxiliary protrusion, a large guide area can be ensured in the height direction or the deforming direction and dimensions can be easily managed in positioning the protrusion to face the opening edge of the accommodating recess at the standby position. Further, the auxiliary protrusion is at least partly in-

serted or insertable into the accommodating recess in addition to the protrusion and the depth of the accommodating recess is increased by as much as the height or dimension along the deforming direction of the auxiliary protrusion, wherefore the strength of the lock arm may be reduced. However, according to the above, only the part of the inner surface of the accommodating recess is or may be recessed to form the auxiliary recess into which the auxiliary protrusion is to be at least partly fitted at the detection position. Therefore, a reduction in the strength of the lock arm can be reduced or suppressed without increasing the depth of the entire accommodating recess.

[0032] In the connector according to a particular embodiment of the present invention, a narrow auxiliary protrusion may be formed to project in the height direction or the deforming direction on the protrusion, a part of the inner surface of the accommodating recess may be recessed to form an auxiliary recess into which the auxiliary protrusion at least partly is fittable or insertable or is to be fitted at the detection position, an area of the front surface of the protrusion corresponding to the auxiliary protrusion in a width direction may be a steeply inclined surface inclined with respect to forward and backward directions and/or continuous and flush with the front surface of the auxiliary protrusion, an area of the front surface of the protrusion not corresponding to the auxiliary protrusion in the width direction may be a moderately inclined surface having a smaller angle of inclination with respect to forward and backward directions than the steeply inclined surface and receded more than the steeply inclined surface, and the moderately inclined surface may come into sliding contact with the opening edge of the accommodating recess in the process of moving the detecting member from the standby position toward or to the detection position, thereby guiding the insertion of the protrusion into the accommodating recess.

[0033] According to this configuration, since the protrusion and the auxiliary protrusion particularly are arranged at positions overlapping in the height direction with respect to the lock projection in a state where the detecting member is at the standby position, the height of the connector can be sufficiently reduced. Further, in the process of moving the detecting member from the standby position to the detection position, the moderately inclined surface comes into sliding contact with the opening edge of the accommodating recess, whereby the protrusion and the auxiliary protrusion are guided and inserted into the accommodating recess.

[0034] The moderately inclined surface may be formed by making the angle of inclination smaller to make the entire area of the front surface of the protrusion and that of the front surface of the auxiliary protrusion flat. However, if the moderately inclined surface is formed in this way, it means a reduction in the height of the upper end of the auxiliary protrusion. Thus, an overlap margin between the auxiliary protrusion and the lock projection in the height direction or the deforming direction is reduced and the height of the connector cannot be sufficiently

reduced. However, in the present invention, the moderately inclined surface is formed only in the area of the front surface of the protrusion not corresponding to the auxiliary protrusion in the width direction. Thus, even if the moderately inclined surface is formed, the height of the upper end of the auxiliary protrusion is unchanged and the overlap margin between the auxiliary protrusion and the lock projection in the height direction is not reduced. Therefore, there is no problem in reducing the height of the connector.

[0035] According to another aspect of the invention, there is provided a method of assembling a connector assembly, in particular according to the above aspect of the invention or a particular embodiment thereof, comprising the following steps: providing a connector having a housing main body and a lock arm projecting from the housing main body and being resiliently deformable in a deforming direction intersecting with a connecting direction of the housing main body with the mating housing, forming a deformation space between the lock arm and the housing main body; providing a mating connector having a mating housing; matingly connecting the housing main body with the mating housing thereby resiliently engaging the lock arm with a lock receiving portion of the mating housing to hold the housing main body and the mating housing in a connected state, wherein lock arm includes an accommodating recess which is open toward the deformation space and/or toward the back; and mounting a detecting member on or to the housing main body movably and configured such that (i) a movement in a movement direction is restricted at the initial position by the contact thereof with the lock arm along the movement direction before the housing main body is connected to the mating housing, (ii) a movement restricted state at the initial position is released and the detecting member is kept at the standby position to substantially face the accommodating recess along the movement direction when the housing main body is properly connected to the mating housing, and (iii) the detecting member reaches the detection position by a displacement operation in the movement direction from the standby position, whereby at least one part of the detecting member is inserted into the accommodating recess.

[0036] These and other objects, features and advantages of the present invention will become more apparent upon reading of the following detailed description of preferred embodiments and accompanying drawings. It should be understood that even though embodiments are separately described, single features thereof may be combined to additional embodiments.

FIG. 1 is a plan view of a housing, on which a detecting member is mounted at an initial position, in a connector according to one embodiment of the present invention,
 FIG. 2 is a rear view of the housing on which the detecting member is mounted at the initial position,
 FIG. 3 is a plan view of the housing,

FIG. 4 is a side view of the housing,
 FIG. 5 is a front view of the housing,
 FIG. 6 is a rear view of the housing,
 FIG. 7 is a plan view of the detecting member,
 FIG. 8 is a side view of the detecting member,
 FIG. 9 is a front view of the detecting member,
 FIG. 10 is a bottom view of the detecting member,
 FIG. 11 is a section showing a state where the detecting member is mounted at the initial position and a housing main body is lightly connected to a mating housing,
 FIG. 12 is a section showing a state where the housing main body is further connected and a lock projection is pressed by a pressing surface of an interfering portion to resiliently deform a lock arm to a large extent,
 FIG. 13 is a section showing a state where the housing main body is properly connected to the mating housing, the lock arm is engaged with a lock receiving portion and the detecting member is kept at a standby position,
 FIG. 14 is a section showing a state where a guide surface of the lock projection is held in sliding contact with an upper end opening edge of an accommodating recess in the process of moving the detecting member toward a detection position,
 FIG. 15 is a section showing a state where the detecting member is located at the detection position and a protrusion is accommodated in the accommodating recess,
 FIG. 16 is a section of an essential part showing a state where the detecting member is retained in the housing main body at the initial position,
 FIG. 17 is a section of an essential part showing a state where a movement of the detecting member to the detection position is prevented at the initial position,
 FIG. 18 is a section of an essential part showing a state where a return movement of the detecting member to the initial position is prevented at the standby position,
 FIG. 19 is a side view with an essential part in section showing a state before the detecting member is mounted on the housing main body, and
 FIG. 20 is a side view with an essential part in section showing a state where the detecting member is mounted on the housing main body and the shake of a main portion is suppressed by first and second shake preventing portions.
 FIG. 21 is a section of the housing main body showing a state where the detecting member is mounted at the initial position, in a connector according to the second embodiment of the present invention,
 FIG. 22 is a section showing a state where a guide surface of the lock projection is held in sliding contact with an upper end opening edge of an accommodating recess in the process of moving the detecting member toward a detection position,

FIG. 23 is a partial enlarged view of FIG. 22, FIG. 24 is a side view of the detecting member, FIG. 25 is a front view of the detecting member, FIG. 26 is a plan view of the detecting member, FIG. 27 is a partial enlarged view of FIG. 24, FIG. 28 is a partial enlarged section, showing a state where a guide surface of the lock projection is held in sliding contact with an upper end opening edge of an accommodating recess in the process of moving the detecting member toward a detection position, in a connector according to the third embodiment of the present invention.

<First Embodiment>

[0037] One particular embodiment of the present invention is described with reference to FIGS. 1 to 20. A connector A according to this embodiment includes a housing 10 and a mating housing 50 connectable to each other, and a detecting member 70 to be mounted on or in the housing 10. Note that, in the following description, sides of the two housings 10, 50 to be connected are referred to as front sides concerning forward and backward directions FBD.

[0038] The mating housing 50 is made e.g. of synthetic resin and includes a (particularly substantially tubular) receptacle 51 which is open forward as shown in FIG. 11. A lock receiving portion 52 is formed in or on (particularly a front end part of the outer or upper wall of) the receptacle 51. The lock receiving portion 52 particularly penetrates through the receptacle 51 (particularly the upper wall) in a height direction HD (direction intersecting with a connecting direction CD of the two housings 10, 50). The inner front surface of the lock receiving portion 52 serves as an engaging surface 53 which is a reverse tapered surface inclined slightly forward toward an upper or outer side. Further, an interfering portion 54 is formed at a position adjacent (particularly immediately before) the lock receiving portion 52 at (particularly the front end part of the outer or upper wall of) the receptacle 51. An inclined surface 55 which is a tapered surface inclined forward toward an upper or outer side is formed at (particularly a lower or inner end part of the front surface of) the interfering portion 54. Further, the lower or inner surface of the interfering portion 54 is arranged substantially horizontally (parallel to the connecting direction CD) from the inclined surface 55 to the lock receiving portion 52 and serves as a pressing surface 56 capable of pressing a protrusion 87 of the detecting member 70 (to be described later) and a lock projection 24 of a lock arm 12 from above or outside.

[0039] The housing 10 is made e.g. of synthetic resin and includes a (particularly substantially block-shaped) housing main body 11 and a resiliently deformable and (particularly substantially cantilever-shaped) lock arm 12 integrally or unitarily coupled to (particularly the upper surface of) the housing main body 11 as shown in FIGS. 3 and 4. One or more unillustrated terminal fittings are

at least partly insertable into the housing main body 11.

[0040] A (particularly substantially arch-shaped or bent or gate-shaped) protection wall 13 at least partly surrounding a rear end part (disengaging portion 28 to be described later) of the lock arm 12 is formed on the upper or outer surface of (particularly a rear end part of) the housing main body 11 as shown in FIGS. 5 and 6. The protection wall 13 particularly is composed of or comprises a pair of outer side walls 14 standing up or projecting from substantially opposite widthwise end parts of the upper surface of the housing main body 11, a pair of inner side walls 15 located at inner sides of the both outer side walls 14 and standing up or projecting from the upper surface of the housing main body 11, and a covering wall 16 connected to (particularly the upper or distal ends of) the both inner side walls 15 and/or the both outer side walls 14 and particularly substantially extending over the entire width of the housing main body 11. As shown in FIG. 19, an inner space of the protection wall 13 serves as a mount space 17 into which the detecting member 70 is to be at least partly inserted in an insertion direction ID (particularly parallel to the connecting direction CD), particularly substantially from behind.

[0041] As shown in FIG. 3, the covering wall 16 particularly is formed with at least one cut portion 18 which is open on the rear end of the covering wall 16. The disengaging portion 28 of the lock arm 12 particularly can be at least partly seen through the cut portion 18. Further, the rear ends of the inner side walls 15 particularly are located before the rear ends of the outer side walls 14 by being at least partly partitioned by the cut portion 18.

[0042] As shown in FIGS. 5 and 19, one or more, particularly a pair of guide grooves 19 are formed on (particularly the inner surface(s) of lower end part(s) of) the (particularly both) outer side wall(s) 14. The (both) guide groove(s) 19 particularly has/have a rectangular cross section, substantially extend in forward and backward directions FBD and/or is/are open on both front and rear ends of the (both) outer side wall(s) 14. One or more, particularly a pair of first retaining portions 21 are formed to project inward on the inner surfaces of (particularly lower parts of the rear ends of) the (particularly both) guide groove(s) 19. As shown in FIG. 16, the rear surface(s) of the first retaining portion(s) 21 particularly is/are tapered surface(s) inclined inwardly toward the front and the front surface(s) thereof extend substantially in a width direction WD (a direction at an angle different from 0° or 180°, preferably substantially perpendicular to the forward and backward directions FBD and/or the inserting direction ID and/or the connecting direction CD).

[0043] One or more, particularly a pair of second retaining portions 22 are formed to project outward on the outer surface(s) of (particularly rear end part(s) of) the (particularly both) inner side wall(s) 15. As shown in FIGS. 5 and 6, the (both) second retaining portion(s) 22 particularly substantially is/are in the form of long and narrow ribs substantially extending upward or outward (particularly in a height direction HD or a direction at an

angle different from 0° or 180°, preferably substantially perpendicular to the forward and backward directions FBD and/or the inserting direction ID and/or the connecting direction CD and/or the width direction WD) from the outer or upper surface of the housing main body 11. As shown in FIG. 16, the rear surface(s) of the second retaining portion(s) 22 particularly is/are tapered surface(s) inclined outwardly toward the front and/or the front surface(s) thereof particularly is/are reverse tapered surface(s) inclined slightly forwardly toward an outer side.

[0044] As shown in FIG. 17, one or more, particularly a pair of restricting portions 23 are formed to project outward on (particularly the outer surface(s) of front end part (s) of) the (particularly both) inner side wall(s) 15. As shown in FIGS. 5 and 6, the (both) restricting portion(s) 23 particularly is/are in the form of long and narrow ribs substantially extending downward or inward in the height direction HD from the lower or inner surface of the covering wall 16. The restricting portion(s) 23 particularly has/have a shorter projecting distance than the second retaining portion(s) 22 and/or a longer extending length than the second retaining portion(s) 22 and/or particularly is/are substantially arranged above or corresponding to the second retaining portion(s) 22. As shown in FIG. 17, the rear surface(s) of the restricting portion(s) 23 particularly is/are tapered surface(s) inclined outwardly toward the front and/or the front surface(s) thereof is/are tapered surface(s) inclined inwardly toward the front.

[0045] As shown in FIG. 4, the lock arm 12 substantially extends backward or along the connecting direction CD from (particularly the upper or outer surface of a front end part of) the housing main body 11. The lock projection 24 is formed to project in the height direction HD in an intermediate part (particularly in a substantially central part) of the lock arm 12 in forward and backward directions FBD. A deformation space 25 is formed between the lower or inner surface of the lock arm 12 and the upper or outer surface of the housing main body 11.

[0046] As shown in FIG. 3, the lock arm 12 particularly includes a base end portion 26 (particularly substantially in the form of a rectangular plate) before the lock projection 24. As shown in FIG. 4, a front end side of the base end portion 26 is coupled to the upper surface of the housing main body 11 and serves as a supporting point of resilient deformation of the lock arm 12. Further, as shown in FIGS. 3 and 4, the lock arm 12 includes one or more, particularly a pair of coupling portions 27 substantially extending backward from (particularly both sides of) the lock projection 24 and the disengaging portion 28 coupled to the rear end(s) of the (both) coupling portion(s) 27, substantially extending in the width direction WD and arranged to be slightly higher. The rear surface of the lock projection 24 serves as a locking surface 29 substantially facing backward, wherein an upper or outer side facing the engaging surface 53 of the lock receiving portion 52 particularly is slightly reversely tapered and/or a lower or inner side facing a movement restricting surface 94 (to be described later) of the detecting member 70

particularly is slightly tapered as shown in FIG. 11.

[0047] When the two housings 10, 50 are properly connected as shown in FIG. 13, the lock projection 24 at least partly is resiliently fitted into the lock receiving portion 52 from below or inside and the locking surface 29 is arranged to be able to come into contact with the engaging surface 53, whereby the two housings 10, 50 are held in a connected state CS. On the other hand, the lock arm 12 is resiliently deformed to at least partly enter the deformation space 25 by pressing the disengaging portion 28 from above or outside with the two housings 10, 50 properly connected. In this way, the lock projection 24 exits from the lock receiving portion 52 and the two housings 10, 50 can be separated or pulled apart.

[0048] Further, as shown in FIG. 11, an accommodating recess 31 is so formed on the lower surface of the lock arm 12 to be open backward. The accommodating recess 31 is so dimensioned and/or shaped that the protrusion 87 of the detecting member 70 at least partly is fittable thereto, and is open on the lower or inner surface (facing toward the deformation space 25) of the lock arm 12 and/or the rear surface of the lock projection 24. The inner upper surface of the accommodating recess 31 particularly is located higher than the upper surface of the base end portion 26 of the lock arm 12. Further, the inner upper surface of the accommodating recess 31 particularly is partly recessed to form an auxiliary recess 32. As shown in FIG. 6, the auxiliary recess 32 is arranged in a widthwise intermediate part (particularly in a widthwise central part) of the inner upper surface of the accommodating recess 31 and has a width which particularly is less than about half (particularly which is about 1/3) of the entire width of the accommodating recess 31. A depth of the auxiliary recess 32 is set to be sufficiently smaller than that of the accommodating recess 31.

[0049] Next, the detecting member 70 is described. The detecting member 70 is likewise made e.g. of synthetic resin and includes a main portion 71 and a resilient arm portion 72 integrally or unitarily coupled to (particularly the front end of) the main portion 71 as shown in FIGS. 7 and 8. The detecting member 70 is to be mounted on or in the housing main body 11 movably from an initial position IP to a detection position DP via a standby position SP.

[0050] As shown in FIGS. 2 and 9, the main portion 71 includes a rear portion 73 substantially extending in the width direction WD and/or the height direction HD. The rear portion 73 is formed with a disengagement window 74. The disengagement window 74 particularly is a recess having a substantially angular U-shaped cross section and/or formed in a widthwise intermediate part (particularly in a substantially widthwise central part) of the upper end edge of the rear portion 73. When the detecting member 70 mounted on the housing main body 11 is viewed from behind, the disengaging portion 28 of the lock arm 12 can be at least partly seen through the disengagement window 74.

[0051] Further, the rear portion 73 includes one or

more, particularly a pair of vertical portions 75 substantially extending in the height direction HD at opposite widthwise end parts and/or a horizontal portion 76 particularly coupled to rear end parts of the both vertical portions 75 and/or substantially extending in the width direction WD. The disengagement window 74 is partitioned by the both vertical portions 75 and the horizontal portion 76. The rear surfaces of the both vertical portions 75 and the horizontal portion 76 are arranged substantially along the height direction HD and can be pressed or operated (particularly in the inserting direction ID or from behind) during a movement to the detection position DP. A pair of catching portions 77 are formed to project on the upper ends of the both vertical portions 75. The both catching portions 77 are or can be caught by fingers or a jig and a displacement force (particularly a backward pulling force) acts on the both catching portions 77 in that state, whereby the detecting member 70 is or can be displaced (pulled back) from the detection position DP to the initial position IP.

[0052] As shown in FIG. 8, the both vertical portions 75 particularly have a substantially rectangular side view and include one or more, particularly a pair of guide portions 78 on (particularly lower end parts of the outer surfaces of) the vertical portions 75. The guide portions 78 particularly substantially are in the form of ribs substantially extending in forward and backward directions FBD particularly over the substantially entire length of the horizontal portion 76. As shown in FIG. 10, one or more, particularly a pair of first stopping portions 79 are formed on (particularly a lower part, further particularly on substantially lower halves of) the both guide portions 78. The rear surfaces of the first stopping portions 79 substantially extend in the width direction WD. Each of the both guide portions 78 includes groove portions 81 located at both front and rear sides of the first stopping portion 79, substantially extending in forward and backward directions FBD and/or open on both front and rear ends.

[0053] As shown in FIGS. 8 and 9, one or more, particularly a pair of first shake preventing portions 82 are formed to project at one or more positions at least partly overlapping with the (particularly both) first stopping portion(s) 79 in forward and backward directions FBD on (particularly the upper surfaces of rear parts of) the (both) guide portions 78. The (both) first shake preventing portion(s) 82 particularly is/are in the form of ribs substantially extending in forward and backward directions FBD and/or substantially having a triangular or pointed cross section and/or arranged adjacent to the widthwise end part(s) of the main portion 71, particularly on lower rear sides of opposite widthwise end parts of the main portion 71.

[0054] Further, one or more, particularly a pair of second shake preventing portions 83 are formed to project on the vertical portion(s) 75, particularly substantially on the upper end surfaces of front parts of the both vertical portions 75. The second shake preventing portions 83 particularly are in the form of ribs substantially extending

in forward and backward directions FBD and/or substantially having a triangular or pointed cross section and/or particularly have a size slightly smaller than the first shake preventing portions 82. The (particularly both) second shake preventing portion(s) 83 is/are arranged adjacent to the widthwise end part(s) of the main portion 71, particularly on upper front sides of the opposite widthwise end parts of the main portion 71. In the moving process of the detecting member 70, the (both) first shake preventing portion(s) 82 is/are held in sliding contact with the inner upper surfaces of the (both) guide groove(s) 19 while being squeezed and/or the (both) second shake preventing portion(s) 83 is/are held in sliding contact with the lower surface of the covering wall 16 while being squeezed, whereby a moving posture of the detecting member 70 particularly substantially is corrected to a proper posture.

