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(54) Ring binder mechanism

(57) A ring binder mechanism (100) for retaining loose-leaf pages, comprising: a housing (101); hinge plates (105) supported by the housing (101) for pivoting motion; a plurality of rings each comprising two ring members, at least one of two ring members being mounted to the corresponding hinge plate and moveable with pivoting motion of the corresponding hinge plate relative to the other ring member between a closed position and an open position; and a rotatably mounted control means; wherein each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plates (105) or the housing (101), and the ring sections for mounting to the hinge plate (105) or the housing (101) of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate. Furthermore, two hinge plates have different widths. According to the invention, the raw materials used for producing the ring binder mechanism may be decreased remarkably, thereby lowering the cost for production, package and shipment. The opening between the free ends of the two ring members is also enough to facilitate adding or removing loose-leaf pages from the rings.

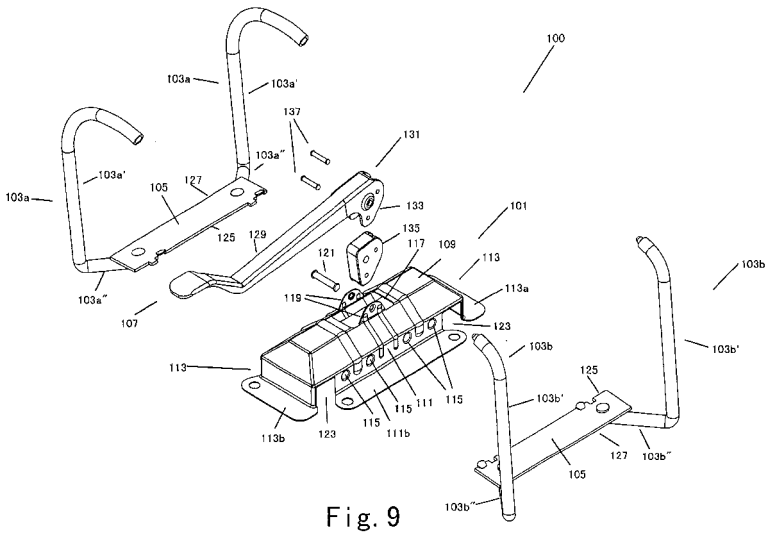

Fig. 9

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Description

Field of the Invention

[0001] This invention relates to a ring binder mechanism for retaining loose-leaf pages, and in particular to an improved ring binder mechanism for saving raw materials and adding or removing easily loose-leaf pages.

Background of the Invention

[0002] In the prior art, a ring binder mechanism is used to retain loose-leaf pages such as hole-punched papers in a file or notebook. For example, Chinese Patent Application No. 200510055025.2 filed by the applicant of this invention disclosed in Fig.15-18B a ring binder mechanism, wherein the ring binder mechanism comprises a plurality of rings comprising each two ring members. The ring members mount on two adjacent hinge plates that join together about a pivot axis and pivot within an elongated housing. The ring binder mechanism also comprises a rotatable control means with a protrusion mounted at the center of the elongated housing. By rotating downwards the control means toward the housing, the protrusion of the control means acts on the two hinge plates to drive the two hinge plates to pivot downwards until the ring members mounted to the hinge plates close and lock together. To open the ring binder mechanism, by rotating upwards the control means away from the housing, a spring attached to the hinge plates pivots the hinge plates upwards through a coplanar position to open the ring members.

[0003] Since the elongated housing typically extends at least between two end rings, the ring binder mechanism of the prior art uses more raw materials, resulting in a higher production cost and a heavier weight and thus increasing the cost for package and shipment. Furthermore, when the ring binder mechanism of the prior art opens, the opening between the free ends of the two ring members is not enough to facilitate adding or removing loose-leaf pages. Furthermore, the ring binder mechanism of the prior art is generally attached to the cover of a file or notebook and the like only at two longitudinal ends, there is also a problem that its attaching to the cover of a file or notebook and the like is not convenient and firm. Thus, there needs an improved ring binder mechanism.

Summary of the Invention

[0004] Therefore, an object of the present invention is to provide a ring binder mechanism, in which the raw material for producing the ring binder mechanism may be remarkably decreased such that the costs for production, package and shipment of the ring binder mechanism can be greatly decreased.

[0005] Another object of the invention is to provide a ring binder mechanism, in which the space between the free ends of two ring members is enough to facilitate adding or removing loose-leaf pages when the ring binder mechanism opens.

[0006] In one aspect, the ring binder mechanism according to the invention for retaining loose-leaf pages comprises: a housing with a top and an opened bottom substantially opposite to the top; two hinge plates supported by the housing for pivoting motion relative to the housing; a plurality of rings for retaining loose-leaf pages, each of the rings comprising two ring members, at least one of two ring members being mounted to the corresponding hinge plate and moveable with pivoting motion of the corresponding hinge plate relative to the other ring member between a closed position and an open position, at the closed position, the two ring members forming a substantially continuous, closed loop for allowing loose-leaf pages retained by the rings to be moved along the rings from one ring member to the other ring member, at the open position, the two ring members forming a discontinuous, open loop for adding or removing loose-leaf pages from the rings; and a rotatably mounted control means, the control means being rotatable to produce the pivoting motion of the hinge plates that brings the ring members to the closed position; wherein each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plates or the housing, and the ring sections for mounting to the hinge plate or the housing of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0007] Preferably, the ring sections for mounting to the hinge plate or the housing are straight and form an inside angle of less than 90° with respect to the plane that the ring sections for retaining loose-leaf pages locate.

[0008] Preferably, the ring sections for mounting to the hinge plate or the housing are L-shaped and form an inside angle of 90° with respect to the plane that the ring sections for retaining loose-leaf pages locate.

[0009] Preferably, two ring members of each of the rings are mounted correspondingly to two hinge plates.

[0010] Preferably, the ring sections for mounting to the hinge plate or the housing of the two ring members of the two rings mounted near the longitudinal ends of the housing form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0011] Preferably, two hinge plates are disposed such that an angle between their outer surfaces is not more than 180°.

[0012] Preferably, the control means is disposed such the control means acts on the inner surfaces of two hinge plates.

[0013] Preferably, two hinge plates are disposed such that an angle between their outer surfaces is not less

than 180° when the ring binder mechanism closes.

[0014] Preferably, the control means is disposed such the control means act on the outer surfaces of two hinge plates.

[0015] Preferably, the ring binder mechanism further comprises a spring for driving the hinge plates to pivot so as to open the ring members.

[0016] Preferably, the spring has an arcuate shape projecting upwards and fits into the hinge plates such that the main portions projecting arcuately upwards in the middle of the spring abut against the outer surfaces of the interconnected hinge plates.

[0017] Preferably, the shape and the size of the free ends of the ring members are selected to allow the control means to be turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

[0018] Preferably, the shape and the size of the free ends of the ring members are selected to prevent the control means from being turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

[0019] Preferably, two hinge plates have different widths.

[0020] Preferably, two ring members of each of rings are different or asymmetric, and the long ring member is mounted to the narrow hinge plate while the short ring member is mounted to the wide hinge plate.

[0021] Preferably, the control means comprises a control lever and a cam portion for acting on the hinge plates.

[0022] Preferably, the ring binder mechanism further comprises a plastic pad block for decreasing the friction between the cam portion and the hinge plates.

[0023] Preferably, the control lever and the cam portion of the control means are formed from plastics by injection molding.

[0024] Preferably, one longitudinal edge portion of the housing is bent downwards to form a bend under rim, and the other longitudinal edge portion is provided along the longitudinal direction with a plurality of protrusions protruding towards the inside of the housing for supporting the hinge plates.

[0025] Preferably, the housing is provided with flat extensions for mounting the ring binder mechanism onto a cover.

[0026] Preferably, the other longitudinal edge portion and two longitudinal ends of the housing are provided respectively with flat extensions extending on the same plane.

[0027] Preferably, two longitudinal edge portions of the housing are bent downwards to form the bend under rims for supporting the hinge plates.

[0028] Preferably, a plurality of reinforcing ribs across the housing are formed on the housing.

[0029] In another aspect, the ring binder mechanism for retaining loose-leaf pages according to the invention comprises: a housing with a top and an opened bottom substantially opposite to the top; two hinge plates supported by the housing for pivoting motion relative to the housing; a plurality of rings for retaining loose-leaf pages, each of the rings comprising two ring members, at least one of two ring members being mounted to the corresponding hinge plate and moveable with pivoting motion of the corresponding hinge plate relative to the other ring member between a closed position and an open position, at the closed position, the two ring members forming a substantially continuous, closed loop for allowing loose-leaf pages retained by the rings to be moved along the rings from one ring member to the other ring member, at the open position, the two ring members forming a discontinuous, open loop for adding or removing loose-leaf pages from the rings; and a rotatably mounted control means, the control means being rotatable to produce the pivoting motion of the hinge plates that brings the ring members to the closed position; wherein two hinge plates have different widths.

[0030] Preferably, two ring members of each of rings are different or asymmetric, and the long ring member is mounted to the narrow hinge plate while the short ring member is mounted to the wide hinge plate.

[0031] Preferably, each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plate or the housing, the ring sections for mounting to the hinge plate or the housing of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing are straight and form respectively an inside angle of less than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0032] Preferably, each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plate or the housing, the ring sections for mounting to the hinge plate or the housing of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing are L-shaped and form respectively an inside angle of 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0033] Preferably, two ring members of each of the rings are mounted correspondingly to two hinge plates.

[0034] Preferably, the ring sections for mounting to the hinge plate or the housing of the two ring members of two rings mounted near the longitudinal ends of the housing form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0035] Preferably, two hinge plates are disposed such that an angle between their outer surfaces is not more than 180°.

[0036] Preferably, the control means is disposed such the control means acts on the inner surfaces of two hinge plates.

[0037] Preferably, two hinge plates are disposed such

that an angle between their outer surfaces is not less than 180° when the ring binder mechanism closes.

[0038] Preferably, the control means is disposed such the control means acts on the outer surfaces of two hinge plates.

[0039] Preferably, the ring binder mechanism further comprises a spring for driving the hinge plates to pivot so as to open the ring members.

[0040] Preferably, the spring has an arcuate shape projecting upwards and fits into the hinge plates such that the main portions projecting arcuately upwards in the middle of the spring abut against the outer surfaces of the interconnected hinge plates.

[0041] Preferably, the shape and the size of the free ends of the ring members are selected to allow the control means to be turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

[0042] Preferably, the shape and the size of the free ends of the ring members are selected to prevent the control means from being turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

[0043] Preferably, the control means comprises a control lever and a cam portion for acting on the hinge plates.

[0044] Preferably, the ring binder mechanism further comprises a plastic pad block for decreasing the friction between the cam portion and the hinge plates.

[0045] Preferably, the control lever and the cam portion of the control means are formed from plastics by injection molding.

[0046] Preferably, one longitudinal edge portion of the housing is bent downwards to form a bend under rim, and the other longitudinal edge portion is provided along the longitudinal direction with a plurality of protrusions protruding towards the inside of the housing for supporting the hinge plates.

[0047] Preferably, the housing is provided with flat extensions for mounting the ring binder mechanism onto a cover.

[0048] Preferably, the other longitudinal edge portion and two longitudinal ends of the housing are provided respectively with flat extensions extending on the same plane.

[0049] Preferably, two longitudinal edge portions of the housing are bent downwards to form the bend under rims for supporting the hinge plates.

[0050] Preferably, a plurality of reinforcing ribs across the housing are formed on the housing.

[0051] Preferably, each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plate or the housing, and the ring section for mounting to the hinge plate or the housing and the ring section for retaining loose-leaf pages locate on the same plane.

[0052] In still another aspect, the ring binder mechanism for retaining loose-leaf pages according to the invention comprises: a housing with a top and an opened bottom substantially opposite to the top; two hinge plates supported by the housing for pivoting motion relative to the housing; a plurality of rings for retaining loose-leaf pages, each of the rings comprising two ring members, at least one of two ring members being mounted to the corresponding hinge plate and moveable with pivoting motion of the corresponding hinge plate relative to the other ring member between a closed position and an open position, at the closed position, the two ring members forming a substantially continuous, closed loop for allowing loose-leaf pages retained by the rings to be moved along the rings from one ring member to the other ring member, at the open position, the two ring members forming a discontinuous, open loop for adding or removing loose-leaf pages from the rings; wherein the housing is provided on one longitudinal edge portion with flat extension for mounting the ring binder mechanism onto a cover.

[0053] Preferably, two longitudinal ends of the housing are provided respectively with a flat extension extending on the same plane.

[0054] Preferably, the other longitudinal edge portion of the housing is bent downwards to form a bend under rim.

[0055] Preferably, the one longitudinal edge portion is provided along the longitudinal direction with a plurality of protrusions protruding towards the inside of the housing for supporting the hinge plates.

[0056] Preferably, wherein holes to be passed through by fasteners are formed on the flat extensions.

[0057] Preferably, the ring binder mechanism further comprises a rotatably mounted control means, the control means being rotatable to produce the pivoting motion of the hinge plates that brings the ring members to the closed position.

[0058] Preferably, two hinge plates have different widths.

[0059] Preferably, two ring members of each of rings are different or asymmetric, and the long ring member is mounted to the narrow hinge plate while the short ring member is mounted to the wide hinge plate.

[0060] Preferably, each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plate or the housing, the ring sections for mounting to the hinge plate or the housing of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing are straight and form respectively an inside angle of less than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0061] Preferably, each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plate or the housing, the ring sections for mounting to the hinge plate or the housing of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing are L-shaped and form respectively an inside angle of

90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0062] Preferably, two ring members of each of the rings are mounted correspondingly to two hinge plates.

[0063] Preferably, the ring sections for mounting to the hinge plate or the housing of the two ring members of two rings mounted near the longitudinal ends of the housing form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

[0064] Preferably, two hinge plates are disposed such that an angle between their outer surfaces is not more than 180°.

[0065] Preferably, the control means is disposed such the control means acts on the inner surfaces of two hinge plates.

[0066] Preferably, two hinge plates are disposed such that an angle between their outer surfaces is not less than 180° when the ring binder mechanism closes.

[0067] Preferably, the control means is disposed such the control means acts on the outer surfaces of two hinge plates.

[0068] Preferably, the ring binder mechanism further comprises a spring for driving the hinge plates to pivot so as to open the ring members.

[0069] Preferably, the spring has an arcuate shape projecting upwards and fits into the hinge plates such that the main portions projecting arcuately upwards in the middle of the spring abut against the outer surfaces of the interconnected hinge plates.

[0070] Preferably, the shape and the size of the free ends of the ring members are selected to allow the control means to be turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

[0071] Preferably, the shape and the size of the free ends of the ring members are selected to prevent the control means from being turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

[0072] Preferably, the control means comprises a control lever and a cam portion for acting on the hinge plates.

[0073] Preferably, the ring binder mechanism further comprises a plastic pad block for decreasing the friction between the cam portion and the hinge plates.

[0074] Preferably, the control lever and the cam portion of the control means are formed from plastics by injection molding.

[0075] According to the ring binder mechanism of one aspect of the invention, since each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plates, and the ring sections for mounting to the hinge plate form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages locate, the length of the hinge plates and thus the length of the elongate housing may be remarkably decreased by properly increasing the length of the ring sections for mounting to the hinge plates when the length between the rings at two longitudinal ends of the housing is constant. As a result, the materials used for producing the hinge plates and the elongate housing may be decreased greatly such that the costs for production, package and shipment of the ring binder mechanism will be lowered remarkably.

[0076] According to the ring binder mechanism of another aspect of the invention, since the two hinge plates is designed such that one hinge plate is wide while the other hinge plate is narrow, the angle range of movement of the narrow hinge plate is larger than the angle range of movement of the wide hinge plate when the ring binder mechanism changes from the closed position to the open position. Therefore, the ring members attached to the narrow hinge plate may open at a larger angle range with moving of the narrow hinge plate such that the opening distance between the free ends of the ring members becomes larger at the open position for adding or removing easily loose-leaf pages.

[0077] The features and advantages of the present invention will be more apparent from the following detailed description of the preferred embodiments taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0078]

Fig.1 is a front view showing the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.2 is a left side view of the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.3 is a right side view of the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.4 is a plan view of the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.5 is a bottom view of the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.6 is a top side perspective view of the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.7 is a bottom side perspective view of the ring binder mechanism according to a first embodiment of the invention at a closed and locked position;

Fig.8 is a cross-section view taken along the line 8-8 in Fig.6;

Fig.9 is an exploded perspective view of the ring binder mechanism according to a first embodiment of the invention;

Fig.10 is a top side perspective view of the ring binder

mechanism according to a first embodiment of the invention at an open position;

Fig.11 is a bottom side perspective view of the ring binder mechanism according to a first embodiment of the invention at an open position;

Fig.12 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a first embodiment of the invention at an open position;

Fig.13 is a schematic diagram showing the ring binder mechanism according to a first embodiment of the invention attached to a file cover;

Fig.14 is a top side perspective view showing the ring binder mechanism according to a second embodiment of the invention at a closed and locked position;

Fig.15 is an exploded perspective view showing the ring binder mechanism according to a second embodiment of the invention;

Fig.16 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a second embodiment of the invention at a closed and locked position;

Fig.17 is a top side perspective view showing the ring binder mechanism according to a second embodiment of the invention at an open position;

Fig.18 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a second embodiment of the invention at an open position;

Fig.19 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a third embodiment of the invention at a closed and locked position;

Fig.20 is an exploded perspective view showing the ring binder mechanism according to a third embodiment of the invention;

Fig.21 is a top side perspective view showing the ring binder mechanism according to a third embodiment of the invention at an open position;

Fig.22 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a third embodiment of the invention at an open position;

Fig.23 is another top side perspective view showing the ring binder mechanism according to a third embodiment of the invention at an open position, in which the control means are shown to be turned to the other end of the housing;

Fig.24 is a front view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position;

Fig.25 is a left side view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position;

Fig.26 is a right side view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position;

Fig.27 is a plan view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position;

Fig.28 is a bottom view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position;

Fig.29 is a top side perspective view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position, in which a part of the housing and a pair of ring are removed to clearly illustrate the inner structure at the assembled state;

Fig.30 is a bottom side perspective view of the ring binder mechanism according to a fourth embodiment of the invention at a closed and locked position;

Fig.31 is a cross section taken along the line 31-31 in Fig.24;

Fig.32 is an exploded perspective view of the ring binder mechanism according to a fourth embodiment of the invention;

Fig.33 is top side perspective view of the ring binder mechanism according to a fourth embodiment of the invention at an open position;

Fig.34 is bottom side perspective view of the ring binder mechanism according to a fourth embodiment of the invention at an open position;

Fig.35 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a fourth embodiment of the invention at an open position;

Fig.36 is another top side perspective view of the ring binder mechanism according to a fourth embodiment of the invention at an open position, in which the control means are shown to be turned to the other end of the housing;

Fig.37 is a bottom side perspective view corresponding to Fig.36;

Fig.38 schematically shows the moving range of the hinge plates;

Fig.39 is an exploded perspective view of the ring binder mechanism according to a fifth embodiment of the invention;

Fig.40 is a top side perspective view of the ring binder mechanism according to a fifth embodiment of the invention at a closed and locked position, in which a part of the housing and a pair of ring are removed to clearly illustrate the inner structure at the assembled state;

Fig.41 is a perspective view of the ring binder mechanism according to a fifth embodiment of the invention at a closed and locked position;

Fig.42 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a fifth embodiment of the invention at a closed and locked position;

Fig.43 is a top side perspective view of the ring binder mechanism according to a fifth embodiment of the invention at an open position;

Fig.44 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a fifth embodiment of the invention at an open position;

Fig.45 is another top side perspective view of the ring binder mechanism according to a fifth embodiment of the invention at an open position, in which the control means are shown to be turned to the other end of the housing;

Fig.46 is a top side perspective view of the ring binder mechanism according to a sixth embodiment of the invention at a closed and locked position;

Fig.47 is an exploded perspective view of the ring binder mechanism according to a sixth embodiment;

Fig.48 is a top side perspective view of the ring binder mechanism according to a sixth embodiment of the invention at an open position;

Fig.49 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a sixth embodiment of the invention at an open position;

Fig.50 is a top side perspective view of the ring binder mechanism according to a seventh embodiment of the invention at a closed and locked position;

Fig.51 is a partial section schematic diagram showing the inner structure of the ring binder mechanism according to a seventh embodiment of the invention at a closed and locked position;

Fig.52 is an exploded perspective view of the ring binder mechanism according to a seventh embodiment;

Fig.53 is another top side perspective view of the ring binder mechanism according to a seventh embodiment of the invention at an open position, in which the control means are shown to be turned to the other end of the housing;

Fig.54 is a top side perspective view of the ring binder mechanism according to an eighth embodiment of the invention at a closed and locked position;

Fig.55 is a cross section view taken along the line 55-55 in Fig.54;

Fig.56 is an exploded perspective view of the ring binder mechanism according to an eighth embodiment;

Fig.57 is another top side perspective view of the ring binder mechanism according to an eighth embodiment of the invention an open position, in which in which the control means are shown to be turned to the other end of the housing;

Fig.58 is a front view of the ring binder mechanism according to a ninth embodiment of the invention;

Fig.59 is a left side view of the ring binder mechanism according to a ninth embodiment of the invention;

Fig.60 is a top view of the ring binder mechanism according to a ninth embodiment of the invention;

Fig.61 is a bottom view of the ring binder mechanism according to a ninth embodiment of the invention;

Fig.62 is an exploded perspective view of the ring binder mechanism according to a ninth embodiment; and

Fig.63 is another top side perspective view of the ring binder mechanism according to a ninth embodiment of the invention an open position, in which the control means are shown to be turned to the other end of the housing.

[0079] The same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

Detailed Description of the Preferred Embodiments

[0080] Fig.1-12 show a ring binder mechanism 100 according to a first embodiment of the invention. The ring binder mechanism 100 generally comprises a housing 101, two rings 103, two hinge plates 105 and a control means 107. The control means 107 is supported by the housing 101, and the rings 103 are mounted to the hinge plates 105. As described hereafter, the control means 107 may rotate relative to the housing to close and lock the ring binder mechanism 100 for retaining loose-leaf pages, or to open the ring binder mechanism 100 for adding or removing loose-leaf pages from the ring 103.

[0081] The housing 101 is elongated with a symmetrically, roughly arch-shaped cross section. A flat top portion 109 is formed at the center of the housing top. The housing 101 has a longitudinal axis, two opposite longitudinal edge portions 111 extending along the longitudinal direction and two longitudinal ends 113. One longitudinal edge portion 111 of the housing 101 is bent slightly downwards to form a bend under rim 111a. The other longitudinal edge portion 111 of the housing 101 and two longitudinal ends 113 form respectively with the flat extensions 111b, 113a, 113b extending in the same plane. Through holes are formed in the flat extensions 111b, 113a, 113b such that the ring binder mechanism 100 may be fixed to the cover 1 of a file or notebook by such fasteners as rivet, as shown in Fig.13. The other longitudinal edge portion 111 with the flat extensions 111b is provided along the longitudinal direction with a plurality of protrusions 115 projecting towards the inside of the housing. Obviously, the flat extensions extending in the same plane may be formed only at the two longitudinal ends 113 of the housing respectively. The other longitudinal edge portion 111 is also slightly bent downwards to form the bend under rim. Otherwise, neither the two longitudinal ends nor the other longitudinal edge of the housing is formed with the flat extensions, and the ring binder mechanism 100 may be fixed to the cover of a file or notebook by such fasteners as rivets through a hole in the housing. The latter is well known in the art. It is conceivable that the housing 101 may be made from metal or other suitable material as long as the material has enough rigidity to ensure the stably mounting of the components of the ring binder mechanism 100, and has enough resilience to allow it to function as a spring.

[0082] An opening 117 for receiving the control means 107 is formed on the flat top portion 109 of the housing 101, and projections 119 with aligned holes are formed at both sides of the opening 117. The control means 107 may be pivotally mounted to the housing 101 by a pivot shaft 121 extending through the holes in the control means 107 and the projections 119. Preferably, the opening 107 and projections 119 are formed at the same time by punching and cutting the housing 101. To enhance the strength of the housing 101, a plurality of reinforcing ribs across the housing 101 may be formed on the housing 101, and preferably the reinforcing ribs may be formed integrally on the housing 101 by punching. Furthermore, pairs of cutouts 123 opposite to each other are provided between the two longitudinal edge portions 111 and the two longitudinal ends 113 of the housing 101 respectively for receiving the rings 103. It should be understood that the housing with various shapes such as an asymmetric housing and the housing with various reference numerals and shapes of opening or cutouts fall within the scope of the invention.

[0083] Each of the rings 103 comprises ring members 103a and 103b mounted respectively at two hinge plates 105. With the bend under rim 111a and the plurality of protrusions 115, the two hinge plates 105 are supported by the housing 101 to pivot to move the ring members 103a and 103b between a closed position and an open position. The ring members 103a and 103b have a cross section of circular shape, and may be made from suitable metals such as steel. At the closed position, the ring member 103a and 103b may form a substantially continuous, closed, "D"-shaped loop ring or loop for retaining loose-leaf pages and for allowing loose-leaf pages to move along the ring 103 from one ring member to the other. At the open position, the ring members form a discontinuous, open loop suitable for adding or removing pages. Although in the illustrated embodiment both of the ring members may move, a mechanism having one movable ring member and one fixed ring member also falls within the scope of the invention. Furthermore, a mechanism with more than two rings and with the rings that form other shapes (e.g., both of the ring members have a semicircular shape) when closed also falls within the scope of the invention.

[0084] Each of the hinge plates 105 is a thin and elongate sheet with a length slightly shorter than the housing 101, and has an inner longitudinal edge 125, an outer longitudinal edge 127 and two longitudinal ends. The two hinge plates 105 interconnect with each other along their inner longitudinal edges in parallel arrangement to form a central hinge with a pivot axis. This may be achieved in a well-known manner. The interconnected hinge plates 105 are disposed within the housing 101 such that the outer longitudinal edge 127 of each of the hinge plates fits loosely between the top of the housing 101 and the corresponding bend under rim 111a and a plurality of protrusions 115 respectively. In this structure, although the hinge plates 105 are disposed within the housing 101, the hinge plates 105 may pivot about the pivot axis. In detail, when the hinge plates 105 pivot to open the rings 103, the pivot axis moves upwards (i.e., moves towards the flat top portion 109 of the housing 101), as shown in Fig.12. When the hinge plates 105 pivot to close the rings 103, the pivot axis moves downwards (i.e., moves away from the flat top portion 109 of the housing 101), as shown in Fig.8.

[0085] Furthermore, the hinge plates 105 are designed such that the angle between the outer surfaces of two hinge plates 105 (i.e., the surfaces facing away from the flat top portion 109 of the housing 101) is always less than 180° when the hinge plates 105 pivot within the housing 101, and the pivot axis never moves to a position lower than the coplanar position of the two hinge plates 105 (i.e., the position that the angle between the outer surfaces of the two hinge plates 105 is equal to 180°). Therefore, the resilience of the housing 101 always moves the pivot axis of the hinge plates 105 upwards and pivots the hinge plates 105 to open the ring members 103a and 103b instead of closing the ring members 103a and 103b. It should be understood that, in an alternative embodiment, the angle between the outer surfaces of the two hinge plates may be more than 180° when the ring binder mechanism closes. Thus, the resilience of the housing moves the pivot axis of the hinge plates 105 downwards and pivots the hinge plates 105 to close the ring members 103a and 103b instead of opening the ring members 103a and 103b. In addition, in a particular embodiment of the invention, the hinge plates may be designed such that they pivot upwards and downwards to allow the pivot axis to pass through the coplanar position (180°) of the hinge plates.

[0086] As described above, the housing 101 supports the control means 107 to allow it to rotate relative to the housing 101. The control means 107 of this embodiment comprises a control lever and a cam portion 131. In this embodiment, the control lever 129 and the cam portion 131 are formed integrally with each other by bending a metal sheet. However, they may be formed separately and then assembled together. As can be seen from Fig. 8 and Fig.9, the cam portion 131 is defined by two separated cam sheets 133. To reduce the friction between the cam portion 131 and the hinge plates 105, a correspondingly shaped pad block 135 is fitted between the two separated cam sheets 133. The pad block 135 is fixed in the space between the two separated cam sheets 133 by two pins 137. The pad block 135 is preferably made from plastics. As described above, the control means 107 is pivotally mounted to the housing 101 by the pivot shaft 121 passing through the cam portion 131 of the control means 107 and the holes of the projections 119 of the housing 101. The control means 107 may have other shapes. For example, when the angle between the outer surfaces of two hinge plates is set to be more than 180°, the control means may be any suitable known structures that apply force to the hinge plates from the bottom side of the hinge plates (i.e., from outer surface of the

hinge plates), such as the control means disclosed in the Chinese Patent Application No.200510055025.2.

[0087] Different from the prior art, each of the ring members 103a and 103b of the ring binder mechanism 100 according to the invention does not locate on the same plane. Each of the ring members 103a and 103b of the ring binder mechanism 100 according to the invention comprises respectively ring sections 103a' and 103b' for retaining loose-leaf pages, and ring sections 103a" and 103b" for mounting to the hinge plates 105. The ring section 103a" and 103b" for mounting to the hinge plates 105 are mounted to the hinge plates 105 at an inside angle of no more than 90° with respect to the plane on which the ring sections 103a' and 103b'for retaining loose-leaf pages locate. Preferably, the ring sections 103a" and 103b" for mounting to the hinge plates 105 are generally straight, and form an inside angle of less than 90° with respect to the plane on which the ring sections 103a' and 103b'for retaining loose-leaf pages locate. Alternatively, the ring sections 103a" and 103b" for mounting to the hinge plates 105 are generally "L" shape, and form an inside angle of about 90° with respect to the plane on which the ring sections 103a' and 103b' for retaining loose-leaf pages locate. In case that the ring binder mechanism 100 has more than two rings 103, two sections of each of ring members 103a and 103b of the rings 103 only near two longitudinal ends of the housing do not locate on the same plane. It should be noted that the ring binder mechanism with one of two ring members of one ring movably mounted to the hinge plate, and the other fixedly mounted to the housing also falls within the scope of the invention.

[0088] The operation of the ring binder mechanism will be described hereinafter with reference to the accompanying drawings. The control means 107 may move selectively the ring binder mechanism 100 to the closed and locked position (as shown in Fig.1-8) and the open position (as shown in Fig.10-12). To close the ring binder mechanism 100, the control lever 129 of the control means of the ring binder mechanism as shown in Fig.10 is rotated down towards the housing such that the acting end of the cam portion 131 of the control means press down against two hinge plates 105. Under the action of the cam portion 131, the pivot axis of the hinge plates 105 moves downwards away from the flat top portion 109 of the housing such that the ring members 103a and 103b mounted to the hinge plates 105 join together with the pivoting motion of the hinge plates to form a closed loop for retaining loose-leaf pages. At the closed and locked position, since the cam portion 131 of the control means 107 still keeps pressing against the hinge plates 105, the ring members 103a and 103b join together and can not separate with each other. The hinge plates 105 is positioned such that the angle between their outer surfaces is at the maximum value but less than 180° (i.e., the pivot axis of the hinge plates locates above the coplanar position (180°)), as shown in Fig.8.

[0089] To open the ring binder mechanism 100, the control lever 129 of the control means of the ring binder mechanism as shown in Fig.6 is rotated upwards away from the housing such that the cam portion 131 of the control means separates from the two hinge plates 105. By manually separating the ring members or under the resilience of housing 101, the pivot axis of the hinge plates 105 moves up towards the flat top portion 109 of the housing such that the ring members 103a and 103b mounted to the hinge plates 105 separate with each other with the pivoting motion of the hinge plates. The resilience of the housing 101 keeps the ring members 103a and 103b in the open state for adding or removing loose-leaf pages. At the open position, the hinge plates 105 are positioned such that the angle between their outer surfaces is at the minimum value, as shown in Fig.12.