[0055] Further, as shown in FIG. 7, one or more, particularly a pair of resilient pieces 84 are formed to substantially project forward on (particularly the front ends of) the (both) vertical portion(s) 75. As shown in FIG. 8, the (both) resilient piece(s) 84 particularly is/are in the form of plate(s) having a substantially rectangular side view and/or resiliently deformable substantially in the width direction WD with the front end(s) of the vertical portion(s) 75 as supporting point(s). As shown in FIG. 9, one or more, particularly a pair of partial locking portions 85 and one or more, particularly a pair of second stopping portions 86 are formed substantially side by side in the height direction HD on (particularly front end parts of) the (both) resilient piece(s) 84.

[0056] The partial locking portion(s) 85 project(s) inward from (particularly substantially upper halves of front end parts of) the resilient piece(s) 84 and substantially extend(s) in the height direction HD. As shown in FIG. 7, the rear surface(s) of the partial locking portion(s) 85 particularly is/are tapered surface(s) inclined inwardly toward the front, and/or the front surface(s) thereof is/are tapered surface(s) inclined outwardly toward the front. As shown in FIG. 17, when the detecting member 70 is at the initial position IP, the front surface(s) of the (both) partial locking portion(s) 85 is/are held in contact with the (both) restricting portion(s) 23 from behind in a semi-locking state, whereby a movement of the detecting member 70 to the detection position DP is (particularly secondarily or additionally) prevented. Further, as shown in FIG. 18, when the detecting member 70 is at the detection position DP, the rear surface(s) of the (both) partial locking portion(s) 85 is/are in contact with the (both) restricting portion(s) 23 from front in a semi-locking state, whereby a movement of the detecting member 70 to the initial position IP is (particularly secondarily or additionally) prevented.

[0057] As shown in FIG. 9, the second stopping portion(s) 86 project(s) inward from (particularly substantially lower halves of front end parts of) the resilient piece(s) 84 and/or substantially extend in the height direction HD. As shown in FIG. 10, the second stopping portion(s) 86 particularly is/are slightly smaller than the partial locking

portion(s) 85. The rear surface(s) of the second stopping portion(s) 86 particularly is/are reverse tapered surface(s) inclined slightly backwardly toward an inner side. As shown in FIG. 16, when the detecting member 70 is at the initial position IP, the rear surface(s) of the first stopping portion(s) 79 particularly is/are held in contact with the first retaining portion(s) 21 from front and/or the rear surface(s) of the second stopping portion(s) 86 particularly is/are held in contact with the second retaining portion(s) 22 from front, thereby preventing the detecting member 70 from being detached from or displaced within the housing main body 11.

[0058] As shown in FIG. 8, the resilient arm portion 72 particularly substantially extends forward in a cantilever manner from a widthwise intermediate part (particularly a substantially widthwise central part of the front end) of the main portion 71. The resilient arm portion 72 particularly is substantially in the form of a rectangular bar and/or resiliently deformable in a deforming direction DD (e.g. the height direction HD or inner and outer directions) particularly with a rear end part connected to the front end of the main portion 71 as a supporting point. In a natural state, the resilient arm portion 72 particularly is inclined upwardly or outwardly at a substantially constant angle of inclination from the rear end to the front end of the resilient arm portion 72. On the other hand, as shown in FIGS. 11 to 13, the resilient arm portion 72 is resiliently deformed along the deforming direction DD to gradually make its angle of inclination smaller as the detecting member 70 is displaced from the initial position IP to the standby position SP. Then, as shown in FIG. 15, the resilient arm portion 72 particularly is substantially in a horizontal posture without being substantially inclined when the detecting member 70 reaches the detection position DP. Thus, the resilient arm portion 72 particularly is in a state to accumulate a resilient force at the standby position SP and the detection position DP.

[0059] As shown in FIG. 8, the protrusion 87 (particularly substantially in the form of a rectangular block) is formed to project upward or outward on or near a front or distal end part of the resilient arm portion 72. A tapered guide surface 88 inclined upwardly or outwardly toward the back is formed on an upper or outer end part of the front surface of the protrusion 87. As shown in FIG. 13, when the detecting member 70 is at the standby position SP, the guide surface 88 of the protrusion 87 particularly is arranged to face an upper or outer end opening edge 31 E of the accommodating recess 31 on the rear surface of the lock projection 24 from behind. Further, as shown in FIG. 14, in the process of moving the detecting member 70 from the standby position SP to the detection position DP, the guide surface 88 of the protrusion 87 slides on (particularly the upper or outer end opening edge 31 E of the accommodating recess 31 and, accordingly, the resilient arm portion 72 is resiliently inclined. Furthermore, as shown in FIG. 15, when the detecting member 70 reaches the detection position DP, the protrusion 87 is positioned and at least partly inserted into the accom-

modating recess 31. A tapered guided surface 34 substantially facing the guide surface 88 of the protrusion 87 at the detection position DP is formed on the inner surface of the accommodating recess 31.

[0060] Further, as shown in FIGS. 8 and 9, an auxiliary protrusion 91 particularly is formed to partly project on the upper end surface of the protrusion 87. The auxiliary protrusion 91 particularly is in the form of a rib substantially extending in forward and backward directions FBD on a widthwise intermediate part (particularly a substantially widthwise central part) of the upper end surface of the protrusion 87. A projecting distance of the auxiliary protrusion 91 is set to be sufficiently smaller than that of the protrusion 87. When the protrusion 87 at least partly is inserted into the accommodating recess 31, the auxiliary protrusion 91 at least partly is fitted and inserted into the auxiliary recess 32.

[0061] The front surface of the auxiliary protrusion 91 serves as a tapered auxiliary guide surface 92 inclined upwardly or outwardly toward the back. The auxiliary guide surface 92 is substantially flush and continuous with the guide surface 88 and/or has substantially the same angle of inclination as the guide surface 88. In the process of moving the detecting member 70 from the standby position SP to the detection position DP, the auxiliary guide surface 92 particularly comes into sliding contact with the upper or outer end opening edge 31 E of the accommodating recess 31, following the guide surface 88. Thus, the amount of resilient deformation of the resilient arm portion 72 particularly is increased by as much as the auxiliary protrusion 91. Note that an area of the upper surface of the auxiliary protrusion 91 behind the auxiliary guide surface 92 is a tapered surface inclined downwardly toward the back.

[0062] Further, a contact portion 93 is formed to project forward on a lower end part of the front end of the protrusion 87. As shown in FIG. 7, the contact portion 93 particularly substantially has a rectangular plan view. When the detecting member 70 is at the initial position IP, the upper or outer surface of the contact portion 93 is arranged substantially horizontally and/or comes into contact with the inner upper surface of the accommodating recess 31 from below. In this way, the resilient arm portion 72 is slightly resiliently deformed with a pre-load applied to the lock arm 12.

[0063] As shown in FIG. 8, a movement restricting surface 94 is formed between the guide surface 88 and the contact portion 93 on the front surface of the protrusion 87. The movement restricting surface 94 is arranged substantially along the height direction HD when the resilient arm portion 72 is in a natural state. Further, as shown in FIG. 11, when the detecting member 70 is at the initial position IP, the movement restricting surface 94 of the protrusion 87 is arranged to face the locking surface 29 of the lock projection 24 from behind.

[0064] Next, functions of the connector A according to this embodiment are described.

[0065] In mounting the detecting member 70, the de-

tecting member 70 at least partly is inserted into the mount space 17 of the housing main body 11 in the inserting direction ID, particularly substantially from behind. In a mounting process, the first shake preventing portion(s) 82 come(s) into sliding contact with the inner upper surface(s) of the guide groove(s) 19 while being squeezed and/or the second shake preventing portion(s) 83 come(s) into sliding contact with the lower surface of the covering wall 16 while being squeezed, thereby ensuring stability in the mounting posture of the detecting member 70.

[0066] Further, in the mounting process, the (both) resilient piece(s) 84 is/are resiliently deformed and the detecting member 70 reaches the initial position IP as shown in FIG. 16, whereby the (both) resilient piece(s) 84 at least partly is/are resiliently restored and/or the second stopping portion(s) 86 is/are arranged to be engageable with the second stopping portion(s) 22 from front. Particularly simultaneously, the first stopping portion(s) 79 is/are arranged to be engageable with the first retaining portion(s) 21 from front. In this way, the detecting member 70 is prevented from being detached (e.g. backward) from the housing main body 11. Further, when the detecting member 70 reaches the initial position IP, the movement restricting surface 94 of the protrusion 87 is arranged to be engageable with the locking surface 29 of the lock projection 24 particularly substantially from behind as shown in FIG. 11. Thus, if it is tried to push the detecting member 70 in the inserting direction ID or forward at the initial position IP, the movement restricting surface 94 comes into contact with the locking surface 29 to prevent any further (forward) movement of the detecting member 70. At this time, as shown in FIG. 17, a forward movement of the detecting member 70 at the initial position IP particularly is secondarily prevented also by the contact of the partial locking portions 85 with the restricting portions 23 from behind. In this way, as shown in FIG. 1, the detecting member 70 is held or positioned at the initial position IP with respect to the housing main body 11 with movements in forward and backward directions FBD prevented.

[0067] At the initial position IP, as shown in FIG. 11, the contact portion 93 of the resilient arm portion 72 comes into contact with the inner upper surface of the accommodating recess 31 and the resilient arm portion 72 is held with respect to the lock arm 12 while accumulating a resilient force. Then, the contact portion 93 comes into contact with the inner upper surface of the accommodating recess 31, whereby an overlap margin between the movement restricting surface 94 of the protrusion 87 and the locking surface 29 of the lock projection 24 is automatically determined at a specified (predetermined or predeterminable) value.

[0068] Subsequently, the housing main body 11 is fitted into the receptacle 51 of the mating housing 50. In a fitting process, after coming into sliding contact with the inclined surface 55 of the interfering portion 54, the lock projection 24 is pressed by the pressing surface 56 of

the interfering portion 54 and the lock arm 12 is resiliently deformed to at least partly enter the deformation space 25 as shown in FIG. 12. Then, when the housing main body 11 is properly connected to the mating housing 50, the lock projection 24 is released from a state pressed by the interfering portion 54, whereby the lock arm 12 is resiliently at least partly restored and the lock projection 24 at least partly is fitted into the lock receiving portion 52 from inside or below as shown in FIG. 13. In this way, an upper or outer part of the locking surface 29 of the lock projection 24 is arranged to be engageable with the engaging surface 53 of the lock receiving portion 52 and the two housings 10, 50 are held in the connected state.

[0069] Further, when the housing main body 11 is properly connected to the mating housing 50, the auxiliary protrusion 91 on the upper end surface of the protrusion 87 is pressed inwardly or downwardly by the pressing surface 56 of the interfering portion 54 as shown in FIG. 13. At this time, the protrusion 87 is kept in contact with the interfering portion 54 without following reciprocal displacements of the lock arm 12 and the contact portion 93 exits from the accommodating recess 31. In this way, the detecting member 70 particularly is kept at the standby position SP where the resilient arm portion 72 is separated from the lock arm 12 and held in contact with the mating housing 50. At the standby position SP, the resilient arm portion 72 is resiliently deformed by the interfering portion 54 and particularly substantially takes an inclined posture approximate to a horizontal posture.

[0070] Further, at the standby position SP, the guide surface 88 of the protrusion 87 particularly is arranged to face the upper or outer end opening edge 31 E of the accommodating recess 31 on the rear surface of the lock projection 24 from behind while forming a small clearance as shown in FIG. 13. That is, the upper end opening edge 31 E of the accommodating recess 31 is arranged to be accommodated within the height range of the guide surface 88 of the protrusion 87.

[0071] Subsequently, the rear surface of the rear portion 73 is displaced or pushed in the inserting direction ID or forward to bring the detecting member 70 to the detection position DP. By applying a (forward) pushing force to the detecting member 70 at the standby position SP, a semi-locking state between the partial locking portions 85 and the restricting portions 23 is released and the resilient pieces 84 are resiliently deformed to move onto the restricting portions 23. Further, in the process of movement to or toward the detection position DP, the guide surface 88 of the protrusion 87 and the auxiliary guide surface 92 of the auxiliary protrusion 91 successively come into sliding contact with the upper end opening edge 31 E of the accommodating recess 31 as shown in FIG. 14, whereby the resilient arm portion 72 particularly is resiliently deformed to a larger extent and inserted deeper into the deformation space 25 and, further, the protrusion 87 is inserted into the accommodating recess 31 from behind.

[0072] When the detecting member 70 substantially

reaches the detection position DP, the protrusion 87 particularly is substantially entirely fitted and accommodated into the accommodating recess 31 and the auxiliary protrusion 91 particularly is likewise fitted and accommodated into the auxiliary recess 32 as shown in FIG. 15. The protrusion 87 comes into contact with the inner front surface of the accommodating recess 31, thereby preventing any further forward movement of the detecting member 70. Further, at the detection position DP, the resilient piece(s) 84 is/are resiliently at least partly restored and/or the partial locking portion(s) 85 come(s) into contact with the restricting portion(s) 23 from front as shown in FIG. 18, thereby preventing a backward movement of the detecting member 70. In this way, the detecting member 70 is kept or positioned at the detection position DP.

[0073] Further, at the detection position DP, the resilient arm portion 72 particularly is held substantially in a horizontal posture in a state where a resilient force is accumulated between the lock arm 12 and the housing main body 11 as shown in FIG. 15. The resilient arm portion 72 is inserted to a proper depth into the deformation space 25, thereby restricting resilient deformation of the lock arm 12, with the result that the two housings 10, 50 particularly are strongly held in the connected state. Note that, in the process of moving the detecting member 70 from the initial position IP to the detection position DP via the standby position SP, the first shake preventing portion(s) 82 come into sliding contact with the inner upper surface(s) of the guide groove(s) 19 while being squeezed and/or the second shake preventing portion(s) 83 come(s) into sliding contact with the lower surface of the covering wall 16 while being squeezed, whereby the inclination of the main portion 71 is avoided and stability in the moving posture of the detecting member 70 is ensured. Further, at each of the initial position IP, the standby position SP and the detection position DP, the shaking of the main portion 71 particularly is suppressed by a shake preventing function of the first and second shake preventing portions 82, 83 and/or the detecting member 70 is positioned and held on the housing main body 11 as shown in FIGS. 2 and 20.

[0074] On the other hand, if the housing main body 11 is kept at a partially connected position without being properly connected to the mating housing 50, the lock arm 12 is pressed by the pressing surface 56 of the interfering portion 54 and kept resiliently deformed in the deformation space 25 as shown in FIG. 12. Accordingly, even if it is tried to displace or push the detecting member 70 in the inserting direction ID or forward in this state, the resilient arm portion 72 cannot enter the deformation space 25 due to the interference of the protrusion 87 with the lock projection 24 and a movement of the detecting member 70 to the detection position DP is hindered. Thus, whether or not the housing main body 11 has been properly connected to the mating housing 50 can be known or detected based on whether or not the detecting member 70 is movable or displaceable toward or to the detection position DP.

[0075] In separating the both housings 10, 50, the catching portions 77 is/are or can be caught by fingers or a jig and the detecting member 70 is displaced or pulled backward in that state. If a backward pulling force acts on the detecting member 70, the partial locking portions 85 and the restricting portions 23 are disengaged while the resilient pieces 84 are resiliently deformed, and the detecting member 70 is pulled back toward or to the initial position IP. Subsequently, the fingers or the jig are/is or can be at least partly inserted into the disengagement window 74 and placed on (interact with) the disengaging portion 28 to press down or displace the disengaging portion 28. In this way, the lock projection 24 is deformed or separated from the lock receiving portion 52 and the lock arm 12 and the lock receiving portion 52 are or can be disengaged. By pulling the housing main body 11 apart from the mating housing 50 with the disengaging portion 28 pressed down or displaced, the two housings 10, 50 can be separated from each other. In this case, the covering wall 16 is present above the disengaging portion 28 and the cut portion 18 does not have a sufficient opening area for allowing the entrance of the fingers or the jig, wherefore the entrance of the fingers or the jig from above is prevented.

[0076] As described above, the following effects can be achieved according to this first embodiment.

[0077] When the detecting member 70 is at the initial position IP, the resilient arm portion 72 comes into contact with the lock arm 12 (particularly substantially in the height direction HD) to apply a pre-load and, accordingly, the resilient arm portion 72 is arranged at a position to be able to come into contact with the lock arm 12 from behind and an overlap margin with the lock arm 12 is properly determined. Thus, even if dimensions of the detecting member 70 are not strictly managed, detection reliability can be improved, thereby improving overall operability.

[0078] Here, when the detecting member 70 is at the standby position SP, the protrusion 87 of the resilient arm portion 72 is arranged at a position at least partly overlapping with the lock arm 12 along the deforming direction DD (particularly substantially in the height direction HD) and the guide surface 88 of the protrusion 87 comes into sliding contact with the lock arm 12 in the moving process or transition from the standby position SP to the detection position DP. Thus, the precision of position accuracy of the protrusion 87 at the standby position SP particularly is required. In that aspect, according to this embodiment, the resilient arm portion 72 comes into contact with the lock arm 12 (particularly substantially in the height direction HD) at the initial position IP. Therefore, position accuracy of the protrusion 87 can be advantageously satisfied.

[0079] Further, the detecting member 70 particularly includes the main portion 71 to be pressed during the movement toward or to the detection position DP, the main portion 71 comes into sliding contact with the housing main body 11 in the moving process of the detecting

member 70, and the first and/or second shake preventing portions 82, 83 are provided on a slide-contact surface of the main portion 71 out of both slide-contact surfaces of the main portion 71 and/or the housing main body 11 and squeezable against the slide-contact surface of the housing main body 11 in the height direction. Thus, the shake of the detecting member 70 (particularly substantially in the height direction HD) is or can be prevented. As a result, detection reliability of the detecting member 70 is further improved.

[0080] Further, since the first and second shake preventing portions 82, 83 particularly are arranged two side by side in forward and backward directions FBD and/or in the height direction HD, the inclination of the detecting member 70 in forward and backward directions FBD is prevented and stability in the posture of the detecting member 70 is ensured.

[0081] Since the protrusion 87 particularly at least partly is accommodated into the accommodating recess 31 of the lock arm 12 when the detecting member 70 reaches the detection position DP, the lock arm 12 and the detecting member 70 are arranged at positions at least partly overlapping along the deforming direction DD (particularly substantially in the height direction HD) and the corresponding dimension (particularly height) of the connector A can be reduced. In this case, the accommodating recess 31 is open toward the deformation space 25 of the lock arm 12 and toward the back, but not open on the front end part connected to the housing main body 11, wherefore a reduction in the strength of the lock arm 12 is avoided. As a result, locking reliability by the lock arm 12 is improved.

[0082] Since the lock projection 24 particularly is formed to project along the deforming direction DD (particularly in the height direction HD) on the lock arm 12 and the accommodating recess 31 is open on the rear surface of the lock projection 24, a large opening area of the accommodating recess 31 can be ensured along the deforming direction DD, within the corresponding dimension of the lock projection 24, particularly in the height direction HD within the height range of the lock projection 24.

[0083] Since the protrusion 87 and the lock projection 24 particularly are arranged at the positions at least partly overlapping along the deforming direction DD (particularly substantially in the height direction HD) when the detecting member 70 is at the standby position SP, the corresponding dimension (particularly height) of the connector A can be further reduced.

[0084] In the process of moving or displacing the detecting member 70 from the standby position SP to the detection position DP, the guide surface 88 of the protrusion 87 comes into sliding contact with the upper or outer end opening edge 31 E of the accommodating recess 31 to substantially guide the insertion of the protrusion 87 into the accommodating recess 31. Thus, stability in the moving operation of the detecting member 70 is ensured.