[0090] In the ring binder mechanism 100 according to the invention, since each of the ring members 103a and 103b comprises the ring sections 103a' and 103b' for retaining loose-leaf pages and the ring sections 103a" and 103b" for mounting to the hinge plates 105 respectively, and the ring section 103a" and 103b" are mounted to the hinge plates 105 with an inside angle of no more than 90° with respect to the plane on which the ring sections 103a' and 103b'for retaining loose-leaf pages locate, the length of the hinge plates 105 and thus the length of the elongate housing 101 may be remarkably decreased by properly increasing the length of the ring sections 103a" and 103b" for mounting to the hinge plates 105 when the length between the rings 103 at two longitudinal ends of the housing is constant. As a result, the materials used for producing the hinge plates and the elongate housing may be decreased greatly such that the costs for production, package and shipment of the ring binder mechanism will be lowered remarkably.

[0091] Fig.14-18 show the ring binder mechanism 200 according to a second embodiment of the invention. Components of the ring binder mechanism 200 of the second embodiment corresponding to components of the ring binder mechanism 100 of the first embodiment are represented by the same reference numerals, plus "100". The detailed description of the same structures in the second embodiment as those in the first embodiment will be omitted. The ring binder mechanism 200 according to the second embodiment is substantially similar to the ring binder mechanism 100 according to the first embodiment except that the ring binder mechanism 200 comprises a spring 239 as shown in Fig.15. The spring 239 is fitted onto the bottom of two hinge plates 205 for driving the hinge plates 205 to pivot so as to open the ring members 203a and 203b. Two notches 241 for receiving the spring 239 are formed at corresponding positions on the longitudinal outer edge 227 of each of the hinge plates 205. The spring 239 is made from a metal wire with a circular cross-section, and formed as a polygonal shape with an open end 243 and a closed end 245. The closed end 245 is bent upward at about 90° for fitting into the notches 241 on one of the interconnected hinge plates 205. The open end 243 of the spring 239 comprises two

free distal ends which are formed by bending twice respectively, in which the first bending is to bend the metal wire upwards at about 90° and the second bending is to bend the bent distal ends outwards at about 90°. Two free distal ends may be detachably fitted into the notches 241 on the other one of the interconnected hinge plates 205. The main portions 247 in the middle of the spring 239 protrude upwards in a generally arcuate shape. When the spring 239 is fitted into the two hinge plates 205, the main portions 247 in the middle of the spring 239 locate substantially below and against the interconnected hinge plates 205.

[0092] As shown in Fig.18, the spring 239 is relatively slack when the hinge plates 205 are positioned such that the ring member 203a and 203b open. The main portions 247 in the middle of the spring 239 which protrude upwards in a generally arcuate shape abut against the hinge plates 205 such that the angle between the outer surfaces of the hinge plates 205 is less than 180° (i.e., the pivot axis of the hinge plates locates above the coplanar position (180°) of the hinge plates 205). To close the ring binder mechanism 200, the control lever 229 of the control means of the ring binder mechanism as shown in Fig. 17 is rotated down towards the housing such that the acting end of the cam portion 231 of the control means 207 presses down against two hinge plates 205. Under the action of the cam portion 231, the pivot axis of the hinge plates 205 moves down away from the flat top portion 209 of the housing and pass through the coplanar position (180°) of the hinge plates 205, such that the ring members 203a and 203b mounted to the hinge plates 205 join together with the pivoting motion of the hinge plates to form a closed loop for retaining loose-leaf pages. At the closed and locked position, the spring 239 is biased properly to flatten the arcuate main portions 247. The control lever 229 of the control means 207 of the ring binder mechanism 200 as shown in Fig.14 is rotated upwards away from the housing such that the cam portion 231 of the control means separates from the two hinge plates 205. At this time, the biased spring 239 restores to its original shape and drives automatically the hinge plates 205 to pivot upwards through the coplanar position (180°) to open the ring members 203a and 203b.

[0093] In this embodiment, the spring 239 drives the hinge plates 205 to pivot so as to open the ring member 203a and 203b and to keep the opened ring members 203a and 203b at the separated state. Therefore, the spring 239 has the same function as the resilience of the housing. An advantageous effect of the mechanism 200 is that it is possible to decrease or eliminate the resilience of the housing and to apply force to the hinge plates 205 only by the spring 239. This allows the pivoting downwards of the hinge plates 205 and passing through the coplanar position (180°) more easily, thereby facilitating the closing of the ring binder mechanism 200. Furthermore, it is possible to open the ring binder mechanism without any manually operating the ring members.

[0094] Fig.19-23 show the ring binder mechanism 300 according to a third embodiment of the invention. Components of the ring binder mechanism 300 of the third embodiment corresponding to components of the ring binder mechanism 100 of the first embodiment are represented by the same reference numerals, plus "200". The detailed description of the same structures in the third embodiment as those in the first embodiment will be omitted. The ring binder mechanism 300 according to the third embodiment is substantially similar to the ring binder mechanism 100 according to the first embodiment except that the structure of the ring members has a little difference between them. As shown in Fig.10 and Fig. 11, especially in Fig.12, when the ring binder mechanism 100 according to the first embodiment of the invention opens, the free end of the ring member 103a prevents the control lever 129 of the control means 107 from rotating from one end of housing to the other end due to its overlength, i.e., the rotation position of the control lever 129 is limited so that it is inconvenient to add or remove loose-leaf pages. As shown in Fig.21-23, in the ring binder mechanism 300 according to the third embodiment of the invention, the shape and size of the free ends of the ring member 303a and 303b are designed to allow the control lever 329 of the control means 307 to rotate from one end of the housing 301 to the other end of the housing 301, thereby facilitating adding or removing loose-leaf pages.

[0095] Fig.24-38 show the ring binder mechanism 400 according to a fourth embodiment of the invention. Components of the ring binder mechanism 400 of the fourth embodiment corresponding to components of the ring binder mechanism 100 of the first embodiment are represented by the same reference numerals, plus "300". The detailed description of the same structures in the third embodiment as those in the first embodiment will be omitted. The ring binder mechanism 400 according to the fourth embodiment is substantially similar to the ring binder mechanism 100 according to the first embodiment except that the structure of the hinge plates has a little difference between them. As shown in Fig.9, the widths of two hinge plates 105 of the ring binder mechanism 100 according to the first embodiment are equal to each other, as shown in Fig.8 and Fig.12. When the ring binder mechanism 100 opens, the hinge plates 105 with equal width move in a relatively small range, which limits the opening distance between the free ends of the ring member 103a and 103b. As shown in Fig.31, 32 and 35, in the ring binder mechanism 400 according to the fourth embodiment of the invention, the widths of the two hinge plates 405 are designed such that one hinge plate is wide and the other hinge plate is narrow. As shown in Fig.38, when the ring binder mechanism 400 changes from the closed position to the open position, the angle range ΔA of movement of the narrow hinge plate 405 is lager than the angle range ΔB of movement of the wide hinge plate 405. Therefore, the ring members attached to the narrow hinge plate 405 may open at a larger range with moving of the narrow hinge plate such that the open-

ing distance between the free ends of the ring members becomes larger at the open position for adding or removing easily loose-leaf pages. Preferably, in case that two ring members of each ring are different or asymmetric, the long ring member 403a is attached to the narrow hinge plate 405 while the short ring member 403b is attached to the wide hinge plate 405. When two hinge plates 405 have different widths, the housing 401 may have a symmetric shape, or an asymmetric shape as shown in Fig.38. It should be noted that a ring binder mechanism in which the ring members 403a' and 403b' for retaining loose-leaf pages and the ring members 403a" and 403b" for mounting to the hinge plates 405 locate on the same plane and mount to the hinge plates perpendicularly to the longitudinal direction of the hinge plates also falls within the scope of the invention.

[0096] Fig.39-45 show the ring binder mechanism 500 according to a fifth embodiment of the invention. Components of the ring binder mechanism 500 of the fifth embodiment corresponding to components of the ring binder mechanism 400 of the fourth embodiment are represented by the same reference numerals, plus "100". The detailed description of the same structures in the fifth embodiment as those in the fourth embodiment will be omitted. The ring binder mechanism 500 according to the fifth embodiment is substantially similar to the ring binder mechanism 400 according to the fourth embodiment except that the ring binder mechanism 500 comprises a spring 539 as shown in Figs.39, 41, 42 and 44. The spring 539 is fitted onto the bottom of two hinge plates 505 for driving the hinge plates 505 to pivot so as to open the ring members 503a and 503b. Two notches 541 for receiving the spring 539 are formed at corresponding positions on the longitudinal outer edge 527 of each of the hinge plates 505. The spring 539 is made from a metal wire with a circular cross-section, and formed as a polygonal shape with an open end 543 and a closed end 545. The closed end 545 is bent upward at about 90° for fitting into the notches 541 on one of the interconnected hinge plates 505. The open end 543 of the spring 539 comprises two free distal ends which are formed by bending twice respectively, in which the first bending is to bend the metal wire upwards at about 90° and the second bending is to bend the bent distal ends outwards at about 90°. Two free distal ends may be detachably fitted into the notches 541 on the other one of the interconnected hinge plates 505. The main portions 547 in the middle of the spring 539 protrude upwards in a generally arcuate shape. When the spring 539 is fitted into the two hinge plates 505, the main portions 547 in the middle of the spring 539 locate substantially below and against the interconnected hinge plates 505.

[0097] As shown in Fig.44, the spring 539 is relatively slack when the hinge plates 505 are positioned such that the ring member 503a and 503b open. The main portions 547 in the middle of the spring 539 which protrude upwards in a generally arcuate shape abut against the hinge plates 505 such that the angle between the outer surfaces of the hinge plates 505 is less than 180° (i.e., the pivot axis of the hinge plates locates above the coplanar position (180°) of the hinge plates 505). To close the ring binder mechanism 500, the control lever 529 of the control means of the ring binder mechanism as shown in Fig. 43 is rotated down towards the housing such that the acting end of the cam portion 531 of the control means 507 presses down against two hinge plates 505. Under the action of the cam portion 531, the pivot axis of the hinge plates 505 moves down away from the flat top portion 509 of the housing and pass through the coplanar position (180°) of the hinge plates 505, such that the ring members 503a and 503b mounted to the hinge plates 505 join together with the pivoting motion of the hinge plates to form a closed loop for retaining loose-leaf pages. At the closed and locked position, the spring 539 is biased properly to flatten the arcuate main portions 547. The control lever 529 of the control means 507 of the ring binder mechanism 500 is rotated upwards away from the housing such that the cam portion 531 of the control means separates from the two hinge plates 505. At this time, the biased spring 539 restores to its original shape and drives automatically the hinge plates 505 to pivot upwards through the coplanar position (180°) to open the ring members 503a and 503b.

[0098] In this embodiment, the spring 539 drives the hinge plates 505 to pivot so as to open the ring member 503a and 503b and to keep the opened ring members 503a and 503b at the separated state. Therefore, the spring 539 has the same function as the resilience of the housing. An advantageous effect of the mechanism 500 is that it is possible to decrease or eliminate the resilience of the housing and to apply force to the hinge plates 505 only by the spring 539. This allows the pivoting downwards of the hinge plates 505 and passing through the coplanar position (180°) more easily, thereby facilitating the closing of the ring binder mechanism 500. Furthermore, it is possible to open the ring binder mechanism without any manually operating the ring members.

[0099] Fig.46-49 show the ring binder mechanism 600 according to a sixth embodiment of the invention. Components of the ring binder mechanism 600 of the sixth embodiment corresponding to components of the ring binder mechanism 400 of the fourth embodiment are represented by the same reference numerals, plus "200". The detailed description of the same structures in the sixth embodiment as those in the fourth embodiment will be omitted. The ring binder mechanism 600 according to the sixth embodiment is substantially similar to the ring binder mechanism 400 according to the fourth embodiment except that the structure of the ring members has a little difference between them. As shown in Fig. 47 and 49, in the ring binder mechanism 600 according to the sixth embodiment of the invention, the shape and size of the free ends of the ring member 603a and 603b are designed to prevent the control lever 629 of the control means 607 from rotating from one end of the housing 601 to the other end of the housing 601.

[0100] Fig.50-53 show the ring binder mechanism 700 according to a seventh embodiment of the invention. Components of the ring binder mechanism 700 of the seventh embodiment corresponding to components of the ring binder mechanism 400 of the fourth embodiment are represented by the same reference numerals, plus "300". The detailed description of the same structures in the seventh embodiment as those in the fourth embodiment will be omitted. The ring binder mechanism 700 according to the seventh embodiment is substantially similar to the ring binder mechanism 400 according to the fourth embodiment except that the pad block disposed between two separated cam sheets 733 of the cam portion 731 of the control means 707 and two pins for mounting the pad block are removed from the ring binder mechanism 700 according to the seventh embodiment of the invention, thereby further simplifying the production process and decreasing the production cost as desired.

[0101] Fig.54-57 show the ring binder mechanism 800 according to an eighth embodiment of the invention. Components of the ring binder mechanism 800 of the eighth embodiment corresponding to components of the ring binder mechanism 400 of the fourth embodiment are represented by the same reference numerals, plus "400". The detailed description of the same structures in the eighth embodiment as those in the fourth embodiment will be omitted. The ring binder mechanism 800 according to the eighth embodiment is substantially similar to the ring binder mechanism 400 according to the fourth embodiment except that the control lever 829 and the cam portion 831 of the control means 807 of the ring binder mechanism 800 according to the eighth embodiment of the invention are formed integrally from plastics by injection molding process, thereby further simplifying the production process and decreasing the production cost as desired.

[0102] Fig.58-63 show the ring binder mechanism 900 according to a ninth embodiment of the invention. Components of the ring binder mechanism 900 of the ninth embodiment corresponding to components of the ring binder mechanism 400 of the fourth embodiment are represented by the same reference numerals, plus "500". The detailed description of the same structures in the ninth embodiment as those in the fourth embodiment will be omitted. The ring binder mechanism 900 according to the ninth embodiment is substantially similar to the ring binder mechanism 400 according to the fourth embodiment except that the ring members 903a' and 903b' for retaining loose-leaf pages and the ring members 903a" and 903b" for mounting to the hinge plates 905 locate on the same plane and mount to the hinge plates perpendicularly to the longitudinal direction of the hinge plates 905.

[0103] Furthermore, in this embodiment, no flat extension is formed on the longitudinal edge portions 911 and the longitudinal ends 913 of the housing 901. Two longitudinal edge portions 911 are bent slightly downwards to form the bend under rims 911 a and 911b for receiving the outer longitudinal edges of two corresponding hinge plates 905. Openings 949 are formed on the housing 901 near the two longitudinal ends 913 of the housing. Cutouts 951 are formed correspondingly at the inner longitudinal edges of two interconnected hinge plates 905 respectively. Therefore, the ring binder mechanism 900 may be fixed to the cover of a file or notebook by such fasteners 953 as rivets.

[0104] Main components of the various embodiments of the ring binder mechanism according to the present invention are made from a suitable rigid material, such as metal (e.g., steel). But the ring binder mechanism made from a non-metal material, specifically including plastics, do not depart from the scope of this invention.

[0105] As various changes may be made in the above ring binder mechanism without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings should be interpreted as illustrative and not in a limiting sense.

Claims

1. A ring binder mechanism for retaining loose-leaf pages, the ring binder mechanism comprising:

a housing with a top and an opened bottom substantially opposite to the top;

two hinge plates supported by the housing for pivoting motion relative to the housing;

a plurality of rings for retaining loose-leaf pages, each of the rings comprising two ring members, at least one of two ring members being mounted to the corresponding hinge plate and moveable with pivoting motion of the corresponding hinge plate relative to the other ring member between a closed position and an open position, at the closed position, the two ring members forming a substantially continuous, closed loop for allowing loose-leaf pages retained by the rings to be moved along the rings from one ring member to the other ring member, at the open position, the two ring members forming a discontinuous, open loop for adding or removing loose-leaf pages from the rings; and

a rotatably mounted control means, the control means being rotatable to produce the pivoting motion of the hinge plates that brings the ring members to the closed position;

wherein each of the ring members comprises a ring section for retaining loose-leaf pages and a ring section for mounting to the hinge plates or the housing, and the ring sections for mounting to the hinge plate or the housing of the two ring members of at least one of two rings mounted near the longitudinal ends of the housing form

respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

2. The ring binder mechanism of claim 1, wherein the ring sections for mounting to the hinge plate or the housing are straight and form an inside angle of less than 90° with respect to the plane that the ring sections for retaining loose-leaf pages locate.

3. The ring binder mechanism of claim 1, wherein the ring sections for mounting to the hinge plate or the housing are L-shaped and form an inside angle of 90° with respect to the plane that the ring sections for retaining loose-leaf pages locate.

4. The ring binder mechanism of claim 1, wherein two ring members of each of the rings are mounted correspondingly to two hinge plates.

5. The ring binder mechanism of claim 1, wherein the ring sections for mounting to the hinge plate or the housing of the two ring members of the two rings mounted near the longitudinal ends of the housing form respectively an inside angle of no more than 90° with respect to a plane on which the ring sections for retaining loose-leaf pages of the two ring members locate.

6. The ring binder mechanism of claim 1, wherein two hinge plates are disposed such that an angle between their outer surfaces is not more than 180°.

7. The ring binder mechanism of claim 6, wherein the control means is disposed such the control means acts on the inner surfaces of two hinge plates.

8. The ring binder mechanism of claim 1, wherein two hinge plates are disposed such that an angle between their outer surfaces is not less than 180° when the ring binder mechanism closes.

9. The ring binder mechanism of claim 8, wherein the control means is disposed such the control means act on the outer surfaces of two hinge plates.

10. The ring binder mechanism of claim 1, further comprising a spring for driving the hinge plates to pivot so as to open the ring members.

11. The ring binder mechanism of claim 10, wherein the spring has an arcuate shape projecting upwards and fits into the hinge plates such that the main portions projecting arcuately upwards in the middle of the spring abut against the outer surfaces of the interconnected hinge plates.

12. The ring binder mechanism of claim 1, wherein the shape and the size of the free ends of the ring members are selected to allow the control means to be turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

13. The ring binder mechanism of claim 1, wherein the shape and the size of the free ends of the ring members are selected to prevent the control means from being turned from one end of the housing to the other end of the housing during opening of the ring binder mechanism.

14. The ring binder mechanism of claim 1, wherein two hinge plates have different widths.

15. The ring binder mechanism of claim 14, wherein two ring members of each of rings are different or asymmetric, and the long ring member is mounted to the narrow hinge plate while the short ring member is mounted to the wide hinge plate.

16. The ring binder mechanism of claim 1, wherein the control means comprises a control lever and a cam portion for acting on the hinge plates.

17. The ring binder mechanism of claim 16, further comprising a plastic pad block for decreasing the friction between the cam portion and the hinge plates.

18. The ring binder mechanism of claim 16, wherein the control lever and the cam portion of the control means are formed from plastics by injection molding.

19. The ring binder mechanism of claim 1, wherein one longitudinal edge portion of the housing is bent downwards to form a bend under rim, and the other longitudinal edge portion is provided along the longitudinal direction with a plurality of protrusions protruding towards the inside of the housing for supporting the hinge plates.

20. The ring binder mechanism of claim 19, wherein the housing is provided with flat extensions for mounting the ring binder mechanism onto a cover.

21. The ring binder mechanism of claim 20, wherein the other longitudinal edge portion and two longitudinal ends of the housing are provided respectively with flat extensions extending on the same plane.

22. The ring binder mechanism of claim 1, wherein two longitudinal edge portions of the housing are bent downwards to form the bend under rims for supporting the hinge plates.

23. The ring binder mechanism of claim 1, wherein a

plurality of reinforcing ribs across the housing are formed on the housing.

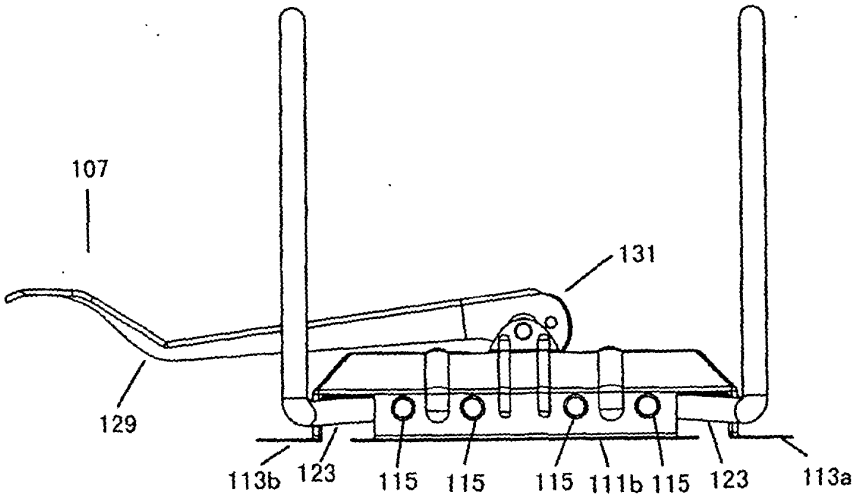


Fig. 1

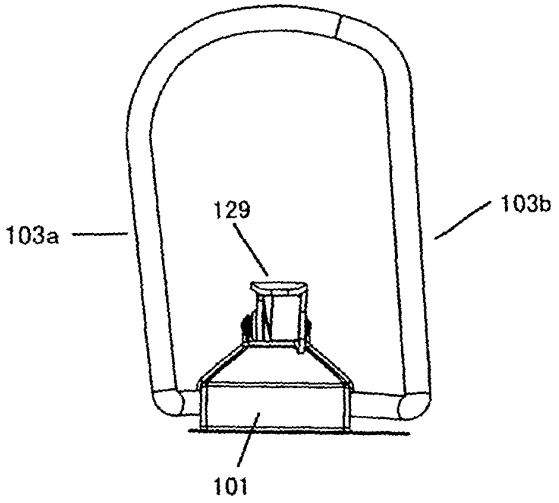


Fig. 2

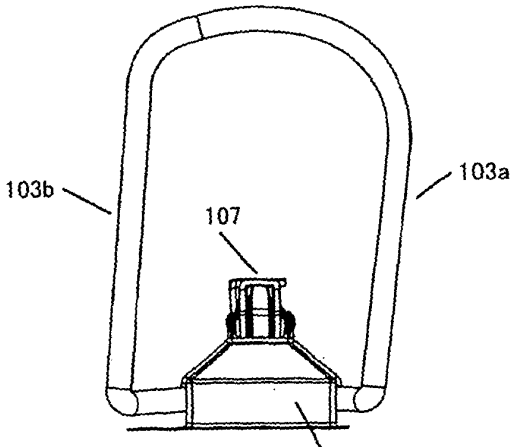


Fig. 3

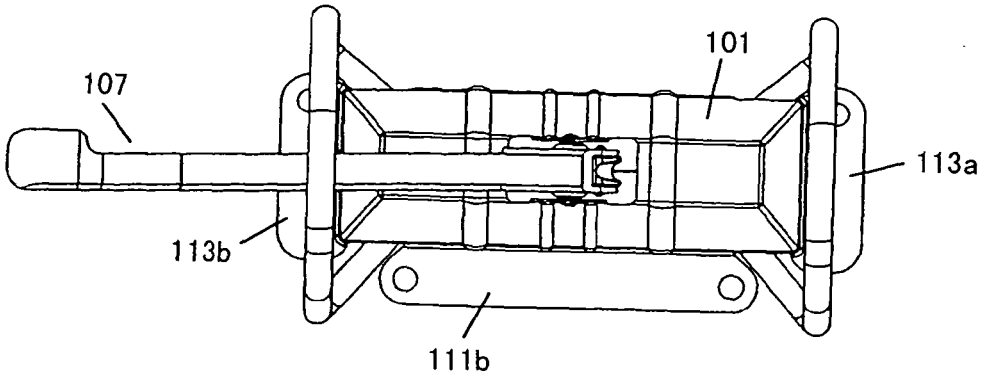
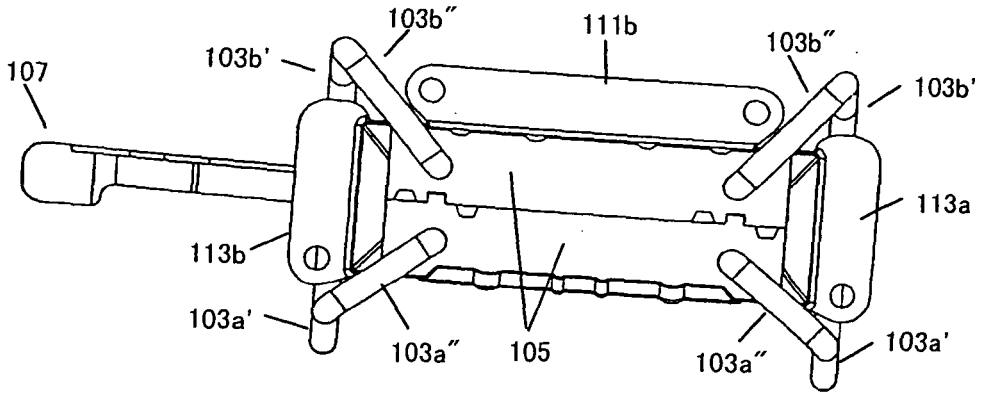

101
107
113a
113b
111b

Fig. 4


103b″
111b
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103b'
107
103b'
113a
113b
103a'
103a″
105
103a″
103a'

Fig. 5

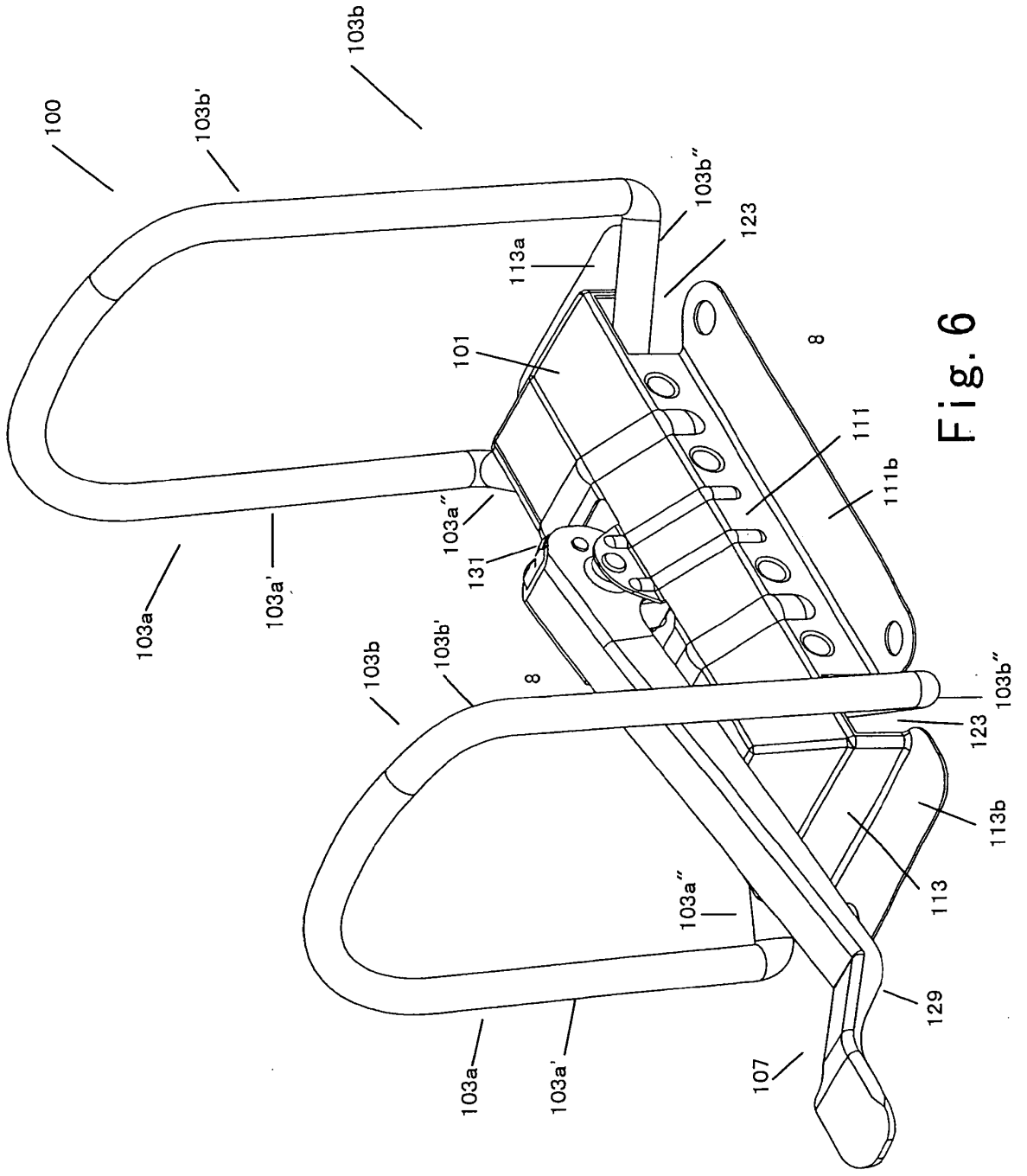

100
103b'
103b
103b''
123
113a
101
8
111
111b
103a''
131
103a'
103a
103b
103b'
8
103b''
123
113b
113
103a''
129
103a
103a'
107

Fig. 6

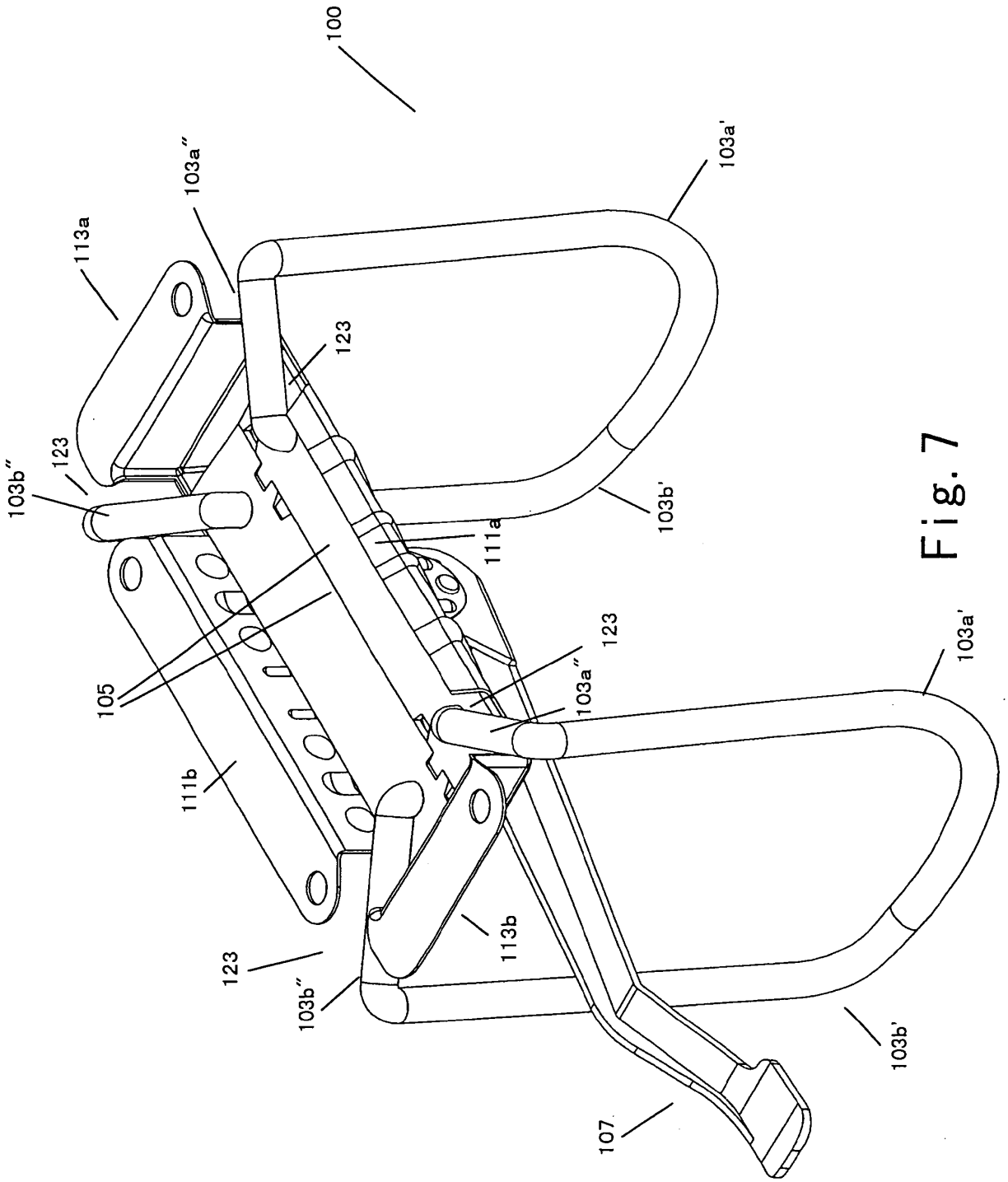

100
103a''
113a
103a'
123
103b''
123
103b'
111a
105
123
103a''
103a'
111b
113b
123
103b''
103b'
107