[0085] Since the auxiliary protrusion 91 particularly is formed to project in the deforming direction DD or the height direction HD on a part of the upper end of the protrusion 87 and/or the auxiliary guide surface 92 continuous with the guide surface 88 particularly is formed on the front surface of the auxiliary protrusion 91, a large guide area can be ensured in the deforming direction DD or the height direction HD and/or dimensional management in positioning the protrusion 87 to face the opening edge of the accommodating recess 31 at the standby position SP can be facilitated. Further, the auxiliary protrusion 91 is at least partly inserted into the accommodating recess 31 in addition to the protrusion 87 and the depth of the accommodating recess 31 is increased by as much as the height of the auxiliary protrusion 91, wherefore the strength of the lock arm 12 may be reduced. However, according to this embodiment, a part of the inner upper surface of the accommodating recess 31 particularly is only recessed to form the auxiliary recess 32 into which the auxiliary protrusion 91 is at least partly fitted at the detection position DP. Thus, the depth of the entire accommodating recess 31 is not increased and a reduction in the strength of the lock arm 12 can be suppressed.

[0086] The surface of the disengaging portion 28 opposite to the surface facing the deformation space 25 is covered by the protection wall 13 and an inadvertent operation of the disengaging portion 28 is prevented by the protection wall 13, whereas the disengaging portion 28 can be operated e.g. by placing fingers or the jig through the disengagement window 74 that is open on the rear portion 73 of the detecting member 70 in disengaging the lock arm 12. Thus, the lock arm 12 can be easily released from the locked state.

[0087] Further, in pulling the mating housing 50 apart from the housing main body 11, the detecting member 70 particularly is or can be pulled back to the initial position IP by catching the catching portions 77 of the rear portion 73 e.g. with fingers or the jig and, thereafter, the disengaging portion 28 can be operated. In this case, since the pair of catching portions 77 particularly are arranged at the opposite sides of the disengagement window 74 on the rear portion 73, space efficiency of the rear portion 73 is improved and the miniaturization of the connector A can be met.

[0088] Accordingly, to improve locking reliability, a lock arm 12 particularly substantially extends backward in a cantilever manner from a front end part of a housing main body 11. The lock arm 12 includes an accommodating recess 31 which is open toward a deformation space 25 therefor and toward the back. When the housing main body 11 is properly connected to a mating housing 50 and a detecting member 70 is displaced (e.g. pushed) from a standby position SP to a detection position DP, at least a part of the detecting member 70 is inserted or fitted into the accommodating recess 31.

<Second Embodiment>

[0089] Next, a second specific embodiment of the present invention is described with reference to FIGS. 21 to 27. In a connector B of this second embodiment, the configuration of a detecting member 100 partly differs from that of the detecting member 70 of the above first embodiment. Since the other components are the substantially same or similar as in the first embodiment, the same or similar components are denoted by the same reference signs and the structures, functions and effects thereof are not described.

[0090] As shown in FIGS. 24 to 27, a protrusion 102 (particularly substantially in the form of a rectangular block) whose shape is partly different from the protrusion 87 of the first embodiment is formed to project upward or outward on or near a front or distal end part of a resilient arm portion 101 forming part of the detecting member 100 made e.g. of synthetic resin. An auxiliary protrusion 103 substantially having the same shape as in the first embodiment is formed to partly project upward on the upper end surface of the protrusion 102. The auxiliary protrusion 103 particularly substantially is in the form of a rib extending in forward and backward directions FBD in a widthwise intermediate part (particularly in a substantially widthwise central part) of the upper or outer end surface of the protrusion 102. Thus, the auxiliary protrusion 103 particularly is narrower or has a smaller width than the protrusion 102.

[0091] A projecting distance of the auxiliary protrusion 103 along the deforming direction DD (particularly in the height direction HD) from the protrusion 102 is set to be sufficiently smaller than that of the protrusion 102 from the resilient arm portion 101 along the deforming direction DD or in the height direction HD. Further, the upper surface of the auxiliary protrusion 103 particularly is a tapered or inclined surface inclined downwardly or inwardly toward the back. When the protrusion 102 at least partly is inserted or fitted into an accommodating recess 31, the auxiliary protrusion 103 at least partly is fitted and inserted into an auxiliary recess 32.

[0092] A central area of the front surface of the protrusion 102 at least partly corresponding to the auxiliary protrusion 103 in a width direction is a steeply inclined surface 104 inclined with respect to forward and backward directions FBD (moving directions ID of the detecting member 100 between a standby position SP and a detection position DP) and continuous and flush with the front surface of the auxiliary protrusion 103. Further, areas of the front surface of the protrusion 102 not corresponding to the auxiliary protrusion in the width direction WD (areas other than the steeply inclined surface 104) particularly are one or more, particularly a pair of lateral (left and/or right) moderately inclined surfaces 105 whose angle of inclination with respect to forward and backward directions FBD is smaller than the steeply inclined surface 104. That is, the front surface of the protrusion 102 is composed of or comprises the steeply inclined surface

104 and the one or more, particularly pair of moderately inclined surfaces 105 located laterally (particularly at both left and right sides) of the steeply inclined surface 104 as shown in FIG. 23. The (pair of) moderately inclined surface(s) 105 particularly is/are receded to form step(s) with respect to the steeply inclined surface 104 (i.e. inclined more backward to be flatter than the steeply inclined surface 104).

[0093] As shown in FIGS. 22 and 23, when the detecting member 100 is at the standby position SP, the moderately inclined surfaces of the protrusion 102 are arranged to substantially face an upper or outer end opening edge 31 E of the accommodating recess 31 on the rear surface of a lock projection 24. Further, in the process of moving the detecting member 100 from the standby position SP to the detection position DP, the moderately inclined surface(s) 105 come(s) into sliding contact with the upper end opening edge 31 E of the accommodating recess 31 as shown in FIG. 23 and, accordingly, the resilient arm portion 101 is resiliently inclined inwardly or downwardly. Further, when the detecting member 100 substantially reaches the detection position DP, the protrusion 102 is positioned and inserted into the accommodating recess 31. At least one tapered or inclined guided surface 34 substantially facing the steeply inclined surface 104 of the protrusion 102 at the detection position DP is formed on the inner surface of the accommodating recess 31.

[0094] Next, functions of the connector B according to the second embodiment are described. When a housing main body 11 is properly connected to a mating housing 50, the auxiliary protrusion 103 projecting from the upper end surface of the protrusion 102 is pressed inwardly or downwardly by at least one pressing surface 56 of an interfering portion 54. The protrusion 102 particularly substantially maintains a contact state with the interfering portion 54 without following reciprocal displacements of a lock arm 12 and a contact portion 93 exits from the accommodating recess 31. In this way, the detecting member 100 is kept at or near the standby position SP where the resilient arm portion 101 is separated from the lock arm 12 and/or held in contact with the mating housing 50.

[0095] In a state where the detecting member 100 is at the standby position SP, the resilient arm portion 101 is resiliently deformed by the interfering portion 54 and takes an inclined posture particularly approximate to a horizontal posture as shown in FIGS. 22 and 23. At the standby position SP, the moderately inclined surfaces 105 of the protrusion 102 are arranged to substantially face the upper or outer end opening edge 31 E of the accommodating recess 31 on the rear surface of the lock projection 24 (particularly substantially from behind) while forming a small clearance. That is, the upper end opening edge 31 E of the accommodating recess 31 is arranged to be at least partly accommodated within the height range of the moderately inclined surfaces 105 of the protrusion 102.

[0096] After the housing main body 11 is properly connected to the mating housing 50, the rear surface of a rear portion 73 of the detecting member 100 is displaced (particularly pushed in the inserting direction ID or forward) to move the detecting member 100 towards or to the detection position DP. In a forward moving process, as shown in FIGS. 22 and 23, the moderately inclined surfaces 105 of the protrusion 102 come into sliding contact with the upper end opening edge 31 E of the accommodating recess 31. In this sliding contact process, resistance due to sliding contact is suppressed to a low level since the angle of inclination of the moderately inclined surfaces 105 with respect to forward and backward directions FBD is smaller than the steeply inclined surface 104.

[0097] By the sliding contact of the moderately inclined surfaces 105 with the upper end opening edge 31 E of the accommodating recess 31, the resilient arm portion 101 is resiliently deformed inwardly or downwardly to a larger extent and/or inserted deeper into a deformation space 25 and, further, the protrusion 102 at least partly is accommodated into the accommodating recess 31 (particularly substantially from behind). When the detecting member 100 reaches the detection position DP, the protrusion 102 is (particularly substantially entirely) fitted and accommodated into the accommodating recess 31 and the auxiliary protrusion 103 is likewise fitted and accommodated into the auxiliary recess 32. By the contact of the protrusion 102 with the inner front surface of the accommodating recess 31, any further forward movement of the detecting member 100 is prevented.

[0098] In the connector B of this second embodiment, the narrow auxiliary protrusion 103 is formed to project in the height direction on the protrusion 102, a part of the inner surface of the accommodating recess 31 is recessed to form the auxiliary recess 32 into which the auxiliary protrusion 103 is to be at least partly fitted at the detection position DP and the area of the front surface of the protrusion 102 substantially corresponding to the auxiliary protrusion 103 in the width direction WD is the steeply inclined surface 104 inclined with respect to forward and backward directions FBD and/or substantially continuous and flush with the front surface of the auxiliary protrusion 103. Further, the areas of the front surface of the protrusion 102 not corresponding to the auxiliary protrusion 103 in the width direction WD particularly are the moderately inclined surfaces 105 having a smaller angle of inclination with respect to forward and backward directions FBD than the steeply inclined surface 104 and/or receded more than the steeply inclined surface 104. In the process of moving the detecting member 100 from the standby position SP toward or to the detection position DP, the moderately inclined surfaces 105 particularly substantially come into sliding contact with the opening edge 31 E of the accommodating recess 31, thereby guiding the insertion of the protrusion 102 into the accommodating recess 31.

[0099] According to this configuration, the protrusion

102 and the auxiliary protrusion 103 are arranged at positions at least partly overlapping along the deforming direction DD or in the height direction HD with respect to the lock projection 24 in the state where the detecting member 100 is at the standby position SP. Thus, the height of the connector B can be sufficiently reduced. Further, in the process of moving the detecting member 100 from the standby position SP toward or to the detection position DP, the moderately inclined surfaces 105 particularly substantially come into sliding contact with the opening edge 31 E of the accommodating recess 31, whereby the protrusion 102 and the auxiliary protrusion 103 are guided and inserted into the accommodating recess 31.

[0100] The moderately inclined surfaces 105 may be formed by making the angle of inclination smaller to make the entire area of the front surface of the protrusion 102 and that of the front surface of the auxiliary protrusion 103 substantially flat as shown by imaginary line L in FIG. 27. However, if the moderately inclined surfaces 105 are formed in this way, the upper surface of the auxiliary protrusion 103 is inclined downwardly toward the back. Thus, height H_b (or position along the height direction HD) of the upper end of the auxiliary protrusion 103 becomes lower than height H_a (or position along the height direction HD) of the upper end of the auxiliary protrusion 103 of this second embodiment. Therefore, an overlap margin between the auxiliary protrusion 103 and the lock projection 24 in the height direction HD is reduced and the height of the connector B cannot be sufficiently reduced.

[0101] However, since the moderately inclined surfaces 105 particularly are formed only in the areas of the front surface of the protrusion 102 not corresponding to the auxiliary protrusion 103 in the width direction WD in the connector B of this second embodiment, even if the moderately inclined surfaces 105 are formed, the height H_a (or position along the height direction HD) of the upper end of the auxiliary protrusion 103 is unchanged and the overlap margin between the auxiliary protrusion 103 and the lock projection 24 in the height direction is not reduced. Therefore, there is no problem in reducing the height of the connector B.

<Third Embodiment>

[0102] Next, a third specific embodiment of the present invention is described with reference to FIG. 28. In a connector C of this third embodiment, the configuration of an auxiliary recess 35 partly differs from that of the auxiliary recess 32 formed on the inner upper surface of the accommodating recess 31 of the lock arm 12 in the connector B of the above second embodiment. Since the other components are the substantially same or similar as in the first embodiment, the same or similar components are denoted by the same reference signs and the structures, functions and effects thereof are not described.

[0103] A rear end part of the accommodating recess 35 of this third embodiment is obliquely cut to form at least one escaping portion 36 which is open inward or downward and backward. By forming the escaping portion 36, the interference of an auxiliary protrusion 103 with a rear end part of the lower surface of a lock projection 24 in the sliding contact process of moderately inclined surfaces 105 with an opening edge 31 E particularly is avoided. Therefore, a guide function by the sliding contact of the opening edge 31 E and the moderately inclined surfaces 105 is continuously displayed until the insertion of the auxiliary protrusion 103 into the auxiliary recess 35 (insertion of a protrusion 102 into an accommodating recess 31) is completed.

<Other Embodiments>

[0104] The present invention is not limited to the above described and illustrated embodiment. For example, the following embodiments are also included in the technical scope of the present invention.

(1) The detecting member may be configured to be incapable of restricting the resilient deformation of the lock arm when the detecting member reaches the detection position.

(2) The accommodating recess may not be so dimensioned and shaped that the protrusion is fittable thereinto and may be so dimensioned that the protrusion is loosely fitted thereinto.

(3) The accommodating recess may be open backward on a part of the lock arm other than the lock projection.

(4) The shake preventing portions may be formed on the housing main body instead of being formed on the main portion. Further, the shake preventing portions may be formed on both the main portion and the housing main body.

(5) A plurality of shake preventing portions may be arranged substantially side by side on the same axes in forward and backward directions FBD and/or the height direction HD.

(6) Three or more shake preventing portions may be arranged substantially side by side in forward and backward directions FBD and/or the height direction HD.

(7) A plurality of auxiliary protrusions may be formed on the upper end of the protrusion. For example, a pair of auxiliary protrusions may be formed on opposite widthwise sides of the upper end of the protrusion. In this case, a plurality of auxiliary recesses may be formed at positions of the accommodating recess corresponding to the auxiliary protrusions.

(8) The guide surface and the guide inclined surface may be curved inclined surfaces.

Reference Numerals

[0105]

5	A ...	connector
	10 ...	housing
	11 ...	housing main body
10	12 ...	lock arm
	13 ...	protection wall
15	24 ...	lock projection
	25 ...	deformation space
	28 ...	disengaging portion
20	31 ...	accommodating recess
	31 E ...	opening edge of accommodating recess
25	32 ...	auxiliary recess
	50 ...	mating housing
	52 ...	lock receiving portion
30	70 ...	detecting member
	71 ...	main portion
35	72 ...	resilient arm portion
	73 ...	rear portion
	74 ...	disengagement window
40	77 ...	catching portion
	82 ...	first shake preventing portion (shake preventing portion)
45	83 ...	second shake preventing portion (shake preventing portion)
	87 ...	protrusion
50	88 ...	guide surface
	91 ...	auxiliary protrusion
55	92 ...	auxiliary guide surface
	B ...	connector

100 ... detecting member

102 ... protrusion

103 ... auxiliary protrusion (narrow auxiliary protrusion)

104 ... steeply inclined surface

105 ... moderately inclined surface

C ... connector

35 ... auxiliary recess

Claims

1. A connector (A; B; C), comprising:

a housing main body (11) to be connected to a mating housing (50);

a lock arm (12) projecting from the housing main body (11), resiliently deformable in a deforming direction (DD) intersecting with a connecting direction (CD) of the housing main body (11) with the mating housing (50), forming a deformation space (25) between the lock arm (12) and the housing main body (11), configured to hold the housing main body (11) connected to the mating housing (50) in a connected state (CS) by being resiliently engaged with a lock receiving portion (52) of the mating housing (50), and including an accommodating recess (31) which is open toward the deformation space (25) and/or toward the back; and

a detecting member (70; 100) to be mounted on or to the housing main body (11) movably from an initial position (IP) to a detection position (DP) via a standby position (SP) and configured such that

a movement in a movement direction (ID) is restricted at the initial position (IP) by the contact thereof with the lock arm (12) along the movement direction (ID) before the housing main body (11) is connected to the mating housing (50),

a movement restricted state at the initial position (IP) is released and the detecting member (70; 100) is kept at the standby position (SP) to substantially face the accommodating recess (31) along the movement direction (ID) when the housing main body (11) is properly connected to the mating housing (50), and

the detecting member (70; 100) reaches the detection position (DP) by a displacement operation in the movement direction (ID) from the standby position (SP), whereby at least one part

of the detecting member (70; 100) is inserted into the accommodating recess (31).

2. A connector according to claim 1, wherein the lock arm (12) extends backward in a cantilever manner from a front end part of the housing main body (11).

3. A connector according to any one of the preceding claims, wherein the lock arm (12) is formed with a lock projection (24) to be at least partly fitted into the lock receiving portion (52) at the time of proper connection.

4. A connector according to claim 3, wherein the lock projection (24) projects in the deforming direction (DD) toward a side opposite to the deformation space (25) on the lock arm (12); and/or wherein the accommodating recess (31) is open on the rear surface of the lock projection (24).

5. A connector according to claim 3 or 4, wherein a protrusion (87; 102) to be at least partly inserted into the accommodating recess (31) at the detection position (DP) is formed to project in the deforming direction (DD) on or near a distal end part of the detecting member (70; 100) and/or arranged at a position at least partly overlapping with the lock projection (24) in the deforming direction (DD) at the standby position (SP).

6. A connector according to claim 5, wherein an inclined guide surface (88; 104, 105) is formed on the front surface of the protrusion (87; 102) at a position to substantially face an opening edge of the accommodating recess (31) on the rear surface of the lock projection (24) in forward and backward directions (FBD) at the standby position (SP) and/or comes into sliding contact with the opening edge (31 E) of the accommodating recess (31) in the process of reaching the detection position (DP) from the standby position (SP), thereby guiding the insertion of the protrusion (87; 102) into the accommodating recess (31).

7. A connector according to claim 5 or 6, wherein an auxiliary protrusion (91; 103) is formed to project in the deforming direction (DD) on a part of a projecting end of the protrusion (87; 102).

8. A connector according to claim 7, wherein an auxiliary guide surface (92) continuous with the guide surface (88) is formed on the front surface of the auxiliary protrusion (91); and/or a part of the inner surface of the accommodating recess (31) is recessed to form an auxiliary recess (32; 35) into which the auxiliary protrusion (91; 103) is to be at least partly fitted at the detection position (DP).

9. A connector according to any one of the preceding claims 5 to 8, wherein:

a narrow auxiliary protrusion (103) is formed to project in the deforming direction (DD) on the protrusion (102); and

a part of the inner surface of the accommodating recess (31) is recessed to form an auxiliary recess (32; 35) into which the auxiliary protrusion (103) is to be fitted at the detection position (DP).

10. A connector according to claim 9, wherein an area of the front surface of the protrusion (102) corresponding to the auxiliary protrusion (103) in a width direction (WD) is a steeply inclined surface (104) inclined with respect to forward and backward directions (FBD) and/or continuous and flush with the front surface of the auxiliary protrusion (103); and an area of the front surface of the protrusion (102) not corresponding to the auxiliary protrusion (103) in the width direction (WD) is a moderately inclined surface (105) having a smaller angle of inclination with respect to forward and backward directions (FBD) than the steeply inclined surface (104) and receded more than the steeply inclined surface (104).

11. A connector according to claim 10, wherein the moderately inclined surface (105) comes into sliding contact with the opening edge (31 E) of the accommodating recess (31) in the process of moving the detecting member (100) from the standby position (SP) to the detection position (DP), thereby guiding the insertion of the protrusion (102) into the accommodating recess (31).

12. A connector according to claim 10 or 11, wherein the accommodating recess (35) is obliquely cut to form at least one escaping portion (36) in order to avoid an interference of the auxiliary protrusion (103) with the lock projection (24) during the process of moving the detecting member (100) from the standby position (SP) to the detection position (DP).