Fig. 7

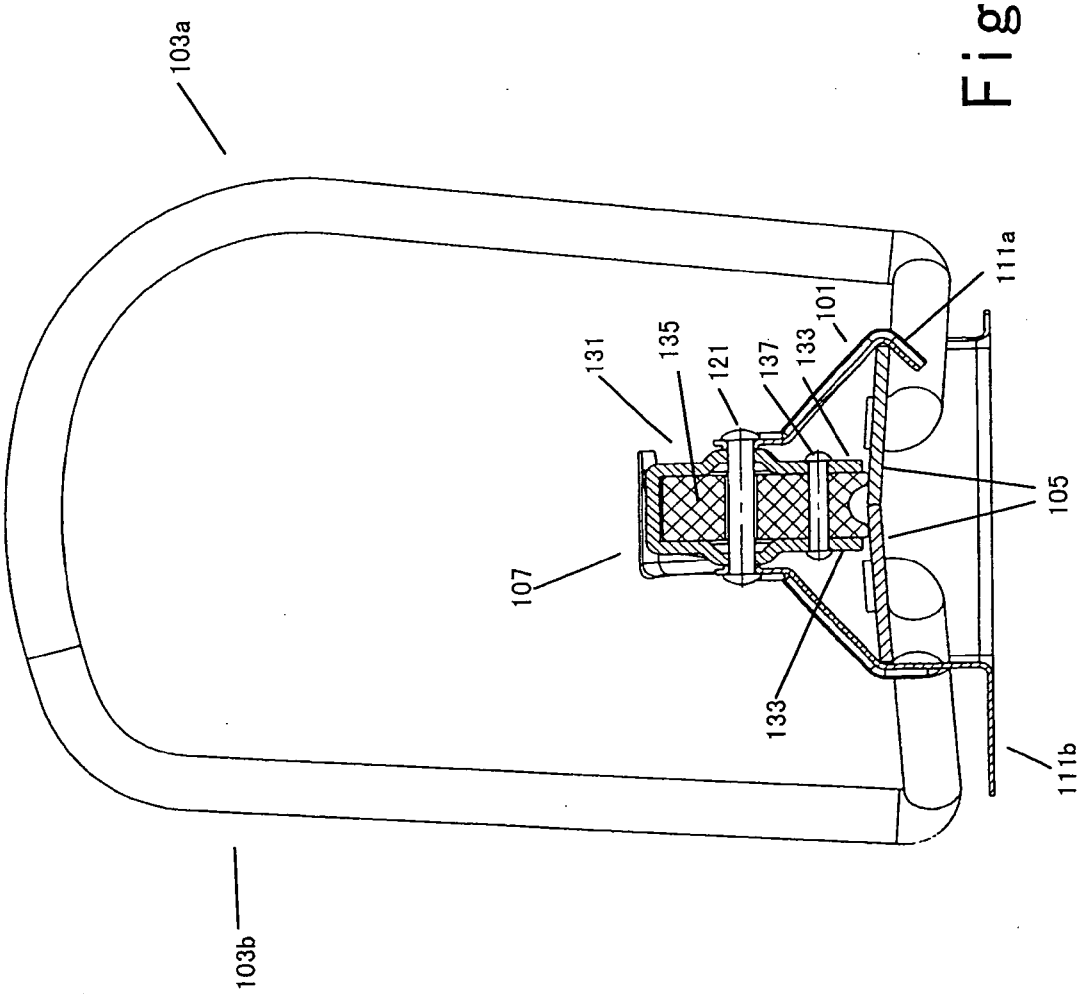


Fig. 8

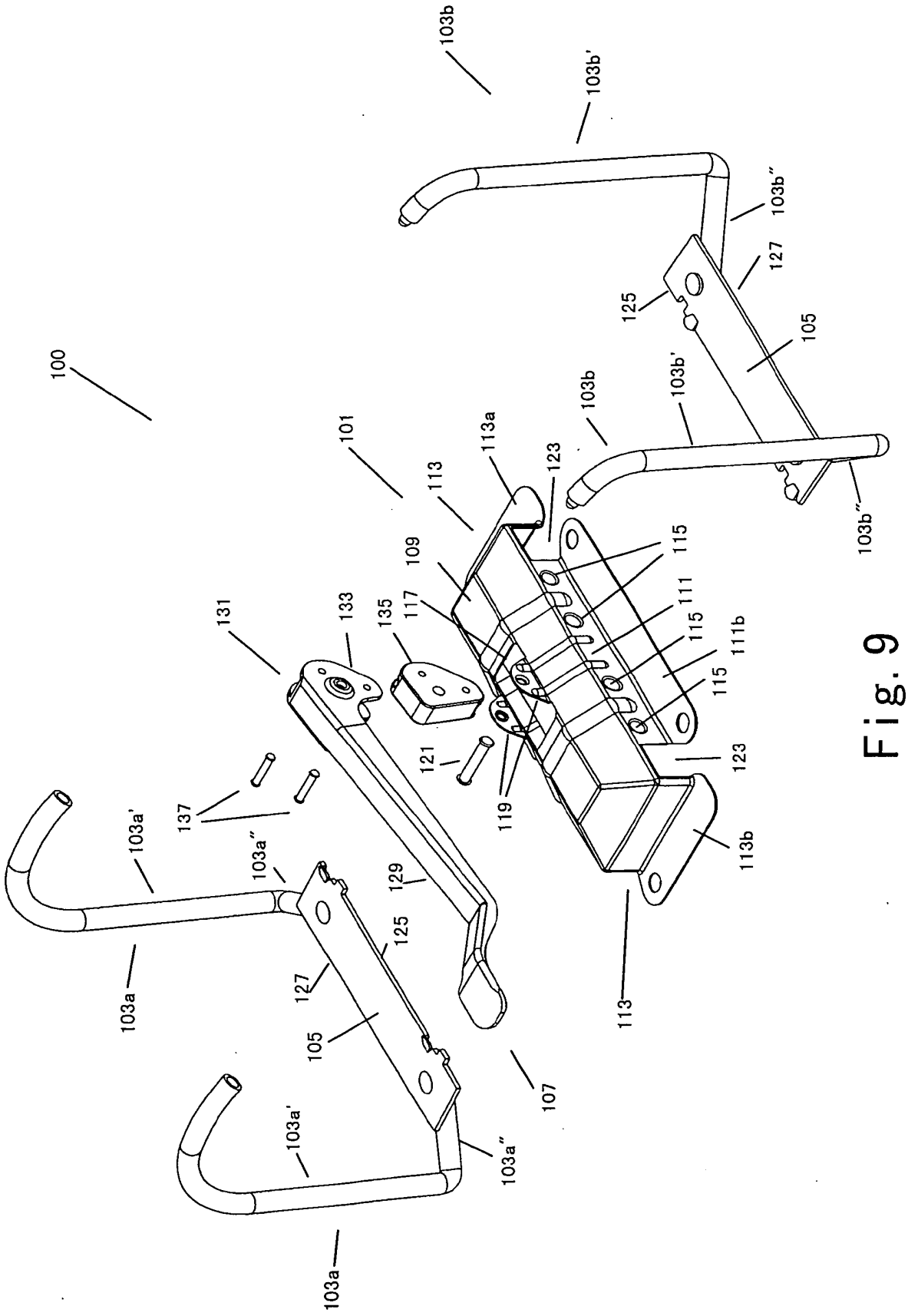

100
101
103a
103a'
103a''
103b
103b'
103b''
105
107
109
111
111b
113
113a
113b
115
117
119
121
123
125
127
129
131
133
135
137

Fig. 9

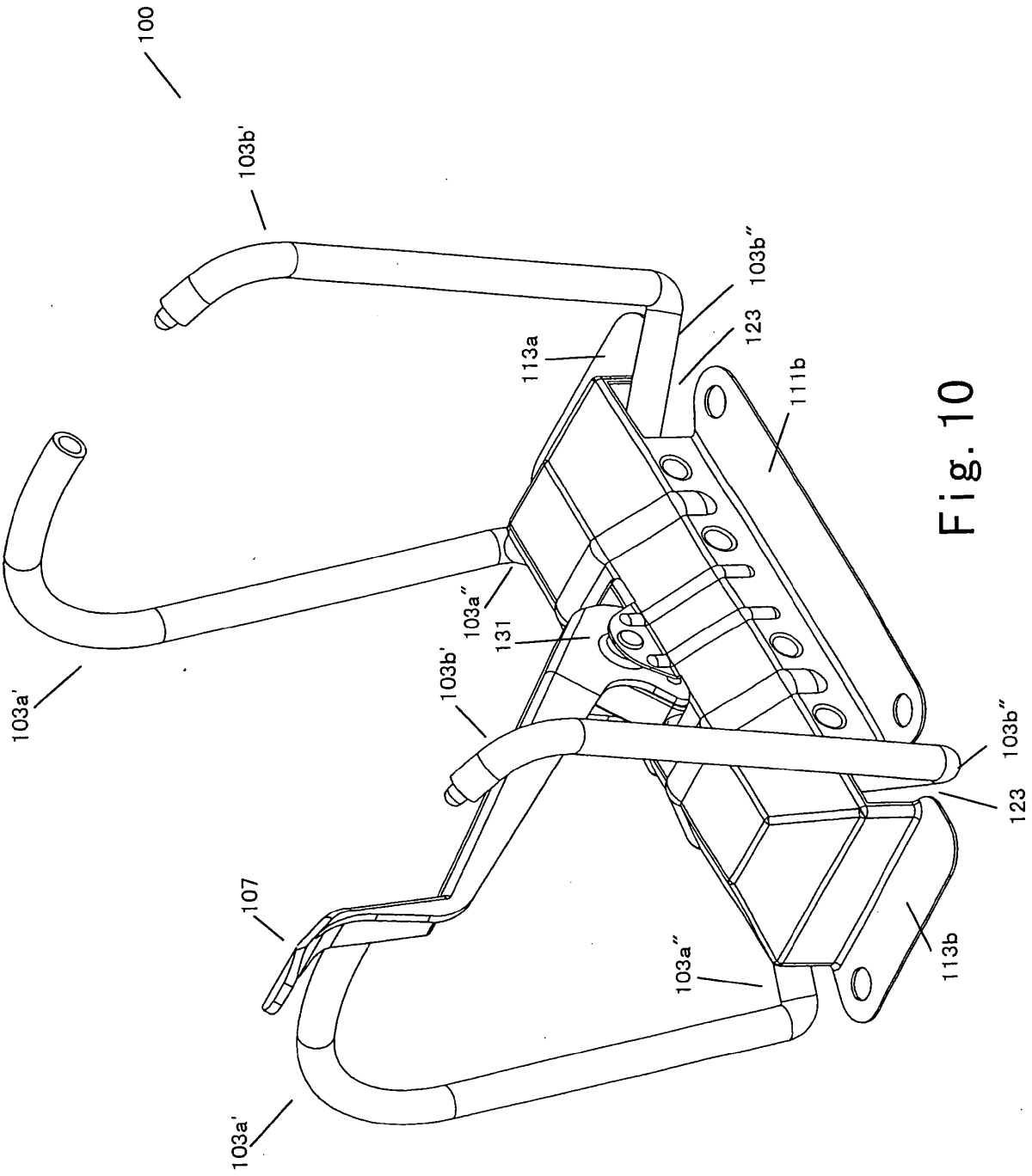

100
103b'
103b''
123
113a
111b
103a''
131
103b'
103a'
123
103b''
107
103a''
113b
103a'

Fig. 10

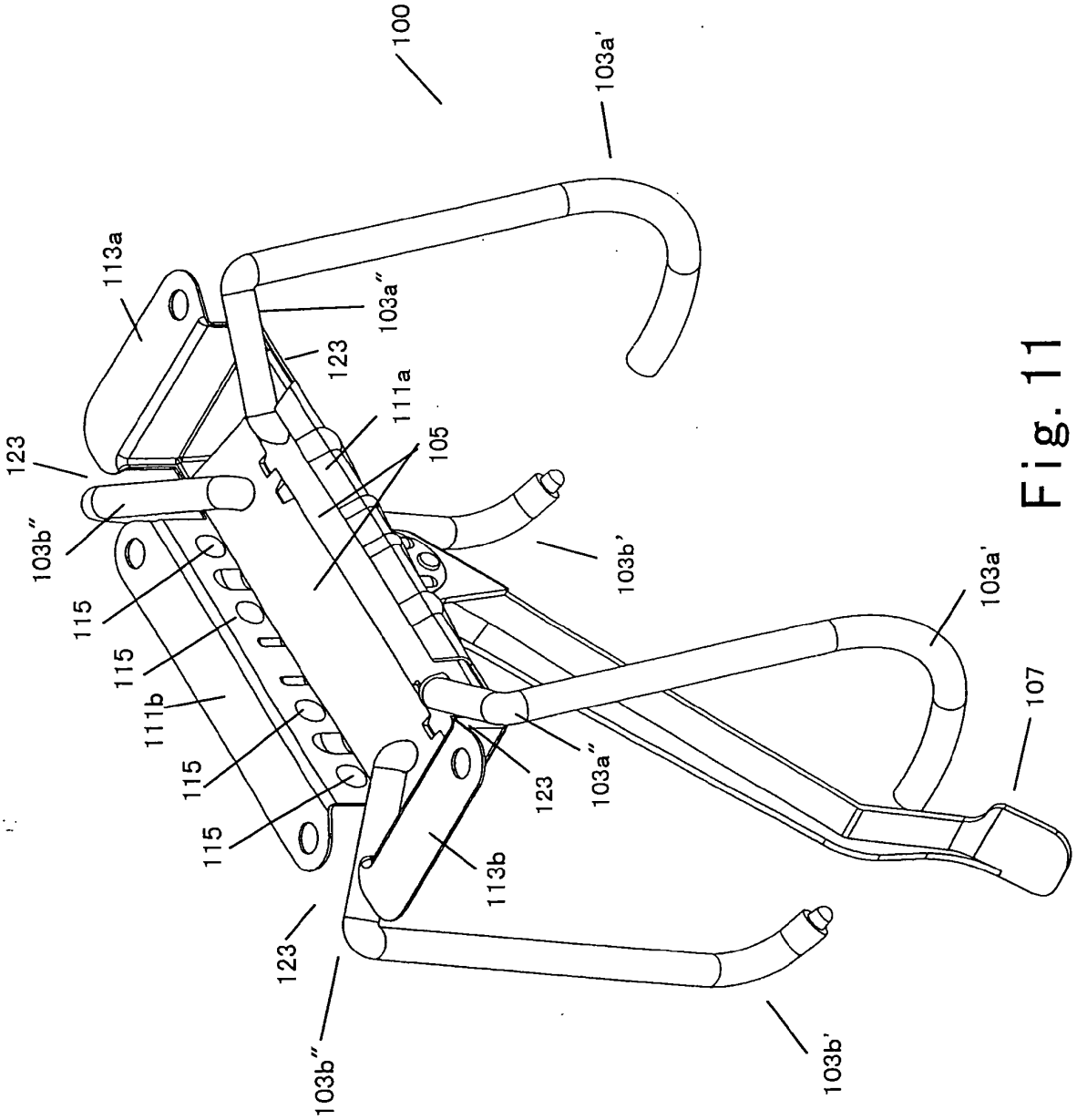

100
103a'
113a
103a"
123
111a
105
123
103b"
103b'
115
115
111b
115
115
103a'
107
123
103a"
113b
123
103b"
103b'

Fig. 11

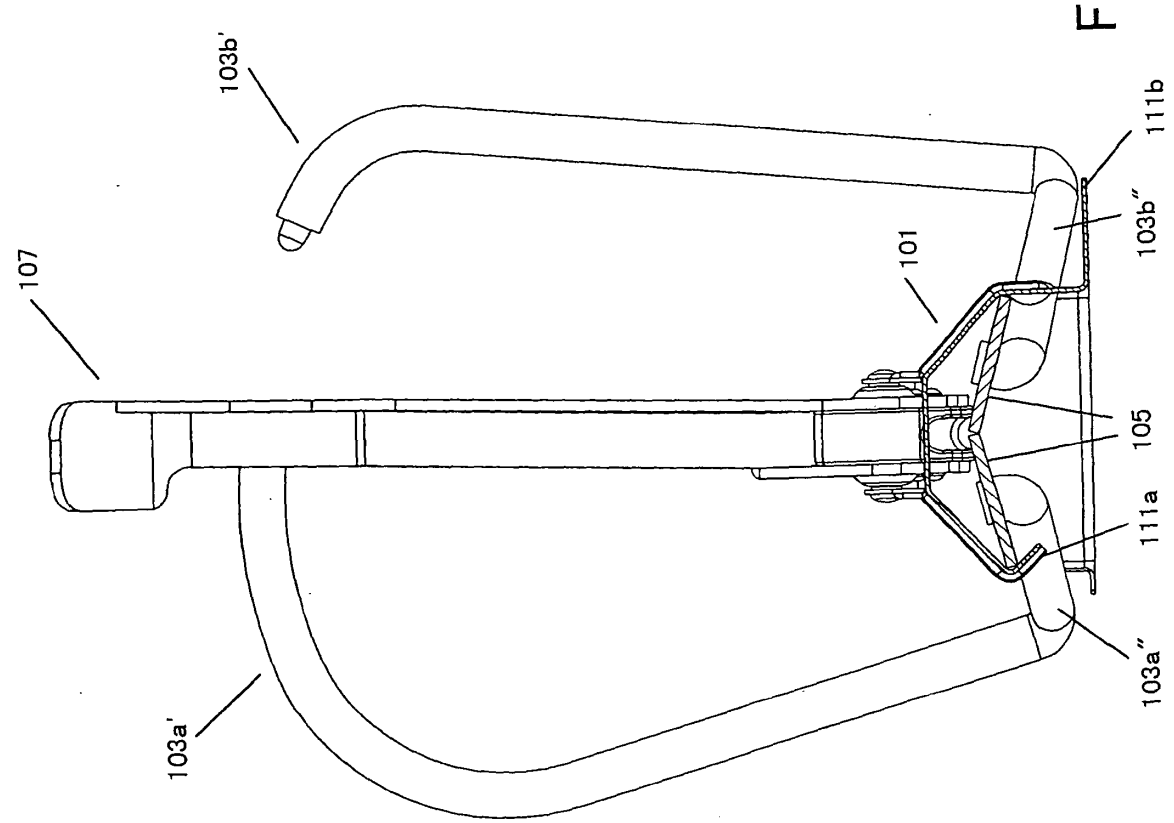


Fig. 12

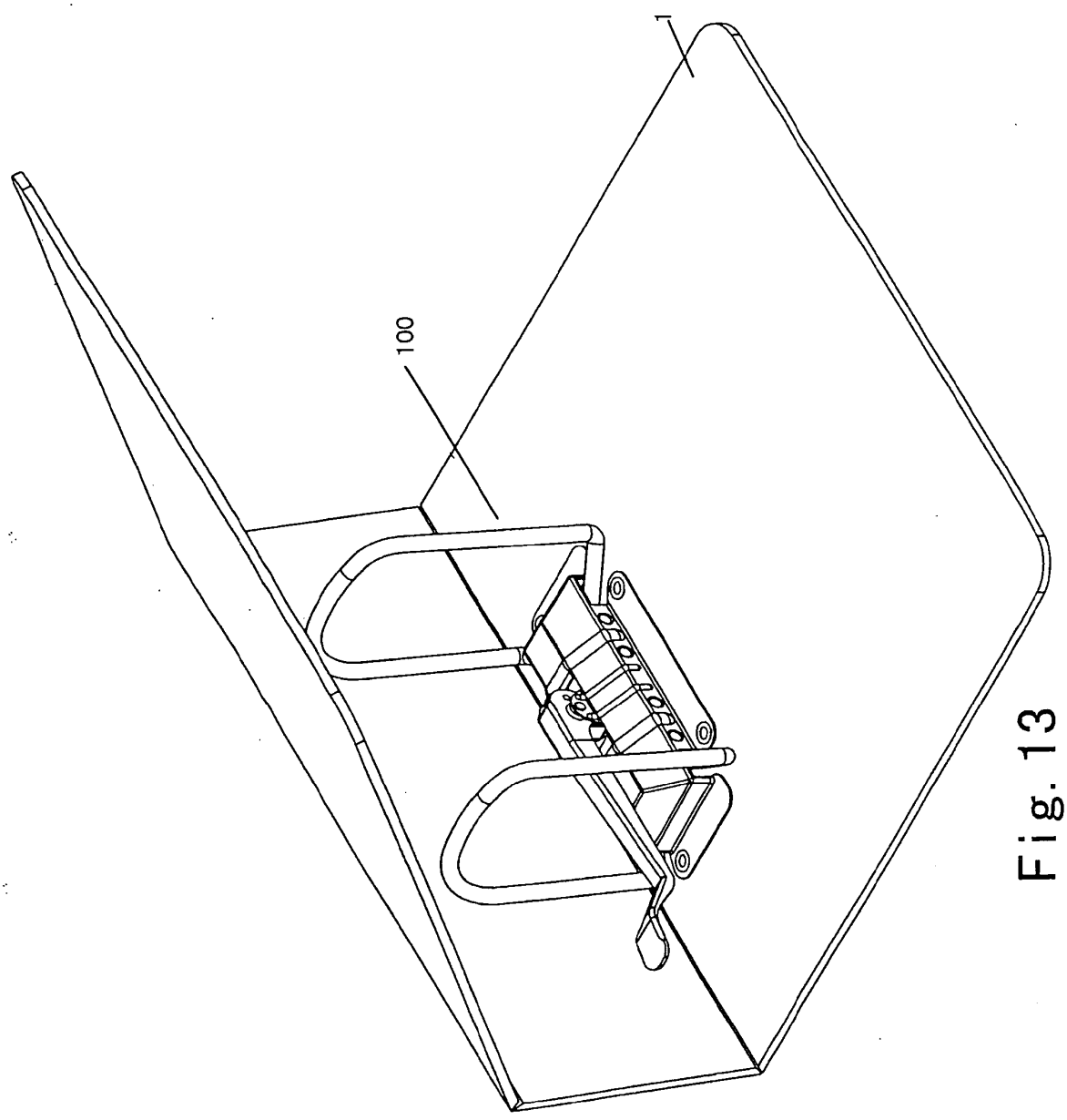


Fig. 13

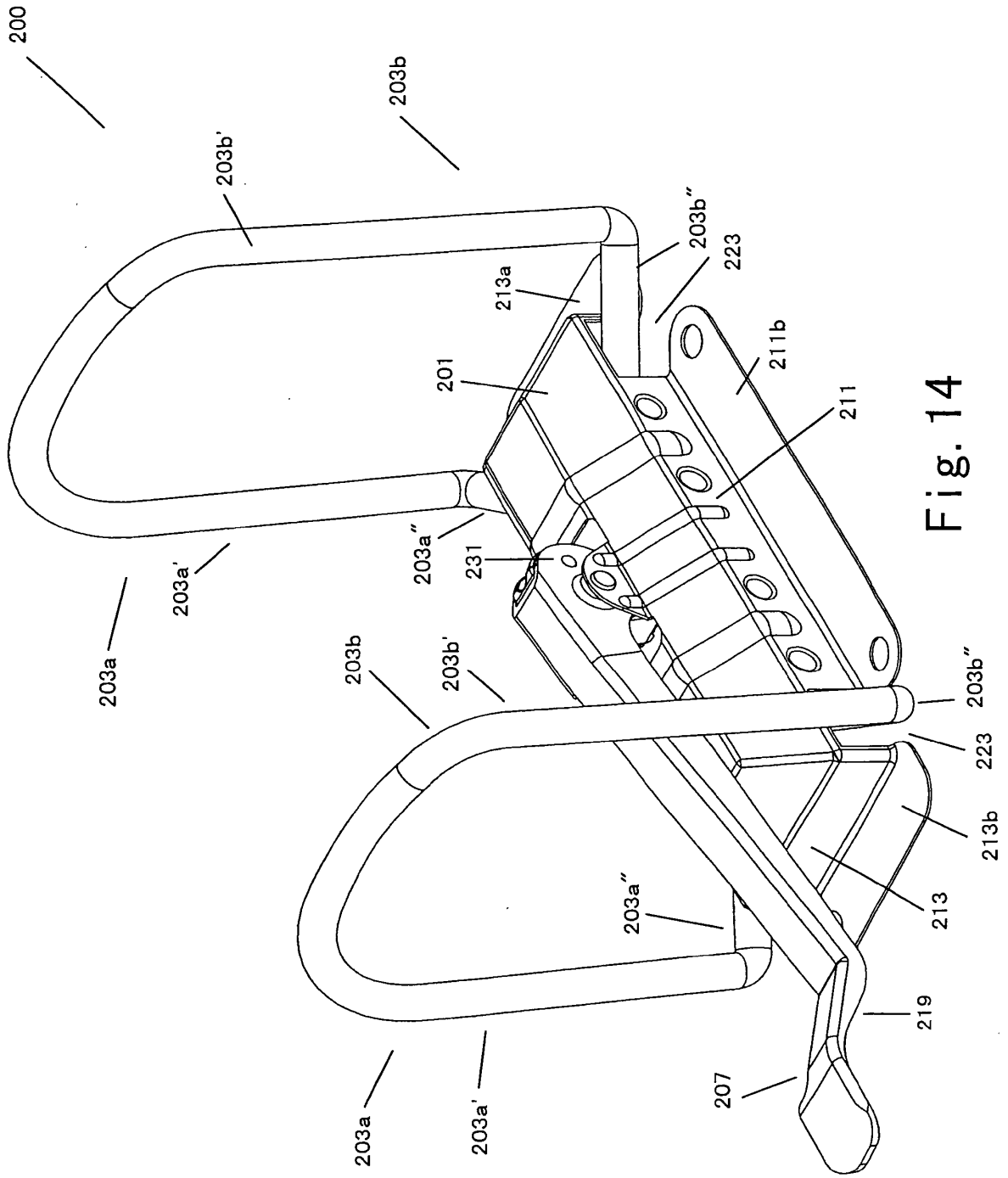

200
203b
203b'
203b''
223
213a
211b
201
211
203a''
231
203a'
203a
203b
203b'
203b''
223
213b
213
203a''
219
207
203a
203a'

Fig. 14

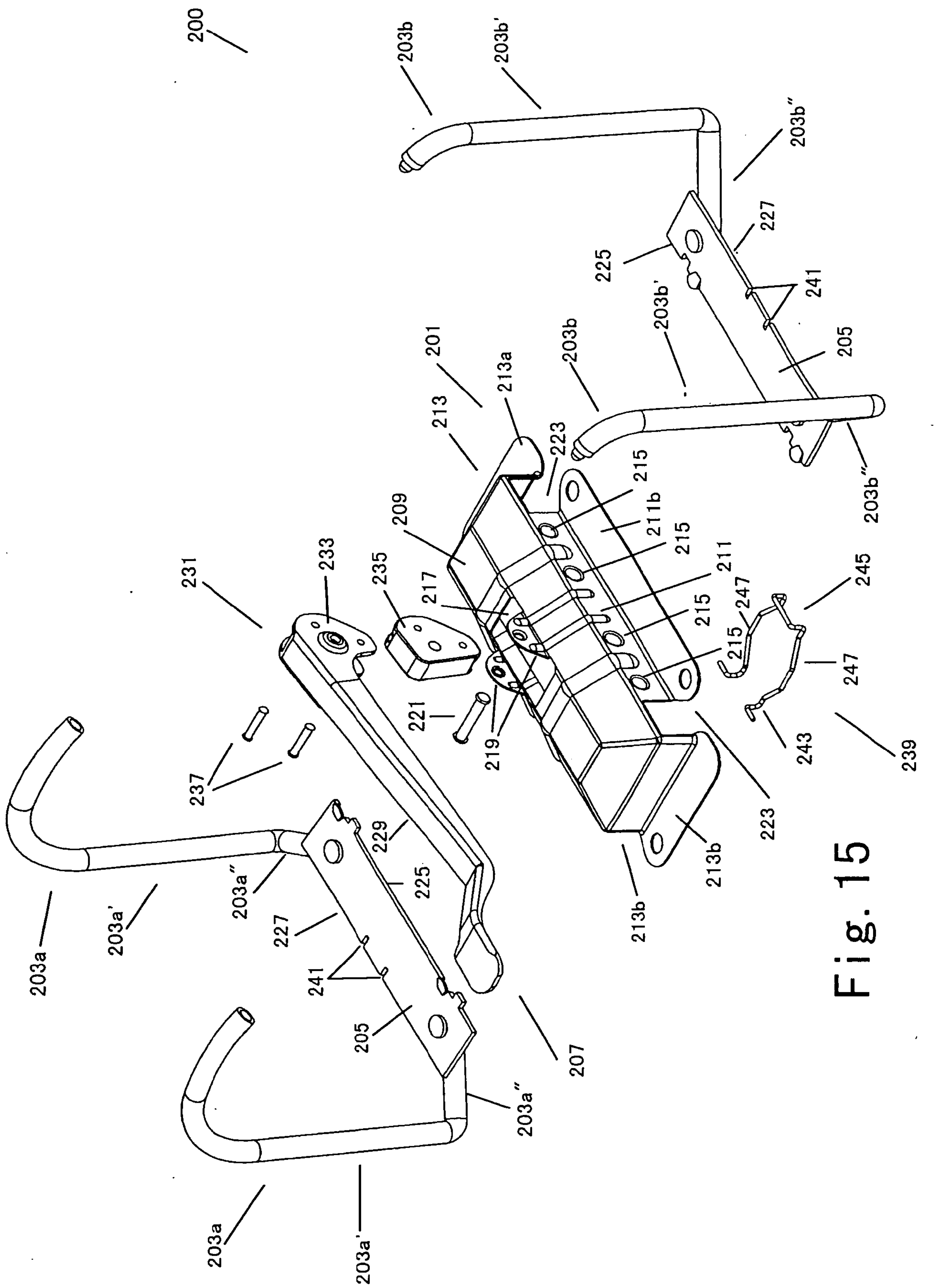

200
201
203a
203a'
203a''
203b
203b'
203b''
205
207
209
211
211b
213
213a
213b
215
217
219
221
223
225
227
229
231
233
235
237
239
241
243
245
247