13. A connector according to any one of the preceding claims, wherein the detecting member (70; 100) is configured such that (i) the insertion movement is restricted at the initial position (IP) by the contact of a resilient arm portion (72) of the detecting member (70; 100) with the lock arm (12) before the housing main body (11) is connected to the mating housing (50); (ii) the movement restricted state at the initial position (IP) is released and the detecting member (70; 100) is capable of reaching the detection position (DP) where the resilient arm portion (72) at least partly enters the deformation space (25) by being displaced from the initial position (IP) when the housing main body (11) is properly connected to the mat-

ing housing (50); and/or (iii) the resilient arm portion (72) is held in contact with the lock arm (12) in the deforming direction (DD) at the initial position (IP) to apply a pre-load to the lock arm (12).

14. A connector assembly comprising:

a connector (A; B; C) according to any one of the preceding claims, having a housing (10); and a mating connector having a mating housing (50) connectable with the housing (10), the mating housing (50) having a lock receiving portion (52) engageable with the lock arm (12) to lock the housings (10; 50) in the connected state (CS).

15. A method of assembling a connector assembly, comprising the following steps:

providing a connector (A; B; C) having a housing main body (11) and a lock arm (12) projecting from the housing main body (11) and being resiliently deformable in a deforming direction (DD) intersecting with a connecting direction (CD) of the housing main body (11) with the mating housing (50), forming a deformation space (25) between the lock arm (12) and the housing main body (11);

providing a mating connector having a mating housing (50);

matingly connecting the housing main body (11) with the mating housing (50) thereby resiliently engaging the lock arm (12) with a lock receiving portion (52) of the mating housing (50) to hold the housing main body (11) and the mating housing (50) in a connected state (CS), wherein lock arm (12) includes an accommodating recess (31) which is open toward the deformation space (25) and/or toward the back; and mounting a detecting member (70) on or to the housing main body (11) movably and configured such that

a movement in a movement direction (ID) is restricted at the initial position (IP) by the contact thereof with the lock arm (12) along the movement direction (ID) before the housing main body (11) is connected to the mating housing (50),

a movement restricted state at the initial position (IP) is released and the detecting member (70; 100) is kept at the standby position (SP) to substantially face the accommodating recess (31) along the movement direction (ID) when the housing main body (11) is properly connected to the mating housing (50), and

the detecting member (70; 100) reaches the detection position (DP) by a displacement operation in the movement direction (ID) from the

standby position (SP), whereby at least one part of the detecting member (70; 100) is inserted into the accommodating recess (31).

5

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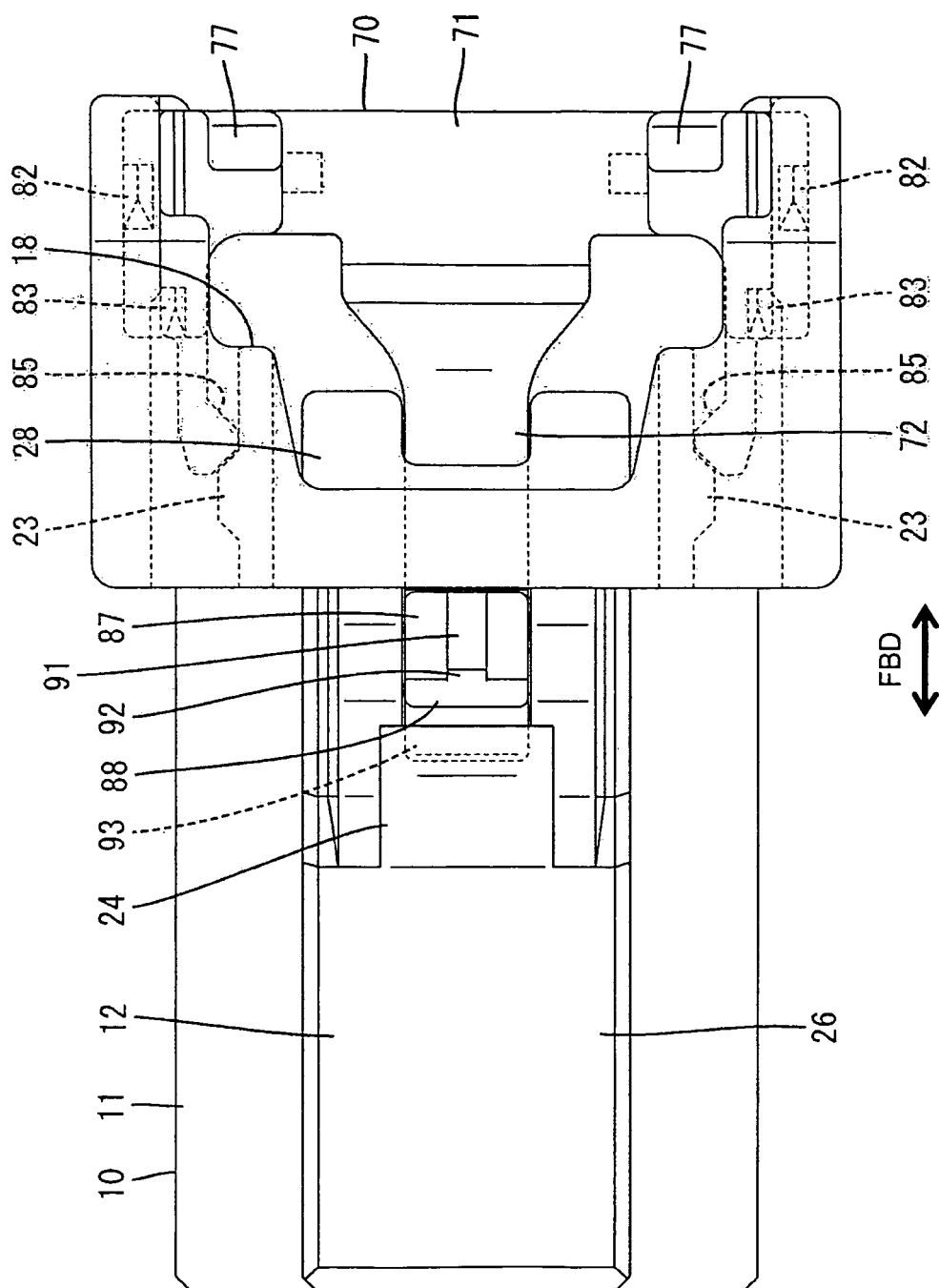