Fig. 15

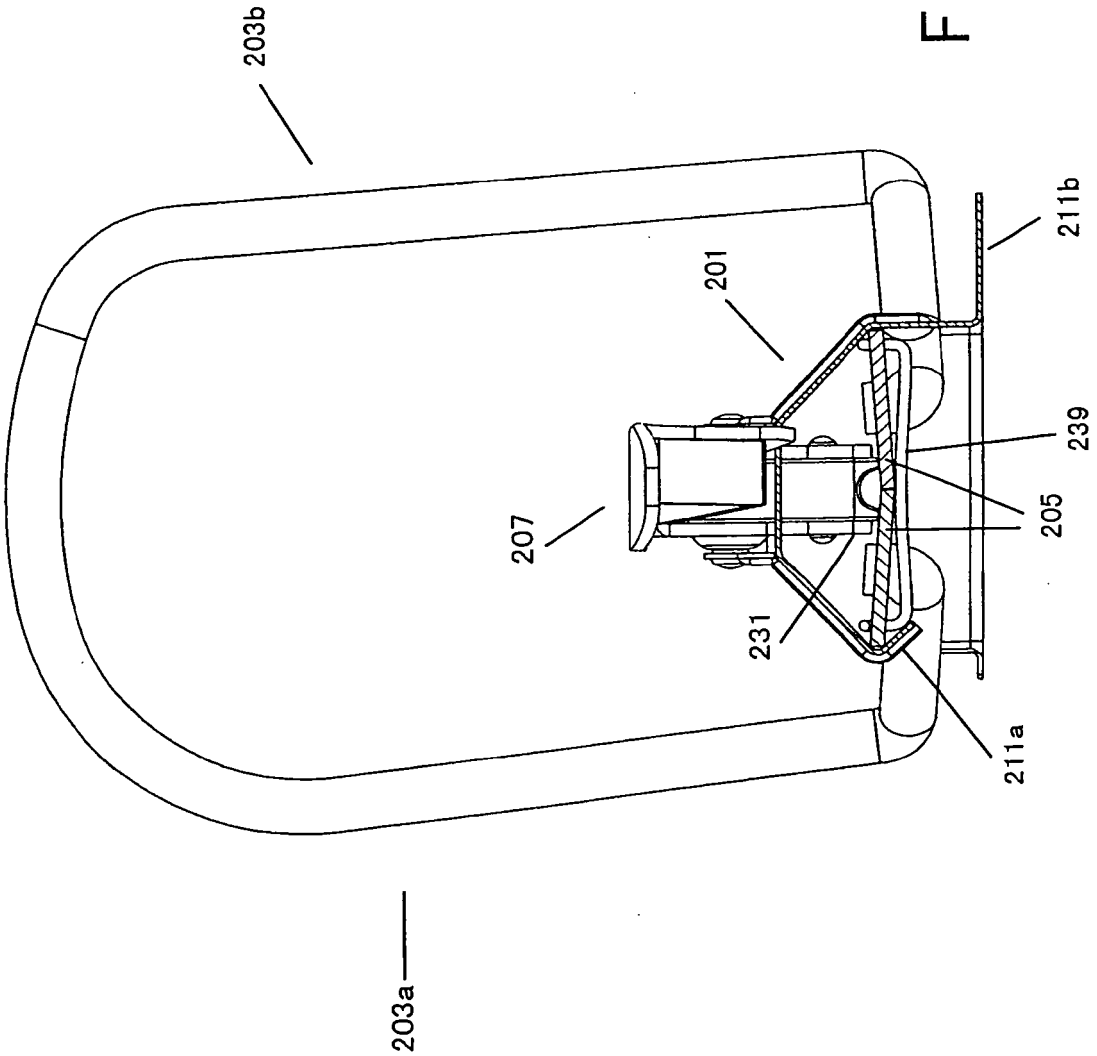


Fig. 16

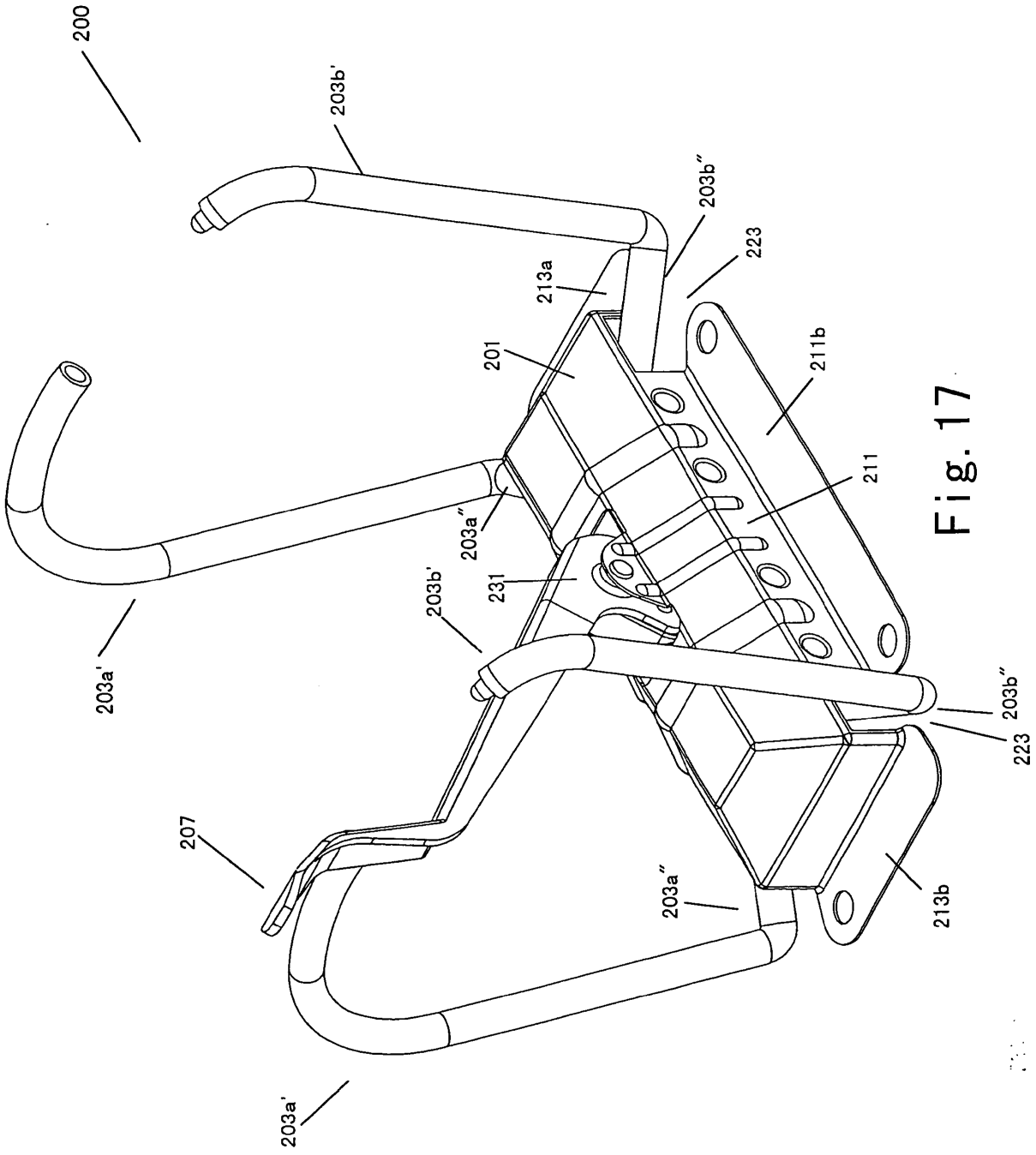

200
203b'
203b''
223
213a
201
211b
211
203a''
231
203b'
203a'
203b''
223
207
203a''
213b
203a'

Fig. 17

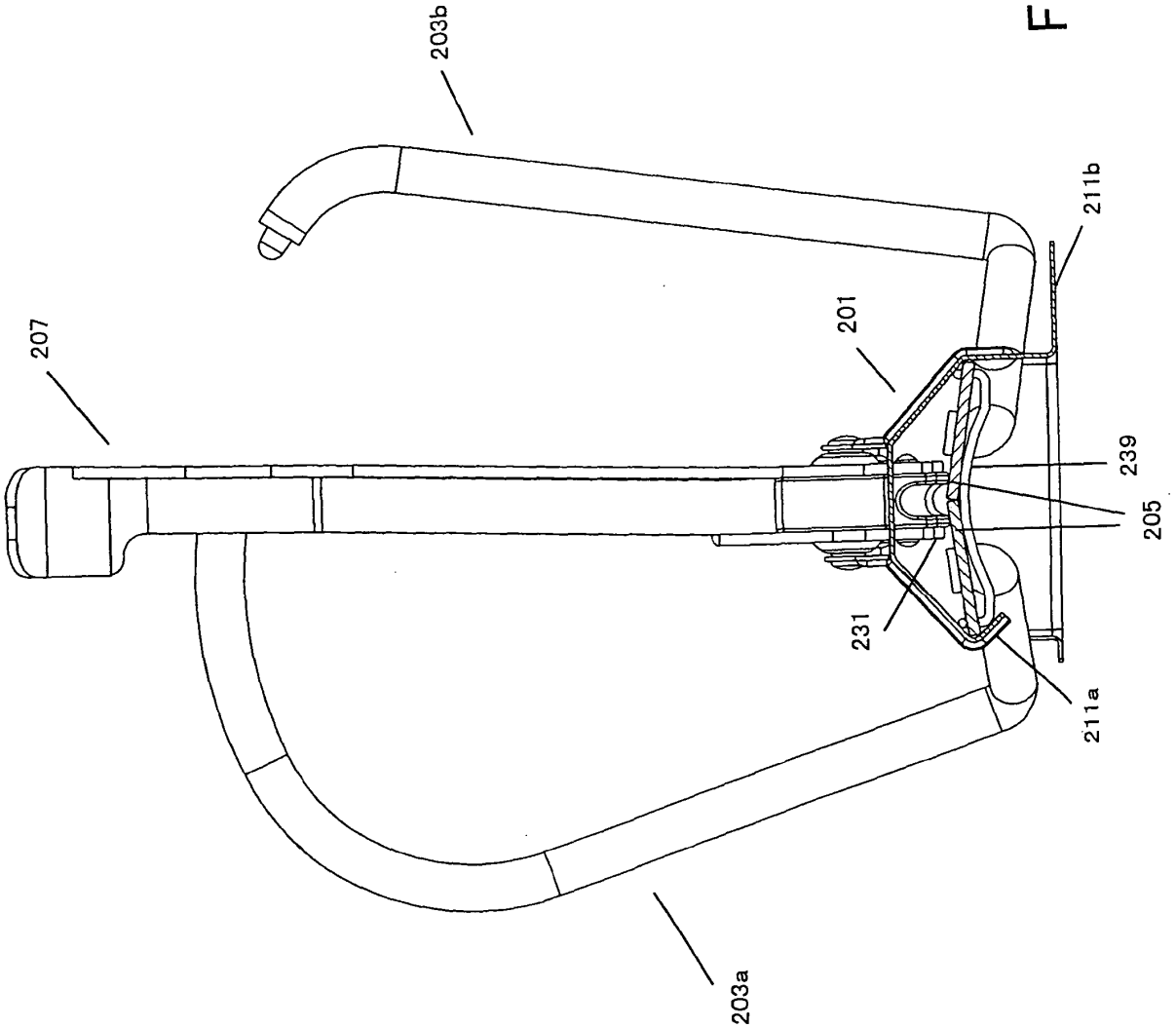


Fig. 18

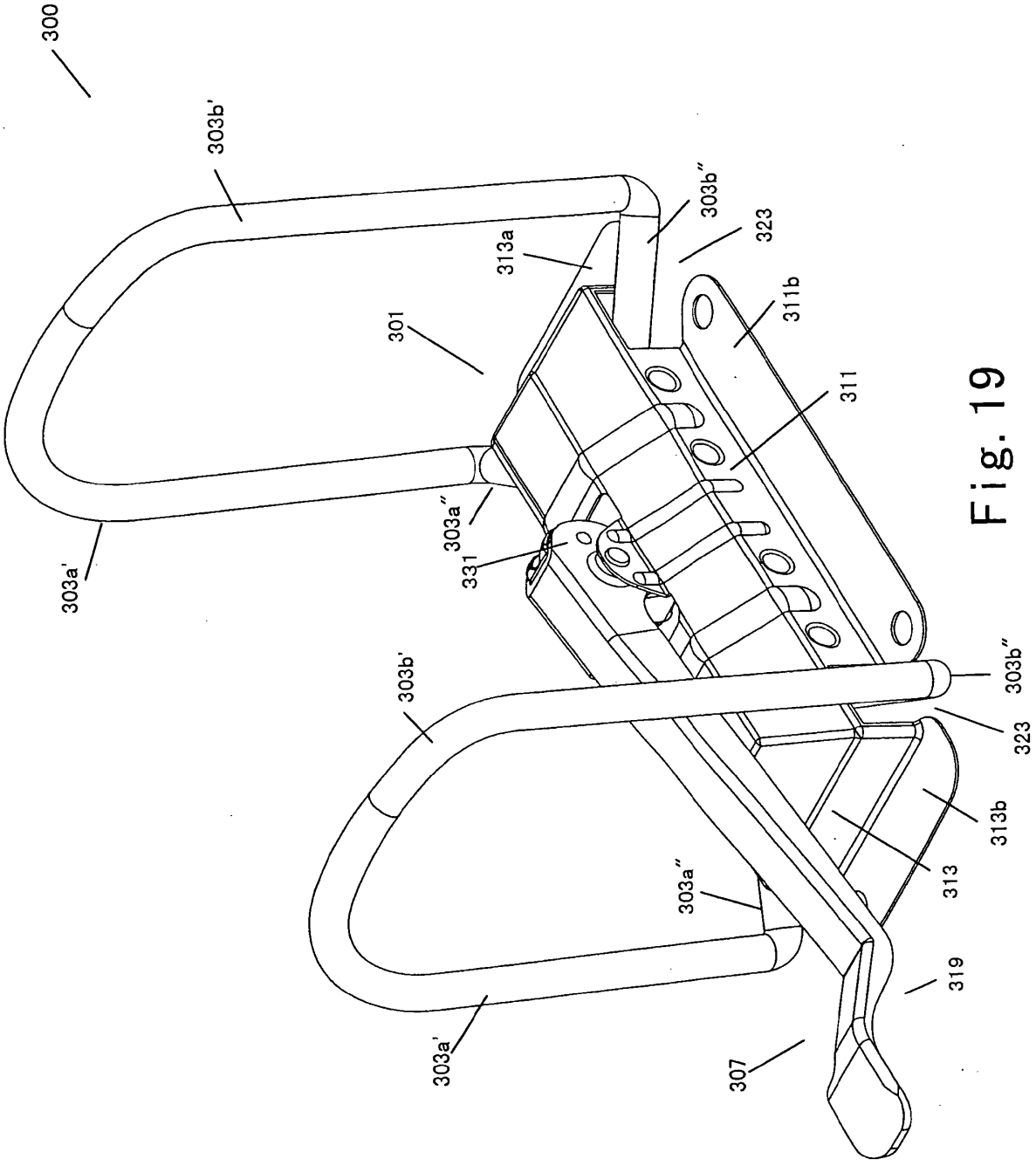

300
303b'
303b''
323
313a
311b
301
311
303a''
331
303a'
303b'
303b''
323
313b
313
303a''
319
303a'
307

Fig. 19

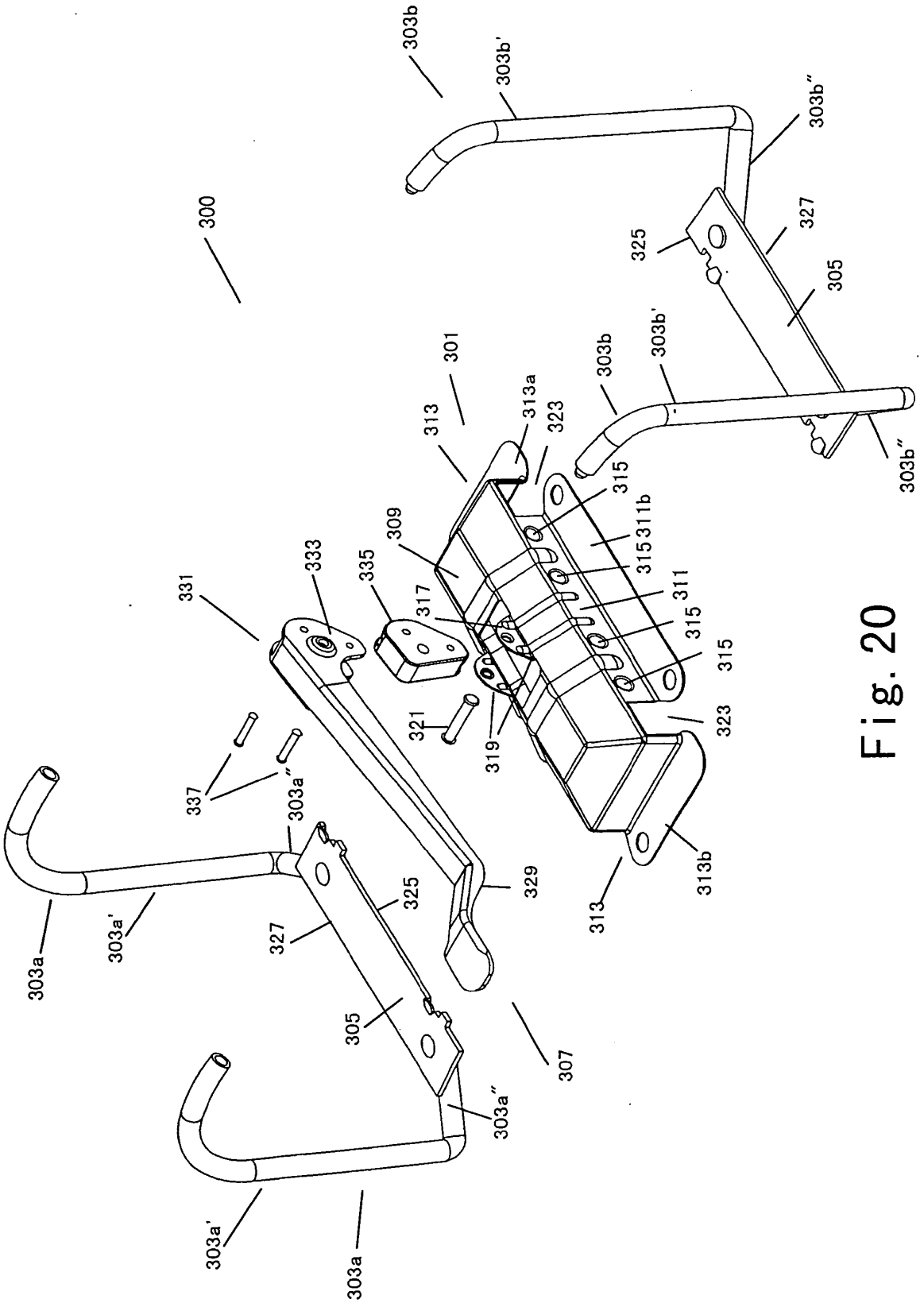

300
301
303a
303a'
303a''
303b
303b'
303b''
305
307
309
311
311b
313
313a
313b
315
317
319
321
323
325
327
329
331
333
335
337

Fig. 20

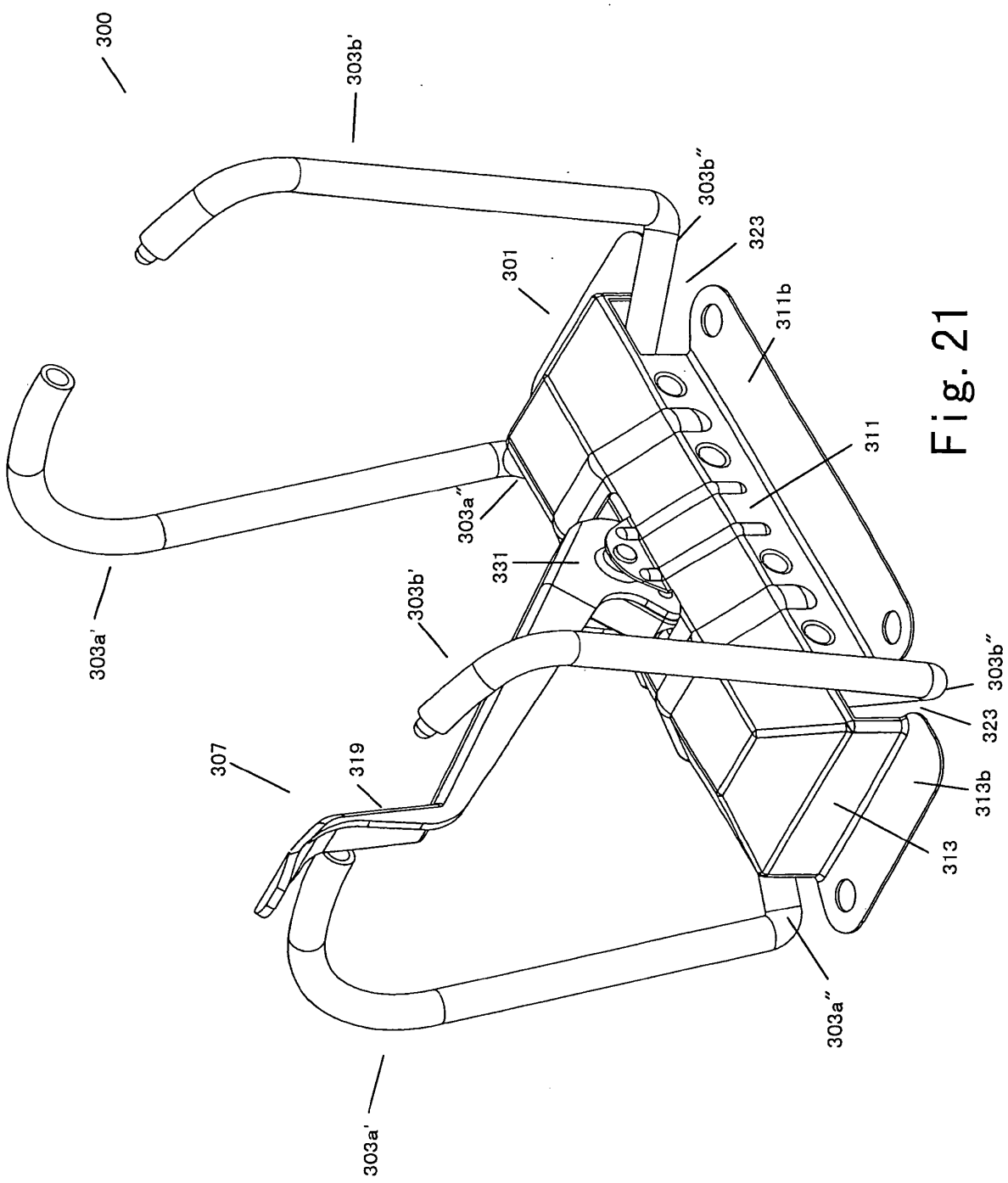

300
303b'
303b''
323
301
311b
311
303a''
331
303b'
303a'
307
319
303b''
323
313b
313
303a''
303a'

Fig. 21

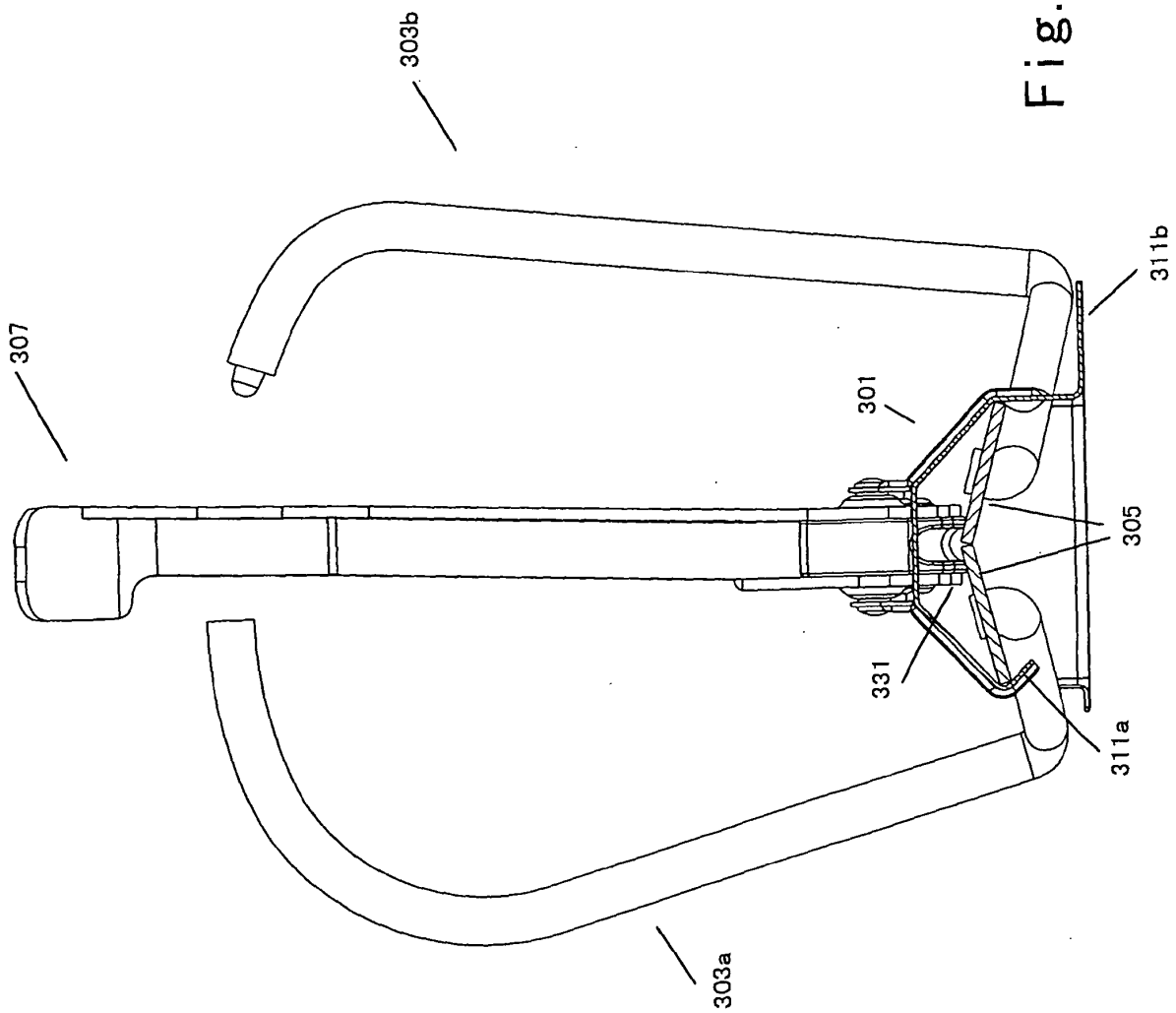


Fig. 22

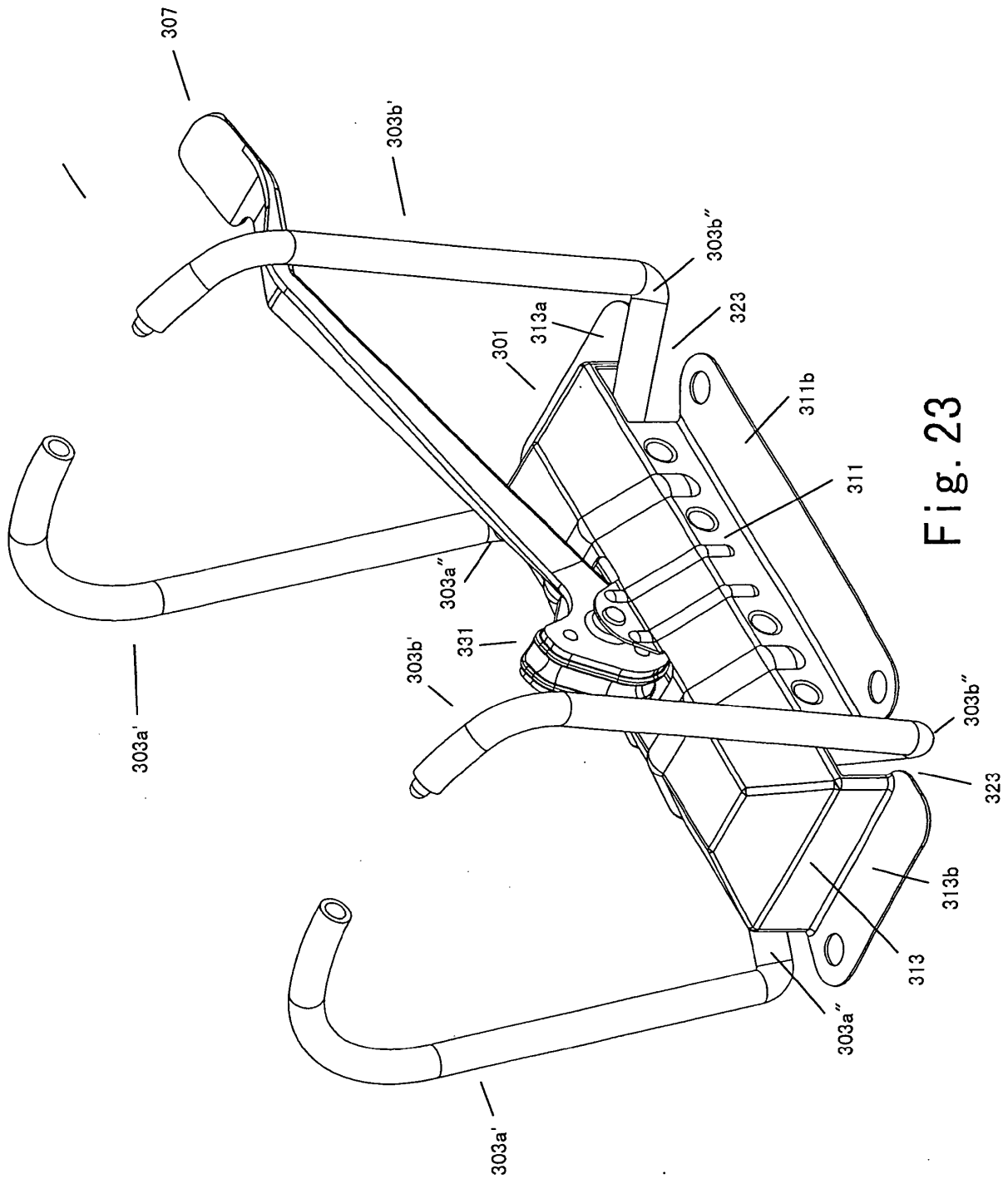

307
303b'
303b''
323
313a
301
311b
311
303a''
331
303b'
303a'
303b''
323
313b
313
303a''
303a'

Fig. 23

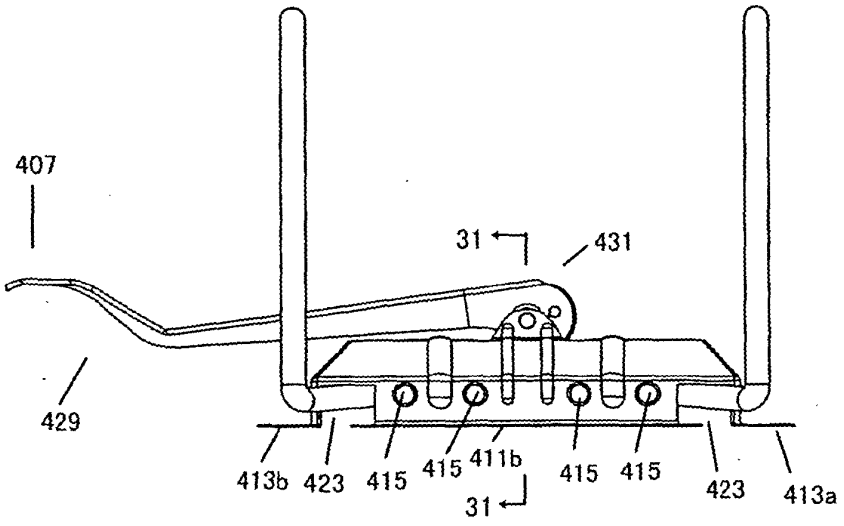


Fig. 24

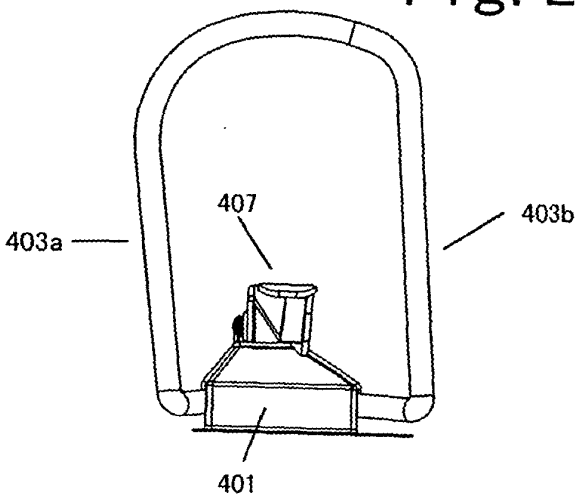


Fig. 25

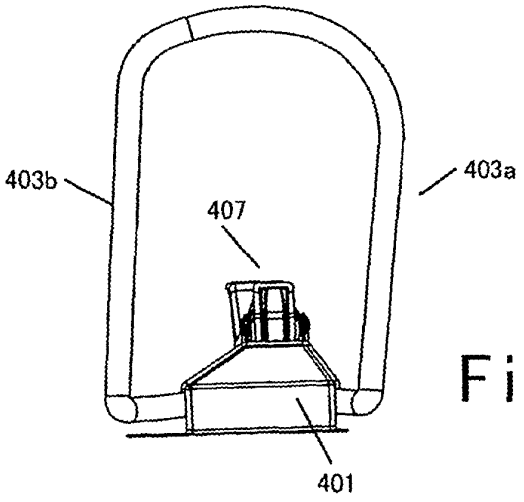


Fig. 26

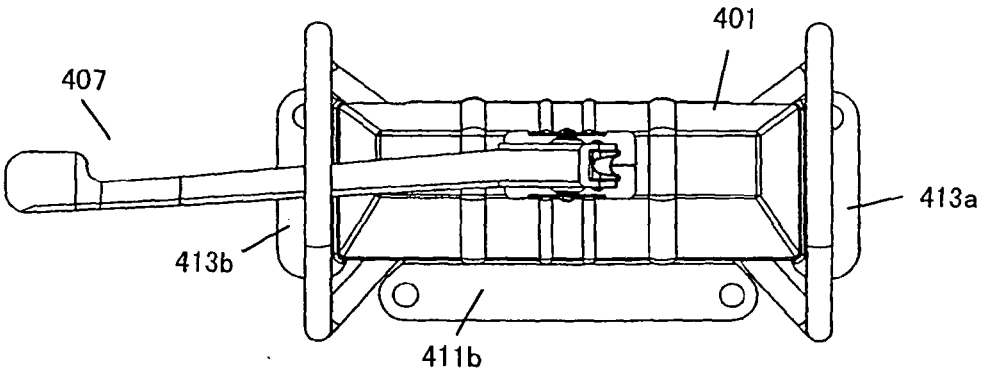

401
407
413a
413b
411b

Fig. 27

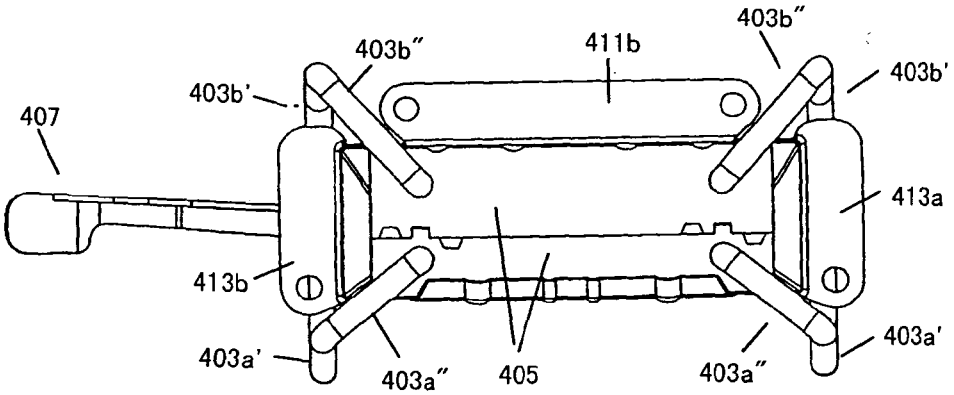

403b″
403b″
411b
403b'
403b'
407
413a
413b
403a'
403a″
405
403a″
403a'

Fig. 28

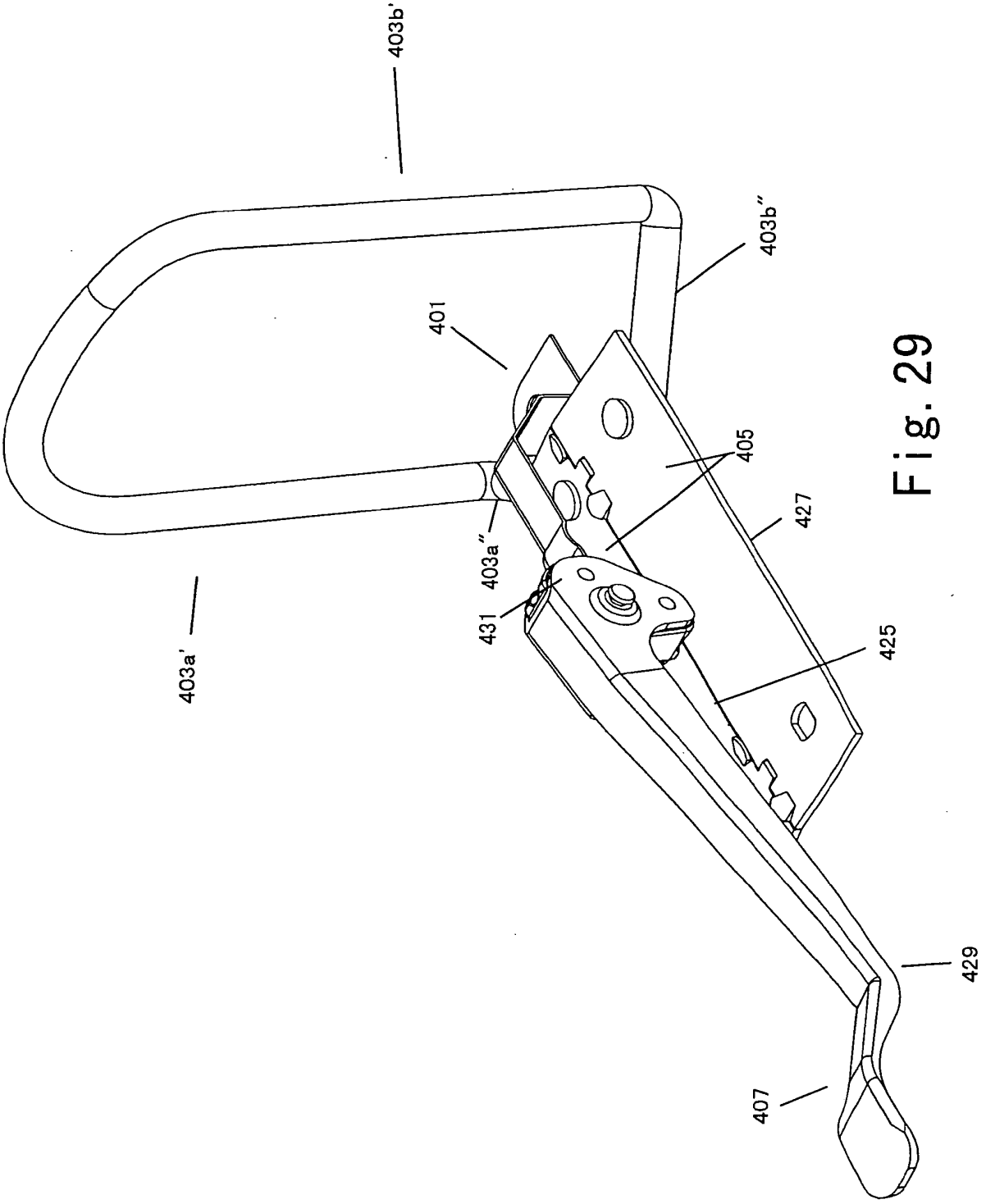


Fig. 29

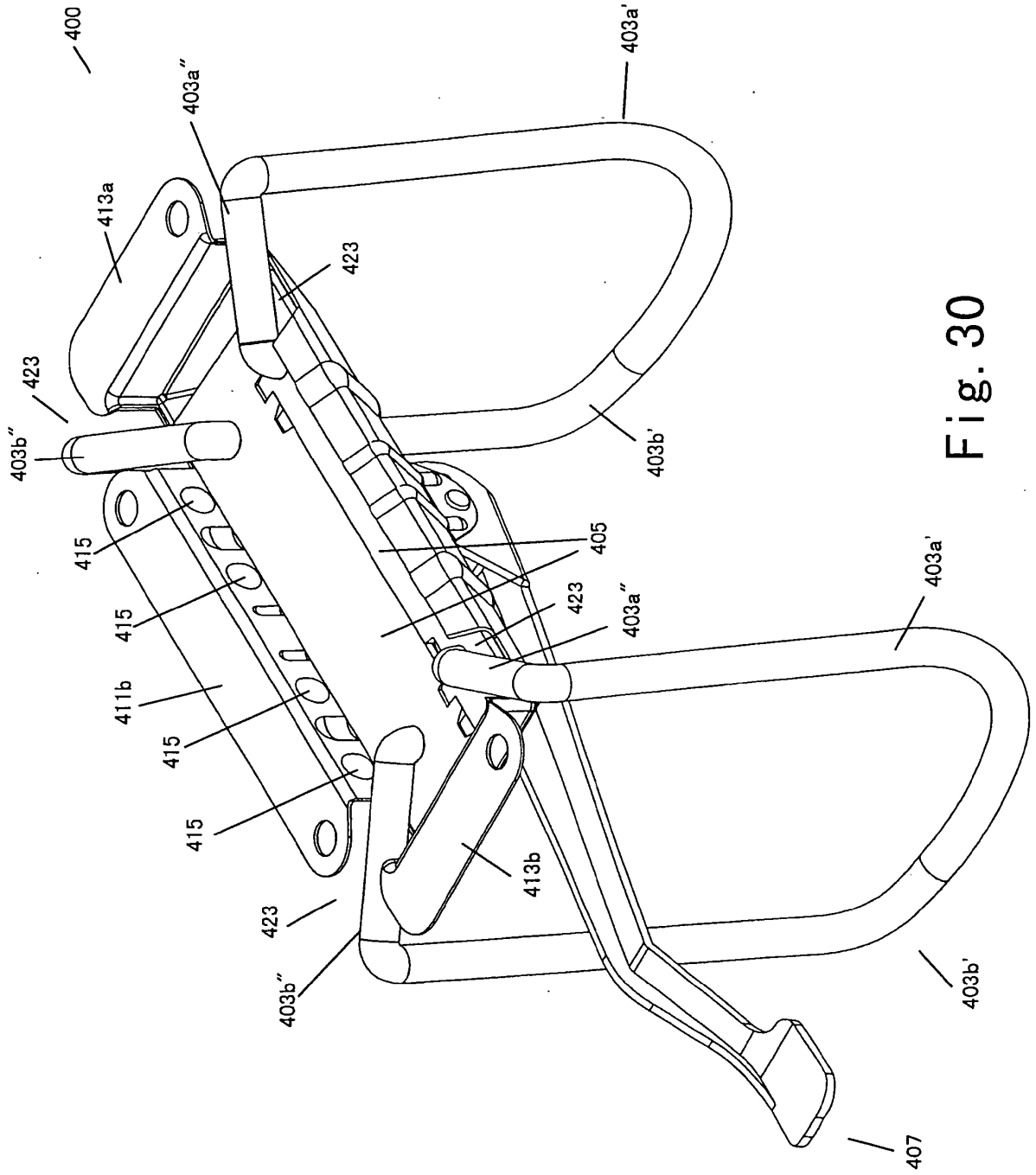


Fig. 30

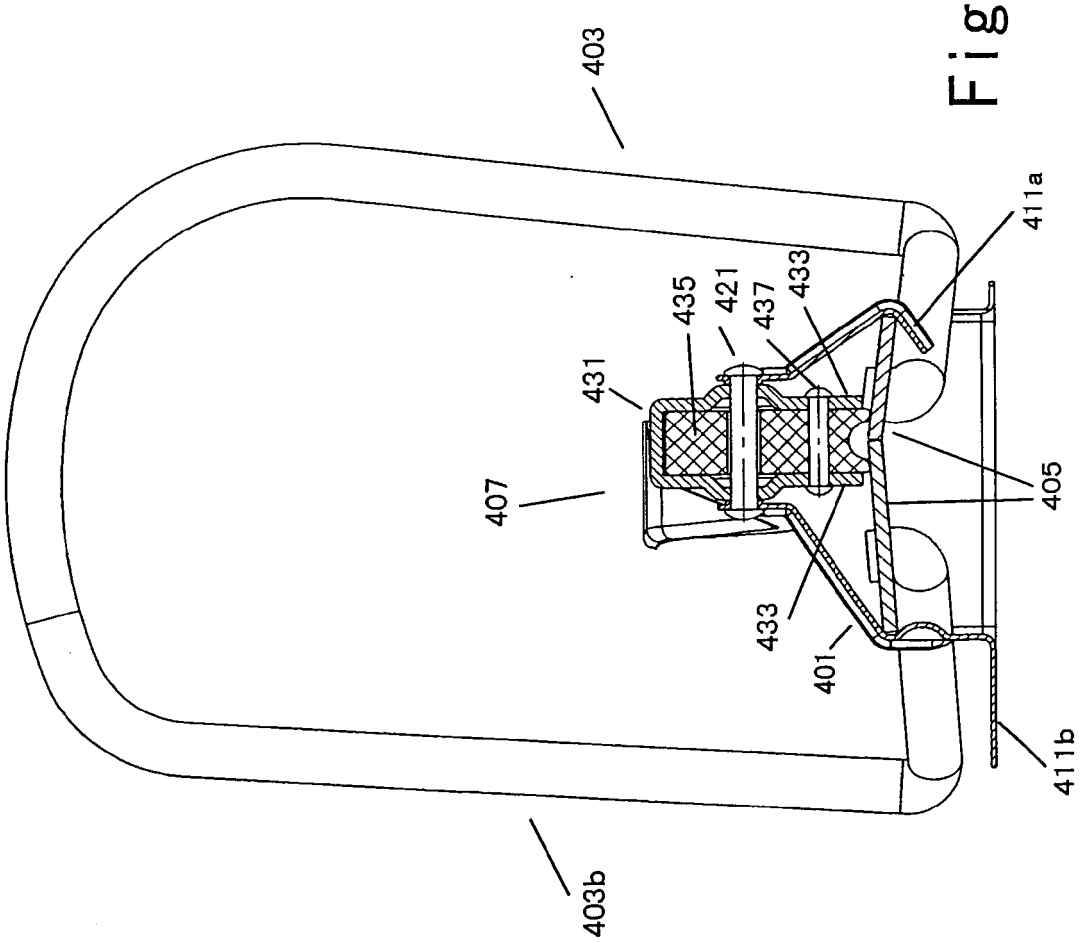


Fig. 31

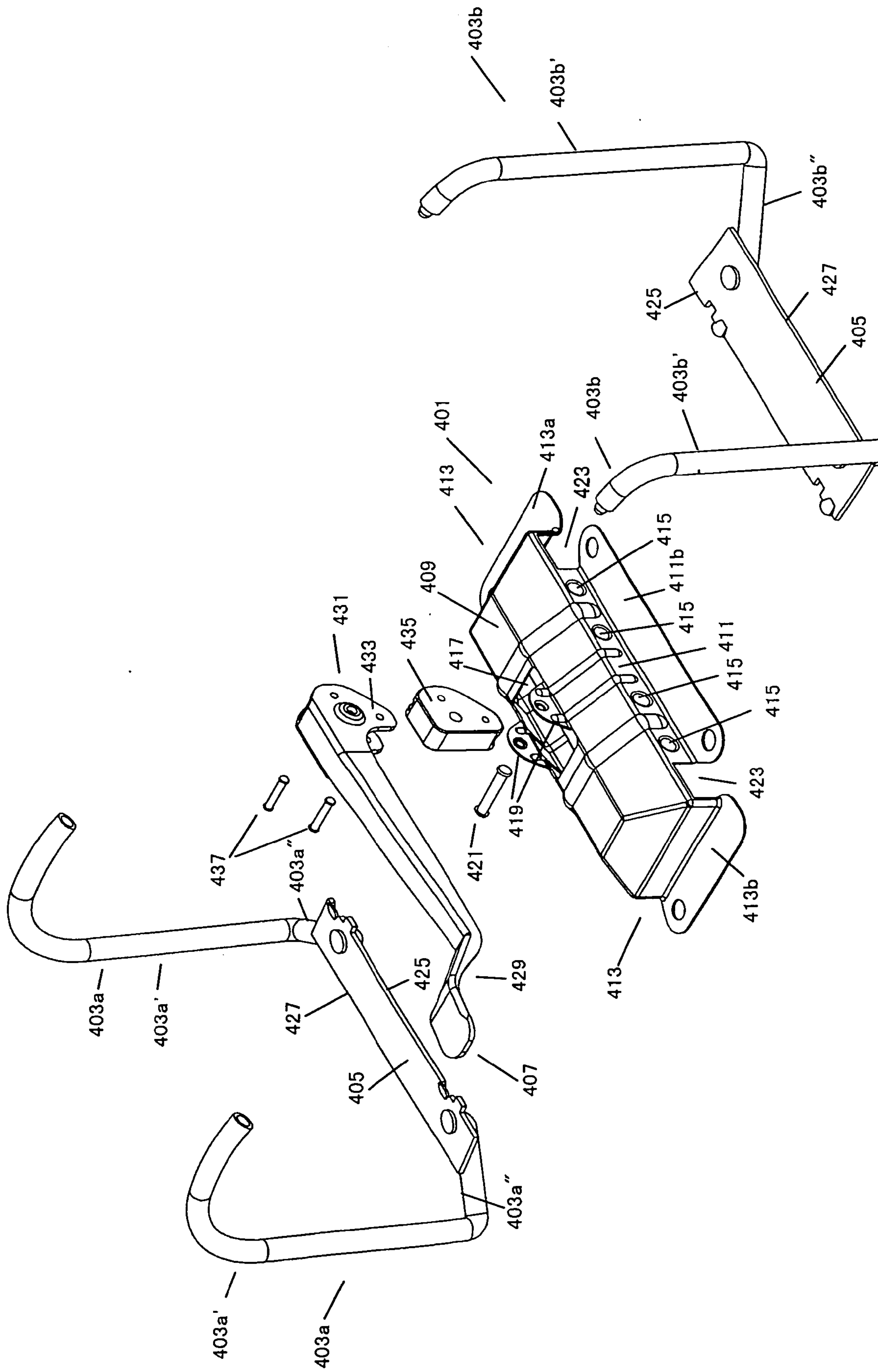

403b
403b'
403b"
425
427
405
403b
403b'
403b"
401
413a
413
423
415
411b
409
415
411
435
417
415
431
433
415
423
419
421
437
403a"
413b
413
429
403a
403a'
425
427
405
407
403a"
403a'
403a

Fig. 32

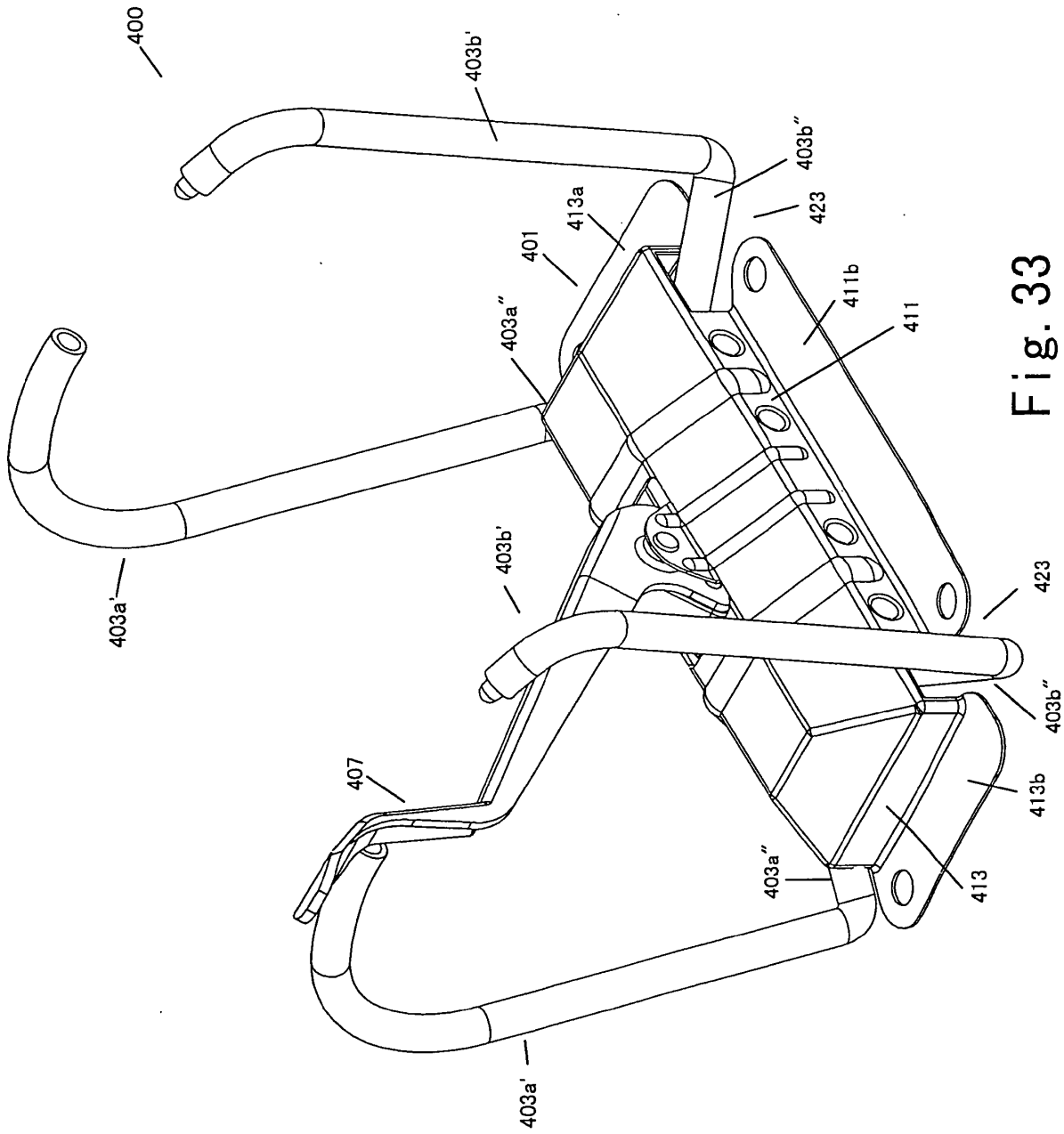

400
403b'
403b''
423
413a
401
403a''
411b
411
403a'
403b'
423
403b''
407
413b
403a''
413
403a'

Fig. 33

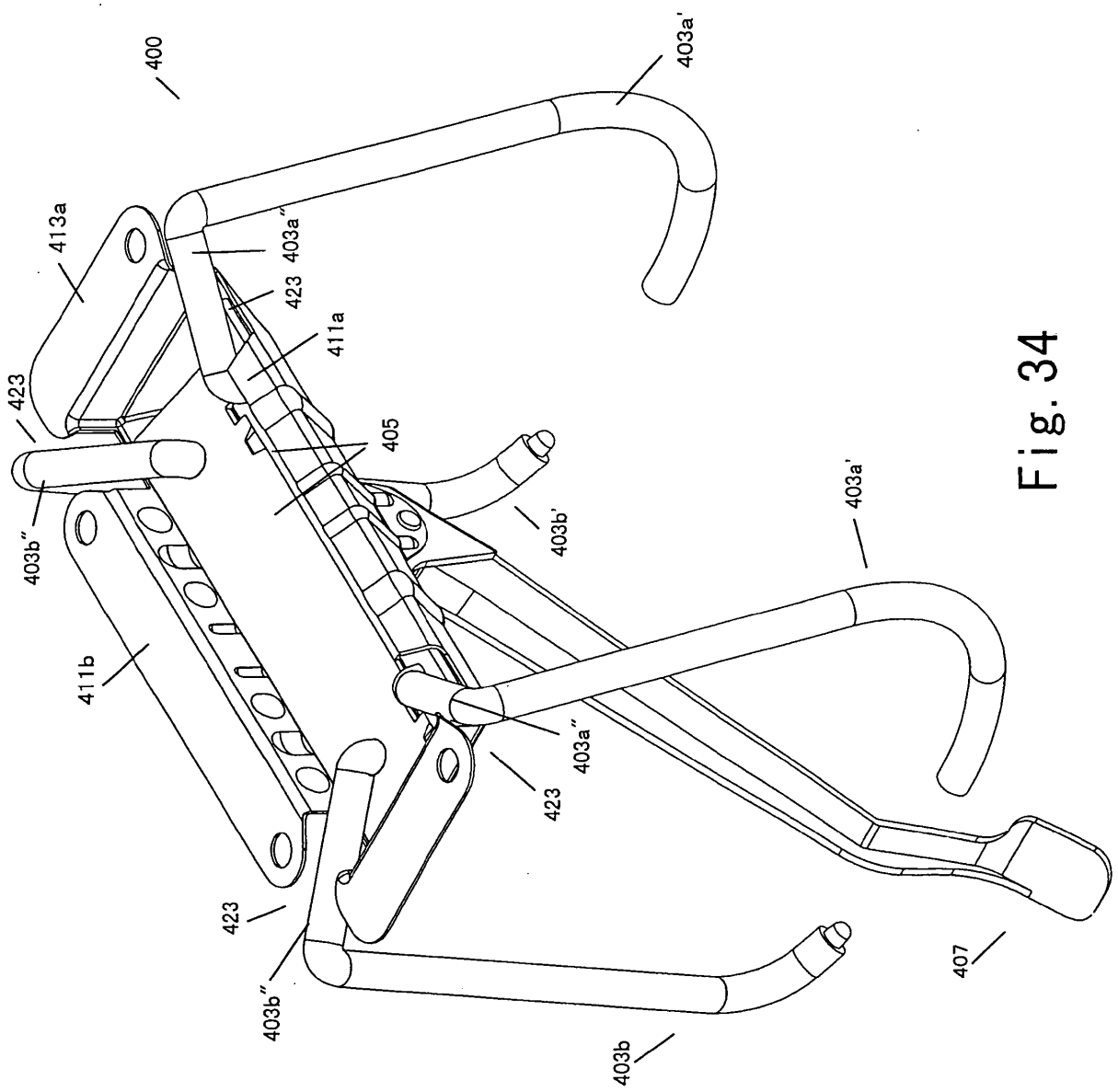

400
403a'
413a
403a"
423
411a
423
405
403b"
403b'
403a'
411b
403a"
423
423
403b"
403b
407