FIG. 1

FIG. 2

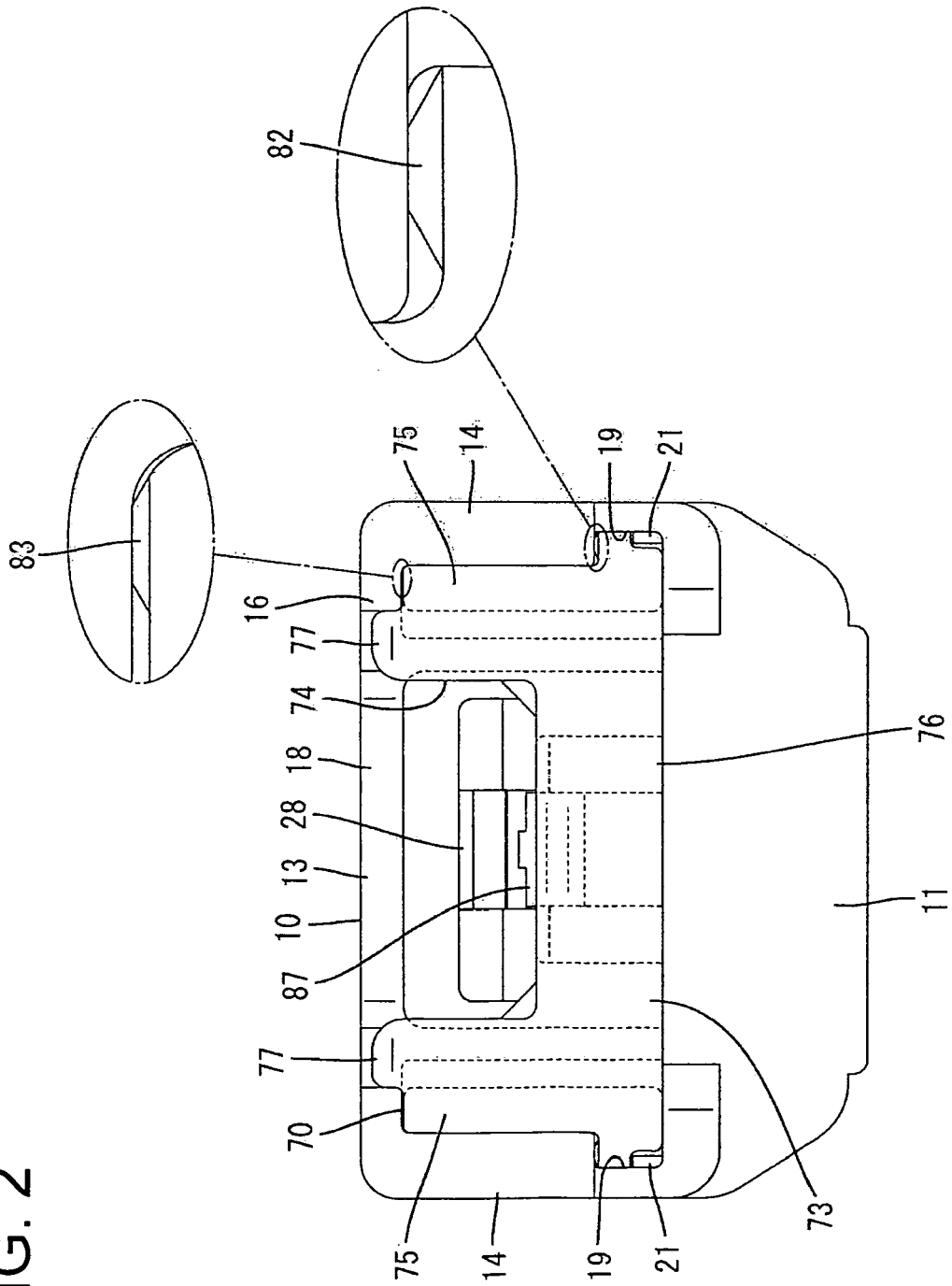


Fig. 3

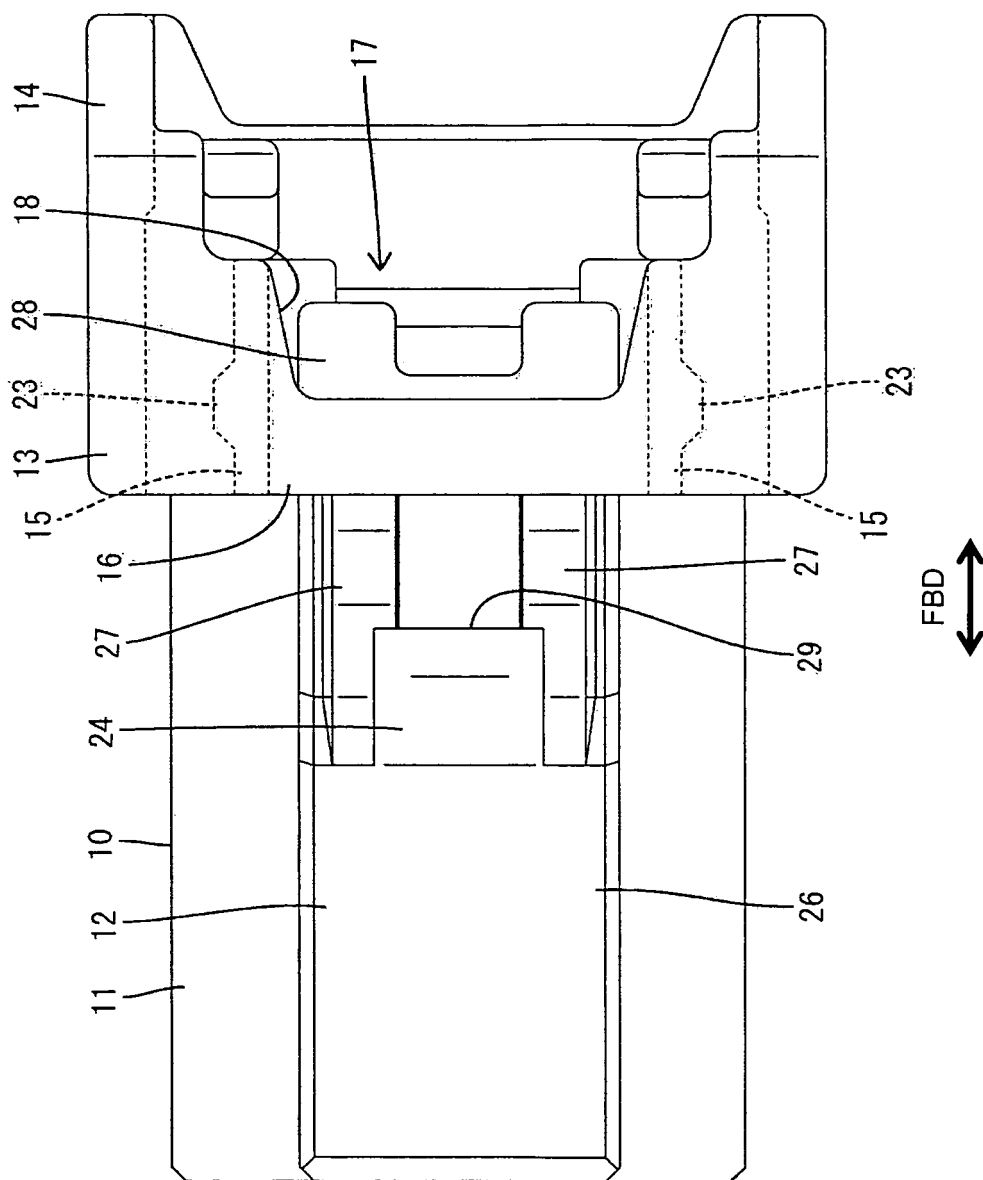


FIG. 4

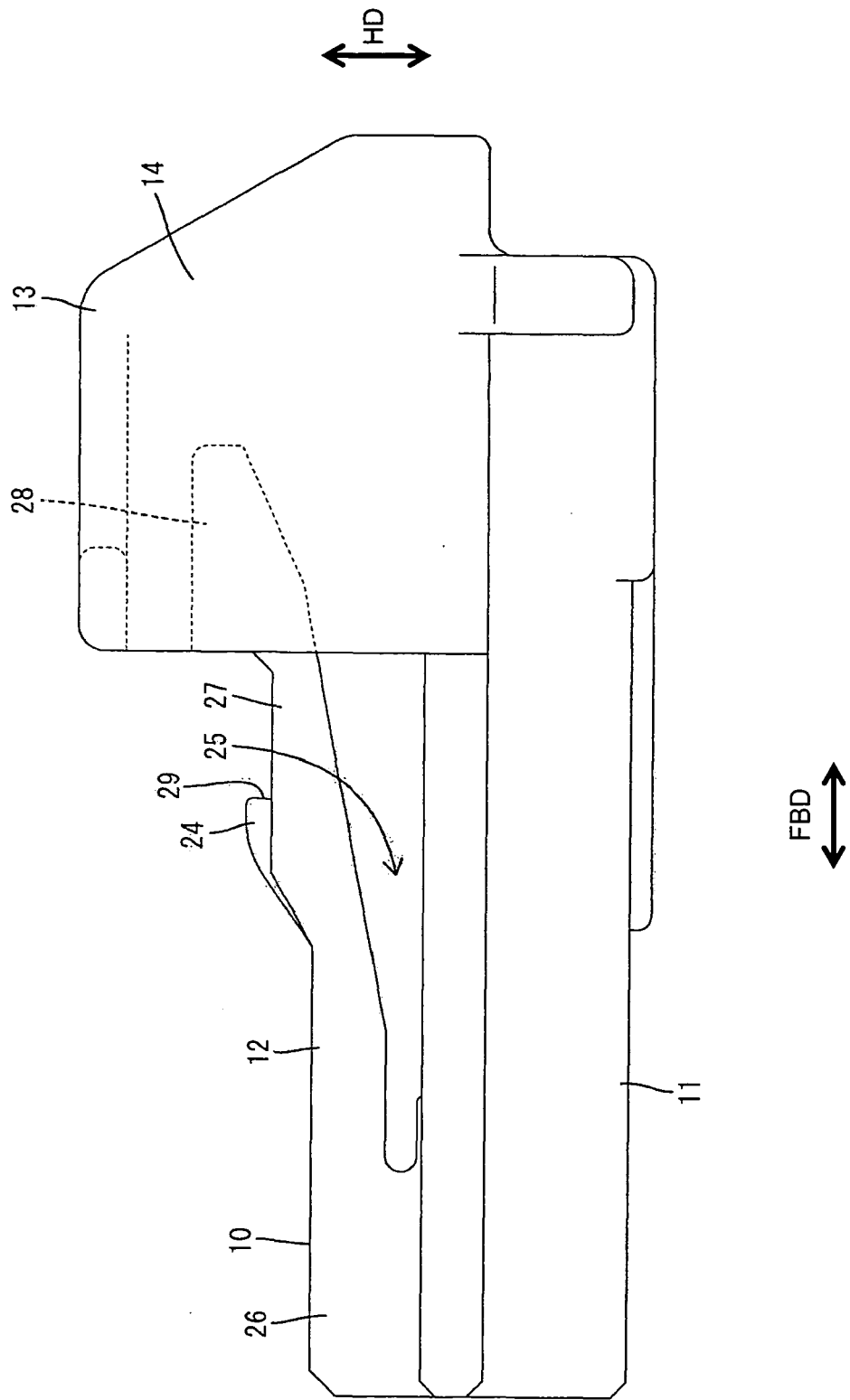


FIG. 5

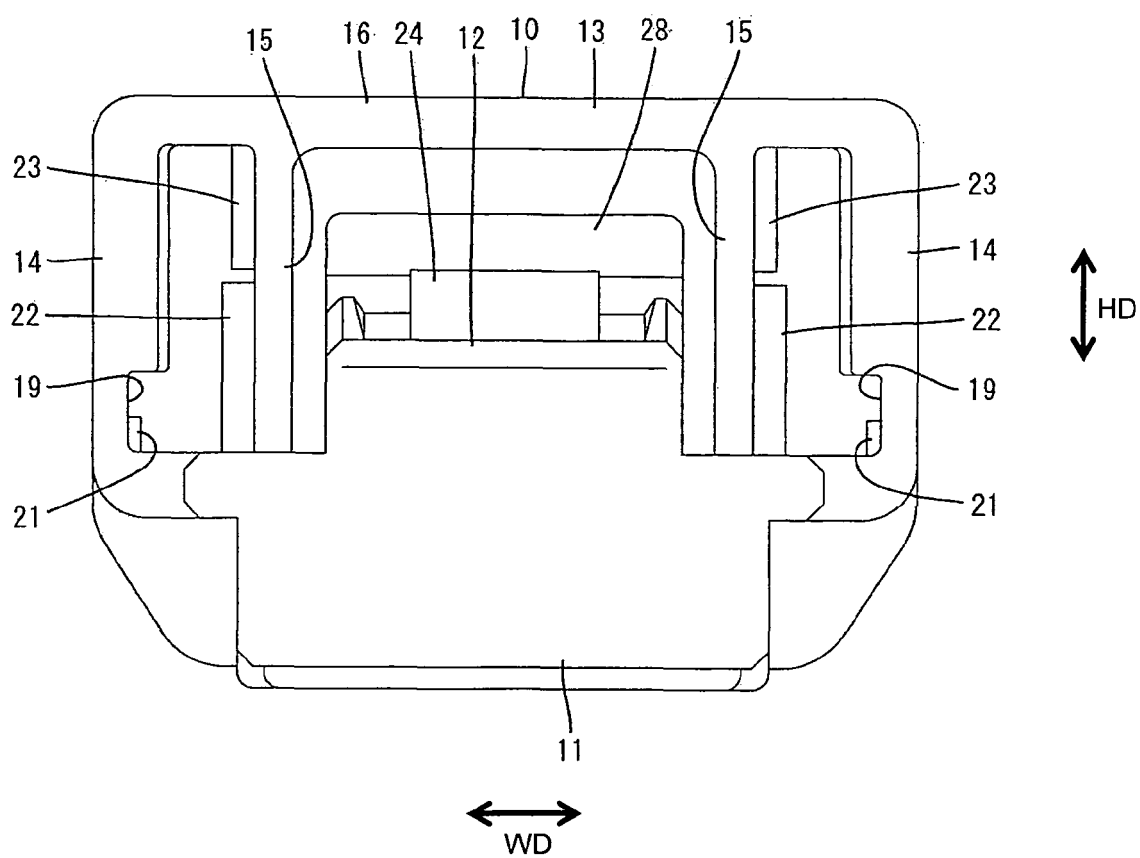


FIG. 6

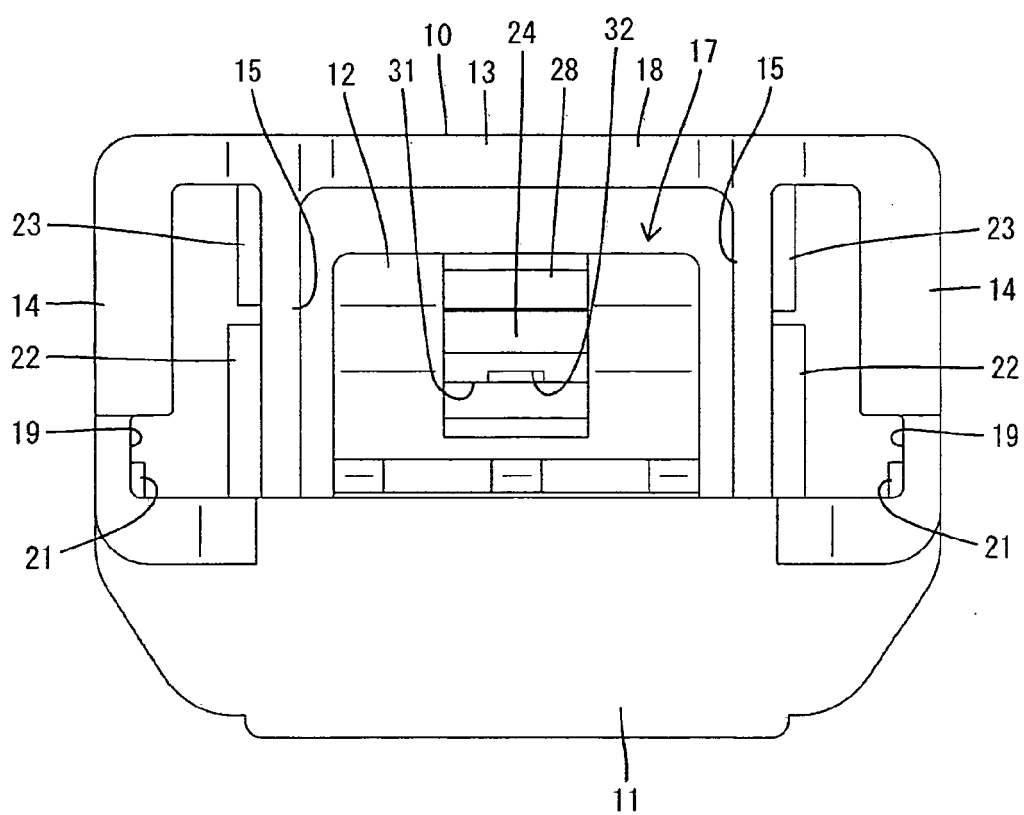


FIG. 7