Fig. 34

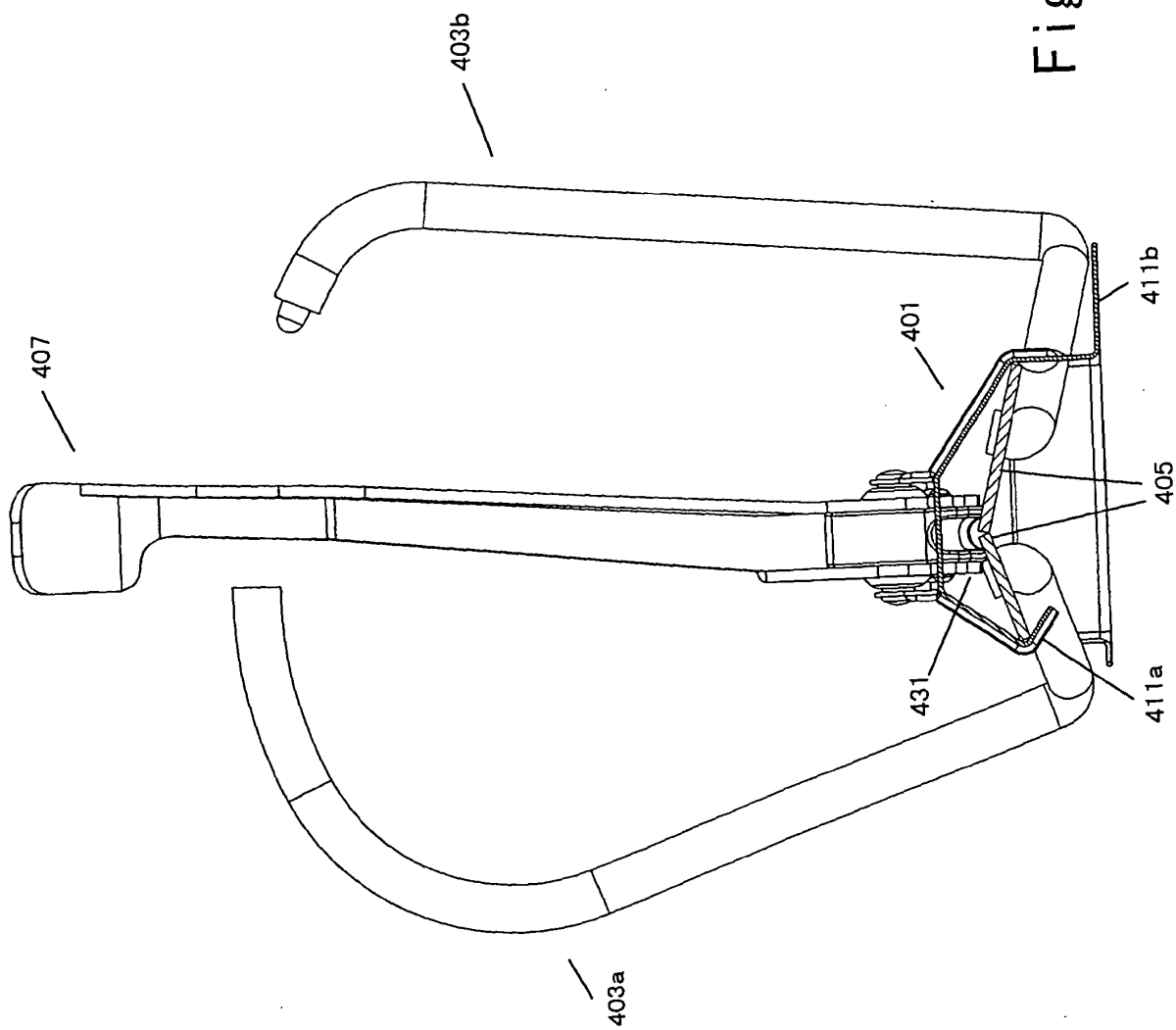


Fig. 35

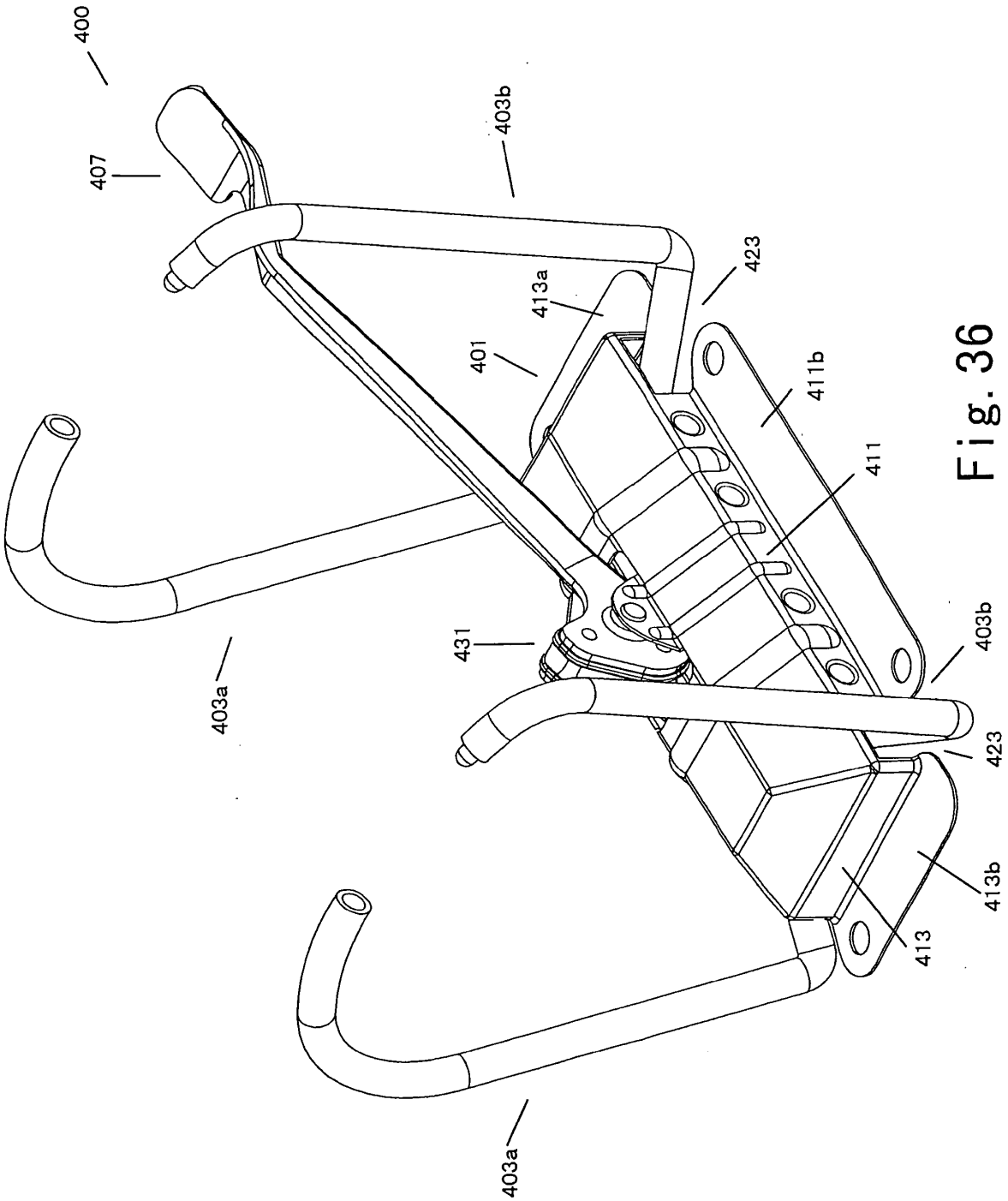

400
407
403b
423
413a
401
411b
411
403b
431
403a
423
413b
413
403a

Fig. 36

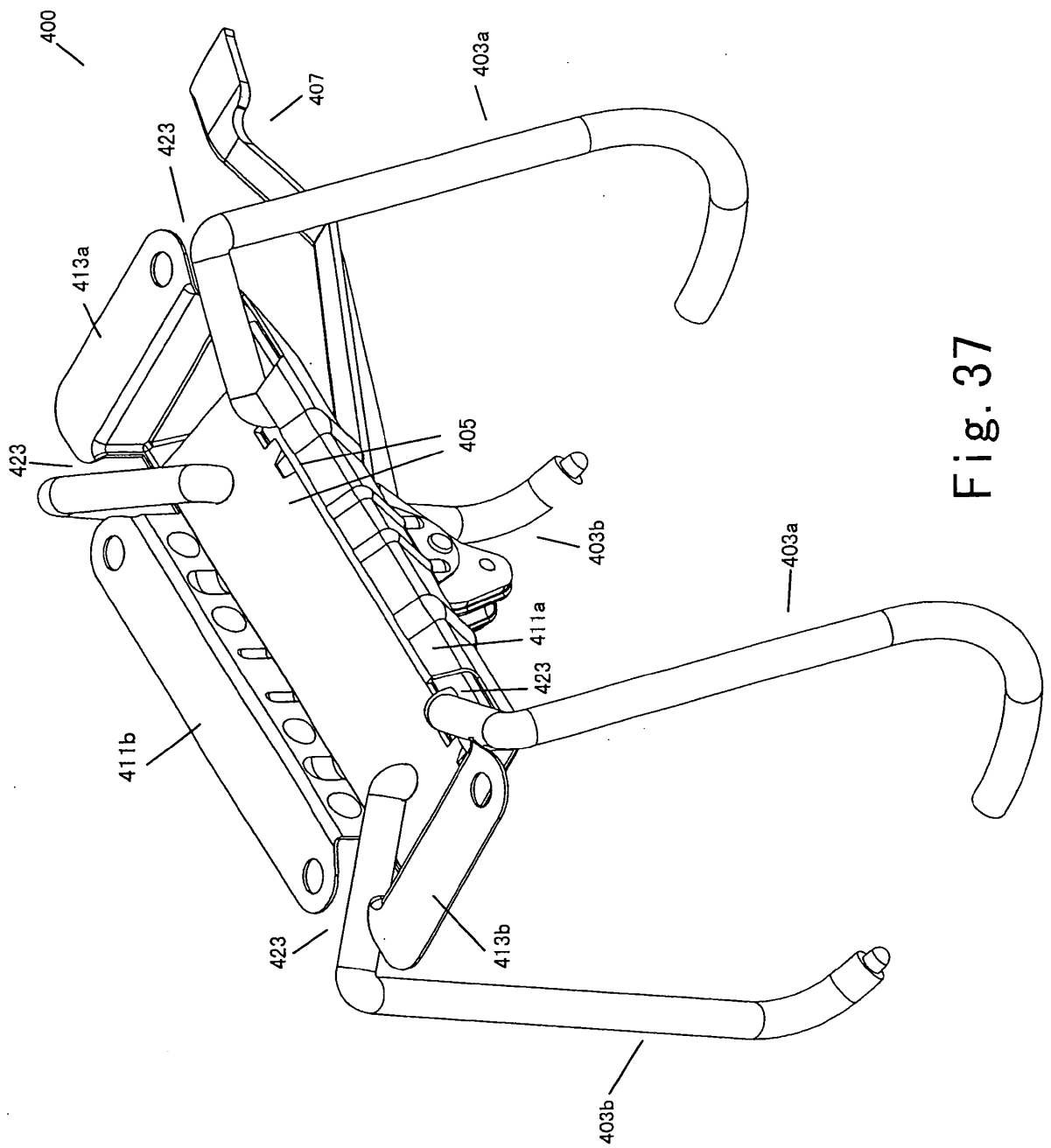

400
407
403a
423
413a
423
405
403b
403a
411a
423
411b
423
413b
403b

Fig. 37

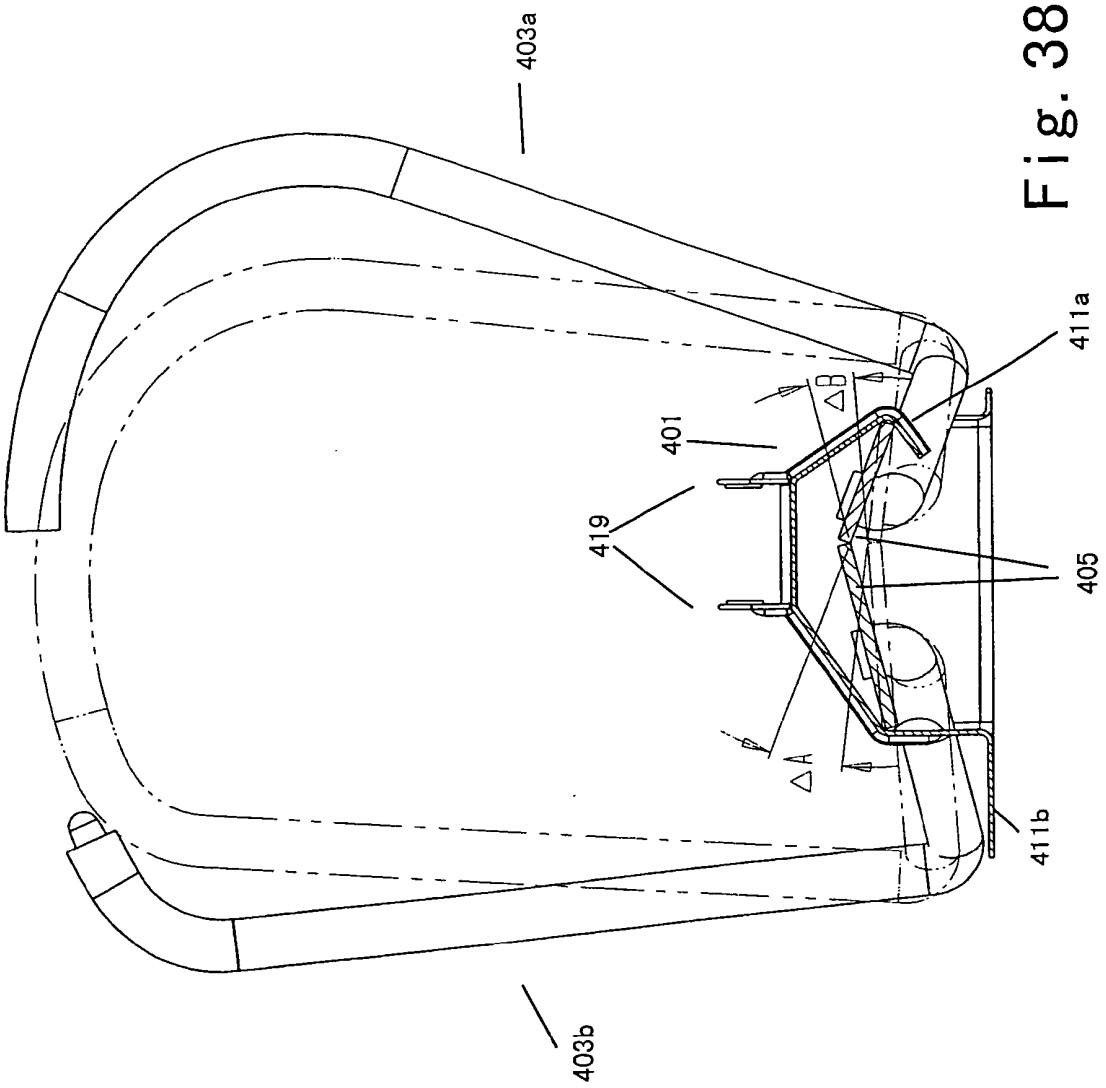


Fig. 38

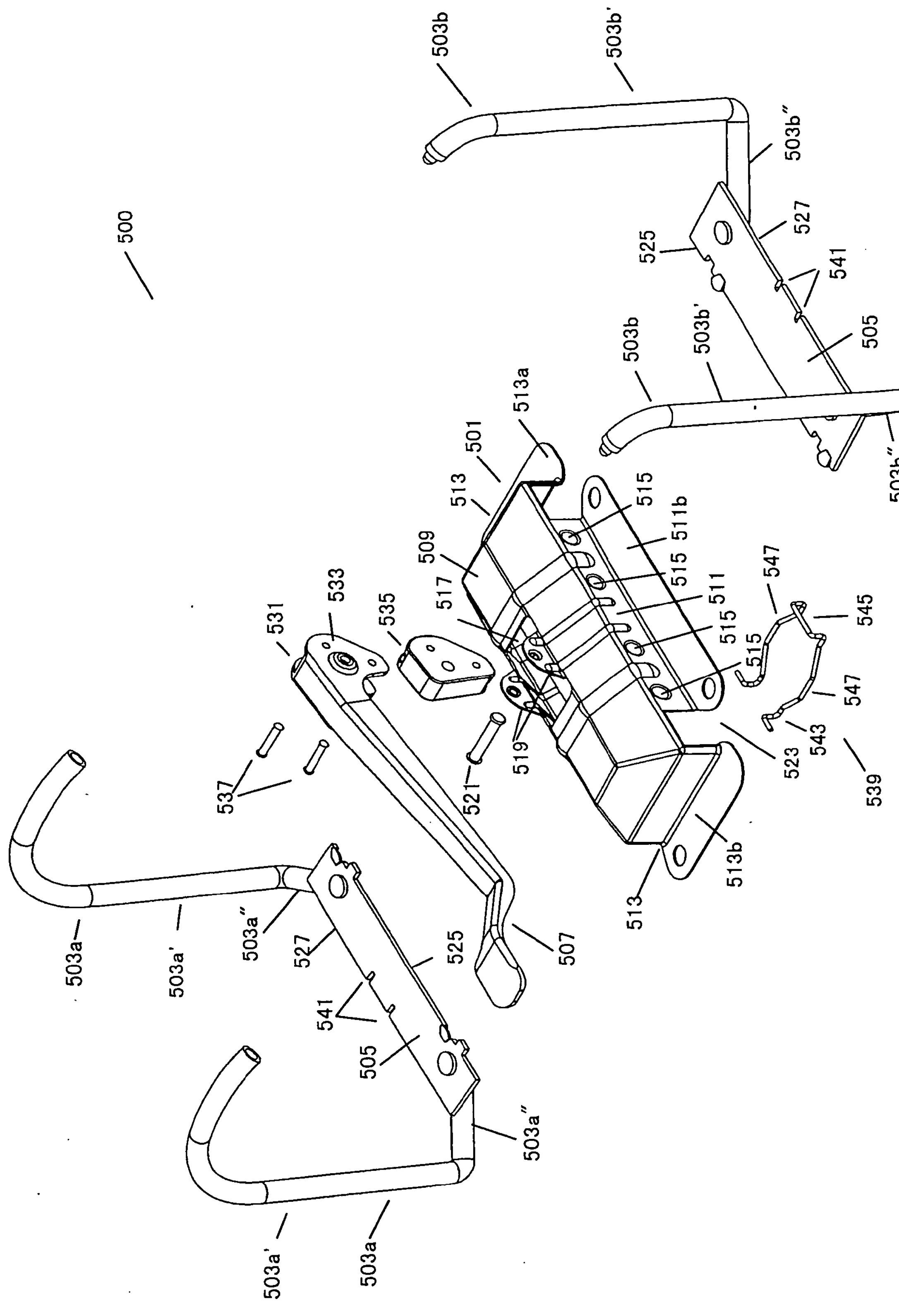

500
501
503a
503a'
503a"
503b
503b'
503b"
505
507
509
511
511b
513
513a
513b
515
517
519
521
523
525
527
531
533
535
537
539
541
543
545
547

Fig. 39

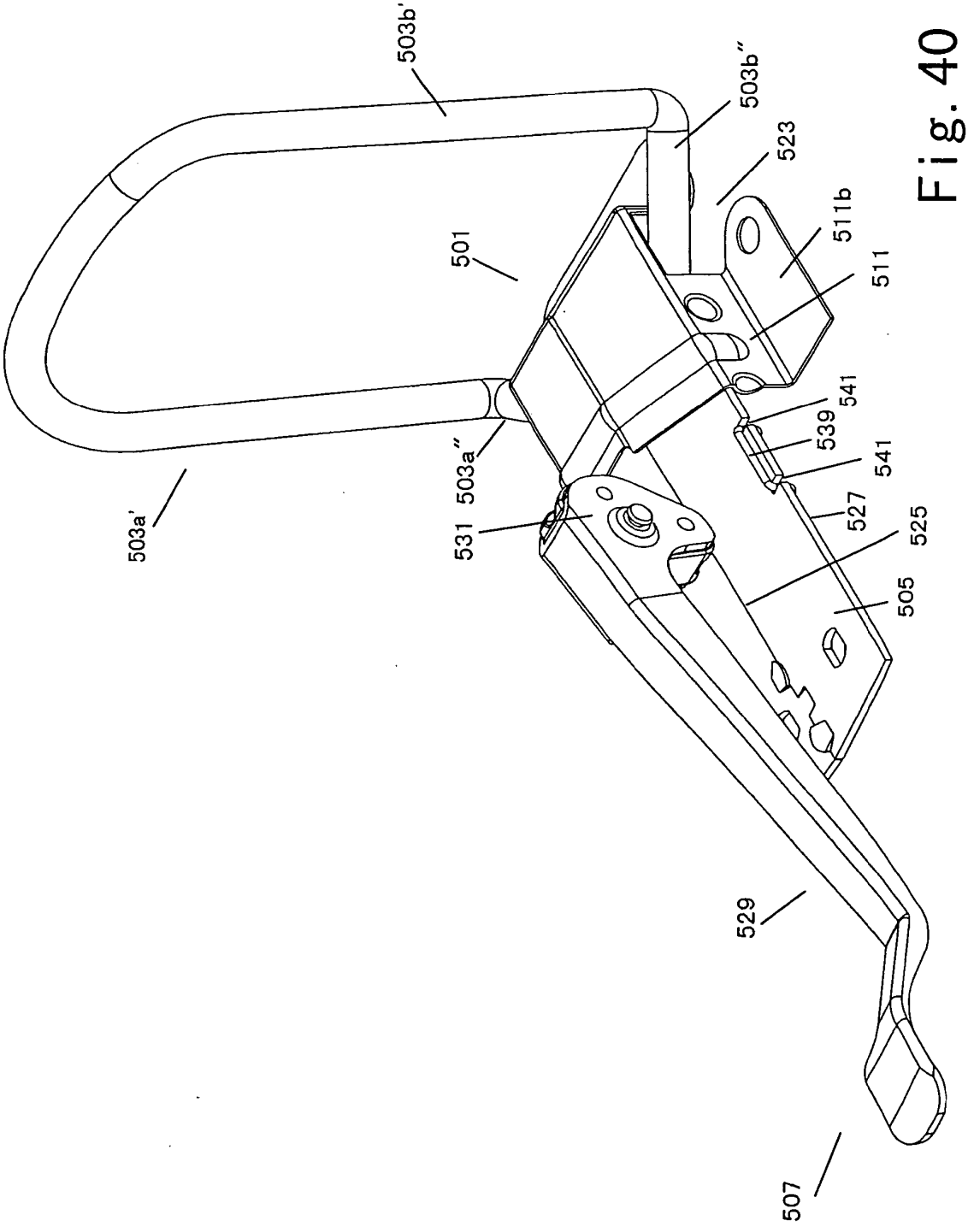

503b'
503b''
523
511b
511
501
541
539
541
503a''
503a'
531
527
525
505
529
507

Fig. 40

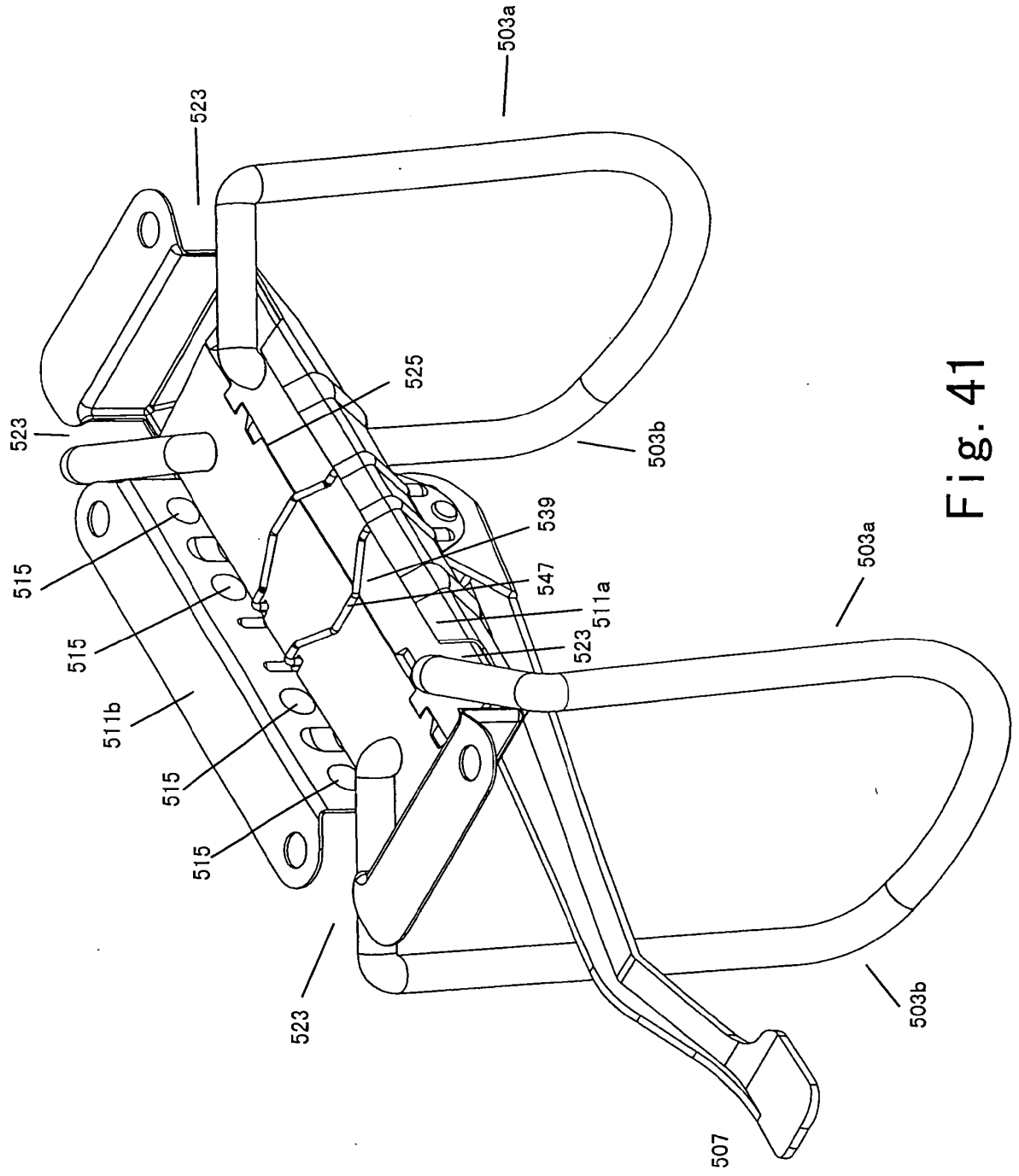

503a
523
525
523
503b
539
515
547
511a
503a
523
515
511b
515
515
523
503b
507

Fig. 41

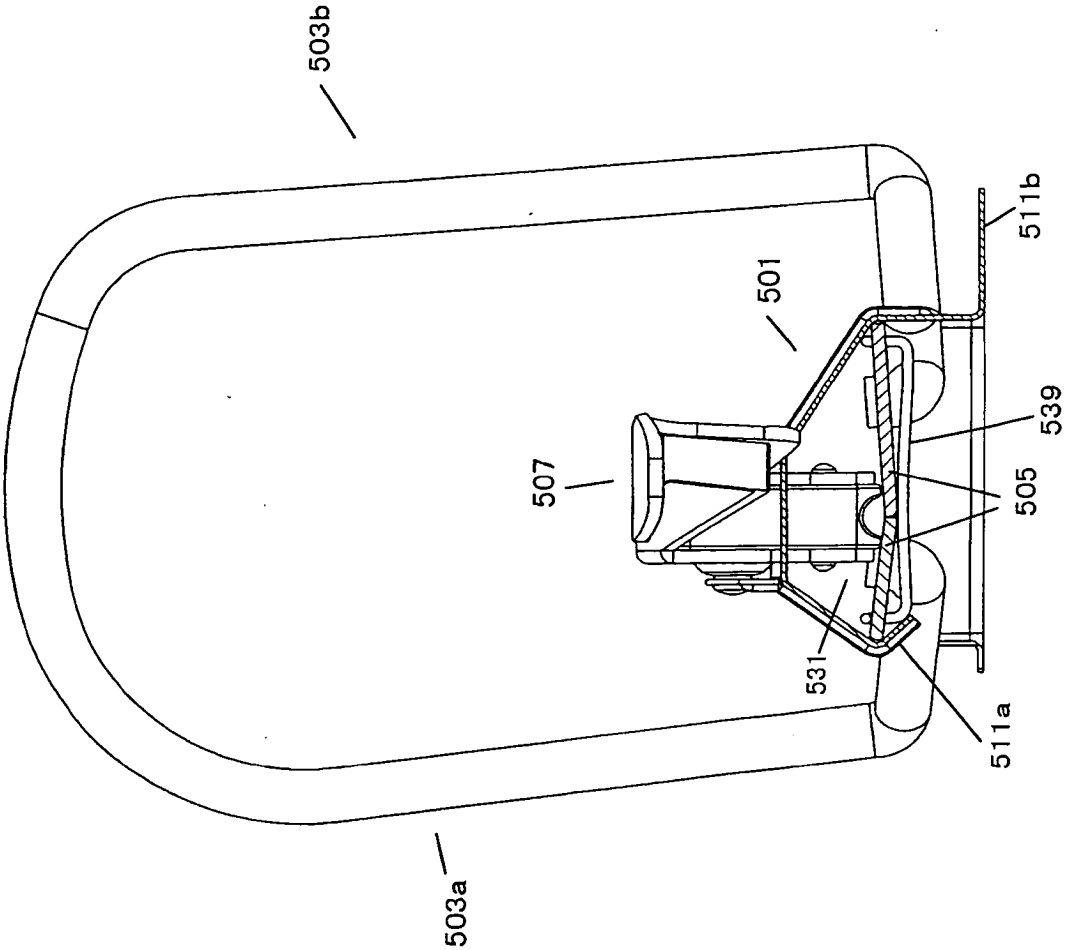


Fig. 42

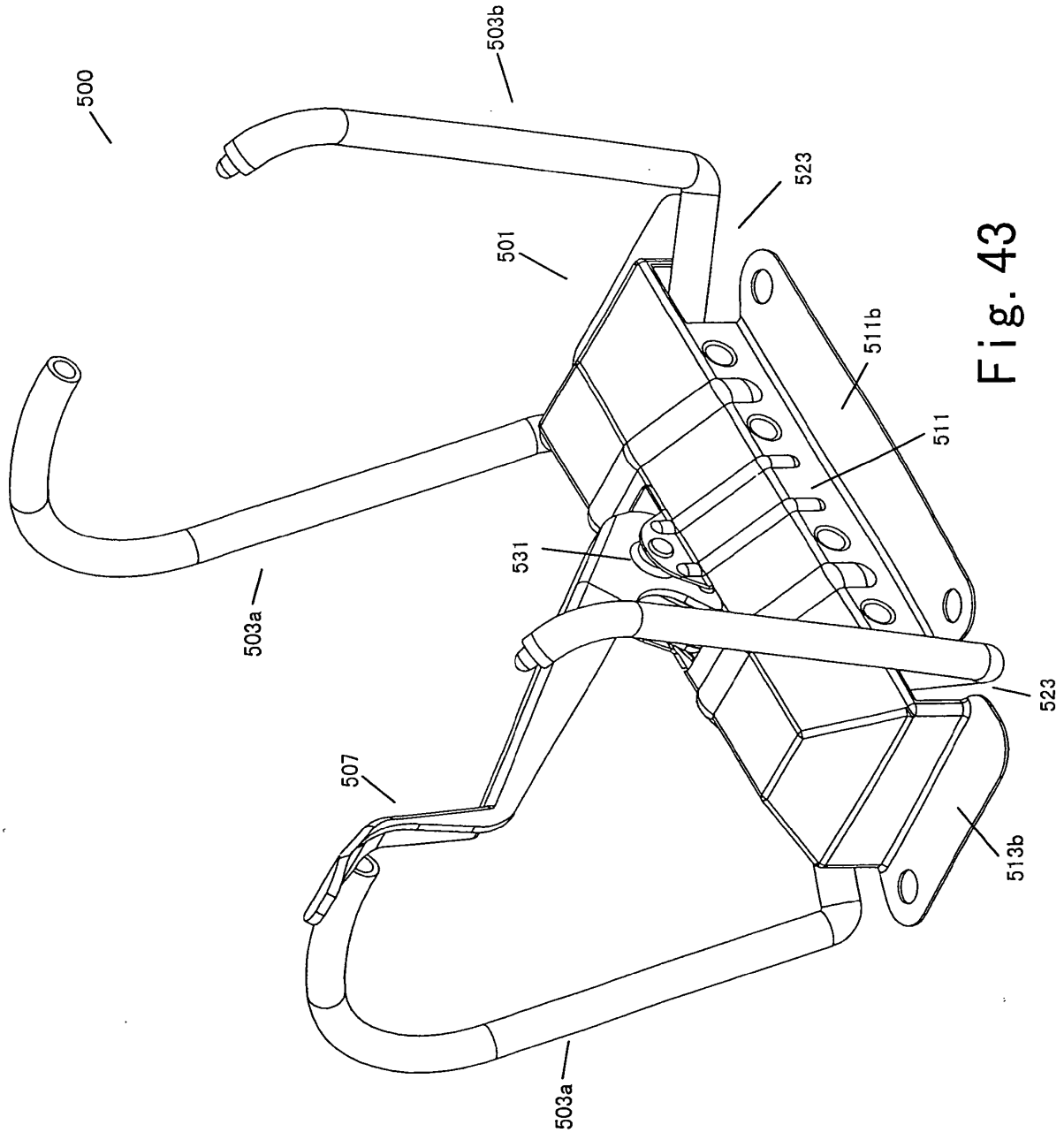


Fig. 43

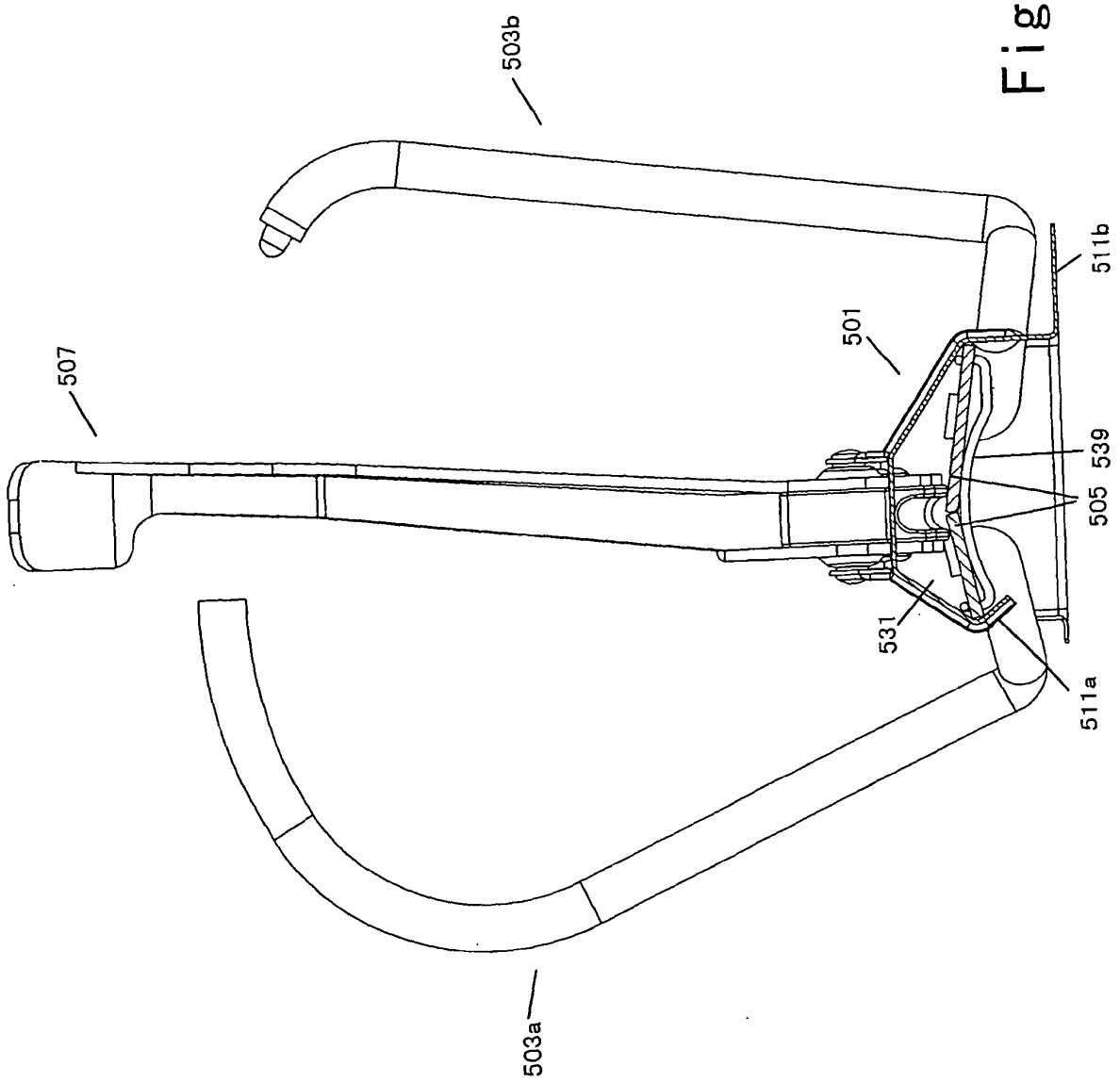


Fig. 44

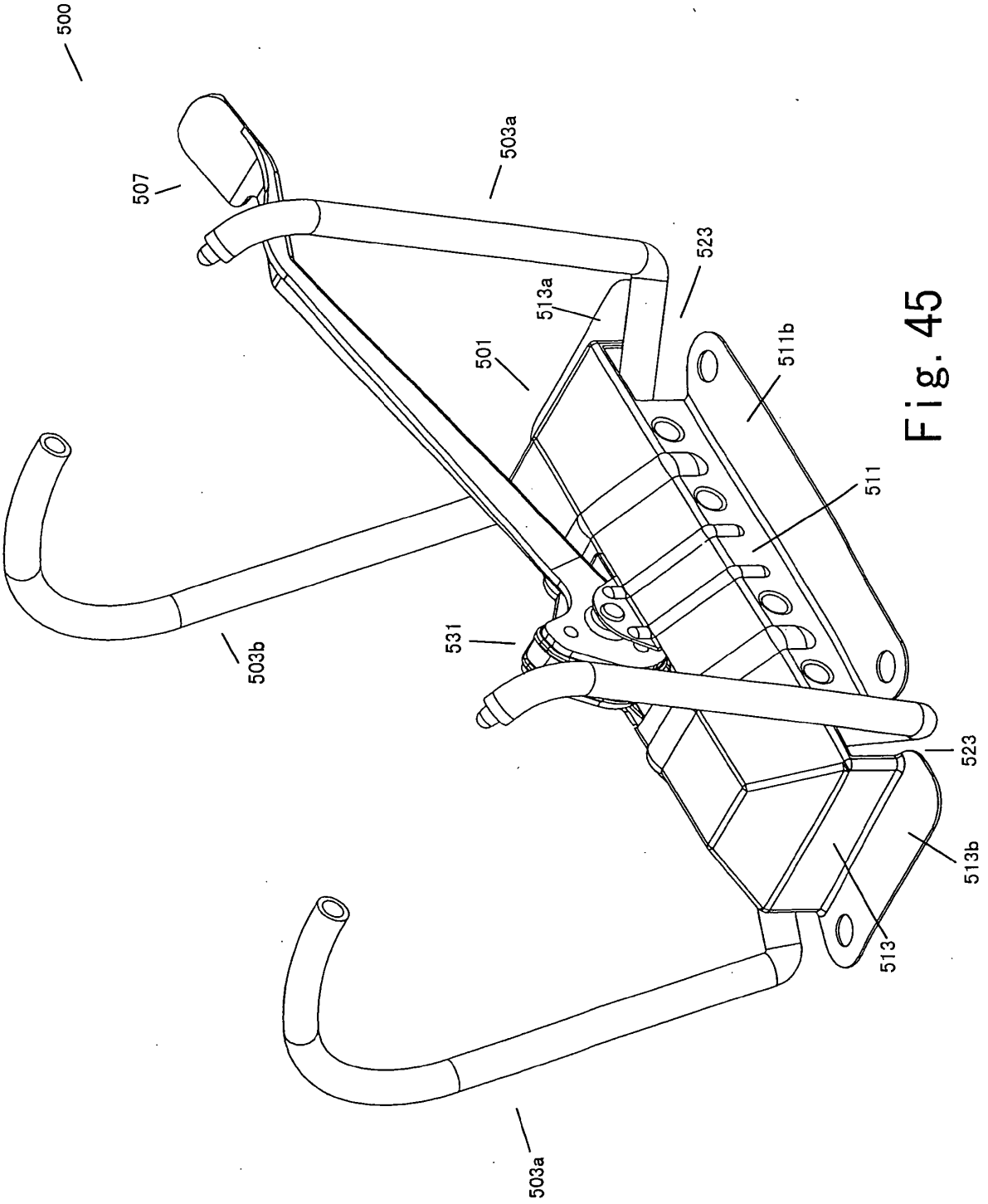


Fig. 45

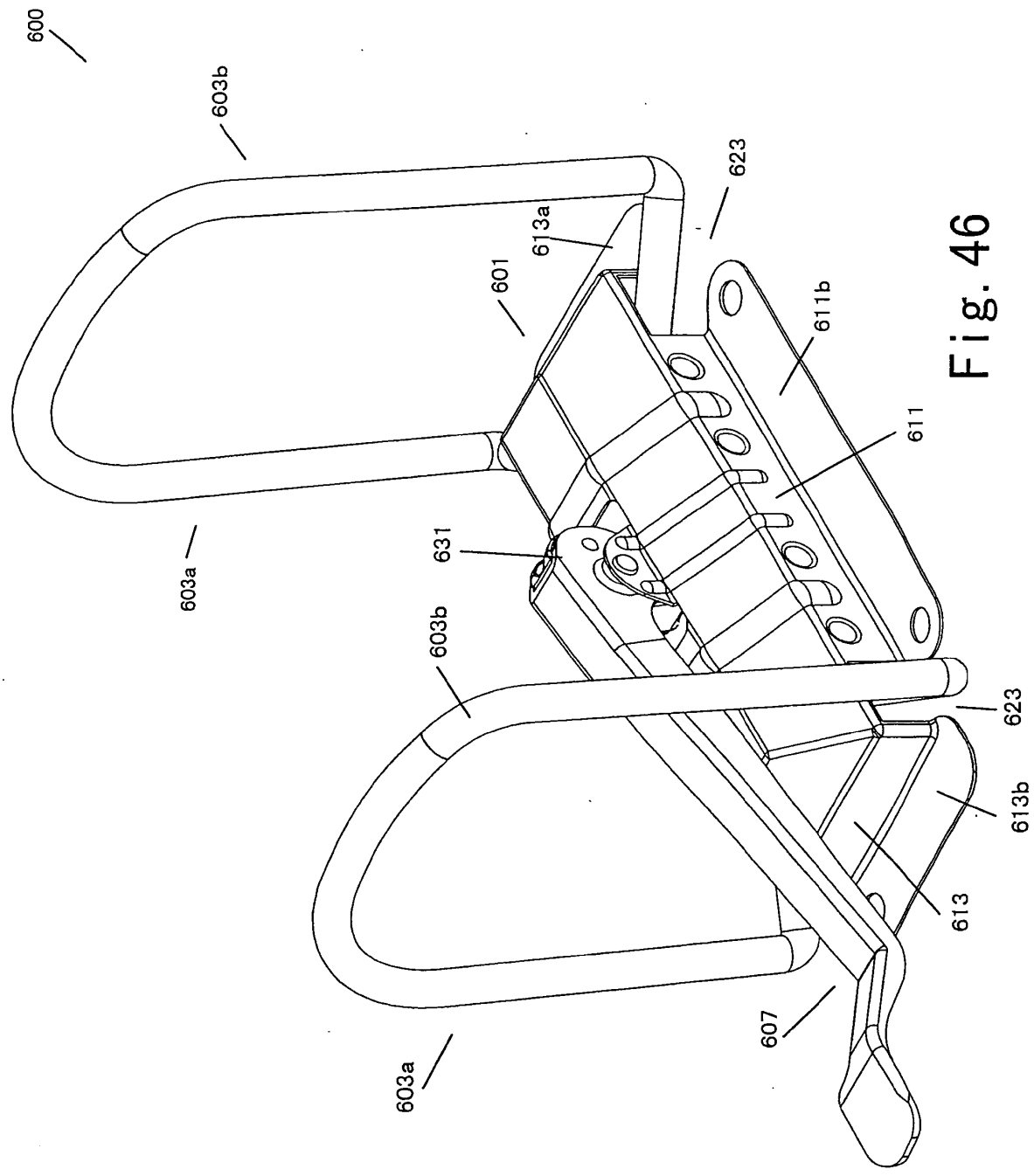

600
603b
623
613a
601
611b
611
631
603a
603b
623
613b
613
607
603a

Fig. 46

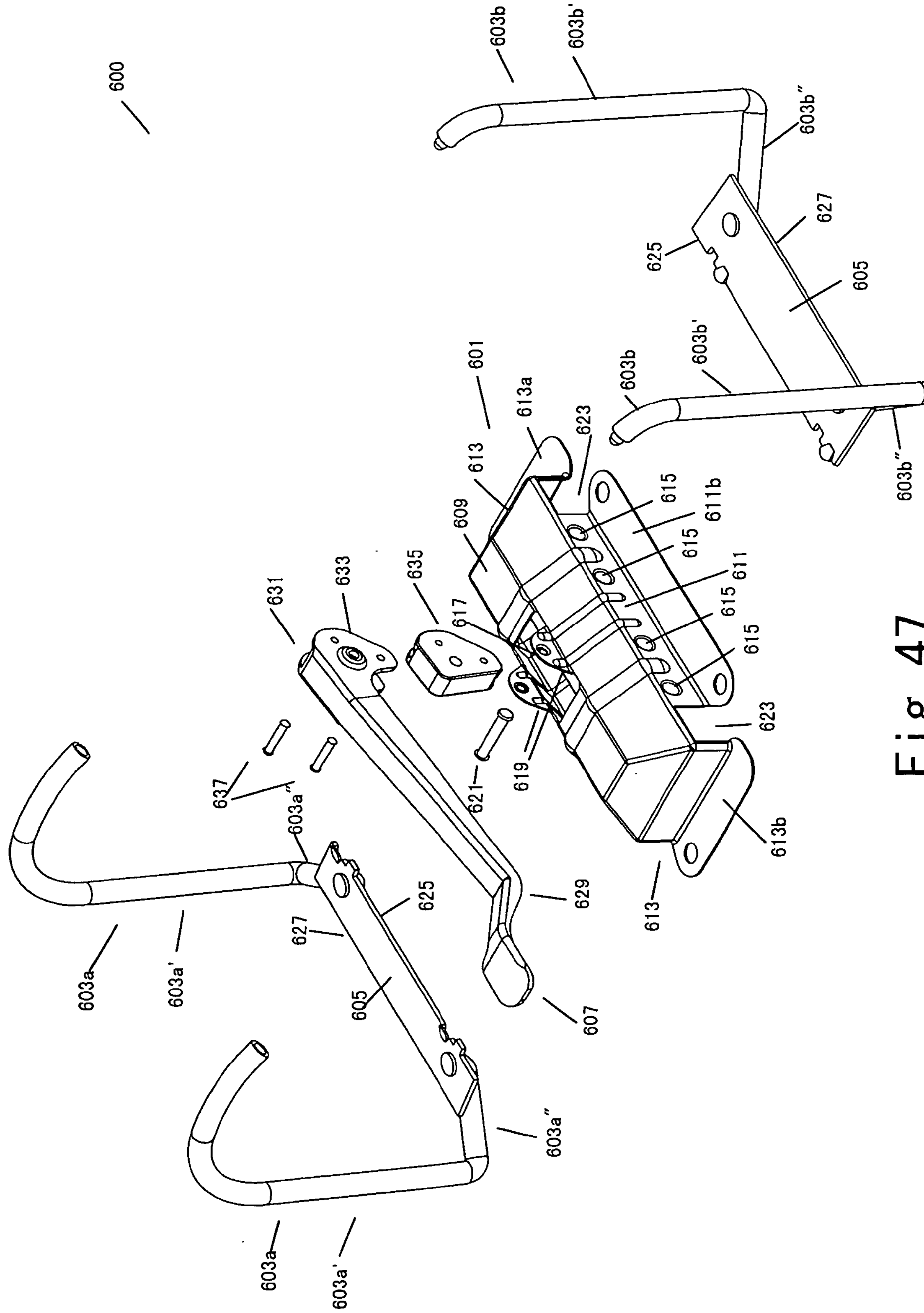

600
603b
603b'
603b"
627
625
605
601
613a
613
623
609
615
611b
611
635
633
631
617
619
621
637
603a"
629
613b
625
627
605
603a
603a'
607
603a"
603a
603a'

Fig. 47

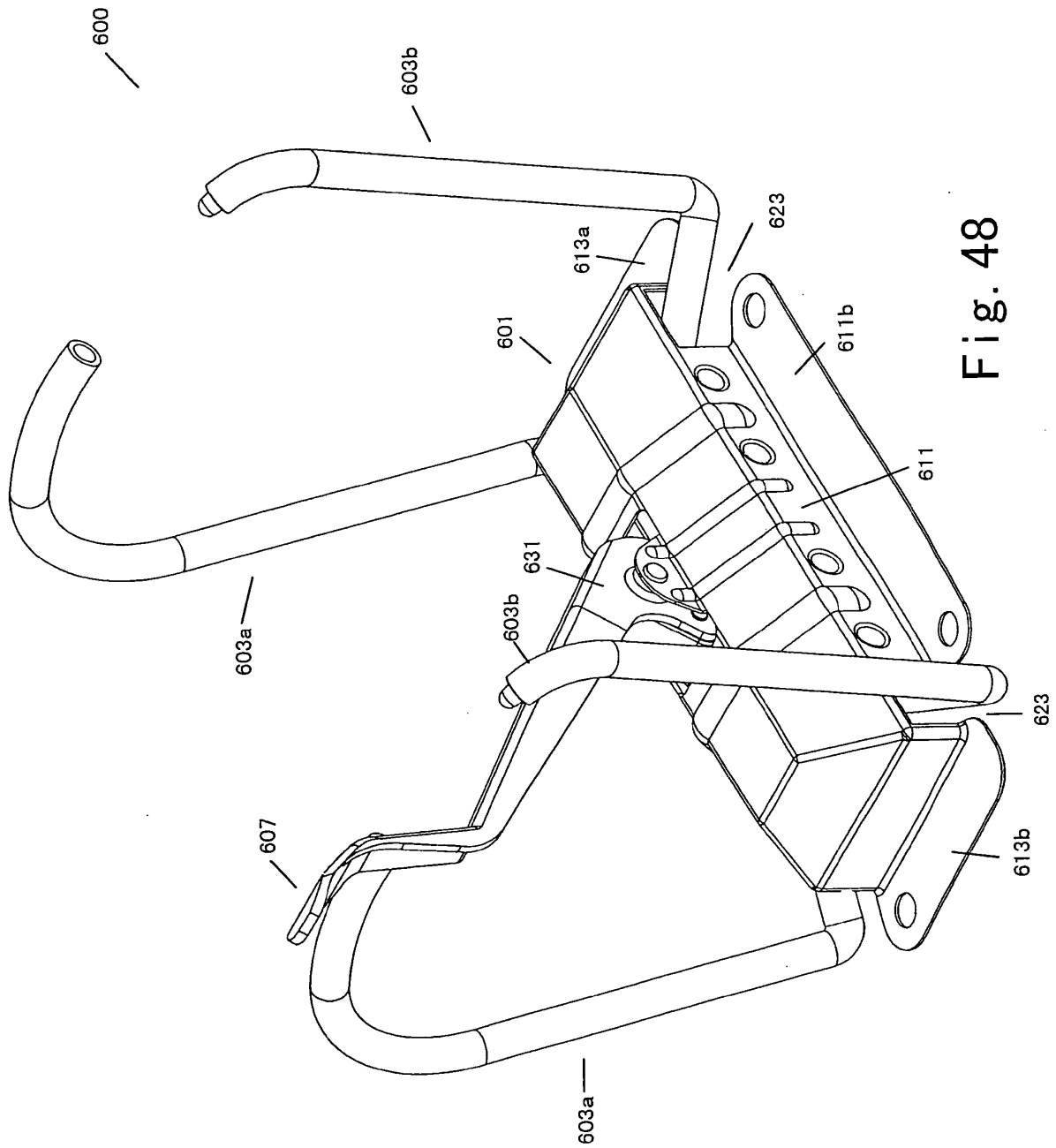
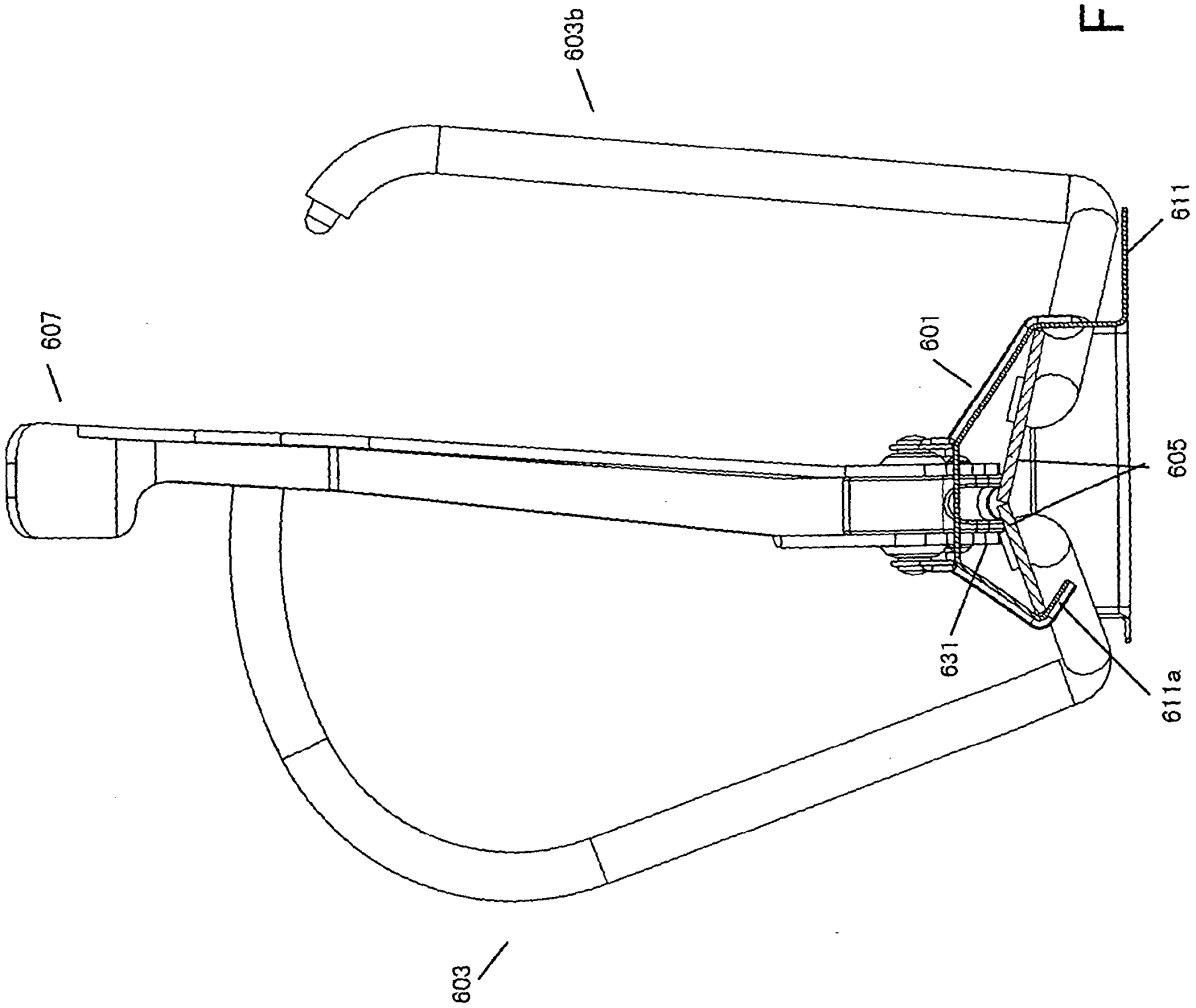


Fig. 48

Fig. 49



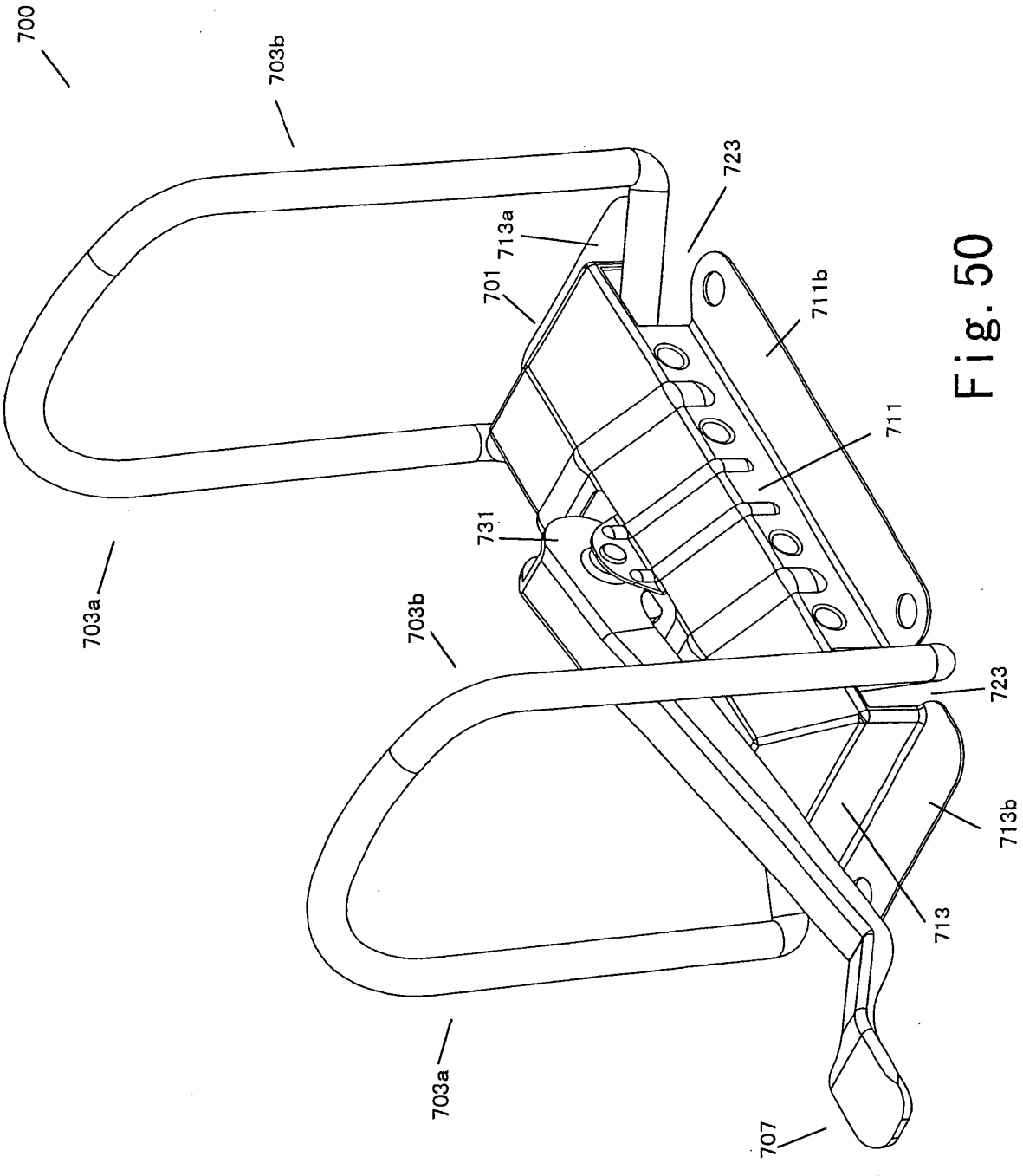

700
703b
723
713a
701
711b
711
731
703a
703b
723
713b
713
703a
707

Fig. 50

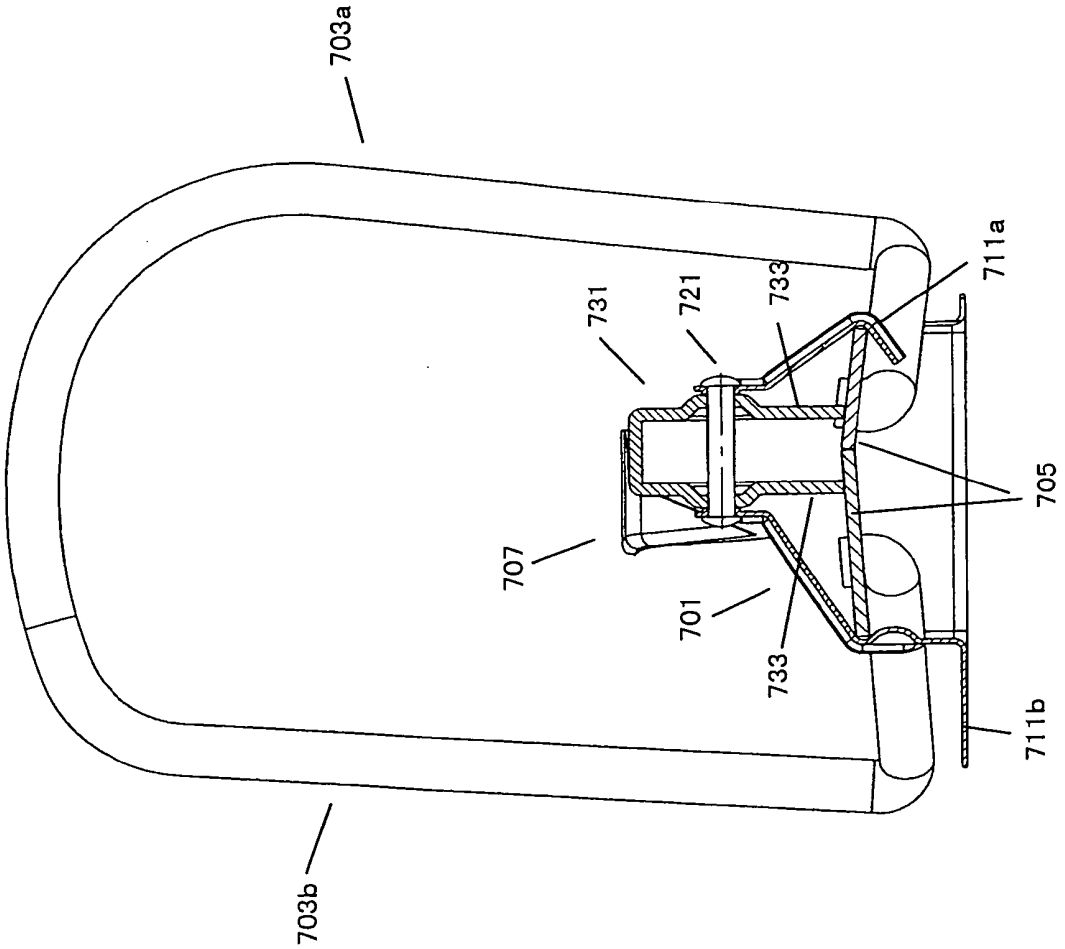


Fig. 51

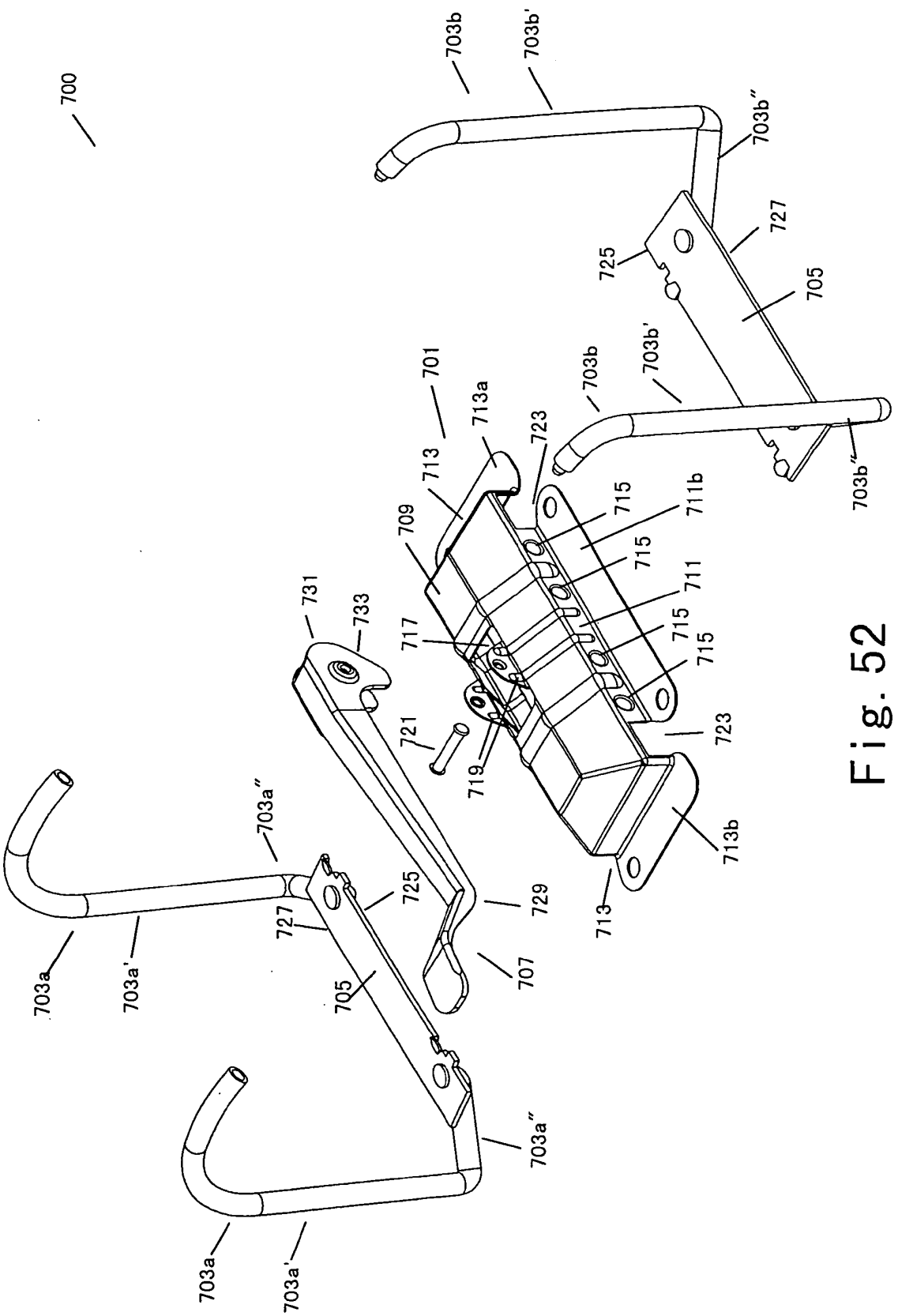

700
703b
703b'
703b"
727
725
705
701
703b'
703b
713a
723
713
709
715
711b
715
711
715
715
731
733
717
721
719
723
713b
713
703a"
725
727
729
707
705
703a
703a'
703a"
703a
703a'