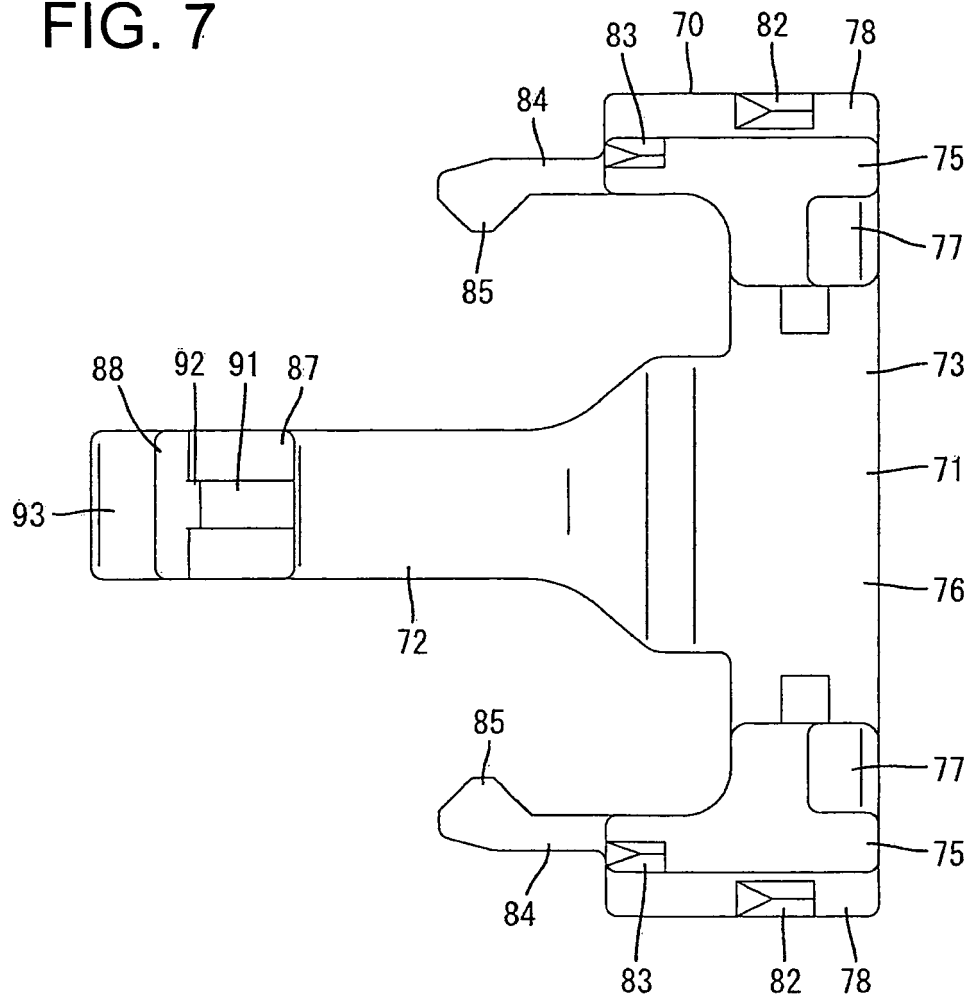


FIG. 8

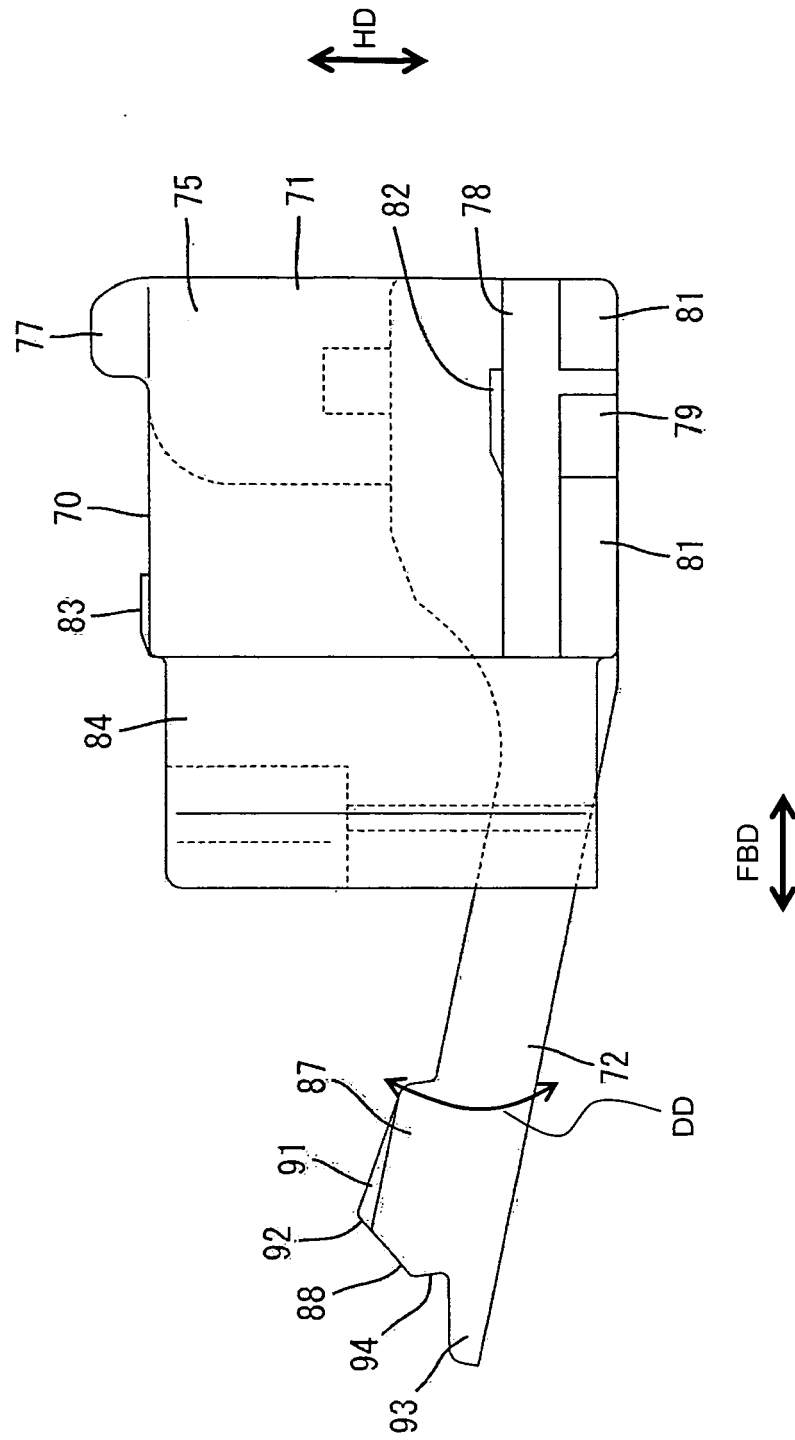


Fig. 9

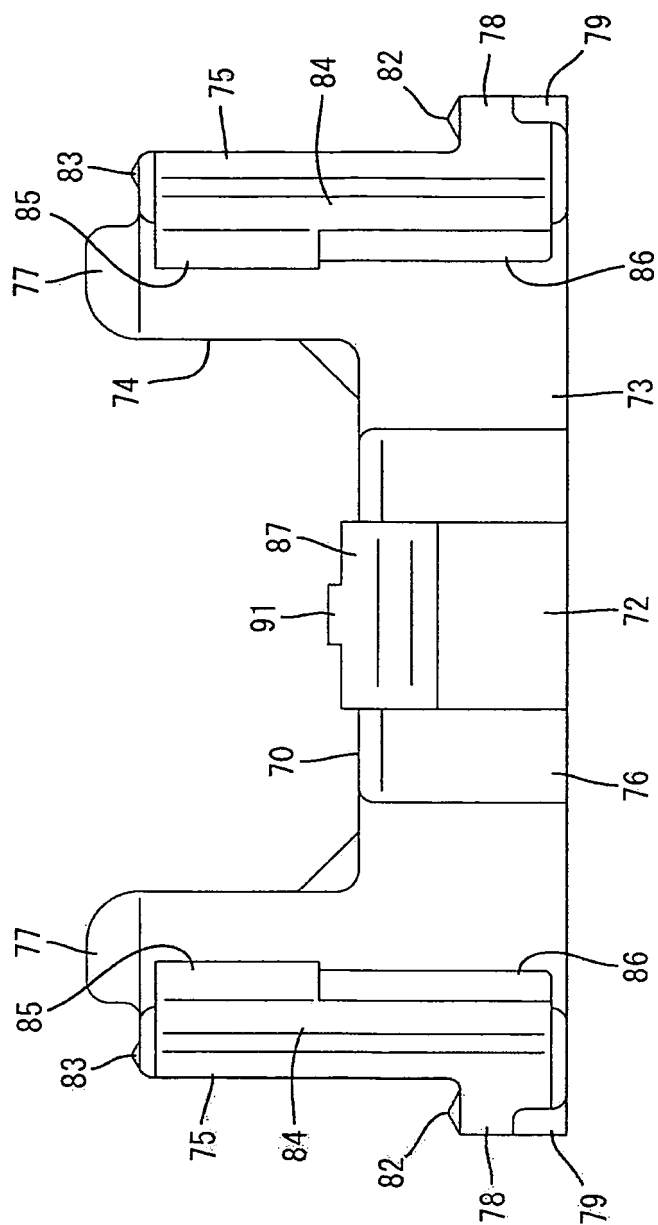


FIG. 10

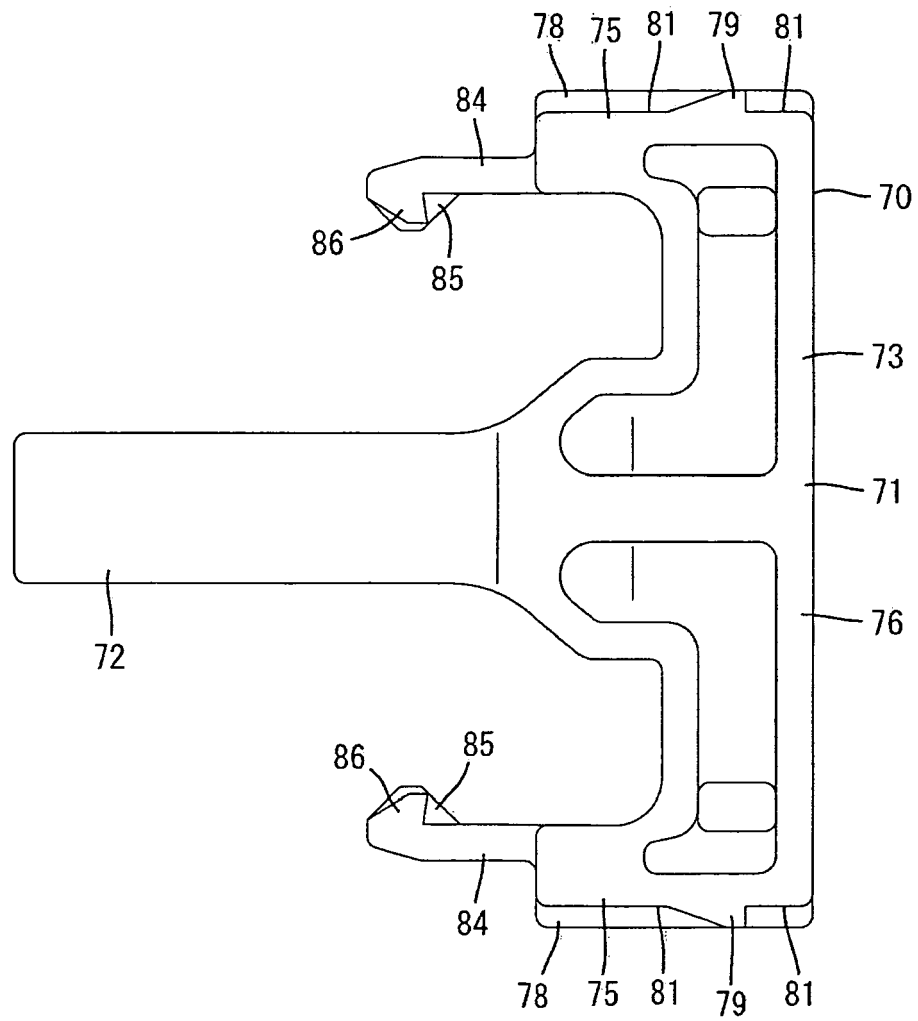


FIG. 11

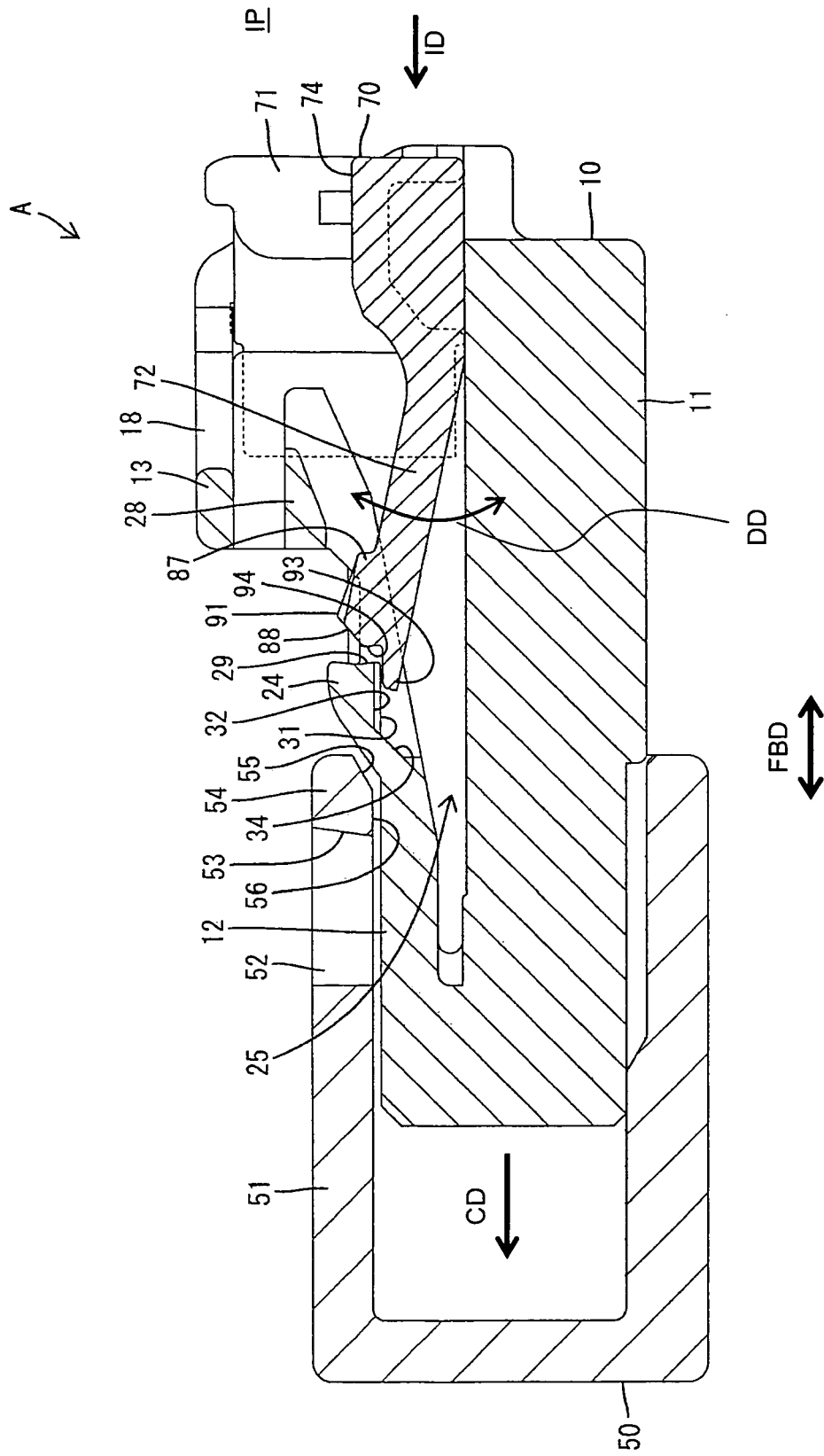
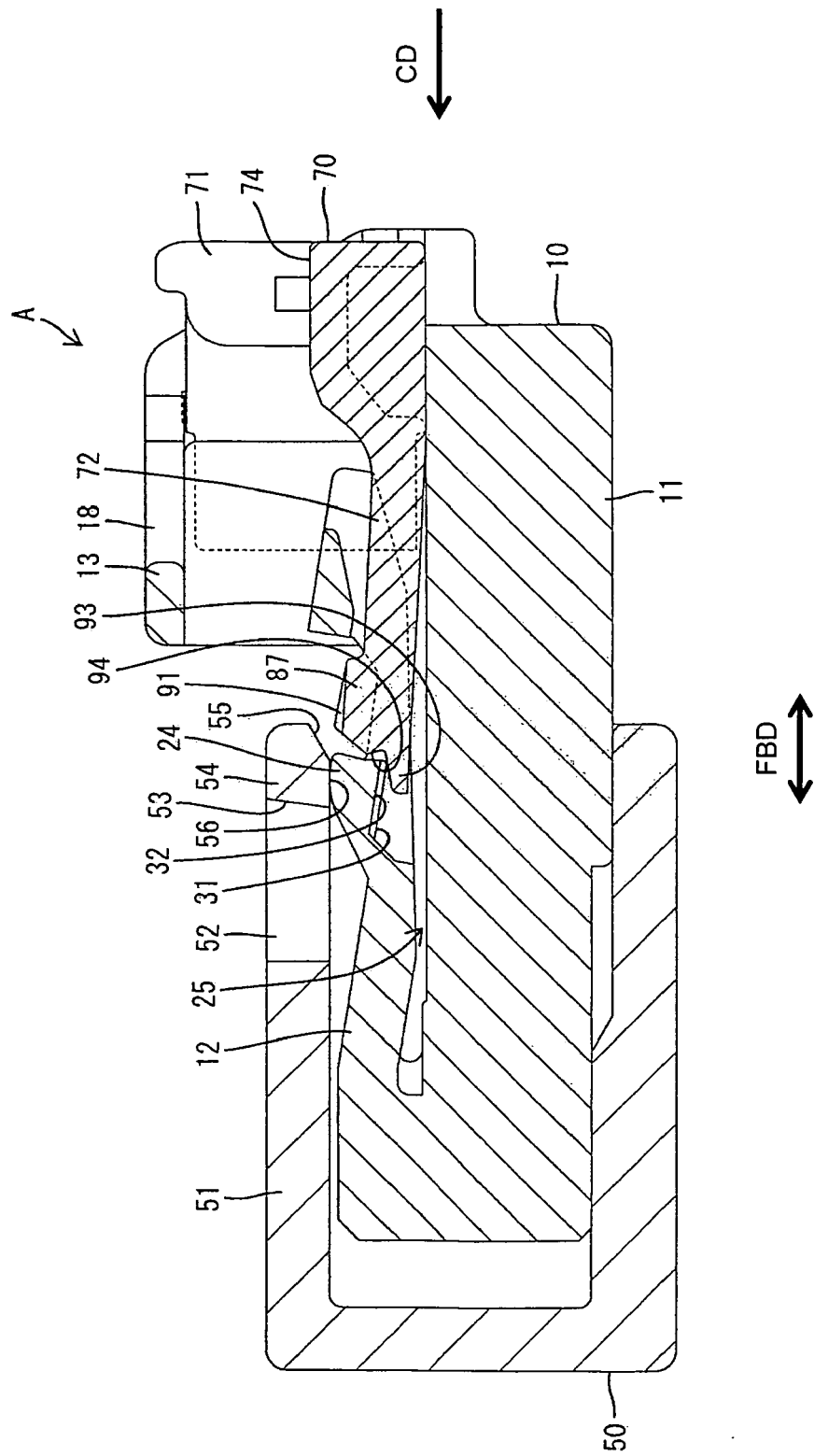


FIG. 12



CS

FIG. 13

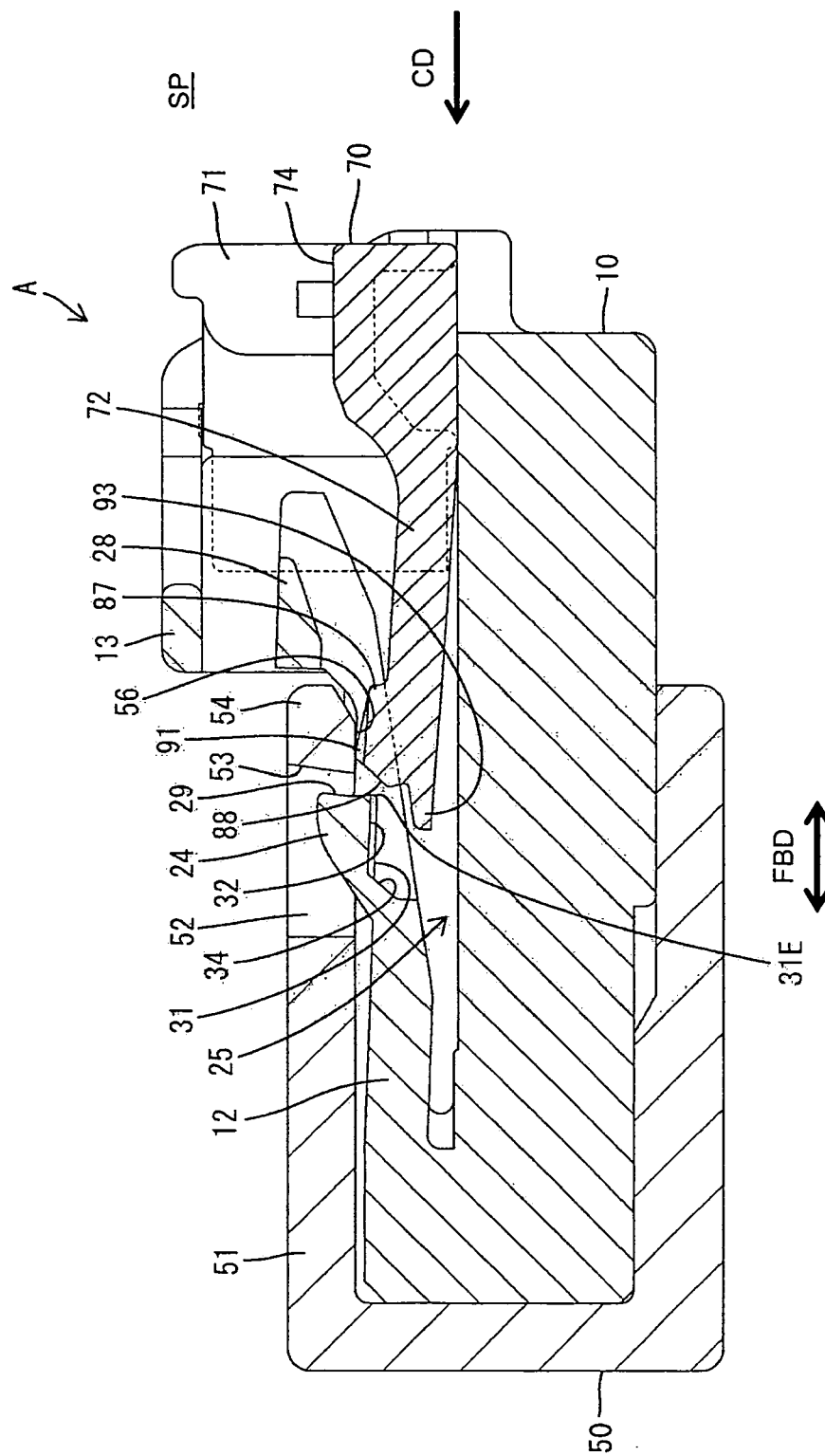


FIG. 14

CS

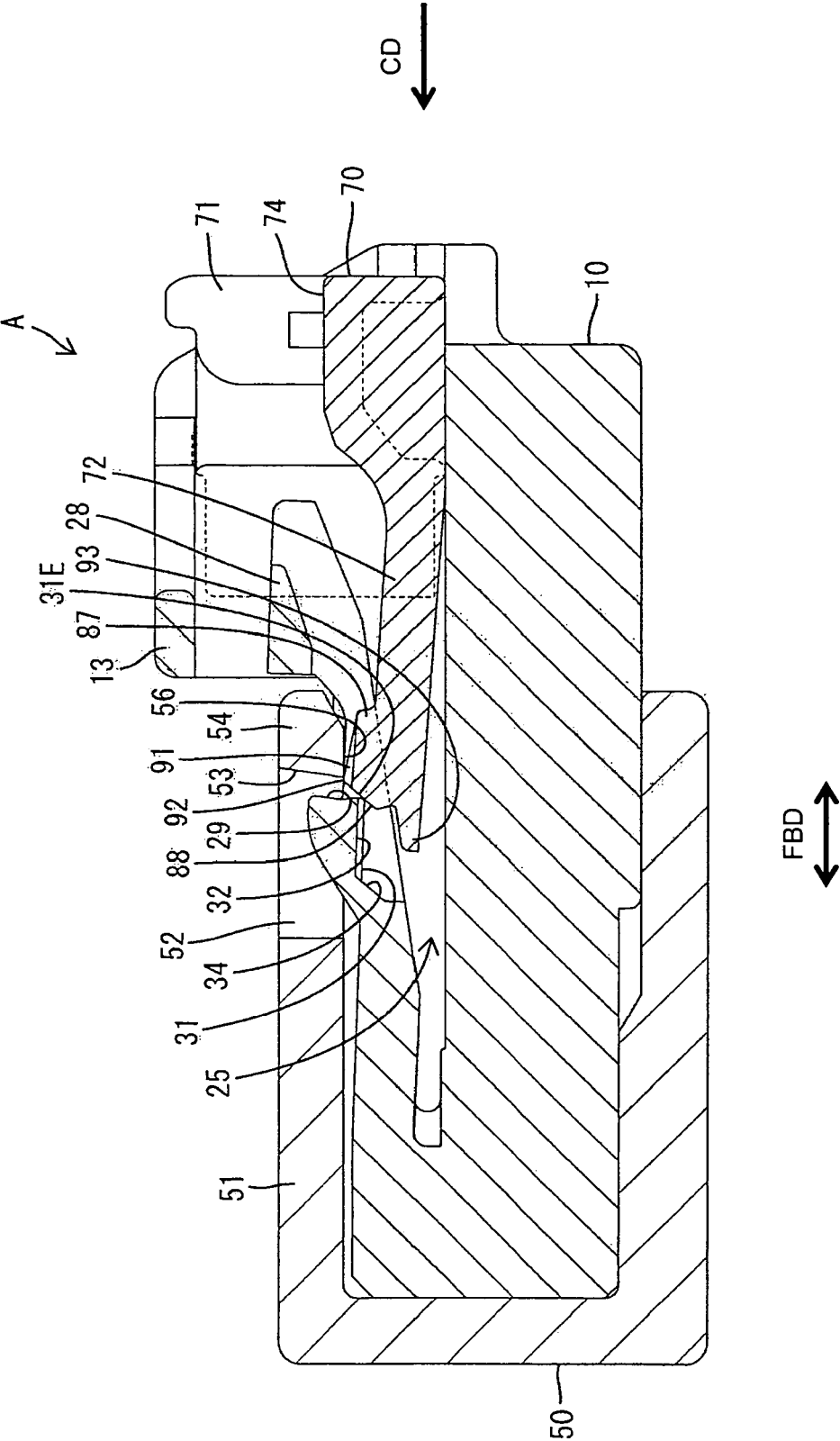


FIG. 15

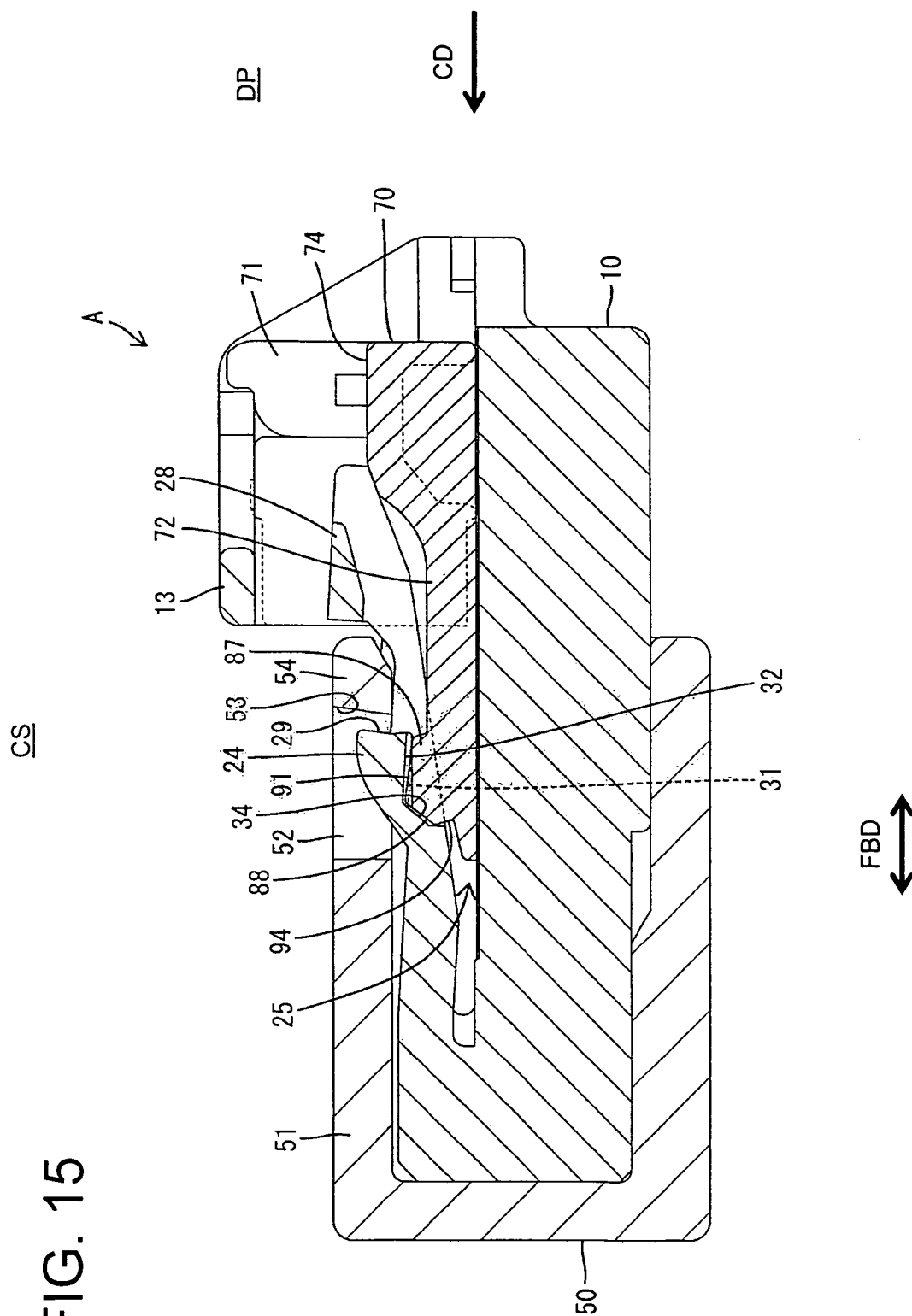


FIG. 16

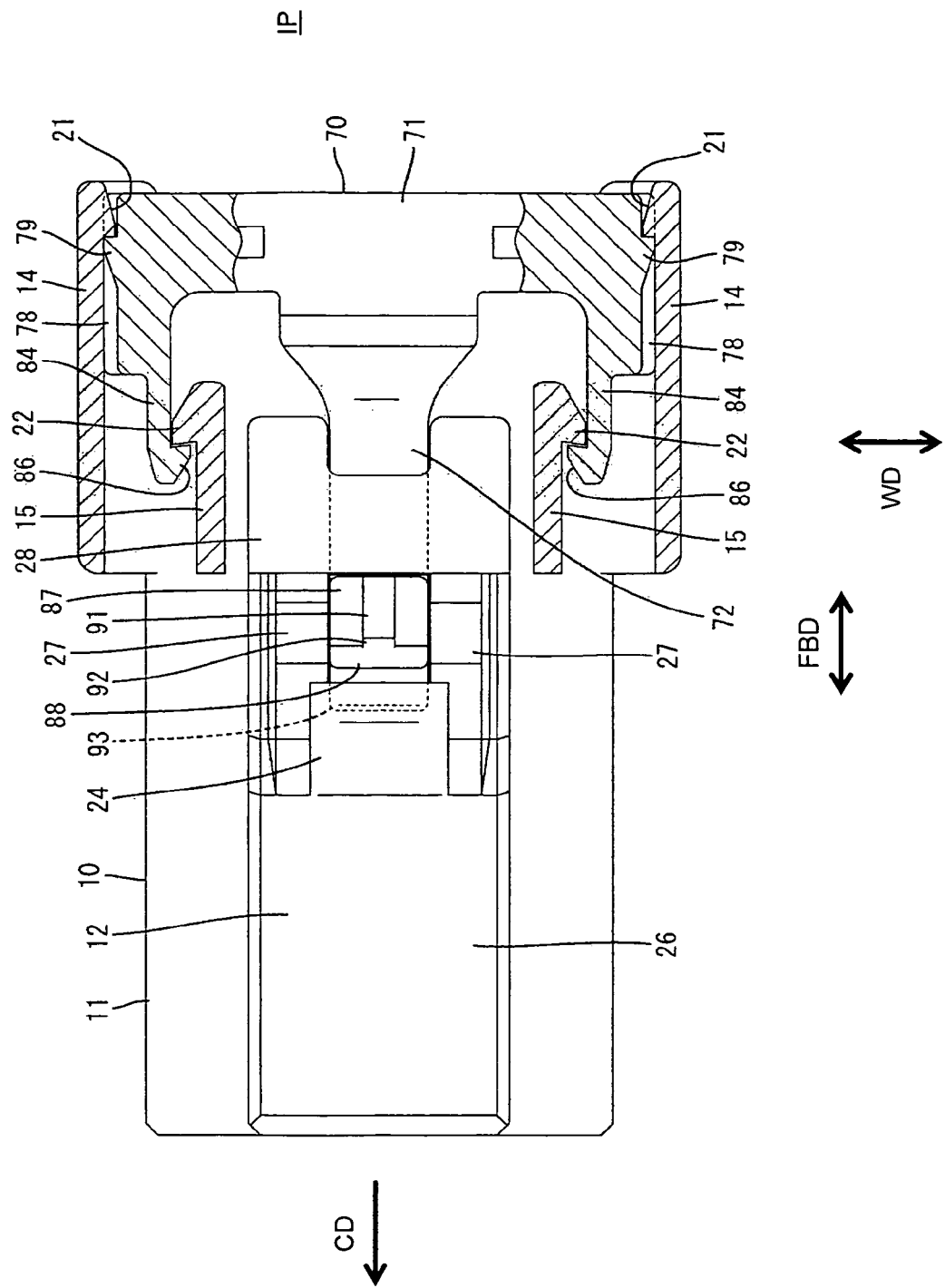


FIG. 17

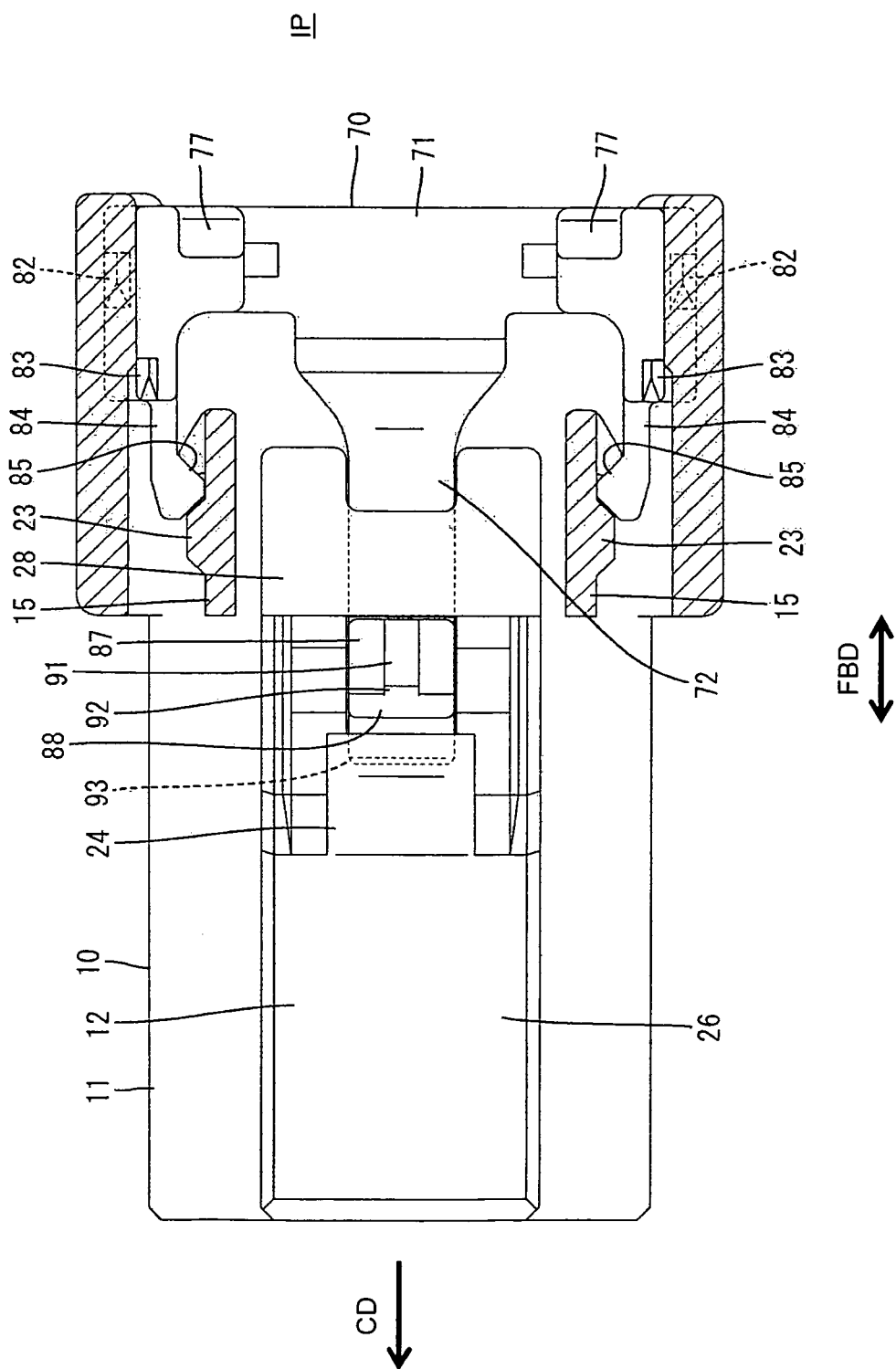


FIG. 18

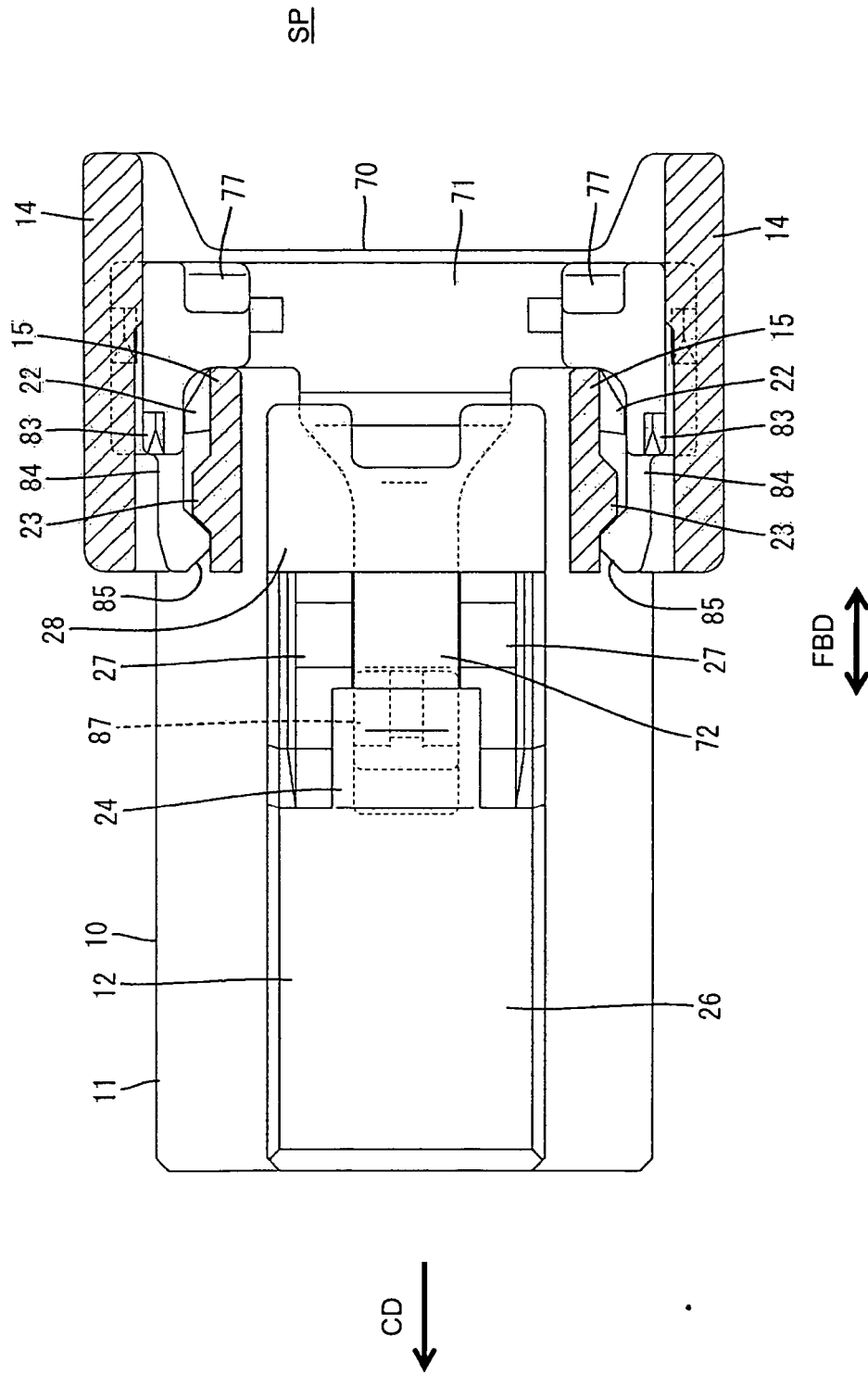


FIG. 19

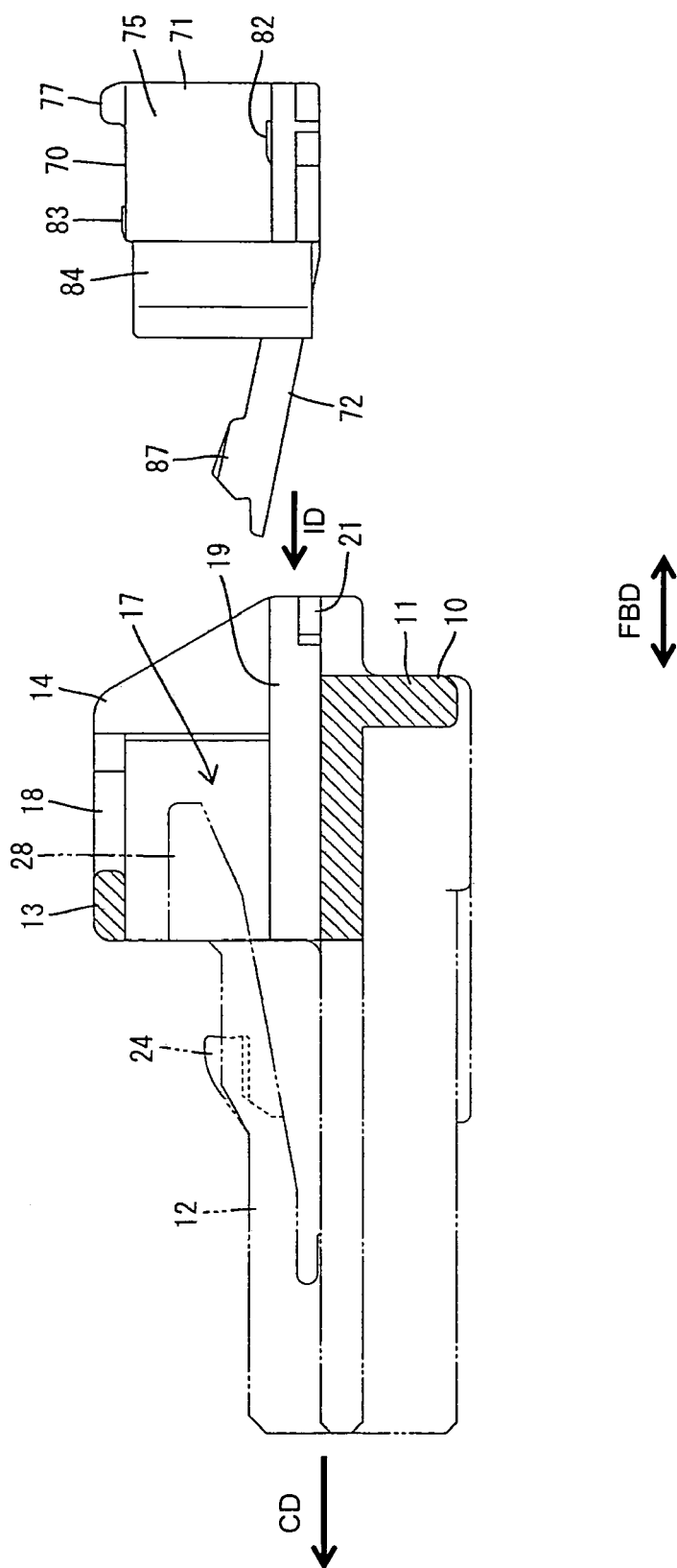


FIG. 20

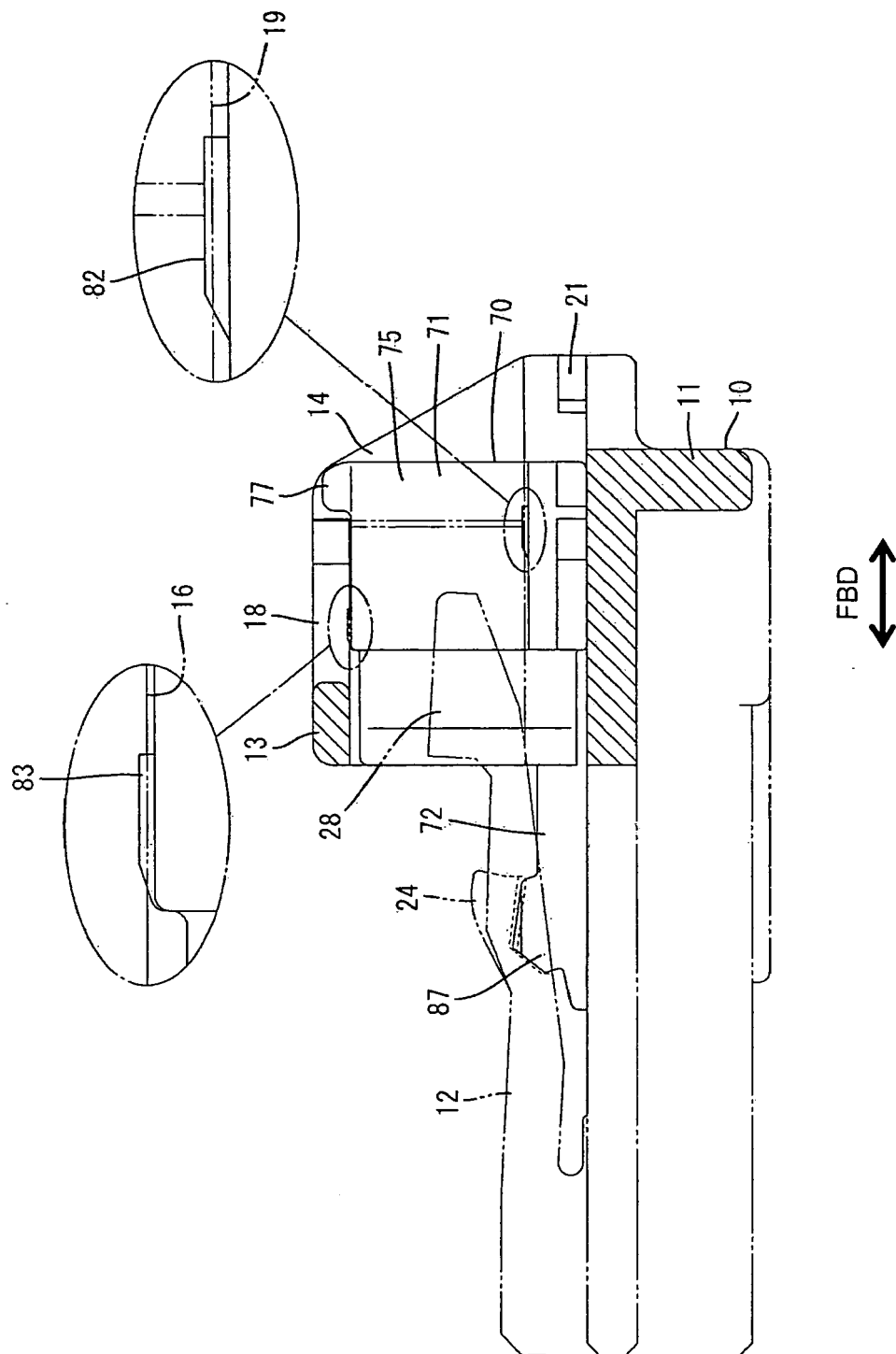


FIG. 21

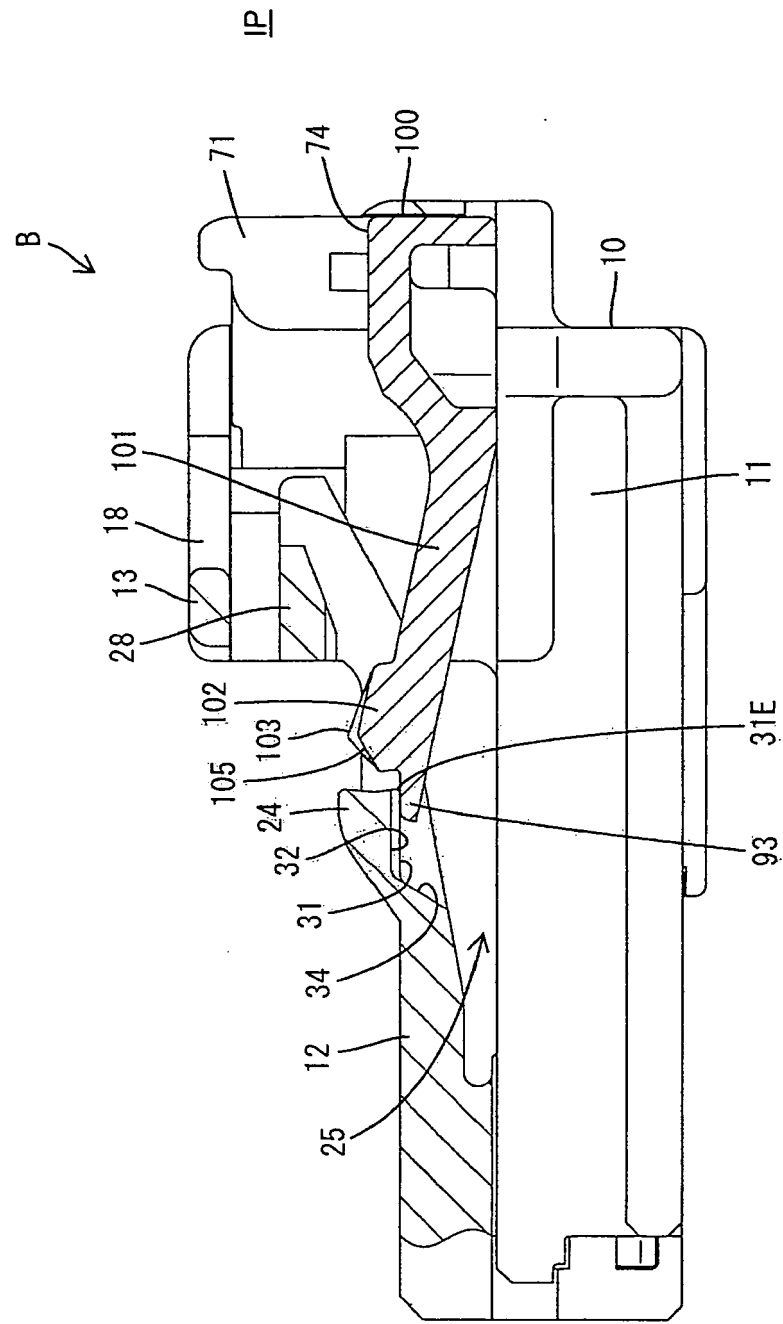


FIG. 22

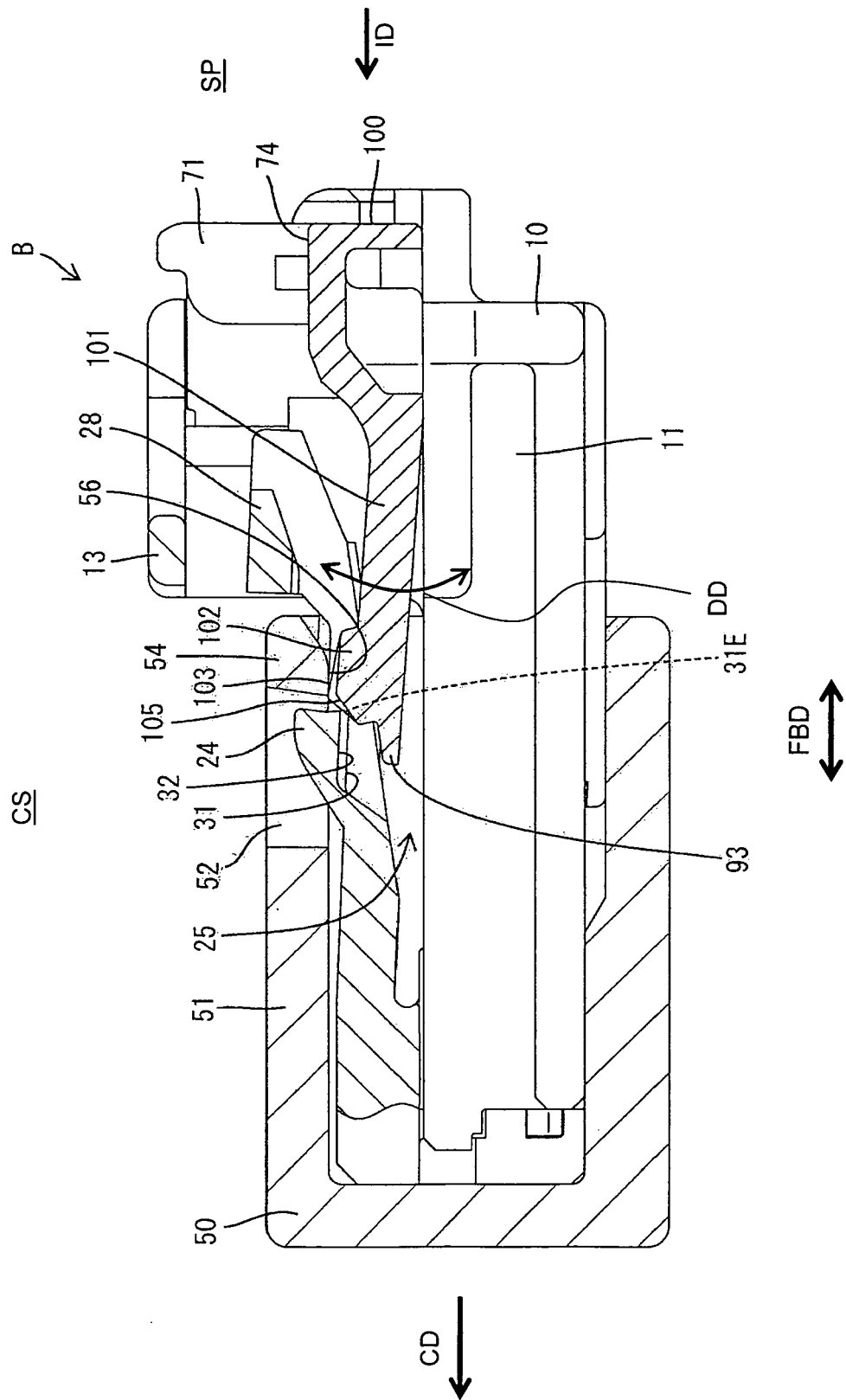


FIG. 23

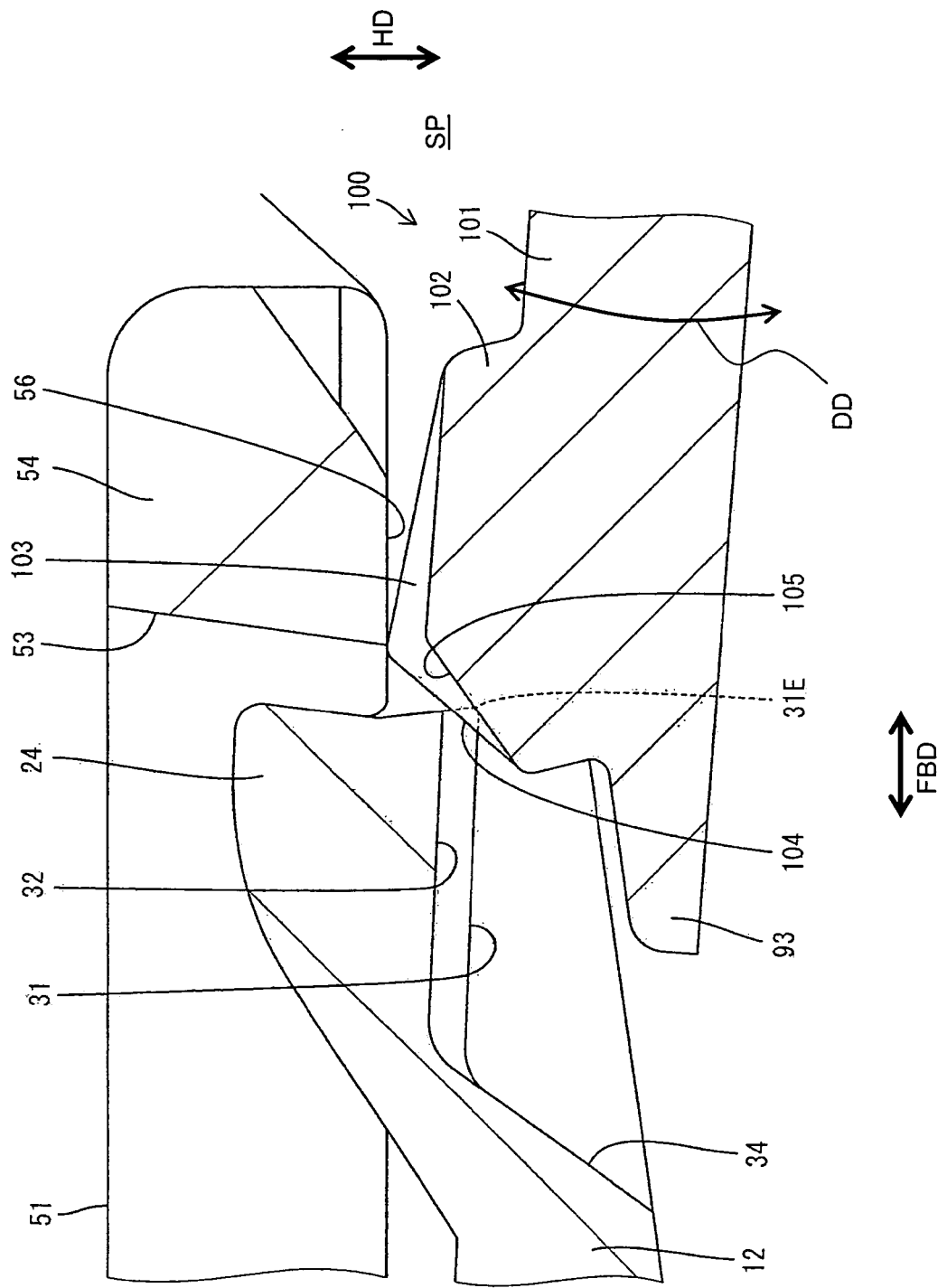


FIG. 24

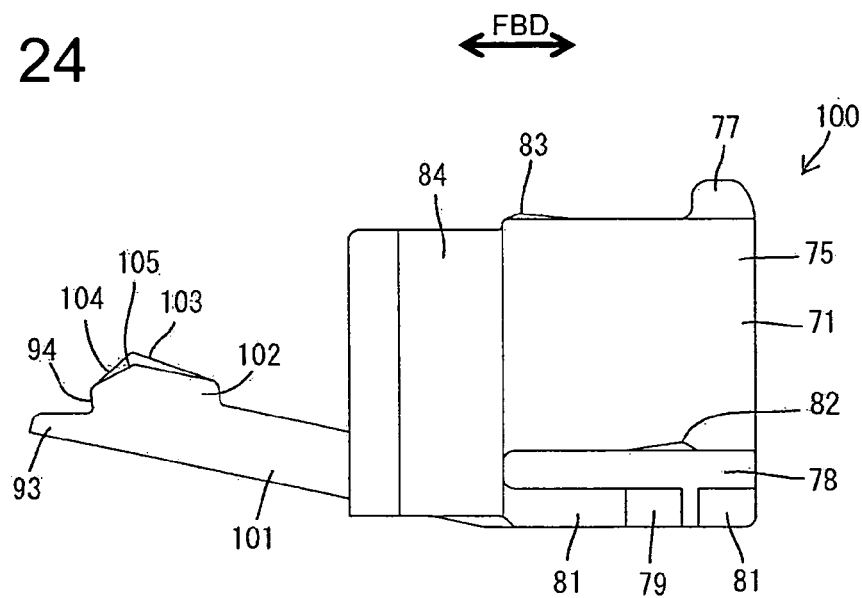


FIG. 25

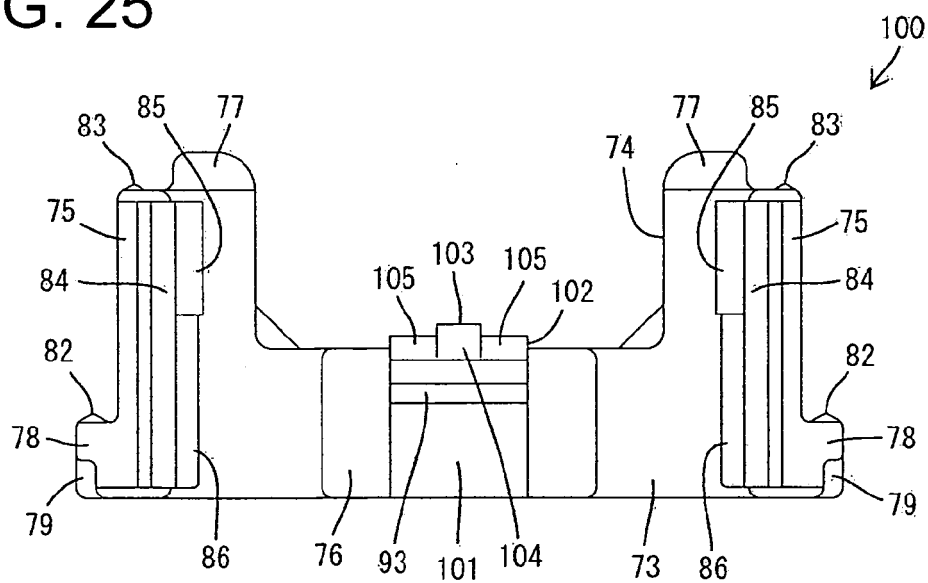


FIG. 26

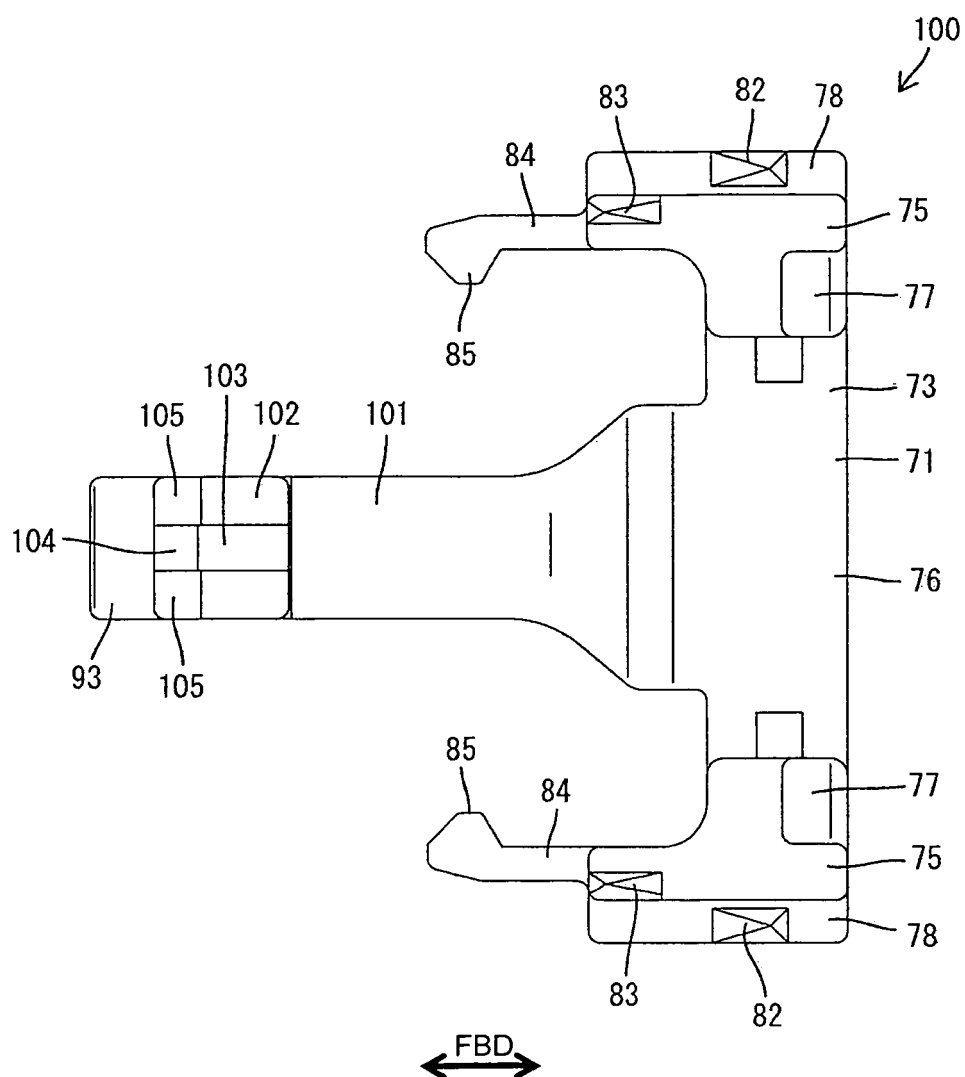


FIG. 27

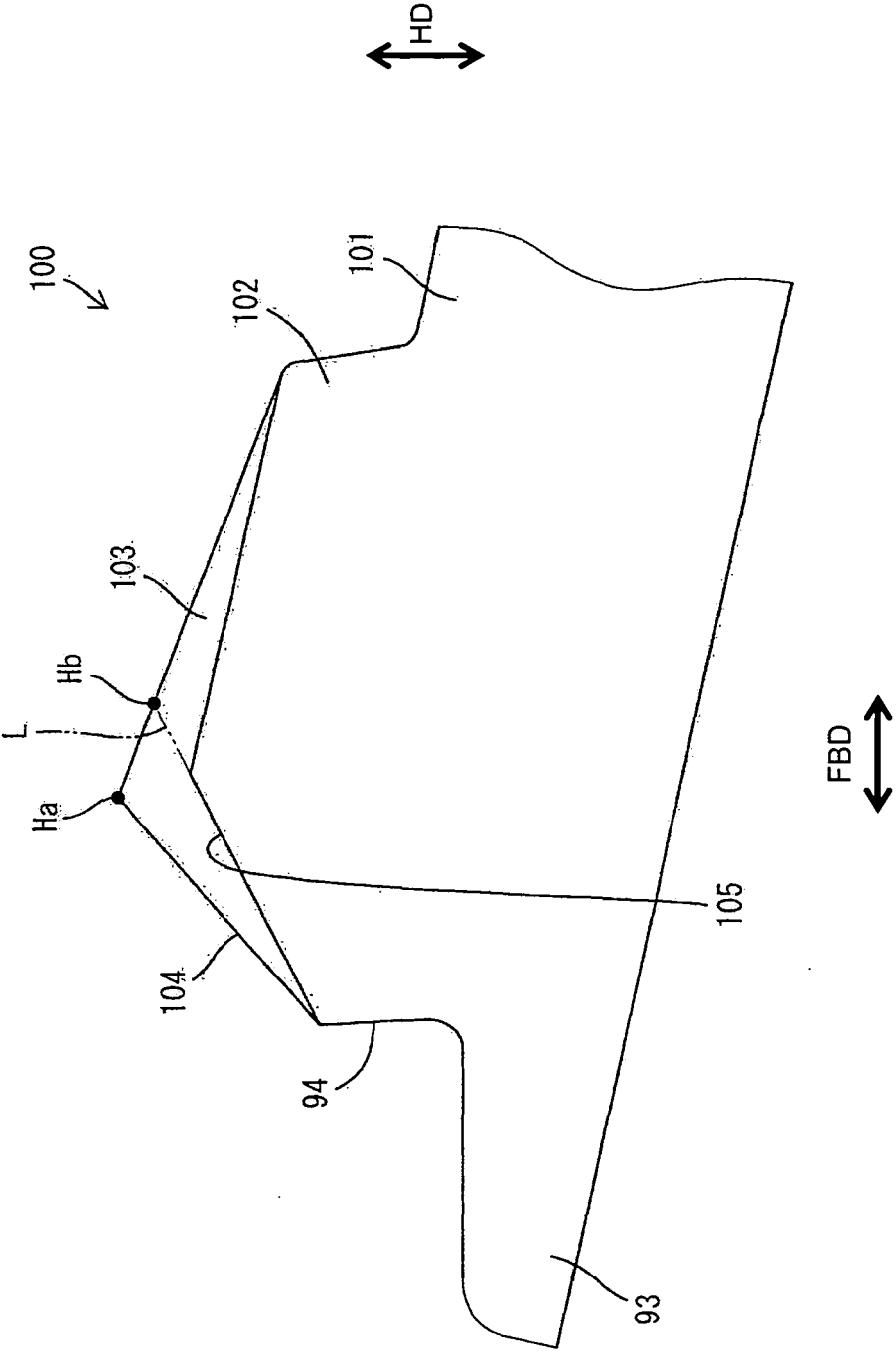
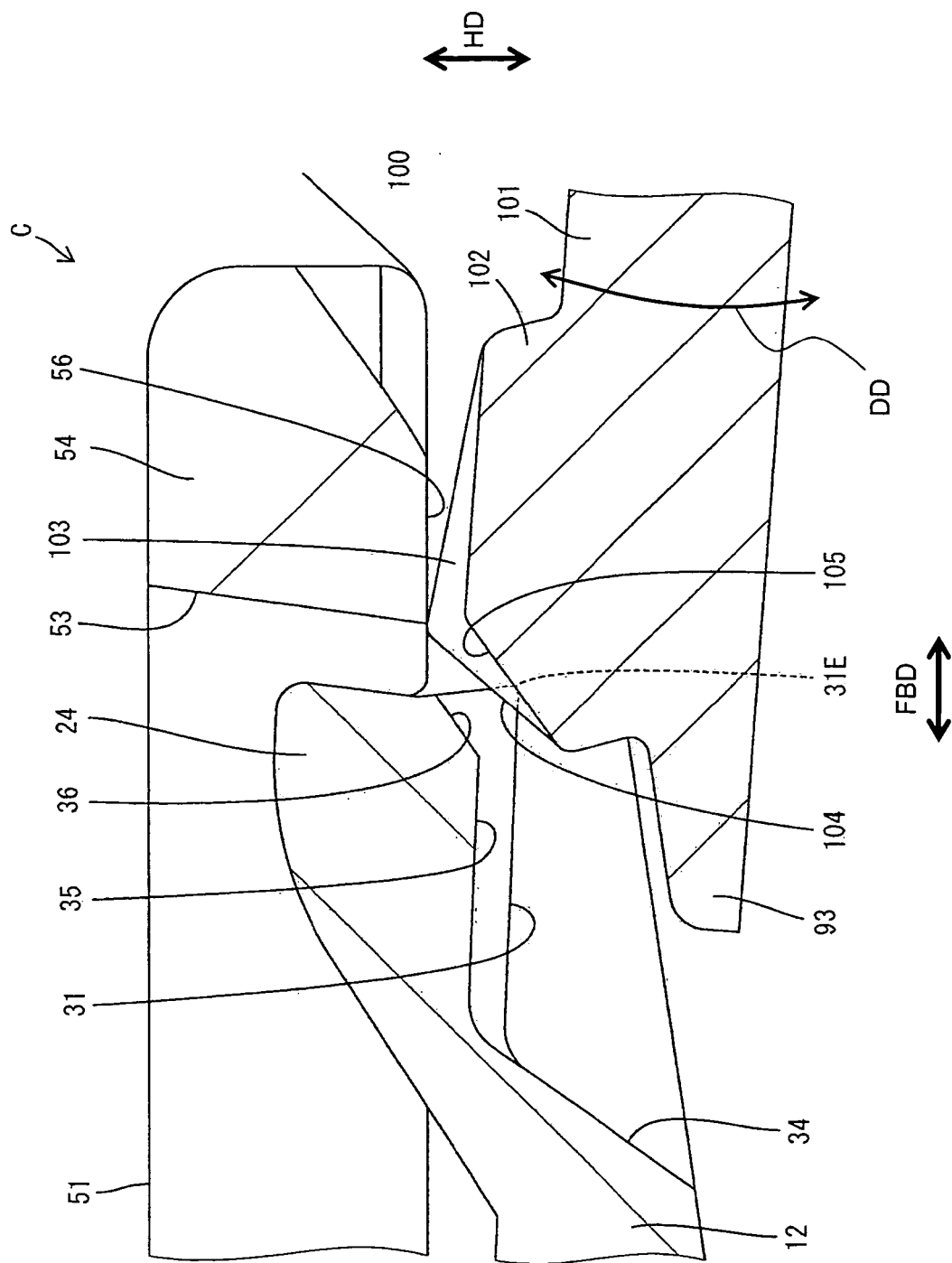


FIG. 28





EUROPEAN SEARCH REPORT

Application Number
EP 13 00 0685

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 6 824 417 B1 (NIMURA KAZUHIKO [JP]) 30 November 2004 (2004-11-30) * abstract * * column 6, line 40 - column 6, line 45 * * figure 9 *	1-15	
A	EP 1 986 284 A2 (SUMITOMO WIRING SYSTEMS [JP]) 29 October 2008 (2008-10-29) * abstract * * sentence 49, paragraph 33 - sentence 55, paragraph 33 * * figure 4 *	1-15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
Place of search		Date of completion of the search	Examiner
The Hague		7 June 2013	Pugliese, Sandro
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EPO FORM 1503 03-82 (P04C01)

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ON EUROPEAN PATENT APPLICATION NO.**

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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