Fig. 52

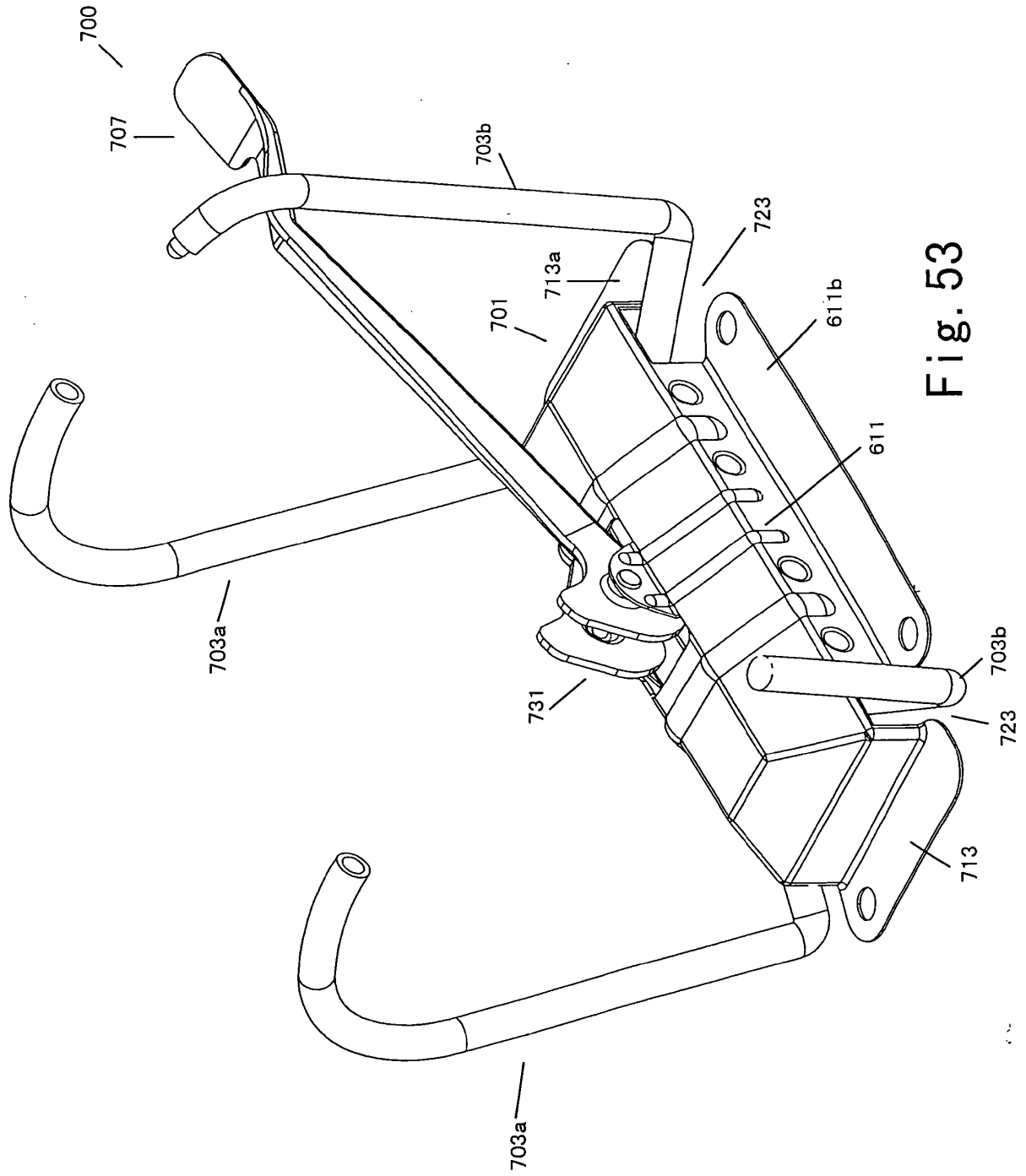


Fig. 53

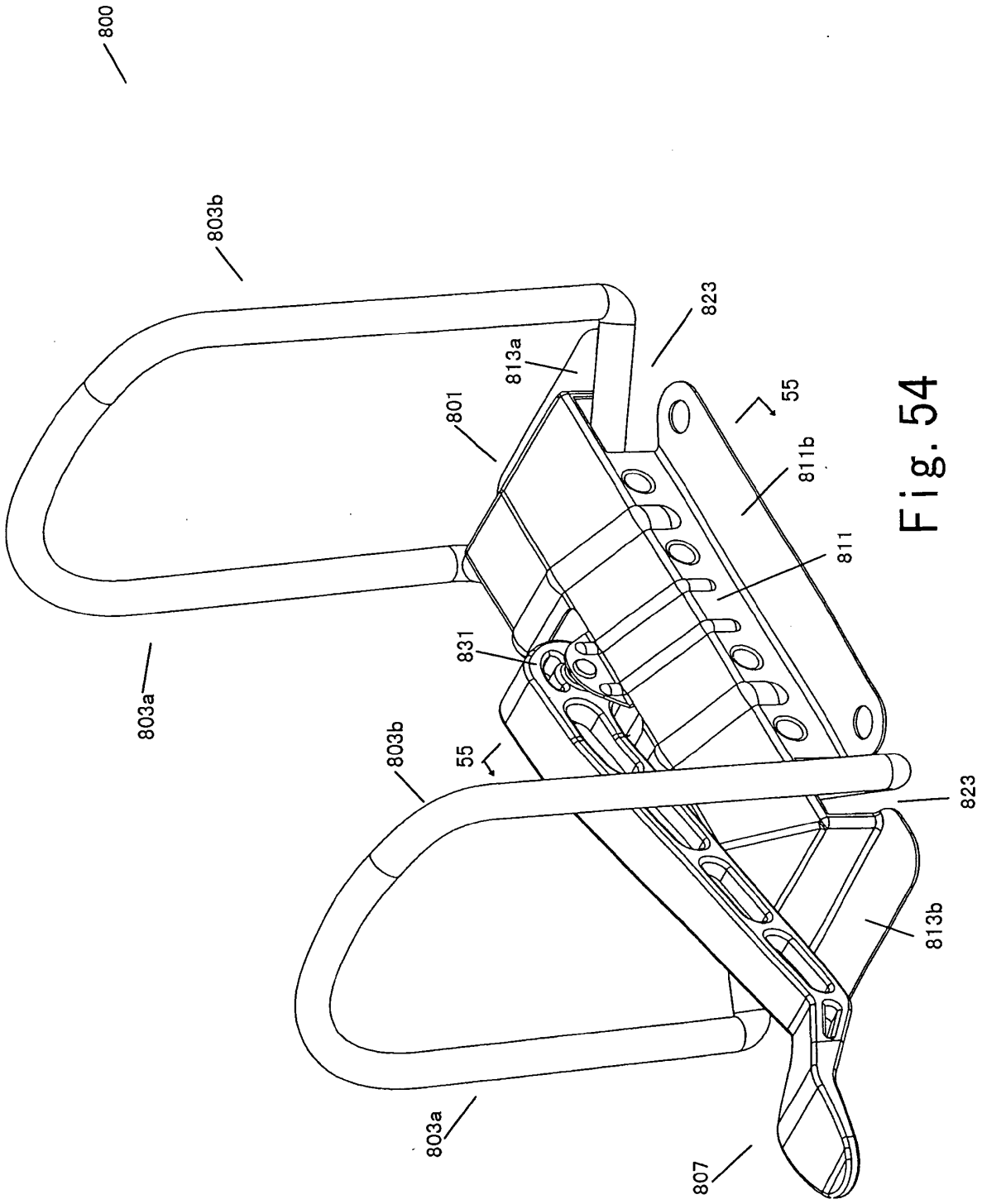

800
803b
823
813a
801
55
811b
811
831
803a
803b
55
823
813b
803a
807

Fig. 54

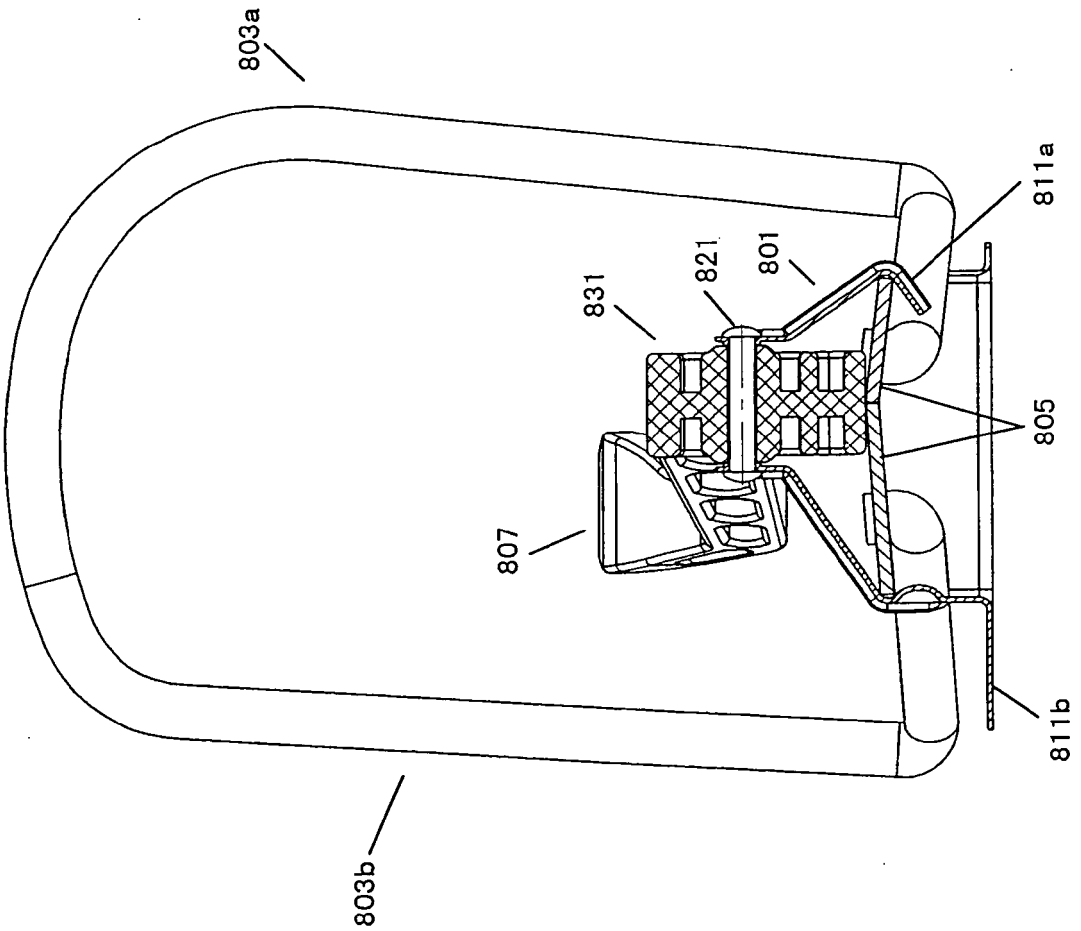


Fig. 55

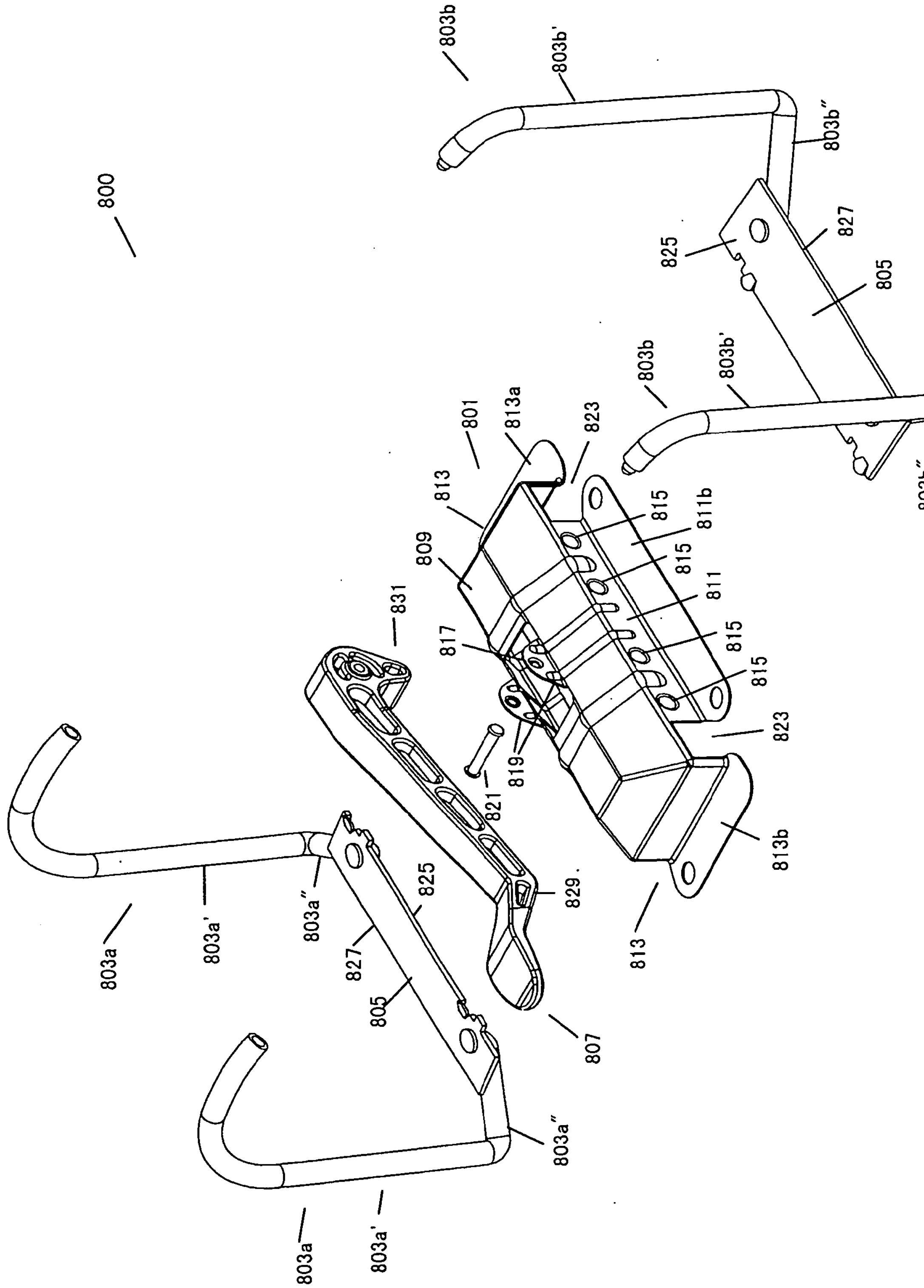

800
803b
803b'
803b"
825
827
805
803b
803b'
803b"
801
813a
823
813
809
815
811b
815
811
815
815
831
817
819
821
823
813b
803a
803a'
803a"
825
827
805
829
807
813
803a"
803a
803a'

Fig. 56

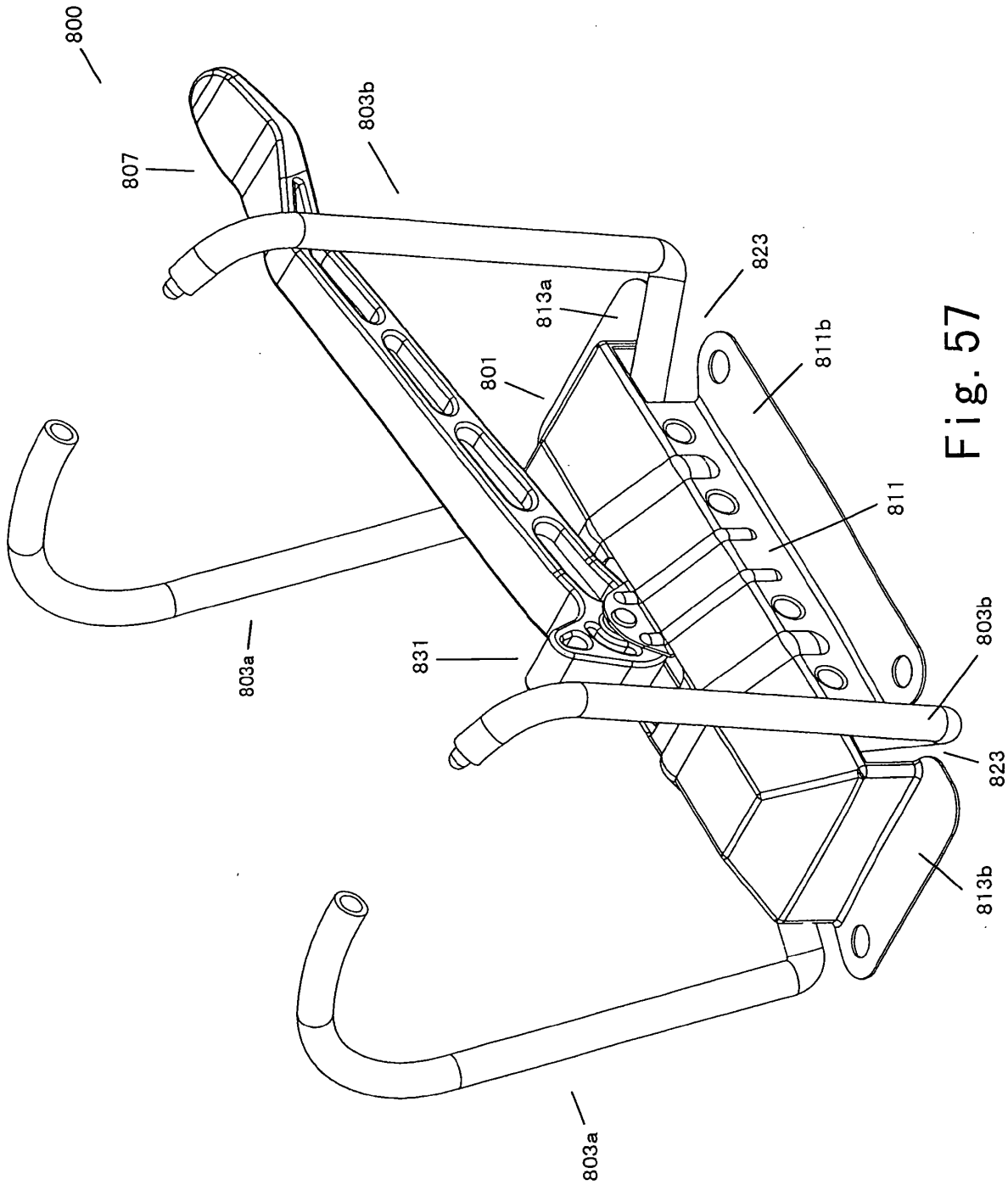


Fig. 57

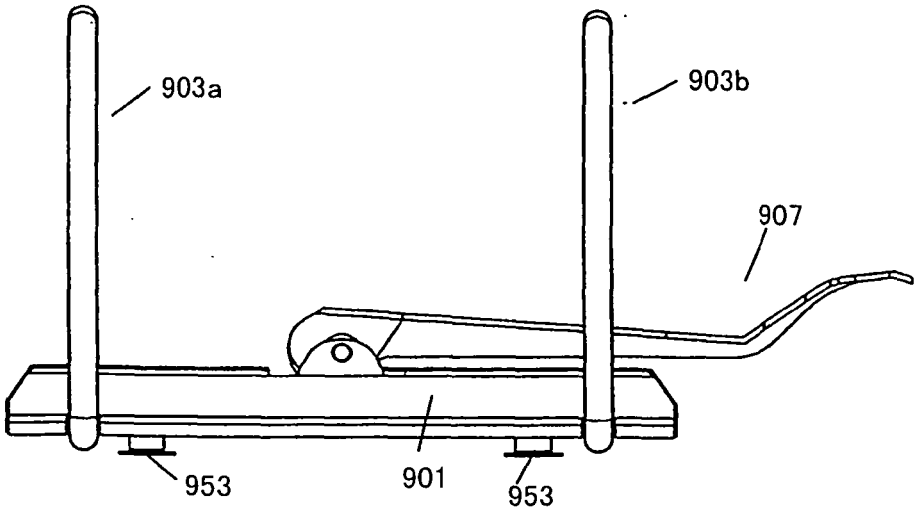


Fig. 58

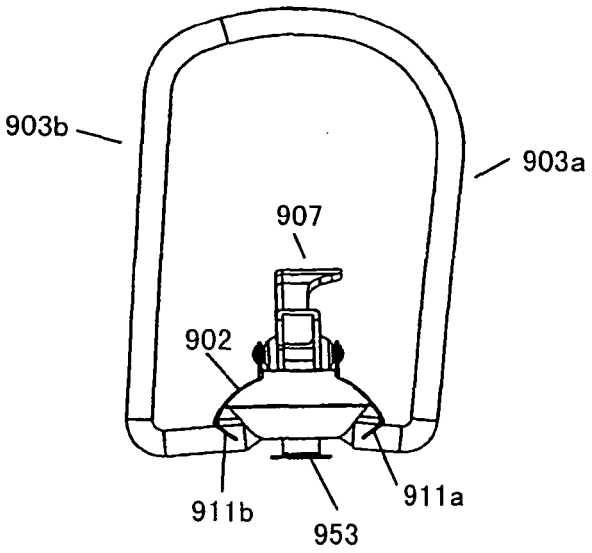


Fig. 59

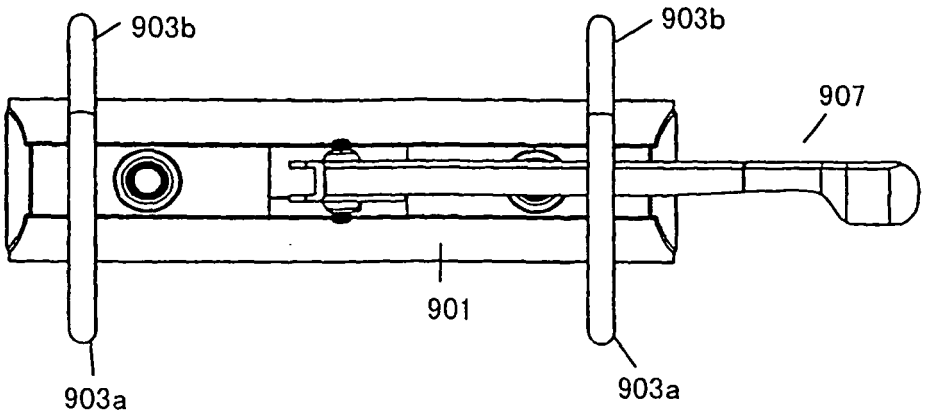


Fig. 60

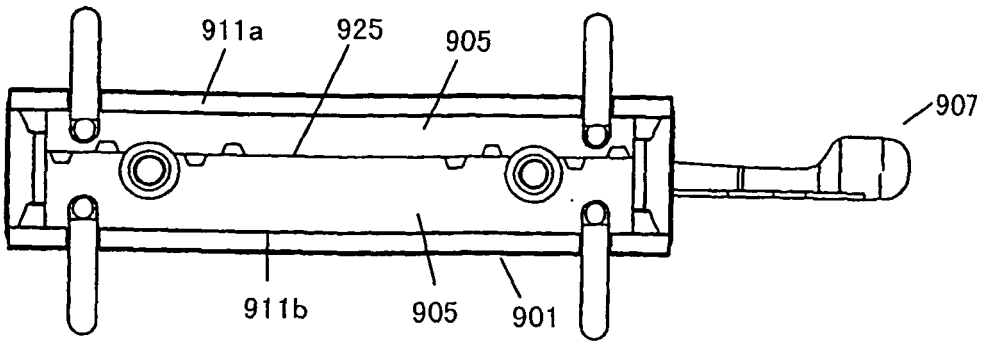


Fig. 61

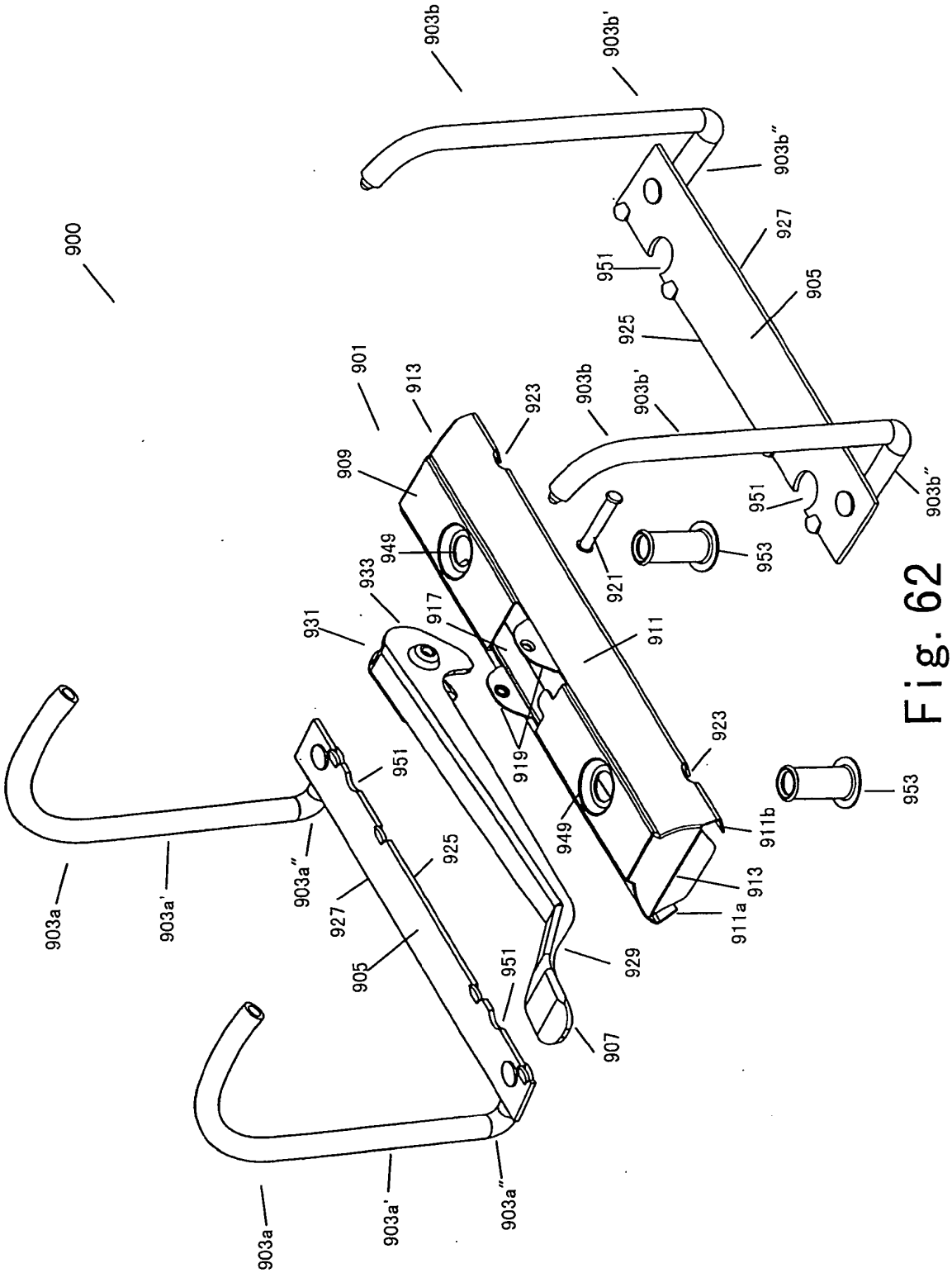

900
901
903a
903a'
903a''
903b
903b'
903b''
905
907
909
911
911a
911b
913
917
919
921
923
925
927
929
931
933
949
951
953

Fig. 62

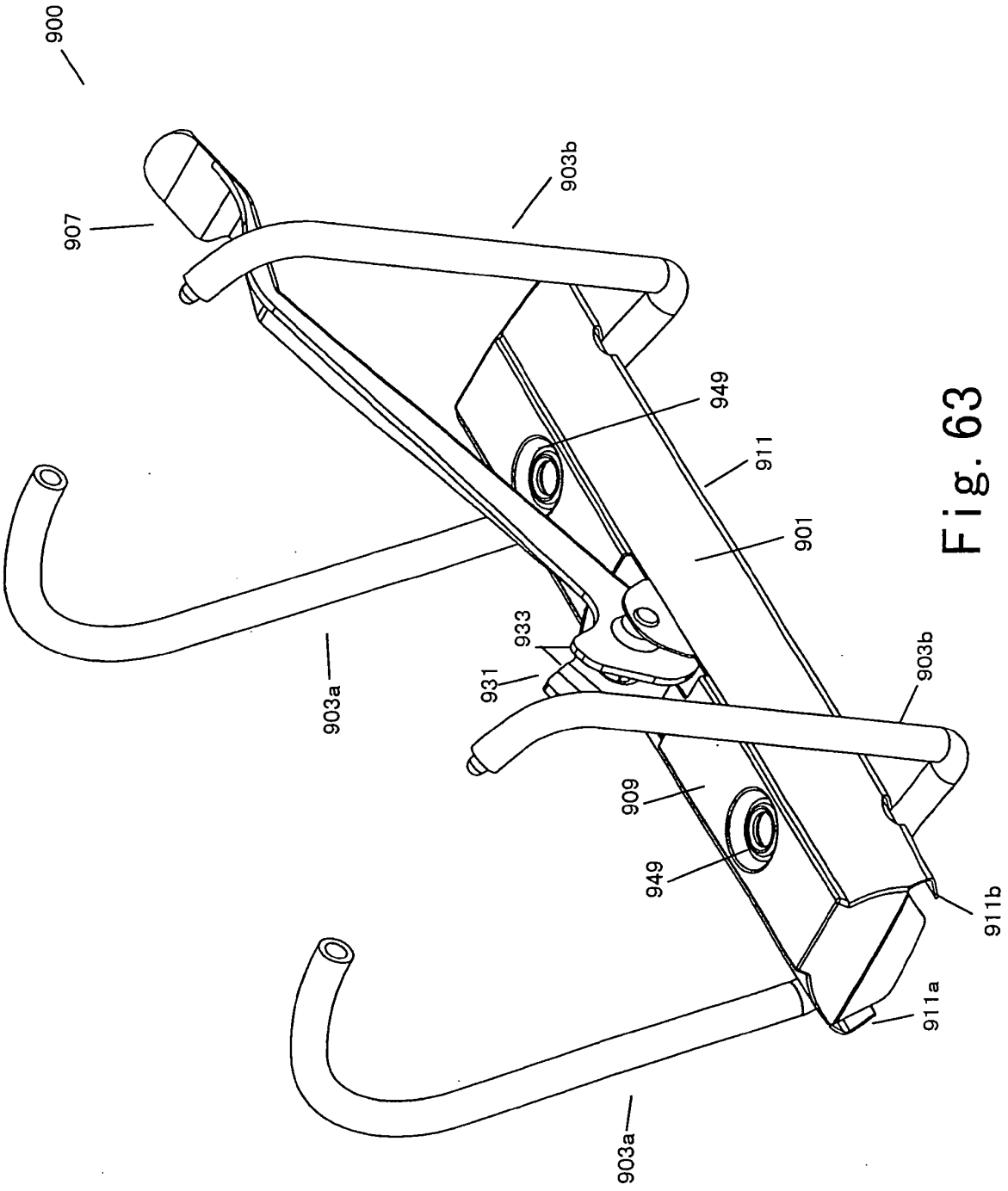

900
907
903b
949
911
901
933
931
903a
903b
909
949
911b
911a
903a

Fig. 63

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 200510055025 **[0002] [0086]**